



NATIONAL HEALTH
LABORATORY SERVICE

Principles of Infection Prevention and Control

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Learning Objectives

- Know the principles of infection control
- Recognize gaps in infection control infrastructure
- Demonstrate proper selection and use of personal protective equipment (PPE)

Practice Objectives

- Prevent the transmission of infections
- Improve performance by identifying trends and intervening to change practice
- Prevent/Control outbreaks

What is infection control?

Infection Control (IPC) encompasses the processes and activities that identify and reduce the risks of acquiring and transmitting infections among individuals in the healthcare setting and in the community

Important knowledge

- Infectious agents: Transmission
- Work practises that prevents transmission of infections in different settings: Procedures
- Management systems that support effective work practises: Antibiotic usage

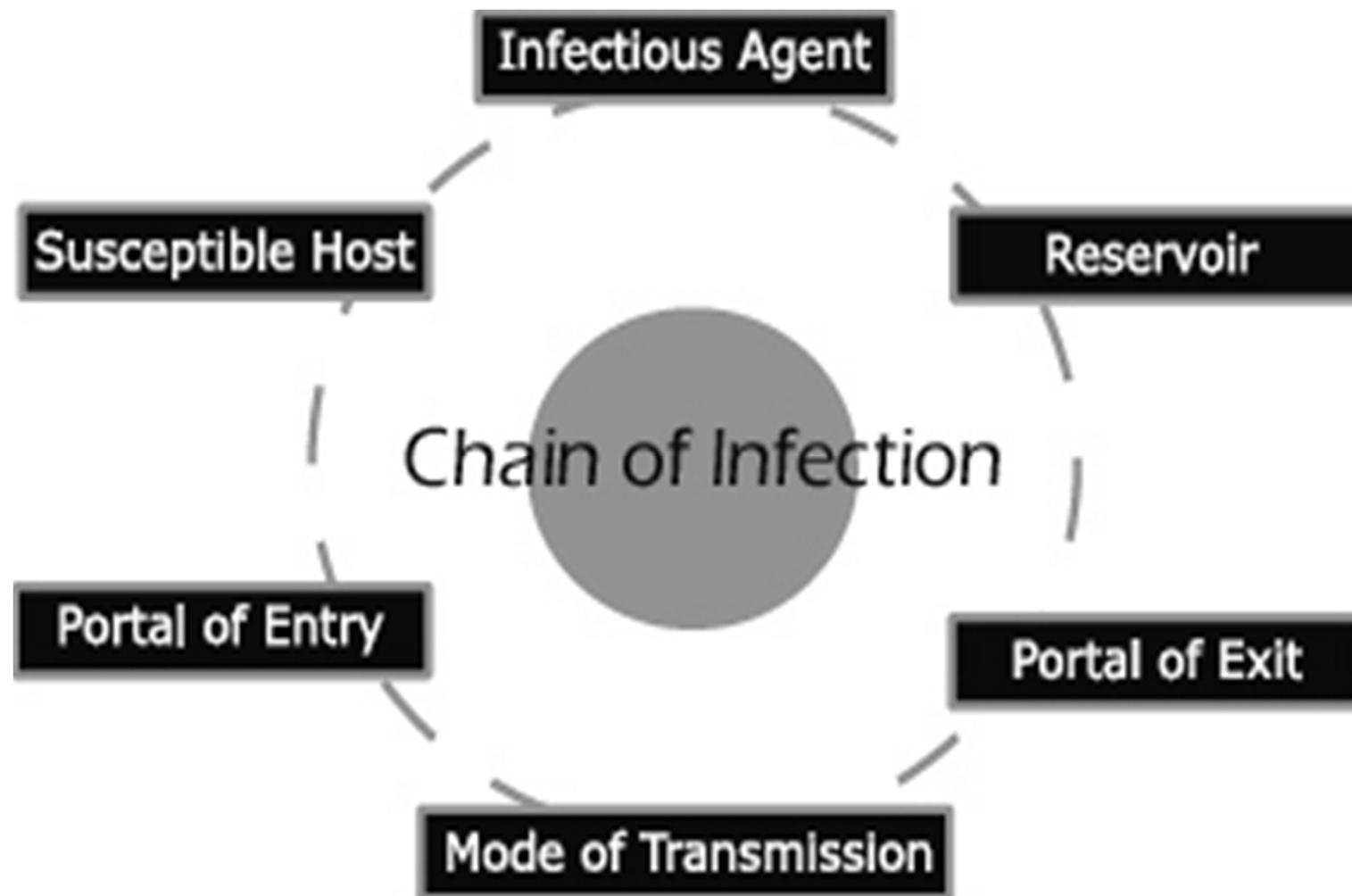
IPC structures

- IPC committee:
 - IPC nurse
 - IPC doctor
 - Quality assurance manager
 - Occupational health practitioner
 - Pharmacist
 - Housekeeping representative
 - Hospital engineer
 - Sterile services manager
 - Representatives from all departments

What is the role of the committee?

- Produce evidence based policies
- Ensure IPC training
- Monitor antibiotic usage and resistance (ties in with antibiotic policy committee)
- Ensure appropriate use of disinfectants
- Regular audits of IPC in the facility

Recap : How are infections transmitted?



Source of infectious agents

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graph TD; A[Source of infectious agents] --> B[Endogenous]; A --> C[Exogenous]; B --> D[The organisms belong to species of the normal human flora]; C --> E[The organisms are derived from a source other than the effected host];
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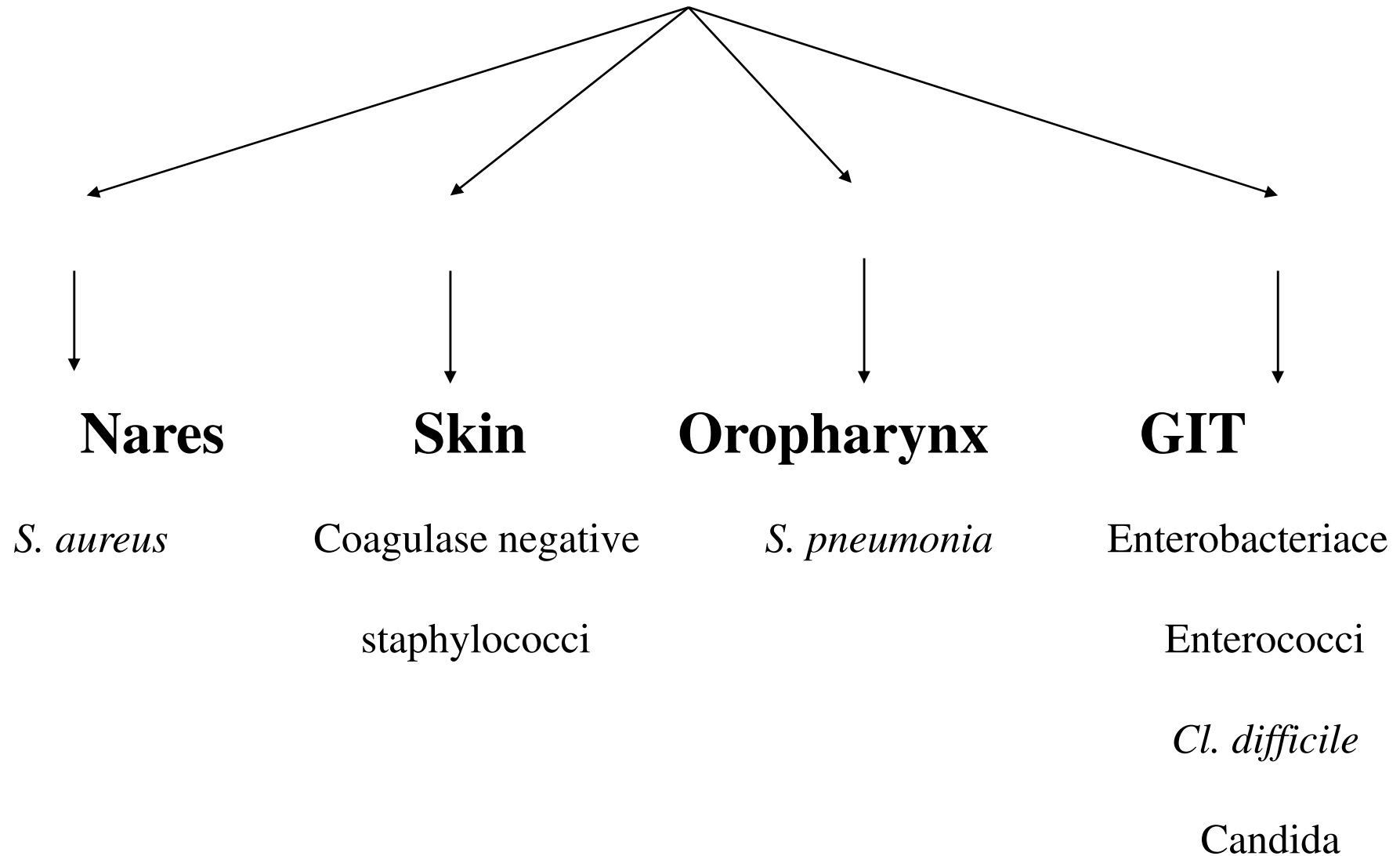
Endogenous

The organisms belong to
species of the normal
human flora

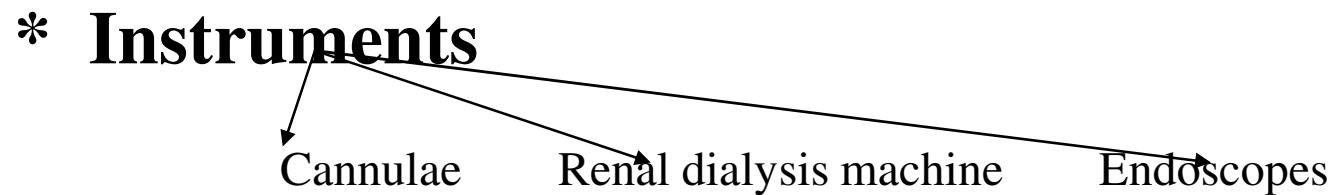
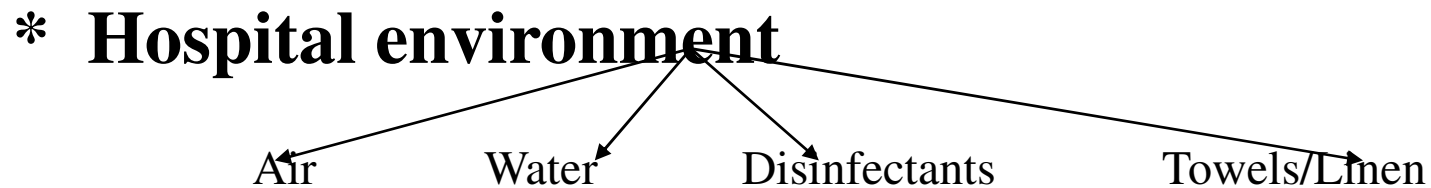
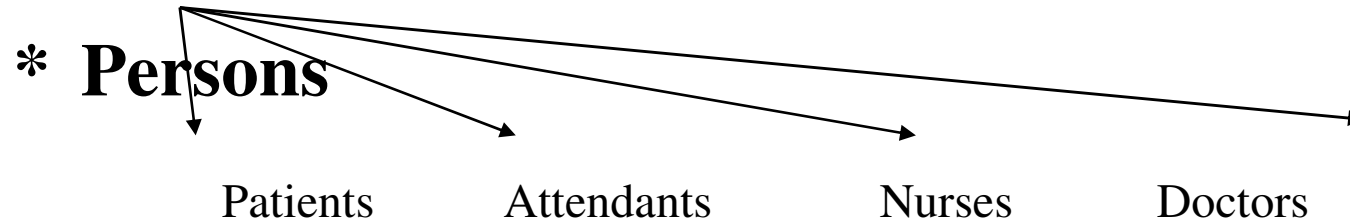
Exogenous

The organisms are derived
from a source other than
the effected host

Endogenous source



Exogenous source



*** Blood and its products**

Types of hospital acquired infections : TOP 5

- 1- Surgical site infection (SSI)
- 2- Urinary tract infection (Catheter-related infection)
- 3- Respiratory tract infection (Ventilator-related infection)
- 4- Blood stream infection (Devices-related infections)
- 5- Gastrointestinal infection

Transmission Prevention Methods

Standard Precautions: (universal)

Basic preventive measures to be used with all patients at all times.

- Hand Hygiene
- Patient Placement (risk assessment)
- Other PPE based upon anticipated exposure
- Safe Work Practices
- Environmental measures (proper waste disposal)

Hand Washing Process

- Wet hands with clean (not hot) water
- Apply soap
- Rub hands together for about 20 seconds
- Rinse with clean water
- Dry with disposable towel or air drier
- Use towel to turn off faucet



Alcohol-based Hand Rubs

- Effective if hands not visibly soiled
- Convenient for use between patients
- Apply appropriate amount
- Covering all surfaces
- Allow it to dry
- More costly than soap & water

Personal Protective Equipment (PPE)

When used properly will protect you from exposure to infectious agents

Know what type of PPE is necessary for the duties you perform and use it correctly



Choosing the Appropriate PPE

Risk assessment

- What Risk?
 - The probability of exposure to a potentially harmful pathogen
 - The severity of the consequences
 - Probability and severity of harm
- How to assess risk?
 - Identify risk
 - Analyse risks identified (consequences and likelihood of occurrence)
 - Determine priorities and control measures
 - Review

Precaution per risk levels

****All levels require hand hygiene****

Transmission / Procedure based precautions:

- **Contact**
- **Droplet**
- **Airborne**

Standard Precautions

- Include the following
 - Hand hygiene
 - Appropriate PPE (gloves, mask, apron)
 - Safe injection practice and disposal of sharps
 - Waste management (disposal)
 - Safe handling of soiled linen
 - Decontamination of medical devices

Contact Precautions

- Direct/indirect contact
- Patient placement/movement:
 - Single room + en suite bathroom
 - Co-horting
 - Isolation ward/unit
- PPE:
 - Have all equipment available for procedures
 - Do not touch eyes, nose, mouth with hands
 - Avoid contaminating environmental surfaces
- Terminal cleaning once patient has been discharged

Droplet Precautions

- large droplets from
 - Sneezing
 - Coughing
 - Talking
- Examples of organisms
 - *Neisseria meningitides*
 - Pertussis
 - Influenza
 - Mumps
 - Rubella
 - Diphtheria
 - Pneumonic plague



Droplet Precautions

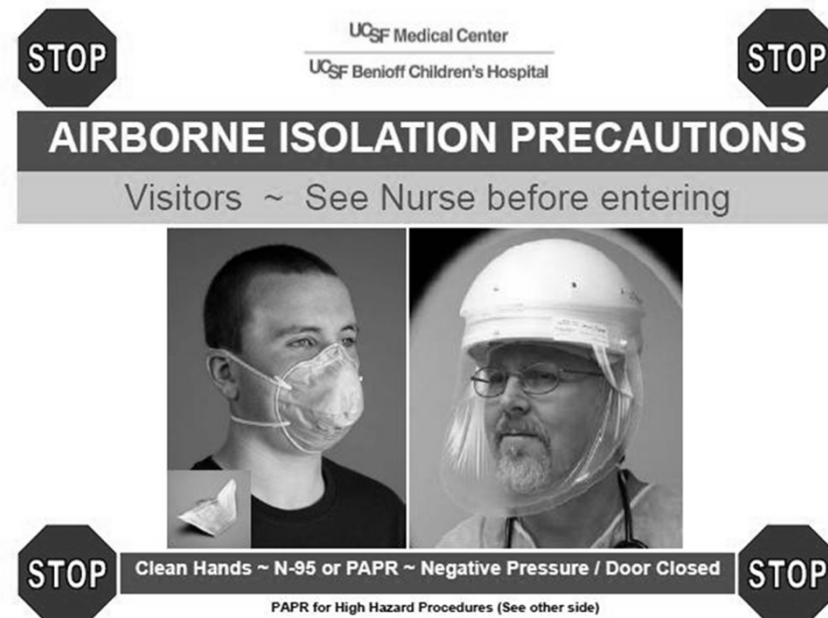
- Patient placement/movement:
 - Single room + en suite bathroom
 - Cohorting
 - Isolation on ward
- PPE:
 - Standard precautions
 - Have all equipment available for procedures
 - Surgical face mask (within 1m of pt)
 - Gloves, eye protection based on procedure



Airborne Precautions

- Small droplet nuclei ($\leq 5\mu\text{m}$)
- Aerosols and air currents

- Examples
 - Tuberculosis
 - Measles
 - *Varicella*



Airborne Precautions

- Patient placement/movement:
 - Single room + en suite bathroom
 - Cohorting
- PPE:
 - Standard precautions
 - Have all equipment available for procedures
 - N95 respirator for close prolonged contact
 - Surgical face mask if not in close contact/for visitors
 - Gloves, eye protection based on procedure

Cleaning and Disinfection and sterilization

- **Detergents**

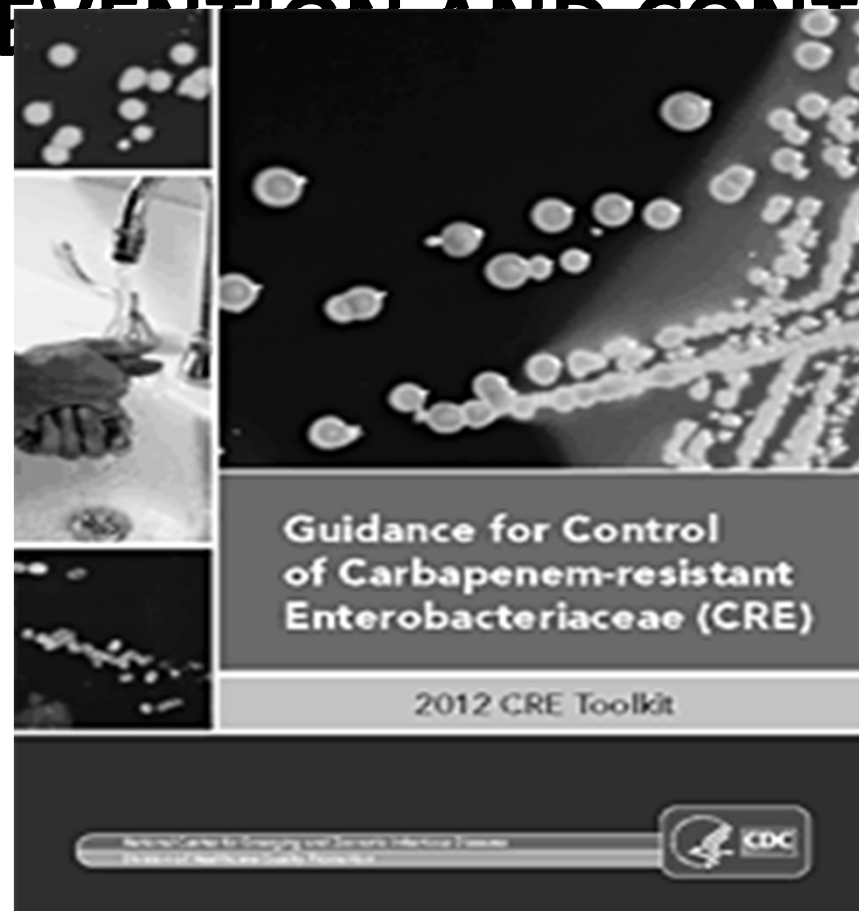
- Remove dirt, soiling
- Mechanical force essential
- Flush with clean water

- **Disinfectants**

- Kill viruses, bacteria
- Decontaminate surfaces
- Type depends on infectious agent
- Use *after* detergent

- **REFER TO BLOCK 4 NOTES ON STERILIZATION AND DISINFECTION.**

MULTIDRUG RESISTANT ORGANISMS & INFECTION PREVENTION AND CONTROL



A Reminder from History

- 1940s: the birth of antimicrobials
- 1950s: *Staphylococcus aureus* resistant to PCN
- 1960s: resistance to Sulfa in gram negatives
- 1970-1980s: strong β -lactam agents for *S.aureus*, emergence of MRSA
- 1980s: cephalosporins with broad spectrum coverage, emergence of ESBL
- 1990-2000s: VRE, VISA
- 2002: VRSA

2013

CRASH PRIDE: The battered Ferrari 612 Scaglietti of tycoon Lonwabo Fezekile Mahlati after it crashed on Hospital Bend

LICENCE TO STALL: James Bond would not be pleased — this immobile be transported to a garage

Lethal bacteria on the rise in SA

Institute wants new superbug to be declared a notifiable disease

BOBBY JORDAN

SOUTH Africa is facing a silent epidemic in hospital wards of potentially lethal bacteria that are resistant to all known drugs.

The National Institute of Communicable Diseases this week said its laboratory had confirmed 63 cases of totally-antibiotic-resistant superbugs collectively known as Carbapenem-resistant Enterobacteriaceae (CREs) since they first appeared in South Africa less than two years ago.

One private laboratory, Ampath, has detected 96 CRE cases since February 2011.

The bug has been found in private and public hospitals around the country. Able to survive in the human stomach and on hospital surfaces, it turns treatable infections into life-threatening cases by transferring its own drug resistance. It can be passed from patient to patient in hospitals.

The bug has yet to be declared a notifiable disease and hospitals

notifiable disease, which will force hospitals to report every case.

"This number [63] does not represent the national prevalence of CREs, but it is a warning of emerging resistance that threatens to produce an epidemic of CREs," the state laboratory said in its latest communicable diseases communique.

The institute's principal pathologist, Olga Perovic, said: "There is a problem. We need to face it. That is what we are trying to do."

The government is finalising a report into a recent CRE outbreak on the East Rand of a bug called NDM-1. Other superbugs

'The number of cases is a warning of emerging resistance that threatens to produce an epidemic

detected "one or two new cases every month" on the East Rand so far this year.

"We take a proactive ultra-cautious approach to all positive results and isolate those patients until discharge," MacLiam said.

Figures published by the South African Society for Clinical Microbiology show that drug-resistant bugs are spreading.

The figures, which do not specify CRE superbug infections, are based on tests of serious infections by several laboratories. They found:

- More than 400 cases of *P.aeruginosa* bacteria from January to June 2012. The bug attacks damaged tissue and infects patients with low immunity; 12% of 44 cases in Cape Town were resistant last-resort antibiotics;

- Only two of more than 800 cases of *Klebsiella pneumonia* responded to Ampicillin, the most common antibiotic. In

2014

- The African Ebola outbreak that keeps getting worse



Methicillin Resistant *Staphylococcus aureus* (MRSA)

- About 3-8% of the population at large is a carrier of MRSA with no apparent ill effect.
- MRSA-colonized and infected patients readily contaminate their environment, and healthcare personnel coming into contact with patients or their environment readily become contaminated
- Transmission:
 - MRSA can survive for hours, up to days on surfaces such as cotton and polyester
 - It's spread most commonly by HCW's hands.

MRSA Prevention

- Contact Precautions
- Hand hygiene – preferably with hand sanitizer
- Handouts for patients and their families
- Surveillance to monitor and measure control efforts
- Judicious use of antibiotics (Antibiotic stewardship)

Vancomycin Resistant Enterococcus (VRE)

- GIT normal flora
- It's of concern when it develops resistance to Vancomycin
- Causes: UTI, bloodstream infection or surgical site infection
- Survives for hours - days on surfaces such as cotton and polyester (scrubs and curtains)
- It's transmitted by contaminated hand and equipment
- Environmental cleaning especially toilets is essential for prevention and control of VRE

***Clostridium difficile* (C.difficile):**

- Usually presents with diarrhea, but may occur without diarrhea and mimic other abdominal syndromes
- Complications (shock, perforation, megacolon, death) developed in 11% with first recurrence
- 20% may have recurrent diarrhea after resolution of the initial episode

***C.difficile* Transmission:**

- Spore forming (hard to kill)
- Survives for months
- Patients easily colonized from contaminated equipment
- Exposure to antibiotics increases the risk

***C.difficile* Prevention**

- Limit movement in and out of the patient's room
- Dedicated patient care equipment
- Ensure cleaning and disinfection of equipment and the environment.
- Hypochlorite for cleaning of the environment
- Soap and water hand hygiene is most effective method
- No Alcohol hand rub ! (enhance sporulation & spread)

Other MDROs: CRE

- Gram-negative bacteria to include:
- Resistant *Acinetobacter* species
- ESBLs = extended-spectrum β -lactamase producing organism
- Resistant *Pseudomonas aeruginosa*
- KPC⁺ organisms = Carbapenem Resistant Enterobacteriaceae / *Klebsiella pneumoniae* carbapenemase producing organism

Diagnose & Treat Infections Effectively

- **Target the Pathogen**
- Take specimen for Culture
- Empiric therapy to likely pathogens according to local data & antibiogram
- Target therapy to known pathogens and antimicrobial susceptibility test results
- Consult experts where indicated.

Prevent Infection

- **Vaccinate**
- Appropriate vaccine as per risk (patients & HCW)
- **Get the catheters out**
- Use catheters only when essential
- Use correct catheter (Type & size)
- Use proper insertion & care protocols
- Remove catheters when no longer essential

Use Antimicrobials Wisely

- **Practice antimicrobial control**
- Engage in local antimicrobial control efforts
- **Use local data**
- Know your antibiogram
- Know your patient population

Use Antimicrobials Wisely

- **Treat infection, not colonization**
- Use proper antisepsis for blood and other cultures
- Culture the blood, not the skin flora or catheter hub
- Use proper methods to obtain all cultures
- **Treat pneumonia, not tracheal aspirate**
- **Treat bacteremia, not catheter tip or hub isolate**
- **Treat sinusitis, not infection of the catheter**

Use Antimicrobials Wisely

Stop antimicrobial treatment

- When the infection is cured
- When cultures are negative & infection is unlikely
- When there is no evidence of infectious disease / condition.

Prevent Transmission

Contain the pathogen- minimize the spread

- Use standard infection control precautions
- Contain infectious body fluids (Follow airborne, droplet and contact precautions)
- When in doubt consult infection control experts

Break the chain of transmission

- Keep your hands clean

Antimicrobial Stewardship

- Optimal choice of antibiotic
- Dose appropriately
- Monitor Duration of treatment
- Control of antibiotic use – develop policies
- Prevents /minimize the emergence of resistance among microorganisms

Thank you !!