DISSERTATION REPORT

ON

‘INFECTION CONTROL IN HOSPITALS’

BACHLERS OF ARCHITECTURE

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Certificate

This is to certify that the dissertation entitled ‘INFECTION CONTROL IN HOSPITALS’ is a bonafide record of independent work done by abhinav bhardwaj under my supervision and thereafter submitted to the school of architecture ,galgotias university,greater noida.

Recommended by-

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submitted to-

School of architecture

Galgotias university

Greater Noida

Acknowledgement-

History of all great works into witness that no great work was ever done without either active or passive support of a person ‘surrounding and one’s close quarters. Thus, it is not hard to conclude how active assistance from senior could positively impact the execution of a project.

I am highly thankful to our learned faculty Miss. Bushra Fatima for active guidance throughout the completion of the project.

Last but not the least, I would also want to extend my appreciation to those who could not be mentioned here but have well played their role to inspire me behind the curtain.

-By Abhinav Bhardwaj

B. arch 4th year

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CHAPTER 1:INTRODUCTION

1.1 Infection control in hospital:-

- Everyone suppose that hospital is the place, where we recover from a disease. However, there is a high risk to acquire a serious infection instead of recovery. The term nosocomial infection or hospital-acquired infection (HAI) is used when a patient gets infected in hospital. Hospital is a place of concentration of infection and the main aim of designers and administration is to isolate and prevent the spread of the infection in order to protect patients. Infection control practices are geared towards reduction of occurrence and transmission of infectious diseases. These diseases are usually caused by bacteria or viruses and can be spread from health worker to patient or vice versa through contact - human contact with an infected surface, airborne transmission through droplets and/or aerosols and, finally, by common vehicles as food or water. Exposure to infectious diseases is one of the most frequently identified occupational hazards facing health care workers.

1.2 Aim-

- To study about hospital aquired infections and how to reduce it.

1.3 Objectives-

The general objectives of infection control in hospitals are:

- To study about different infections which are aquired from hospitals.
- To suggest measures for enhancing the practice of hospital aquired infection control.
- To study the factors for non-compliance of infection control measured amongst doctors and nurses.

1.4 Need and scope-

- This is the most important thing which should be kept in mind while designing the hospital. No matter how good a hospital is designed,how good are services and how good is an overall design,if the infection control criteria is poor,then overall design is considered poor.
- Hospital can be considered as the most sensitive place if we talk about infections and diseases which can be caused by it.

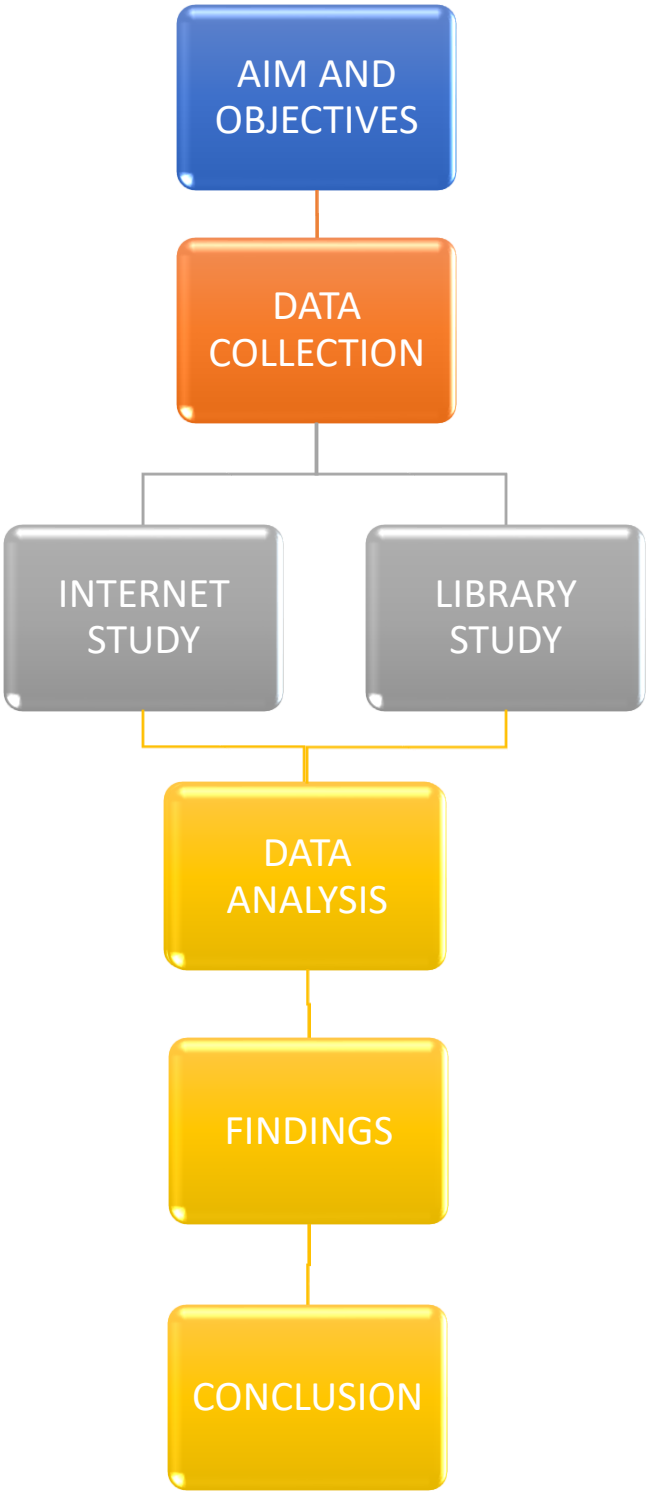
1.5 Methodology-

- Stage 1-collection of data, study of hospitals.
- Stage 2-synopsis, introduction of the project, validity and scope of project
- Stage 3-climate and services, problems and potentials
- Stage 4- case studies- available data, user comments

- Stage 5- library study, vernacular architecture, standards, similar existing projects
- Stage 6- environment, problems and potentials,

1.7 LIMITATIONS-

- First of all, infection control in hospitals is very important and a vast topic to make research on which consists of every minor and major place in the hospital which can also be considered as a limitation.
- For the purpose of the dissertation ,we would cover all the respective data and make surveys of every respective matter of the hospital taking one particular space as a whole and thereafter study the design ,guidelines and other data of that space taking the infection control in consideration.The space would be general medicine GENERAL WARDS and INPATIENT ROOMS.


AIM AND OBJECTIVES
DATA COLLECTION
INTERNET STUDY
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CHAPTER 2:LITERATURE STUDY-

1.1.GENERAL GUIDELINES:

- Critical instruments/equipment (that are those penetrating skin or mucous membrane) should undergo sterilization before and after use. e.g. surgical instruments.
- Semi-critical instruments / equipments (that are those in contact with intact mucous membrane without penetration) should undergo high level disinfection before use and intermediate level disinfection after use. e.g. endotracheal tubes.
- Non-critical instruments / equipments (that are those in contact with intact skin and no contact with mucous membrane) require only intermediate or low level disinfection before and after use. e.g. ECG electrodes.

- Standard Precautions

- Standard Precautions are designed to reduce the risk of transmission of micro-organisms from both recognized and unrecognized sources of infection in the hospital. Standard Precautions applies to all patients regardless of their diagnosis. Standard Precautions shall be implemented when contact with any of the following are anticipated:

1. Blood
2. All body fluids, secretions and excretions, with the exception of sweat regardless of whether or not they contain visible blood.
3. Non-intact skin (this includes rashes)
4. Mucous membranes

1.2.COMPONENTS OF INFECTION CONTROL PROGRAMME-

- Basic measure for infection control-standard and additional precaution
- Education and training of health care workers.
- Protection of health care workers
- Identification of hazards and minimizing risks.
- Aseptic techniques
- Use of single use device, reproccessing of instrumental and equipment
- Antibiotic usage, management of body/blood fluid,exposure handling of blood/blood product and hospital waste management.
- Surveillance
- Outbreak investigation

- Incident monitoring

1.3.INFECTION CONTROL PROCESSES-

- **Standard Precautions**

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- **Standard Precautions Requirements**
  - **Hand hygiene:**

- Pathogenic organisms from colonized and infected patients (and sometimes from the environment) transiently contaminate the hands of staff during normal clinical activities and can then be transferred to other patients.
- Proper hand hygiene is an effective method for preventing the transfer of microbes between staff and patients. Increasing hand-washing compliance by 1.5 – 2 folds would result in a 25-50-% decrease in the incidence of healthcare associated infections.

PERSONAL PROTECTIVE EQUIPMENT-

- **Use of Gloves:**Clean gloves must be worn when touching blood, body fluids, excretions, secretions and contaminated items and when performing venipuncture.
- **Face Mask, eye protection & face shield:** Face Mask must be worn during procedures or patient care activities that are expected to generate splashes or sprays of blood, body fluids.

1.4. CLEANING, DISINFECTION AND STERILIZATION-

- **CLEANING OF ENVIRONMENTAL SURFACES**

- Clean housekeeping surfaces (e.g., floors, walls, tabletops) on a regular basis, when spills occur, and when these surfaces are visibly soiled.
- Disinfect environmental surfaces (e.g., bedside tables, bedrails, and laboratory surfaces)
- Clean walls, blinds, and window curtains.
- Decontaminate mops heads and cleaning cloths regularly to prevent contamination (e.g., launder and
- dry at least daily).

- **CLEANING OF BEDDING AND BLANKET**

- Clean and disinfect mattress impermeable covers.
- Launder pillow covers, washable pillows, and blankets between patients or when they become
- contaminated with body substances.

- **DISINFECTION**.

Most microbes are removed from defined object or surface, except spores.

Classified according to their ability to destroy different categories of microorganisms:

• High Level disinfectants : Glutaraldehyde 2%, Ethylene Oxide

• Intermediate Level disinfectant : Alcohols, chlorine compounds, hydrogen peroxide, chlorhexidine,

• Low level disinfectants : Benzalkonium chloride, some soaps

- **GENERAL GUIDELINES FOR DISINFECTION:**

• Critical instruments/equipment (that are those penetrating skin or mucous membrane) should undergo sterilization before and after use. e.g. surgical instruments.

• Semi-critical instruments /equipments (that are those in contact with intact mucous membrane without penetration) should undergo high level disinfection before use and intermediate level disinfection after use. e.g. endotracheal tubes.

• Non-critical instruments /equipments (that are those in contact with intact skin and no contact with mucous membrane) require only intermediate or low level disinfection before and after use. e.g. ECG electrodes.

CHAPTER 3:DATA COLLECTION-

1.INFECTION CONTROL MEASURES-

The hierarchy of control measures includes four groups of measures:

- use of airborne infectious isolation rooms (AII) – to separate the infected patients from other persons;
- engineering measures –reducing the concentration and prevention of the spread of infection;
- administrative measures – reducing the risk of exposure to infection;
- use of personal respiratory protective equipment –reducing the risk of exposure to infection in high risk areas, particularly in isolation rooms

➢ AIRBORNE INFECTIOUS ISOLATION ROOMS-

Airborne infectious isolation room is a room for patients with suspected or confirmed infectious diseases. The main purposes of an AII room are:

- to separate the infected patients from other persons;
- to provide a favourable environment for efficient reduction of concentration of pathogens in the room generated by the infected patient;
- to prevent the escape of pathogens out from the AII room

For these purposes two ventilation criteria are applied:

- directional airflow by sustenance of negative air pressure with respect to all adjoining spaces;
- air distribution pattern by providing good mixing and direction of airflow from clean areas to less clean areas

Regardless of the number of isolation rooms, they should be grouped together in one area of the hospital. Firstly, this measure allows reducing the risk of infection spread. Secondly, it simplifies the installation, maintenance and control of the ventilation system for AII rooms. And thirdly, it facilitates care of infected patients.

➢ ENGINEERING MEASURES-

Engineering control of infection in health care facilities is performed by HVAC systems and it is the most effective among the hierarchy of control measures. There is a variety of demands that the HVAC systems of health care facility should meet. Health care facility HVAC systems must be at the highest standard of performance and reliability. It is a specific case when the HVAC systems are so important and integral part 10 Of the building processes. All these features make the design of health care facility HVAC systems the most sophisticated and unique.

Along with the AII rooms HVAC systems intend to achieve the following aims:

1) Prevention of infection escape out of the isolation room;

2) Health care workers protection;

3) Reducing patient care waiting time;

4) Providing comfort for patients;

5) Reducing energy consumption

In order to achieve these aims the following measures must be taken:

- Ensuring directional airflow inward the AII room by providing appropriate pressure difference with respect to all adjoining spaces;
- Reducing infection concentration in all areas of the AII room by contaminant dilution, filtration, exhausting and ultraviolet germicidal irradiation (UVGI);
- Providing appropriate air temperature and humidity and avoiding high velocities in occupation zone;
- Providing appropriate local ACR in occupation zone by ensuring good mixing
- of air and avoiding formation of stagnant zones;
- Reducing air flow setting time by improving control system ;
- Minimizing air flow volumes for energy saving

Ensuring directional airflow inward the AII room-

Directional air flow inward the AII room is achieved by creating negative pressure in the room in dependance with the adjacent spaces, because air always flows from area with a higher pressure to a lower pressure area. Negative pressure is achieved by providing a certain volume flow differential between exhaust and supply (exhaust flow rate higher than the supply flow rate).

The required level of negative pressure to ensure an appropriate air flow inward the AII room primarily depends on the configuration of ventilation system and room design. However, according to the guidelines, the minimal level of pressure difference must be at

2.5 Pa (0.01 w.g.). A higher level of pressure difference may be an advantageous factor, but it leads to more energy consumption and in some cases is excessive. /1, p.

Monitoring of pressure difference is no less important. A pressure sensing device can be used for several purposes:

• to ensure that the ventilation system works properly and required pressure difference is maintained;

• to prevent leaving the door open: an audible warning can be used to alert, when the door was left opened. The signal must have a time delay to offer enough time for health care workers to enter the room without activating the warning;

• to measure the adjusting pressure difference, when a variable air flow system are used. In this case the pressure sensing device is an important part of control system and affects its efficiency

➢ ADMINISTRATIVE MEASURES

The following chapter is based on the Guidelines for Preventing the Transmission of Mycobacterium tuberculosis in Health-Care Facilities.

Besides engineering measures, there are also administrative measures of the infection control, which are not less important. The most significant are:

1) Developing and implementing effective polices and protocols for early identification and isolation of infected patients.

2) Implementing effective work practices among health care workers.

3) Educating and training health care workers.

4) Screening health care workers for infections.

The most important practices include:

• education of infected patients about the mechanisms of infection transmission, the reason of isolation and measures to reduce infection spread;

• obligatory wearing of respiratory protection for all persons entering the AII room;

• minimizing the number of persons entering the AII room;

• giving general instructions about infection transmission to all visitors;

• prohibition of leaving the AII room for infected persons; • keeping the door of the AII room closed;

Studies show that the administrative measures can significantly reduce the risk of infection in health care facilities. At the first sight these measures seem to be simple and easy, but unfortunately the neglecting these measures lead to serious consequences. The administration and health care workers are primarily responsible for stringent respect of these measures.

CHAPTER 4:CASE STUDY 1 –

1.1.INTRODUCTION-

When the statutes of the hospital of St John Bridgewater were developed in 1219, Bishop Joscelin of Bath commented -, “No lepers, lunatics or persons having the following sickness or other contagious diseases are to be admitted to the house, and if any such be admitted by mistake, they are to be expelled as soon as possible”. Hospitals and healthcare institutions have certainly come a long way from the days of Bishop Joscelin. We are not as drastic in our sentiments today and we do not expel patients with infectious diseases. In fact, we admit them to suitably planned facilities and rooms and ensure that they do not cause unnecessary hazards to staff and other hospital users.

The physical design of a hospital is an essential component of its infection control measures to minimize the risk of transmission of any infectious disease. When historical and traditional hospitals were built, there were minimal concerns of new emerging infectious diseases. Today, with a more progressive outlook, it is the fundamental requirement to adopt a holistic view of the design and management of hospitals. Designing hospitals to be open, public spaces can make it difficult to control the spread of infectious diseases. The ease of travel and transportation today helps people cross borders easily. They can harbor, carry or catch infectious agents readily. During the Severe Acute Respiratory Syndrome (SARS) outbreak it became clear that the multiple public entrances in hospitals make it difficult, and often costly, to control entry and thus infiltration of infectious diseases.[2,3]

Only a few hospitals have an adequate supply of isolation and negative pressure rooms in wards, emergency departments (EDs) and Intensive Care Units (ICUs). While hospitals may not have complete control over host factors and agents, they are still responsible for the environment that surrounds the patients. By controlling and ensuring adequate sanitization of the environment of the host, hospital authorities can reduce the incidence of hospital acquired infections.

A decision on hospital buildings must be based on multiple factors besides cost, like fire protection, strength of construction material, hygiene, building health, environmental protection, sound isolation, energy saving, durability and utilization rate, among others. Even after initial completion of the hospital building, systematic data collection and feedback for addition, modification and upgrading of the infrastructure must be ongoing.[4] Built-in flexibility in design is becoming more crucial, mainly because technology is quickly obsolete and patient population is constantly changing. For example, single rooms may be more useful to have as they can be converted to isolation rooms more readily during an outbreak. Healthcare buildings are a complex environment with a need for specialized areas like high wear and tear areas, circulation areas, wards, specialized theatres and hazardous material chain of disposition. Choice of material and finish is also important and needs to be mainstreamed into the planning stages.

With the challenges of new and emerging infectious diseases as well as higher public expectations and awareness of healthcare related issues, much consideration has to be given to these in the planning phase of building hospitals. For existing institutions and hospital buildings, renovation and upgrading plans must incorporate the necessary changes. Among the various methods for infection control two important environment factors are isolation and ventilation. Infected patients or those highly susceptible to infection need to be isolated in private rooms with proper ventilation systems in order to stop spread and reduce the possibility of developing a new infection. Bronson Methodist Hospital in Michigan

demonstrated that private rooms, location of sinks and air flow design have resulted in a 10-11% decline in overall nosocomial infections rate.

1.2.THE SINGAPORE GENERAL HOSPITAL WAY-

Following the experience of SARS in 2003, infectious diseases and potential infectious patients are now being managed with high vigilance in an upgraded infrastructure at Singapore General Hospital. At points of entry into the hospital and in the ED, patients are screened using a rapid questionnaire on their travel exposure, fever history and symptoms. Body temperature is recorded and documented. Any one with fever and a positive response to any question will be channeled to be managed in the febrile area of the ED. This febrile screening step is done outside the ED in a specially planned area before formal ED triage is done. The rationale is to identify the high risk patients as soon and as early as possible. Other points of entry into the hospital are also regulated, especially during high risk periods.

1.3.PATIENT MANAGEMENT IN FEVER AREA-

These areas are relatively new areas, constructed following the lessons learnt during the SARS outbreak [Figures 1 and and2].2]. Many healthcare systems were overwhelmed by the SARS epidemic. The system design, public health functions, equipment and supplies as well as collaborative arrangements were either not in place or not in alignment then. Existing triage areas in the ED are often designed with patient flow and satisfaction in mind, rather than healthcare workers safety and protection. As air currents may transport infections, fever and high risk patients are now being managed separately from others. The febrile areas in the ED have undergone structural re-engineering and upgrading of the ventilation system [Figure 3]. There usually exist design flaws in many hospitals, such as turbulent ventilation across patient access areas, the flow of aerosolized gases between treatment areas and the shortage or absence of negative pressure rooms. Consideration of design, equipment and ventilation are important Building ventilation, whether natural or mechanical serves to dilute droplets nuclei in the air and is the single most important engineering control in the prevention of transmission of airborne infections.[6–8] In the new fever areas, rooms with negative pressure ventilation are now available. The exhaust rate in these rooms must exceed the air supply rate by a generous margin. Infected air from patients in this area is prevented from staying in the area and circulating in the corridor, by an exhaust system that filters it to the outside environment. During the construction phase, it is essential to consult the ventilation engineer with regard to the sufficient amount of flow without causing too high turbulence.

Figure 1 The separate screening area for febrile patients

Figure 2 A separate new entrance to the 'fever area' where there is minimal air mix with the other areas of the emergency department

Figure 3 "Fever" consultation rooms with negative pressure ventilation

The positive pressure gradient between the isolation cubicles/rooms and the rest of the area is approximately 15 Pa. A negative pressure room should also preferably have windows which do not open. Having ante-rooms too will help reduce the escape of droplet nuclei during opening and closing of doors. It must also be noted that patients and staff in negative pressure rooms are at increased risk in the event of a fire. This is because fire and smoke can be drawn into these rooms from the adjacent corridors or wards by reason of the differential pressures. The SARS virus is transmitted primarily by bio-aerosol droplets or direct, very close personal contact. During the outbreak when onsite measurement of bio-aerosol dispersion was done, it was able to predict the distribution fairly well, in agreement with the spatial infection pattern of SARS cases.[3]

Febrile patients who are non-ambulatory and too ill to walk are managed in the critical care/resuscitation area which has two end rooms prepared with negative pressure ventilation and separated from other cubicles with heavy lead doors [Figure 4].

The observation unit in the ED is also equipped with isolation rooms for the management of potentially high risk and infectious patients. The doors of these rooms are fitted with a self closing device. For isolation rooms with no negative pressure ventilation, it is important to have them well ventilated with adequate fresh air exchange. The hospital Infectious Diseases committee has also come up with guidelines and operating procedures on the recommendations for the admission of suitable patients to isolation rooms as well as negative pressure rooms.

These infrastructure changes and facilities are not going to be effective if the staff do no change their mindset and remain highly compliant with guidelines and safe practices [Figures 5 and and6].6]. A consolidated strategy which is multipronged is essential. These would include not just structural changes but also mechanisms for contact tracing, syndromic surveillance, proper hand washing techniques and the practice of universal precautions.

Figure 4 Negative pressure ventilation end cubicle in the resuscitation area with lead X-ray proof door partitions

Figure 5 A separate emergency pharmacy in the 'fever' area to reduce patient movement as much as possible

Figure 6 Signages and restricted entry points are important especially during outbreaks

Disinfection and cleaning of the febrile areas too represent a crucial duty. Non-disposable material, equipment and work surfaces must be subjected to frequent cleaning and thus must incorporate materials with resistance to solutions and solvents as well as spread of infection. Disinfection with hypochlorite, 1000 ppm, is regularly done. This is for all wards, environment, facilities, equipment, horizontal surfaces, surfaces touched by patients and staff as well as toilet facilities. In fact the choice of color and ambience of the hospital areas and rooms can have an effect and psychological implications on both staff and patients treatment, management and recovery.

HOSPITAL DESIGN AND HYGINE-

One key component of limiting the spread of healthcare related infectious diseases is adequate infection control practice. A cornerstone of this is ensuring good hand hygiene. Hand washing has been recommended as the single most important practice to control hospital acquired infection. In isolation rooms, of observation and general wards, there are personalized hand washing facilities within each room to reduce cross-contamination. These isolation rooms help to prevent direct and even indirect contact transmission and droplet transmission. Access to examination gloves, alcohol-based hand-rub and trash containers or receptacle is also important. Many have the perception that unavailability or inadequate hand washing facilities and sinks contribute towards poor compliance. Few studies have prospectively evaluated the association between hand hygiene compliance and building plan and design. Lankford *et al*. found that hand hygiene compliance in a new healthcare facility (with more sinks provided) decreased significantly.[12] They concluded that peer and team behaviour have greater impact on good habits rather than just building design and ergonomics. This was echoed by a few other studies as well.

CONCLUSION-

In being able to handle outbreaks well, there must be collaboration and a consolidated strategy which is understood and practiced by all. At the hospitals there must be continuity between Emergency Departments, observation wards and general wards, ICUs, isolation wards, operating theatres, laboratories and outpatient clinics. However, this must go beyond just healthcare institutions and hospitals. At the national level, it must include primary care and general practice clinics, communicable diseases centers, government services, schools, the mass media and press, immigrations department, transportation department, pharmaceutical industry, the police and many more. Frequent exercises to practice and test out our preparedness are also very crucial because then only can we learn the setbacks and correct them.

The Ministry of Health, Singapore Medical Association, College of Family Practitioners and various other healthcare organizations have created a detailed plan called the Primary Care Pandemic Framework, to help primary care clinics work with the 18 government polyclinics to provide appropriate care for influenza and non-influenza patients during a pandemic. The Framework advises on how to prepare and organize a primary care clinic for a pandemic; including modifications to clinic workflow and processes to avoid cross infection, use of personal protection equipment, hospital referral and environmental design and cleaning.[17] Both infrastructure and design have a significant effect on our work in the healthcare sectors. This issue has often been taken for granted but now is the time to make it work for us and our patients.

CASE STUDY 2 –

1.GOLDEN JUBILEE NATIONAL HOSPITAL SCOTLAND-

Why install screens at a largely single-bedded room hospital? At Scotland's impressive Golden Jubilee National Hospital, managed by the National Waiting Times Centre Board, large doors of the single patient rooms are invariably left open to allow nursing staff to easily check on the occupants.

Pull-around curtains were previously used to screen off the door for privacy while doctors or nursing staff were in attendance or visitors were present. Yet the curtains presented their own problems, as senior manager infection prevention and control Robert Gray told Hospital Bulletin: "We were looking for an alternative to curtains, something easy to clean and that would reduce laundry costs.

"With curtains you've got the hassle of removing them and the cost of cleaning. Before, we had three different sizes of curtains per ward and spares." Enter Silentia screens – a highly flexible alternative which gives privacy and dignity, with an easy to clean and highly manoeuvrable solution. They are ideal for quickly creating a separate room within a room. However, with curtains being shown to harbour infection and needing to be regularly laundered or replaced, if disposable, the particular benefits recognised by the Golden Jubilee are that the Silentia screens have a hard, cleanable surface that is easily wiped down – just like any other item of furniture. A boon to improving increased patient privacy and dignity, the screens also reduce sound travel by around 20 %. In hospitals with multi-bed wards this allows private conversations to be held a few feet away from the neighbouring bed.

"We arranged a presentation by Silentia, who brought some sample screens," said Robert. "They did a presentation to nursing staff, infection prevention and control estates and housekeeping." The 157 Silentia screens chosen by the Golden Jubilee are either seven or nine panels wide.

Robert explained: "The screens were supplied eight or nine months ago and are gradually being phased in across the hospital as rooms become available. We chose white coloured screens as they are neutral and you can easily see if there is any staining. They're robust, fold-up easily and can be cleaned in situ.

"We got the whole of the supply towards the end of the last financial year. Fixing was done by estates using a template, so it was straightforward. They're fixed to the wall and secure. They pull out to form a wall so it feels more private for the patient. The screens can run at an angle if required."

CLEANING IS EASY

"Nearly all the rooms are single patient rooms. In some rooms we have day patients, with two patients per room with a screen between them." The screens are compatible with all major cleaning solutions used on the ward, while the patented hinges are designed not to trap dirt and be easy to clean. The castors are removable, enabling them to be washed separately. "If the screens are stained in any way – with blood or body fluids – they are cleaned by the nursing staff," said Robert. "Housekeeping staff clean the screens as part of their daily

routine cleaning as part of the fixtures and fittings. There is a high level of cleaning of these screens. You wouldn't be able to do this with curtains.

"I am aware that the screens can be fully disassembled and the wheels removed for cleaning, if necessary". On the hospital's Ward 2 East orthopaedics, staff nurse Anne McKinley said: "The screens are great for patient privacy. The doors are very wide and it's easy for passers-by to see into the room. With the screens you can easily wipe them down. If there's been an infection we use a chlorine-based detergent/disinfectant.

MINIMIZE DELAYS WHEN PREPARING A ROOM

"Patients are amazed at the level of cleanliness. We're almost spoilt to be working here, added Anne." Some patients like to watch TV late at night. The screens help to keep the noise down. The cleaning teams at Golden Jubilee National Hospital report to infection prevention and control. Housekeeper Mary Filshie explained: "I've been at the hospital for ten years and only work on this ward. If the curtains were dirty or had stains we had to get a porter to take them down, replace them with another curtain, and take the soiled one to the laundry for cleaning. So it could delay the use of the room and take the porter away from their duties. Now we have the screens we don't have to get in touch with the porters.
"We clean each patient room once a day and also give them a check clean. The screens are cleaned with a damp cloth – a single cloth for each screen – with detergent or disinfectant when necessary. The screens are easy to handle. You just take the brake off, pull the screen right out, and clean from top to bottom of each panel."

INCREASED PRIVACY AND PATIENT DIGNITY

The hospital, situated to the west of Glasgow in Clydebank, Dunbartonshire, is a national resource for Scotland. Flora Robertson, a patient from Castle Douglas, said:
"I have been in hospitals before where there are just curtains. In a room like this the screens immediately give you privacy, without you being shut in. It seems very easy to use."
Tim Clarke, director Silentia UK,explained: "We introduced the screens three years ago at the annual conferences of both IPS, the Infection Prevention Society, and AHCP, the Association of Healthcare Cleaning Professionals, and at subsequent regional branch meetings and study days. These led to individual enquiries from healthcare professionals who recognised the need for environmental and infection control friendly screens, with the added benefit of increasing patient privacy and dignity.

"Infection prevention and control leads appreciate the benefits of hard surface screens which are compatible with recommended detergents and disinfectants and can be cleaned on site or in the ward, as opposed to curtains which, in a time-consuming process, have to be removed and replaced to achieve the same level of cleanliness. From a patient's perspective Silentia screens provide a level of privacy which includes the reduction of sound travel between patients and their visitors, staff and ambient noise – for example the patient and doctor can discuss their condition discreetly."

Tim said: "For the facilities and housekeeping teams, Silentia screens remove the hassle of hanging curtains, removal of curtains, laundry of curtains and the loss of curtains, and of course the cost of laundering. Being constantly available and quick to clean the screens have also helped to reduce bed blocking. Any issues of infection prevention and control can be

dealt with in situ, in the ward or indeed in the single patient room – without any concerns over replacement."

OVER 2,000 SCREENS

So how have the screens been accepted since their introduction three years ago? "We've found that more and more infection prevention and control and facilities teams are now aware of Silentia screens and we are now receiving daily enquiries from all over the UK," said Tim. "The questions I'm asked are: Can they be cleaned? Will they go around the bed? Do they stop sound travel? Are they easy to use and can they be used for what they are designed for? The answer is 'yes' to every question. These screens are popular with clinical and facilities staff, and patients too. In Scotland we have 157 screens here at Golden Jubilee, and screens at Girvan Community Hospital and schools, with other orders in the pipeline. We have supplied over 2,000 screens. In England and Wales these have been for flagship hospitals, community hospitals and clinics, GP surgeries and special schools."

Tim added: "Silentia screens are available in a range of heights, lengths and colours, including wall fixing and mobile versions. There is a some suspension movement in the wheel to allow for areas with uneven floors. With Silentia you can quickly separate a room within a room without altering walls. "The screens can be cleaned in situ and easily removed and the wheels detached for general cleaning and decontamination. Silentia is continually developing new products and features."

CHAPTER 5:COMPARATIVE ANALYSIS –

CASE STUDY 1	CASE STUDY 2
• Measures are taken for wards ,emergency departments, and I.C.U.s. • No such particular measures were taken for privacy. • Patient management was a measure to avoid infection in fever and emergency areas. • Specific focus on design along with hand hygine.	• Measures are taken especially for I.C.U's. • Patient privacy was kept in mind. • Infection control was done mainly be screening. • Hand hygine was also incorporated by no particular focus was given to it.
• "Fever" consultation rooms with negative pressure ventilation. • A separate emergency pharmacy in the 'fever' area to reduce patient movement as much as possible	• No such rooms with such measures were taken. • No such provisions were given.
• Room types differed.	• All the rooms were single patient rooms so maintainance and services were easy.

CHAPTER 6:CONCLUSION –

- Treatment of patient infections comprises a significant percentage of the operational costs of any hospital. Many patients are admitted with infections or with diseases that make them more susceptible to infection, and without proper infection control, infections can spread among patients and staff. Standard hospital-cleaning procedures1 and standards for air and water systems2 have reduced the risk of infection from the hospital environment; hence, very few hospital-acquired infections come from the building's air or water. Today, the primary source of hospital-spread infections is personnel who move from patient to patient, often carrying medical devices and equipment. Modern hospitals should be designed to reduce this risk of transfer of infection by personnel.
- Semiprivate room designs increase the likelihood of infections spreading among patients and staff.
- Private rooms make the spread of infection less likely because patients and visitors do not share space and equipment with other patients.
- An important factor in the transmission of infection is proximity, and one of the most effective ways to reduce the risk of transmission is to increase the functional distance between patients. Open ward or semiprivate room designs make it more likely that infections can be spread among patients and staff.
- Hand hygiene is the single most important way to prevent hospital infections.
- Because infections significantly add to the cost of medical care, reductions in infection rates significantly reduce the operational costs of the hospital and the overall costs of medical care, as well as making the hospital a safer environment for the patient.
- Private hospital rooms have many advantages, such as increased privacy (for patients, visitors, and staff), fewer medical errors, a quieter and more restful environment, and reduced stress for the patient, as well as a potential reduction in infection rates.

CHAPTER 7

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