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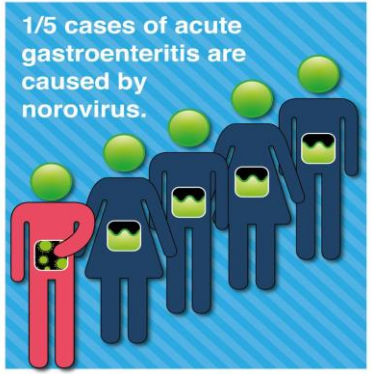
Level 3 Health and Social Care: Principles and Contexts

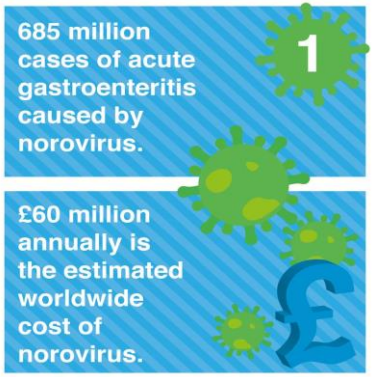
Infection Prevention and Control

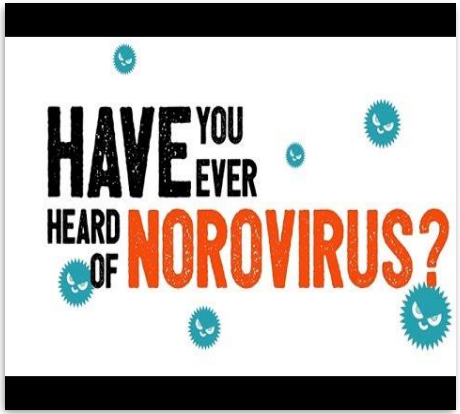
QUESTION?

Jayne has been on a cruise and has just returned home. While she was away, her father had a heart attack and is now in hospital. Since she returned, Jayne has been vomiting and has had diarrhoea and she thinks she may have norovirus as some of the other passengers were confined to their cabins with this complaint.

- ★ **Should Jayne go to the hospital to visit her father?**
- ★ **What advice would you give her?**







WHAT IS IPC?

WHAT IS INFECTION PREVENTION AND CONTROL (IPC)?

A practical and proven set of organisational and technical approaches and measures to prevent the spread of avoidable infections and antimicrobial resistance (AMR) within both community and health care settings.

WHO, May 2019

5 REASONS FOR IPC

1. Directly improves outcomes
2. Reduces healthcare costs
3. Monitors and tracks quality care
4. Consists of proven strategies
5. Scalable and adaptable to local contexts

An **infection is** the invasion of an organism's body tissues by disease-causing agents, their multiplication, and the reaction of host tissues to the **infectious** agents and the toxins they produce.

GIG CYMRU NHS WALES | Iechyd Cyhoeddus Cymru Public Health Wales

Infections, particularly those known as **health care acquired infections** (**HCAI** or **HAI**) (which means that patients/clients acquire the infection while receiving care from health services), are one of the biggest challenges facing health services throughout the world.

EPIDEMIOLOGY

Epidemiology is the study of public health; that is, determining frequency, patterns, sources and other aspects of health of populations – for example, the number of cases of meningitis or diabetes in a population, but also the relationship of that number to the size of the population.

The resulting rate allows epidemiologists to compare disease occurrence across different populations. This can be related to microbiology (the study of bacterial, viral, fungal and parasitic organisms) that cause infections in bacterial epidemics like the measles outbreak due to fewer people vaccinating their children in the UK, or determining the factors involved in the Ebola outbreaks in Africa in 2015 or in COVID-19.

It also involves working on plans to control the spread of the outbreak, and prevent exposure to minimise the risk of spreading.

FLORA

WHAT DO WE MEAN BY FLORA?

- ★ In any given city there are individuals who live there permanently and individuals that are just passing through.
- ★ On the human body, the same basic concept occurs with respect to **flora**, the collection of microorganisms inhabiting a person.
- ★ There are two types of flora, **normal flora** and **transient flora**.

NORMAL FLORA

Normal (resident) flora are microorganisms that are always present on or in a person and usually do not cause any disease. These are like the permanent residents of a city; they're not just passing through!

Depending on the part of the body, the normal flora can vary. For example, on the skin, normal flora is made up of bacteria such as ***staphylococci***. In the mouth, bacteria called ***streptococci*** can be found.

Just like the normal residents of a city like to keep their city in order, resident flora typically do not cause problems to the person. However, just like some people take advantage of a city and its residents when it's weak by committing crimes, some resident flora are potential opportunistic pathogens.

So, these microorganisms lay low and cause no trouble when the person is healthy. However, as soon as they sense the person is sick with another serious problem, they may strike to cause a disease of their own.

TRANSIENT FLORA

While cities have permanent residents, they also have visitors. These would be like ***transient flora***; microorganisms occasionally found on or in a person.

Some of these microorganisms cause no trouble, like tourists passing through a city, while others are most definitely trouble, like terrorists coming into a city to wreak havoc.

For example:

- ★ ***Norovirus*** is a contagious virus that can give you the stomach flu.
- ★ It's not found in your gut on a normal basis, but if you eat or drink it in your food, you might feel pretty bad for a few days.

Summary

- ★ **Flora** is a word for the collection of microorganisms inhabiting a person.
- ★ **Normal (resident) flora** are microorganisms that are always present on or in a person and usually do not cause any disease. For instance, a lot of staphylococci inhabit your skin. You'd have to scrub your hands with soap and water to have a good shot at removing these guys.
- ★ **Transient flora** are episodic microorganisms found on or in a person

INFECTION vs DISEASE

DISEASE BY PATHOGEN?

Any pathogen (microorganism), or agent of disease, that is out to get you uses a sequence of events similar to the one the Greeks devised to destroy the city of Troy - except these pathogens are out to destroy your body instead of a city.

WHAT IS AN INFECTION?

When a pathogen (microorganism) enters the human body and multiplies inside it, we term that process an **infection**.

The ease with which an infectious agent can enter, survive, and multiply within the human body is known as **infectivity**.

OPPORTUNISTIC INFECTION

Virtually any infection that causes a disease, and even one that doesn't cause any obvious signs of a disease, may lead to something known as an **opportunistic infection**.

An opportunistic infection is an infection that results from a pathogen that doesn't cause disease in a normal, healthy host but one that instead takes advantage of a weakened immune system in order to do so.

Basically, these pathogens are little wimps that wouldn't dare take on a healthy person's immune system and instead wait for them to become **immunocompromised**, or incapable of forming a normal immune response.

WHAT IS A DISEASE?

When the body's receptors, cells, tissues, or organs are damaged, destroyed, or inactivated, resulting in an abnormal state of function, health and clinical signs and symptoms, we term that process a **disease**.

However, disease is a two-way street. The human body has an immune system, which fights off pathogens trying to freely multiply within the body. The problem is the immune system is sometimes not very picky in how it wages war. Inside the body, the immune system not only damages the invading pathogen but also the body's own cells, tissues, and organs.

An infection is just one potential cause of disease but not the only one. In fact, sometimes the root cause of a disease, or the **aetiology** of it, is unknown. Often, a disease is **idiopathic**, meaning it's a disease that has no known cause.

WHAT ARE INFECTIOUS DISEASES?

Infectious diseases are distinguished from other illnesses and disorders because they can be transmitted from someone who is ill either directly or indirectly to other individuals, who then develop the same infectious disease and are also able to pass it on. A familiar example is the ‘common cold’ which almost everyone has experienced at some time in their lives.

THE CHAIN OF INFECTION

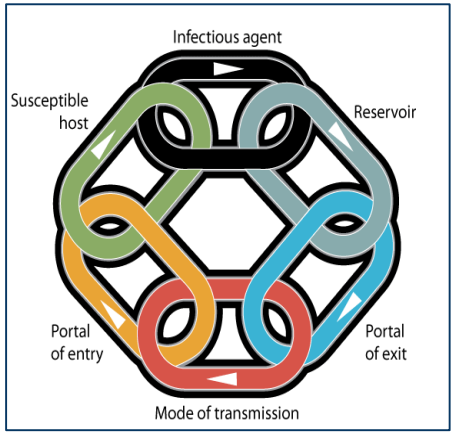
Infectious diseases result from the interaction of an ***agent***, a ***host***, and an ***environment***. Most of these diseases follow a typical ***chain of infection*** that ends with an infected ***host***. Understanding the chain of infection can help with both the prevention and treatment of infectious diseases.

THE CHAIN OF INFECTION

The **chain of infection**, if we think of it as an actual chain, is made up of six different links:

1. **pathogen (infectious agent)**
2. **reservoir**
3. **portal of exit**
4. **mode of transmission**
5. **portal of entry**
6. **the new (susceptible) host.**

Each link has a unique role in the chain, and each can be interrupted, or broken, through various means.



An illness begins with the **chain of infection**. The first step in this chain is a **pathogen** (such as a virus or bacterium) that lives in a reservoir. The **reservoir** may be a human, an animal, or part of the environment. The pathogen exits its reservoir and is transmitted toward the new host. One method of transmission from a human reservoir is coughing. The pathogen then enters the new host. It may be inhaled or ingested. It may also penetrate through a mucous membrane or a wound.

Infection prevention and control (IPC) depends upon breaking one of the links in this chain. Understanding the pathogen, its portals of exit and entry, and its transmission is important. This understanding can help people identify the most susceptible link and focus prevention efforts on breaking it.

THE CHAIN OF INFECTION

INFECTIOUS AGENT (PATHOGEN)

This is the disease-causing organism; for many illnesses and diseases this is a virus or bacterium.

In order to break this link, various methods can be used, including the pasteurization of milk, the chlorination of drinking water, or the use of disinfectants.

RESERVOIR

This is the natural environment that the pathogen requires for survival; reservoirs can be a person, an animal, or an environmental component, such as soil or water.

This link can be broken through medical treatment and testing, insect and rodent eradication, or quarantine.

PORTAL OF EXIT

This link is needed for the pathogen to leave the reservoir. If the reservoir is a human, then the portal of exit may be saliva, mucous membranes, feces, blood, or nose or throat discharges.

By using barrier methods, such as condoms or masks, or covering the mouth while coughing, this link can be broken.

MODE OF TRANSMISSION

The pathogen can be transmitted either directly or indirectly. Direct transmission requires close association with the infected host, but not necessarily physical contact. Indirect transmission requires a vector, such as an animal or insect.

The link can be broken through hand washing, safe sex practices, or avoiding contact with infected individuals.

PORTAL OF ENTRY

Entry of the pathogen can take place in one of three ways: penetration, inhalation, or ingestion. The level and severity of an infection may depend on the depth of penetration.

Similar to the portal of exit, barrier methods, such as condoms or masks, can be used to break this link along with other methods, such as insect repellants.

SUSCEPTIBLE (NEW) HOST

Once in the new host, various factors influence the severity of infection, including the strength of the immune system and the reproductive rate of the pathogen.

Immunisation, health promotion, and medical treatment can be used to break this link in the chain.

EXAMPLE OF CHAIN OF INFECTION

An example of illness resulting from the chain of infection is the common cold. In this case, the ***pathogen*** is often referred to as rhinovirus. The ***reservoir*** is another person carrying this virus, who then propels the virus into the air via a ***portal of exit***, such as a cough or sneeze. The ***mode of transmission*** is direct to the ***new host***, which takes place through inhalation (the ***portal of entry***) of the virus.

THE CHAIN OF INFECTION?

Infectious Agent	Reservoir	Portal of exit	Mode of transmission	Portal of entry	Susceptible Host
UNPROTECTED SEX	HUMANS	OPEN WOUNDS	KISSING	SNEEZING, VOMITING	
DIRTY SURFACES	ANIMALS, INSECTS	BACTERIA, VIRUSES	INHALING	INFANTS, THE ELDERLY	

BREAKING THE CHAIN OF INFECTION

You **put on gloves** before bandaging a patient's wound

You **place a mask** over a patient's nose and mouth because they have suspected TB

You **protect the heels and elbows** of an elderly patient to prevent the breakdown of skin

You promote a project to get rid of unnecessary standing water to **reduce mosquito population**

Infectious Agent → **Reservoir** → **Portal of exit** → **Mode of transmission** → **Portal of entry** → **Susceptible Host**

A wound with a staphylococcus infection is **bandaged**

You eat a **healthy diet, exercise and get plenty of sleep** to be as healthy as possible

Your patient is put on an **antibiotic** to treat a chest infection