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Case Series

Case Studies in Infectious Diseases and Dermatology

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Introduction

Dentistry involves the use of protective barriers such as gloves, masks, protective eyewear, and protective clothing. The NEBOSH National General Certificate in Occupational Health and Safety (NGC) provides a broad understanding of health & safety issues and is an essential qualification for anyone with health and safety responsibilities as part of their role. This case study series aims to highlight the importance of these occupational certification to health care careers. When exposure to blood borne pathogens may occur as in dental offices, the employer has the responsibility for provision, maintenance and effective disposal of personal protective equipment (PPE). The protective value of gloves cannot be understated. There is a high occurrence of hepatitis B in dental and medical personnel.

Recent infection control lapses due to noncompliance with recommended reprocessing procedures highlight a critical gap in patient safety. Healthcare facilities including hospitals, clinics and doctor's offices are urged to review appropriate policies and procedures as recommended by device manufacturers and comply with current standards and guidelines.

Case Study 1

The incident: Mrs Jude came into Dr. Blue ban's office for a crown. After the preparation, Dr. B asked his assistant (Marta) to take an impression. Just before placing the impression tray in Mrs Jude's mouth, Mrs Jude said, "Wait I have to sneeze." Marta turned her head as Mrs Jude sneezed. Marta excused herself from chair side because she felt the spatter on her cheek and in the corner of her eye. She removed her prescription glasses, wiped her skin and eye, and quickly returned to take the impression. Three days later, Marta developed an eye infection that her doctor said was PINK EYE.

Identify potential opportunities for disease transmission in this scenario. Which preventive measures could have been used?

The Infectious Agent

Pseudomonas species are commonly found in water, vegetation and soil, and can be found in the throat, stool and skin of healthy individuals [5]. These species are known to cause infections in the skin, ears, eyes and urinary tract system. They are predominantly found in medical facilities, such as hospital mops, taps, sinks, food and other respiratory devices. This makes it possible for them to spread from one patient to another or from medical staff to the patients.

These pathogens are prevalent in hospital settings, and the symptoms presented depend on the part of the body infected. When the skin is infected, the severity is less than when these pathogens infect the lungs and the blood. When the pseudomonas bacterium meets the skin, the symptoms mainly include draining wounds, redness and abscesses in the skin. When they infect the eye, symptoms include inflammation, redness, impaired vision, pain, pus and swelling. They are commonly known as opportunistic infections, as healthy individuals are less likely to be affected, while immune-compromised people face the most significant risk of infection.

Réservoir

Dental water lines are likely to be sources of in-

fections, as they can harbour bacteria, algae and fungi. Thus, it is recommended that dentists use water treatment systems to improve the quality of water used. Dental clinics have several potential reservoirs for bacteria aerosols and spatter that are disseminated during dental procedures. Other common reservoirs include eyewash stations, sinks, taps and dental equipment [4]. Respiratory equipment is dental units can also be common reservoirs of these pathogens. The spread of these infections can be prevented through regular disinfection and cleaning of dental equipment and washing stations [3]. These bacteria are commonly re-introduced in the hospital environment through plants, fruits, vegetables and patients moved from one hospital to another. Patients' hands are a common reservoir, where patients will contact other reservoirs of the bacteria or ingest food and water contaminated with the pseudomonas.

Portal of Entry

The most common portals of entry for such infections include the nose, eyes, mouth, ears, and skin. Other portals of entry can include the lungs for ventilator patients, skin for burn patients, and the urinary tract for patients who have undergone uropathy. Pseudomonads are opportunistic pathogens that cause a variety of infections, including those in the lungs, skin, wounds, urinary tract, and blood.

Dental technicians improperly cleaning dental instruments before sterilization and apparently hand-scrubbing the contaminated instruments represent breaches in protocols that were made in the dental clinic.

Mode of Transmission

The most common mode of transmission for infectious agents in dental offices includes ingestion, injection, inhalation or contact with skin or infected mucus [3]. Inhalation of these bacteria happens when they exit the body and are suspended in the air when another individual is around and not covered with a face mask. Body fluids and contact with blood are another prominent form of transmission [3]. Saliva usually contains blood derived from gingival bleeding, and thus, contact with saliva can also be a mode of transmission. Percutaneous injuries are also a standard mode of transmission, such as exposure to infected needle sticks. Martha was exposed to the coughing patient and the washing sink and tap, where she did not use proper preventative measures. Thus, she was most likely to be exposed to these pathogens. Her wiping her glasses and skin could have transmitted these pathogens from her skin to her glasses to her eye.

Suggested Preventative Measures

The spread of these infections can be prevented by practising proper isolation procedures for patients infected and proper aseptic techniques. Dentists are also required to properly clean and disinfect catheters, respirators and other medical instruments. Regular hand washing is also crucial in preventive the spread of these infections through physical contact [3]. Dental staff are also required to utilize protective gear such as eye protection, gloves, gowns and medical face masks [3]. Proper management and disposal of sharp objects, such as needles, at the dental unit, is crucial in preventing exposure to these pathogens [3]. This promotes a culture of safe workplace practices where body fluids and other secretions are handled with care. Other common forms of prevention include scheduling infected patients for the last appointments of the day to reduce the chances of exposure for other patients. Patients should also be offered mouth rinses before treatment begins, and dentists and dental assistants should be immunised against potential and prominent infections and strains [3]. Placing scalpels, blades and syringes in puncture-proof containers that should also be placed close to the area of operation to prevent further spreading of the bacteria. Needles should not be recapped to reduce the risk of accidental injuries.

Additionally, these syringes should be kept from being intentionally broken or bent before being disposed of. In place of recapping syringes in between injections, dentists are advised to place the needles in a sterile environment. This also includes utilizing new needles for each patient to prevent cross-contamination.

Case Study 2

Jenna was a dental assistant at Dr. Davido's office. When being interviewed for the job, Jenna misled

Dr. D when she told him she had gotten the hepatitis B vaccination series when she was in dental assisting school. She refused the vaccinations, but the school still allowed her to complete the 1-year training program. Last Friday, Jenna dismissed the last patient of the day (Ms. Mead nap) and was gathering up the instruments from the bracket table when she punctured her thumb with a contaminated explorer. She informed Dr. D, and the well-organized post exposure medical follow-up procedures in Dr. D's office were instituted. Jenna informed the evaluating physician that she had not been vaccinated for hepatitis B. The medical evaluation confirmed that Jenna was not immune to hepatitis B and that Ms. Mead nap was a hepatitis B carrier (positive for the hepatitis B surface antigen [HBsAg]) but negative for the hepatitis B antigen (HBeAg). Jenna was shook-up when she learned of these results. She received the hepatitis B immune globulin and began the hepatitis B vaccination series but remained anxious about the situation for quite a while.

Introduction

Hepatitis B is a viral infection that is characterized by a liver infection resulting from the Hepatitis B virus. This is predominantly transmitted through body fluids such as semen, blood and vaginal fluids.

Etiology/causes

Hepatitis B can be caused by both infectious and noninfectious causes. Infectious causes include fungi, viruses, parasites, and bacteria, while noninfectious causes include drugs, alcohol, and autoimmune diseases. This disease can be transmitted through sexual contact, sharing needles and syringes, and during childbirth and pregnancy.

Mode of Transmission

Hepatitis b can be transmitted through horizontal or vertical transmission. Horizontal transmission involves sexual contact or contact with mucus substances [6]. This can occur during unprotected sex or contact with contaminated drug syringes. Vertical transmission involves a mother-to-newborn pipeline of the virus [6].

Pathology

Pathogenesis of HBV results from the immune system being invaded by the virus, resulting in liver disease such as cirrhosis or hepatocellular carcinoma. The incubation period after exposure is usually between 30-180 days, where most immune-competent individuals recover, while a smaller percentage suffer the advanced stage of HBV [6]. HBV causes cytotoxic injuries to the liver, which can also happen in post-liver transplant scenarios.

Diagnosis and Treatment

The diagnosis of Hepatitis B is conducted through patient medical history analysis, laboratory exams, physical exams, and imaging. Some of the symptoms that physicians look for in patients include nausea, anorexia, vomiting, jaundice, abdominal pain, dark urine, and clay-coloured stool [6]. In advanced stages, some diagnostic symptoms include infections of the liver, coma, ascites, confusion, and gastrointestinal bleeding.

The treatment of hepatitis B involves the prescription of FDA-approved drugs, including nucleoside analogs, interferon, and nucleotide analogs [6]. Antiviral therapy is also crucial in treating and preventing hepatitis B, as it reduces liver inflammation, prevents the replication of the virus, and reduces the progression of the infection to liver cirrhosis.

Epidemiology

HBV is a prevalent disease that poses a global public health threat. There are reported 60,000 new cases of hepatitis b virus infections in the U.S annually [6]. There are more than 2 million people infected with chronic HBV, with a higher prevalence in minority communities, including Hispanic, Asian and Black communities [6]. Children below the age of 12 years have a lower infection risk in the U.S [6]. HBV is responsible for about 5-10% of end-stage liver diseases and causes about 5000 loss of lives annually [6]. Areas with better access to healthcare services have a lower incidence rate due to access to vaccinations.

Micro Biome of Human Skin

The human skin hosts various microorganisms that contribute to supporting and training the immune system to fight off pathogens. There are diverse and essential viruses, bacteria, archaea and fungi found on the skin, with everyone having about 1000 bacteria species on the skin. The

skin microbiome is developed at birth, with these microbial agents training the immune system to support communal organisms and fight pathogens. The skin microbiome continues to advance until one gets to puberty. At this stage, the developmental and hormonal changes contribute to the advancement of the skin microbial agents into adulthood. The study of the microbiota composition of human skin in different body sites is crucial in understanding the aetiology of various skin disorders, such as eczema or psoriasis.

Various factors influence the microbial flora of the skin. Environmental aspects such as clothing, occupation, and antibiotic use influence the skin microbiota. Soaps, hygienic products, cosmetics and individual uses are also contributing factors to the microbes of the skin [1]. This is because these products contain ingredients that may alter the skin barrier. Similarly, the weather is an essential aspect, where high humidity and high-temperature areas result in individuals having higher levels of bacteria on the feet, back and auxiliary vaults [1]. Studies indicate that in high-humidity and low-temperature areas, individuals had higher levels of gram-negative bacteria on the feet and the back [1]. The sex, location and age of the individual also influence the presence of microbial flora on human skin. The microbial increases as a child ages, as they begin to form during birth or a few minutes after caesarian birth [1]. Puberty brings about more changes, where sebum production increases coupled with an increase in lipophilic bacteria on the human skin [1]. Men and women also present differing microbial presence due to differences in sebum production, hormones and sweat production.

Immunological Diagnosis of Skin Diseases

The skin provides a physical barrier from external threats but also provides an avenue where various inflammatory processes resulting from pathogens thrive [2]. Some blistering skin conditions can be identified through immunofluorescence microscopy, which identifies the antibodies on the skin. These conditions include pemphigus, pemphigoid, dermatitis herpetiformis, and epidermolysis bullosa acquisita. Blisters and erosions characterize these skin diseases after minor trauma on the skin, such as on the knees, buttocks, or elbows.

Conclusion

From the above case studies, it deduced that dental environmental surfaces prone to disease spread can be categorized into clinical contact and housekeeping surfaces. Because surface barriers such as cling plastic wraps, bags, tubes and general housekeeping items like plastic sheets, wrap-around backs of side chairs used by the dental team are touched during patient care, following a wipe-discard-wipe routine becomes essential for pre-clinical disinfection. In addition, using water-based disinfection such as synthetic phenolics, quaternary ammonium compounds help in solubilising blood, saliva and facilitate their removal.

Confidential employee medical records including written opinions regarding hepatitis B vaccination and preexposure medical evaluations and any vaccination declination statements must be maintained for the duration of employment. With the intention to improve patient and provider safety in health care, it is important engage in science-based learning, avail and maintain society membership foster collaborative leadership with individuals, agencies, care providers to ensure they all achieve a shared vision.

Conflict of Interest

The author has no conflict of interest with the general health care provisions but aims to reemphasis the salient features of the healthcare protocol.

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