Outbreak investigation & root cause analysis (RCA)

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Hospital Authority Centre for Health Protection, Kowloon, Hong Kong Special Administrative Region
1 - 3 November 2017.
(Organizers: Infectious Disease Control Training Centre, Hospital Authority/Infection Control Branch, Centre for Health Protection and Chief Infection Control Officer’s Office).
Aims

- **Aims of an outbreak investigation**
  - To identify the source of the outbreak
  - To identify the reservoir(s)
  - To identify the mode of spread
  - Eliminate the reservoir(s) and stop ongoing transmission
  - Prevent future infection/s

- **Aims of a route cause analysis**
  - Seeks to identify the origin of a problem using a specific set of steps
    - Determine what happened
    - Determine why it happened
    - Figure out what to do to reduce the likelihood that it will happen again
Reasons for investigation outbreaks

- Prevent additional cases
- Prevent future outbreaks
- Assess prevention interventions
- Learn about new diseases
- Learn something new about an old disease
  - New route of transmission
  - Complication of new procedures
  - New sources
- Reassure the patients/staff/public
Descriptive epidemiology

- The 5W's of descriptive epidemiology:
  - What = health issue of concern
  - Who = person
  - Where = place
  - When = time
  - Why/how = causes, risk factors, modes of transmission
Decision to investigate an outbreak

- **Further investigations vs implementing interventions**
  - Number of patients affected
  - Associated morbidity
  - Presence of unusual or severe symptoms of disease
  - Possibility of common source
  - Resource requirements
  - Level of public health importance

- **Some outbreaks**
  - Resources may be best utilised reinforcing basic infection control practices
    - May terminate the outbreak
    - Minimise the cost and resource utilisation associated with an extensive investigation
Definitions

- **Epidemic**
  - Is the occurrence of more cases of disease than would normally be expected in a specific place or group of people over a given period of time.

- **Outbreak**
  - The same as an epidemic.
  - The term outbreak is often used rather than epidemic to avoid sensationalism.

- **Cluster**
  - Is a group of cases in a specific time and place that may or may not be greater than the expected rate.

- **Endemic**
  - A higher background rate of disease.

- **Pandemic**
  - Very widespread, often global, disease.
Outbreaks in healthcare facilities

- Wenzel RP
  - 1978 - 1982 University of Virginia
    - 9.8 outbreaks per 100,000 admissions
    - 10/11 outbreaks occurred in ICU
    - 8/11 outbreaks involved bloodstream infections

- Baltimore, Maryland
  - 36-bed NICU
  - Oct 2004 - Feb 2005
  - Investigation included:
    - Case identification
    - Review of medical records
    - Environmental cultures
    - Patient surveillance cultures
    - Personnel hand cultures
    - Pulsed-field gel electrophoresis (PFGE)
  - The case-control study included case identification and review of medical records
  - Infection control measures were implemented

Outbreaks in healthcare facilities

- Baltimore, Maryland...
  - 18 NICU neonates had cultures that grew MDR S. marcescens
  - The case-control study - 16 cases, 32 controls

Results

- PFGE analysis
  - 15 cases - a single strain of MDR S. marcescens
  - 2 cases unique strains/ 1 case isolate could not be subtyped
  - An unrelated MDR S. marcescens isolate was recovered from a sink drain
  - Exposure to inhalational therapy was an independent risk factor for MDR S. marcescens acquisition

- Extensive investigation failed to reveal a point source for the outbreak

Comments

- Transient carriage on the hands of staff or on respiratory care equipment - likely mode of transmission
- Cohorting patients and staff, at the cost of bed closures and additional personnel - interrupted transmission

Outbreaks in healthcare facilities

- CDC/Division of Healthcare Quality Promotion (DHQP), 1990 - 1999
- 114 onsite outbreak investigations
  - 71% involved hospitals inpatients
    - 28% in ICUs, 72% non-ICU settings
  - 8% outpatients
  - 5% LTCFs
  - 4% home healthcare settings
  - 73% were caused by bacteria
  - 46% associated with invasive devices or procedures
    - Haemodialyzers (10 outbreaks)
    - Needleless devices (7 outbreaks)
    - Surgery (21 outbreaks)
    - Dialysis (16 outbreaks)

Outbreaks in healthcare facilities

- Gastmeier et al review of 1,022 outbreak publications (majority 1990’s)
  - 83% from hospitals
  - 46% occurred in ICU
  - 11% outpatient care setting
  - 37% not able to identify a source
  - 28% mode of transmission not clear

- Pathogens
  - Staphylococcus aureus outbreaks - 77% MRSA
  - Other Multi-drug resistances outbreaks
    - *K. pneumoniae* - 49.3% MDR
    - *Acinetobacter baumannii* - 37.5% MDR
    - *M. Tuberculosis* - 66% MDR

Outbreaks in healthcare facilities

- 2010 survey - USA ICPs
  - A Part 2 survey including - outbreak investigations

Results

- 822 responses
- 386 outbreak investigations
- 289 US hospitals
- Nearly 60% of the outbreaks were caused by 4 organisms:
  - norovirus (18%)
  - *Staphylococcus aureus* (17%)
  - *Acinetobacter* spp (14%)
  - *Clostridium difficile* (10%)

*Frequency of outbreak investigations in US hospitals: Results of a national survey of infection preventionists AJIC Feb 2012, Volume 40, Issue 1, Pages 2-8.*
Outbreaks in healthcare facilities

- 2010 survey - USA ICPs........
  - Norovirus occurred most often in behavioural health & rehabilitation/long-term acute care units
  - Other organisms occurred in medical/surgical units
  - Unit/department closure - 22.6%
    - Norovirus
  - Investigations were most frequently conducted in community/nonteaching hospitals and facilities with 201 to 300 beds
    - Mean number confirmed cases - 10
    - Mean duration - 58 days

Frequency of outbreak investigations in US hospitals: Results of a national survey of infection preventionists
AJIC Feb 2012, Volume 40, Issue 1, Pages 2-8.
USA-Hepatitis B & C outbreaks 2008 - 2016

- 59 outbreaks (two or more cases) of viral hepatitis related to healthcare reported to CDC during 2008-2016
  - 56 (95%) occurred in non-hospital settings

- Hepatitis B
  - Total 24 outbreaks including one of both HBV and HCV:
    - 179 outbreak-associated cases
    - >10,935 persons notified for screening
  - 18 outbreaks occurred in long-term care facilities:
    - 133 outbreak-associated cases of HBV
    - Approx. 1,680 at-risk persons notified for screening
    - 83% (15/18) of the outbreaks assoc with infection control breaks during assisted monitoring of blood
  - 5 outbreaks occurred in other settings:
    - A free dental clinic in school gymnasium
    - An outpatient oncology clinic a hospital surgery service
    - Two at pain remediation clinics
      - One outbreak of HBV and
      - One with both HBV and HCV
    - 46 outbreak-associated cases of HBV and
    - > 8,500 persons at-risk persons notified for screening
USA-Hepatitis B & C outbreaks 2008 - 2016

- **Hepatitis C**
  - 36 total outbreaks including one of both HBV and HCV
    - >288 outbreak-associated cases
    - >105,048 at-risk persons notified for screening
  - 13 outbreaks occurred in outpatient facilities
    - 111 outbreak-associated cases of HCV
    - >73,873 persons notified for screening
  - 20 outbreaks occurred in haemodialysis settings
    - 100 outbreak-associated cases of HCV
    - 2,979 persons notified for screening
  - Three outbreaks occurred because of drug diversion by HCV-infected health care providers
    - 78 outbreak-associated cases of HCV
    - >26,217 persons notified for screening
Outbreaks - Asia Pacific Region

A gloves-associated outbreak of imipenem-resistant Acinetobacter baumannii in Guangdong, China

Outbreaks of health care-associated Burkholderia cepacia bacteremia and infection attributed to contaminated sterile gel used for central line insertion under ultrasound guidance and other procedures

Epidemiology and Infection Control II

American Journal of Infection Control

Research Article

Open Access

Abstract

Background: Imipenem-resistant Acinetobacter bauamnnii was detected in our hospital. We aimed to describe an outbreak of IPAB infection and its control measures.

Methods: An environmental investigation was undertaken to identify the source of the outbreak. Isolates were collected and compared to control strains. The infection was controlled by implementing new infection control measures.

Results: Thirty-five IPAB infections were identified between November 2017 and January 2018. Twenty-nine patients were affected, and 16 patients recovered. The infection was controlled by implementing new infection control measures, including enhanced hand hygiene, improved environmental cleaning, and the use of personal protective equipment.

Conclusions: The outbreak was successfully controlled through enhanced infection control measures. These include improved hand hygiene, increased environmental cleaning, and the use of personal protective equipment.

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Received 30 March 2015; returned for modification 12 September 2015

September 1, 2017 Volume 45, Issue 9, Pages 954–958

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Outbreaks - Asia Pacific Region

Carrie Lam issues action call in Hong Kong hospital flu crisis

Authority in charge of public wards told to come up with urgent measures as doctors struggle to cope with deadly summer outbreak
Recognising and investigating an outbreak

- **Infection control “detective”**
  - Investigating an outbreak is like being an infection control “detective”

- **Detection of outbreaks**
  - Alert/s from an effective surveillance program
  - Alert/s from “alert” organism surveillance software
    - Laboratory
    - Infection control
  - Alert/s from staff
    - Physicians
    - Nurses
    - Microbiologist

*Wenzel RP. Prevention and Control of Nosocomial infections. 4th Edition, Lippincott, Williams and Wilkins*
Recognising and investigating an outbreak

- Determining the existence of an outbreak
  - Exclude pseudo outbreaks
  - Define the case/s
  - Determine/ascertain the facts to define the case/s
  - Develop hypotheses
  - Evaluate hypotheses
  - Compare pre-epidemic and epidemic rates to confirm the existence of an outbreak
  - Implement control and prevention measures
  - Communicate findings

Recognising and investigating an outbreak

- **Epidemiologic studies**
  - **Line listing**
    - Line listing
      - A list of cases and a few factors about each case to assist in generating your hypothesis
  - **Epidemic curve**
    - A plot of the number of cases
  - **Comparative studies**
    - Risk factor assessment
      - Case control study
      - Cohort study
  - **Additional studies**
    - Review practices/literature
    - Observational studies
    - Isolate typing

*Wenzel RP. Prevention and Control of Nosocomial infections. 4th Edition, Lippincott, Williams and Wilkins*
What skills do you need?

- Logical thinking
- Problem solving
- Quantitative skills
- Epidemiological knowledge
- Judgement
- Diplomacy

*The Thinker, 1904, Auguste Rodin, Musse Rodin, Paris.*
Determining the existence of an outbreak
Possible outbreak

Staff  Surveillance data  Microbiology data

Define a case

Define pre outbreak and outbreak periods

Case definition same in both periods

Yes

Laboratory methods same in the two periods

Yes

Surveillance/case find same in the two periods

Yes

Compare attack rates for the two periods

Test for statistical significance P<0.05

Yes

An outbreak is defined, proceed to investigate

No

STOP - clarify before proceeding

No

STOP - clarify before proceeding

No

STOP - clarify before proceeding

No

STOP - possibly an important cluster

Ask these questions?

- Do the laboratory findings correlate with the clinical findings?
- Has the data collection or surveillance method changed?
  - New data collector
  - New data collection tool
- Has the case finding methods changed?
- Have laboratory methods changed/improved?
  - Is there a new diagnostic test?
Exclude pseudo-outbreaks

- **False clusters of infection**
  - Recovery of a specific micro-organism from clinical specimens in the absence of any evidence of infection
  - Contamination of clinical specimens
    - Collection/handling
    - Laboratory procedures

- **Real clusters of infection**
  - May be a chance clustering of unrelated cases in space and time
Pseudo-outbreaks

- False Cluster
  - May - Aug 1981
  - 38 positive BC/18 patients - Serratia marcescens
    - Patients rarely showed clinical symptoms
    - Occurrence was random
      - Multiple wards and units involved
      - More on Mondays and Thursdays
    - Some patients had positive → negative → positive results
  - Skin prep suspected
    - Alcoholic/chlorhexidine
      - No growth
Pseudo-outbreaks

- False Cluster......
  - Number > in haematology/oncology ward
    - Screening BCs Mon & Thurs
  - Hypothesis - skin carriage
    - Venipuncture sites inspected
      - Bruising noted from previous venipuncture
    - Anticoagulant therapy
    - Frequent prothrombin time blood samples
  - Retrospective review of pathology records
    - BCs/prothrombin time specimen collected at the same time
Pseudo-outbreaks

- Blood collection process
  - Some staff placing blood in prothrombin tube before BC bottles
  - End of syringe sometimes touched internal surface of prothrombin tube
- Prothrombin tube
  - Sodium citrate
    - Serratia marcescens
- Immediate withdrawal of tubes
  - Autoclaved tubes only
  - Outbreak terminated
  - Re-training in BC collection methods
- Shortly after:
  - New sodium citrate tubes (UK)
  - Micro and culture
    - Acinetobacter sp
    - Pseudomonas maltophilia
Case definitions

- **Case definition**
  - Review medical records of potential cases to formulate a case definition
    - Simple or complex
    - May evolve as more information becomes known
    - Uncertainty in the diagnosis
      - “definite” and “possible”
  - **Include:**
    - Who is affected (person)
    - Where cases were occurring (when)
    - Time period over which the cases occurred (time)
    - Setting (place)
    - Confirmatory laboratory tests, if available
Case definitions

- Include......

- Clinical information about the disease/infections
  - Signs and symptoms
  - Diarrhoea, vomiting or both
  - Type of infection
    - Bloodstream infection
  - Organism

- Case definitions are important to allow early identification of cases and implementation of control measures and limiting the risk of transmission

- Sometimes case definitions may be set by others
  - WHO, Health departments
    - SARs, MERs, H1N1
CASE DEFINITION VIRAL GASTROENTERITIS

Patients or staff with:

- Diarrhoea - Three or more loose stools in a 24 hour period
  OR
- Vomiting - two or more episodes in a 24 hour period
  OR
- Diarrhoea and Vomiting - one or more episodes of BOTH symptoms in a 24 hour period

But excluding:

- Long standing diarrhoea associated with disability or other medical cause and incontinence diarrhoea associated with ingestion of laxative drugs

OUTBREAK THRESHOLD

Two or more cases in a room, area or ward/unit with dates of onset within 7 days of each other
The infection control “detective”

- Look for additional cases
  - Review medical records, microbiology, pathology, ward/unit, pharmacy and infection control records (surveillance data)
  - Apply the case definition consistently and without bias
  - Seek assistance from other healthcare workers to identify cases
- Observe what is happening
  - “Shoe leather” infection control
- Keep good records during your investigation
Confirm an outbreak is occurring
Epidemic Curve

- Shows the time course
- Visual display
- Identifies where you are in the course of the outbreak
- May be able to estimate time periods of exposure (known source)
- Epidemic patterns
  - Common source exposure
  - Person to person spread
  - Both
Epidemic Curve - person to person spread

- Scabies
  - The number of cases increases slowly, levels off and then slowly decreases
  - Time interval between cases may suggest the incubation period

Epidemic Curve - point sources

- Salmonella foodborne outbreak
  - The number of cases rises and falls rapidly
  - Transmission is from a point or a common source
  - All the cases occur within 1 incubation period

LARGE OUTBREAKS OF \textit{Salmonella Typhimurium} PHAGE TYPE 135 INFECTIONS ASSOCIATED WITH THE CONSUMPTION OF PRODUCTS CONTAINING RAW EGG IN TASMANIA

Nicola Stephenson, Cameron Saut, Simon M Fristone, Utilano Lignoul, Cameron Bell

Confirm an outbreak is occurring

- Compare pre-epidemic and epidemic periods

Statistically significant $P<0.05$
Establishing an Outbreak Control Team

- Outbreak Control Team
  - Immediate or continuing hazard
  - One or more cases of serious disease
  - Large numbers of cases
  - Involvement of one or more HCF

- Outbreak Control Team
  - Focal point for flow of information
  - Coordination of investigations
  - Develop
    - Intervention strategies
    - Communicate strategies
  - Determine the costs
  - Maintain a log of events
  - Prepare a final report
Spot map - may suggest the location or pattern of transmission
Spot map - may suggest the location or pattern of transmission
Establishing an Outbreak Control Team

- **Team representatives**
  - Executive mgt
  - Wards/Unit dept heads
  - Infection Control
  - Infectious Diseases/Microbiology
  - Public Affairs
  - Staff Health services*
  - Pharmacy**

  *if outbreak involves staff
  **if outbreak involves drugs/infusions

- **Team communication**
  - Administration
  - Department heads
  - Frequent:
    - Telephone calls
    - Personal briefings
Review of literature and facility Policies/Guidelines - helps to formulate a hypothesis

- Literature review
  - Previous reports
  - Possible reservoirs
  - Modes of transmission
  - Develop line listing
  - Control measures
    - Most effective


Review of literature and facility Policies/Guidelines - helps to formulate a hypothesis

- Policies/Guidelines
- Review with staff
  - Device use
  - Invasive procedures
  - Mechanical ventilation
  - Wound dressings
  - Specimen collection
  - Cleaning and disinfecting
  - procedures


Check on laboratory support

- Essential that laboratory staff be involved in investigations
  - Save the isolates
  - Types of specimens
  - Help develop the hypothesis
  - Secular trends of pathogens
    - Automated or computerised pathogen detection systems
Check on laboratory support

- Culture surveys
  - Epidemiologically directed
    - Based on the results of your epi investigation
  - Extensive cultures (personnel/environment) in the absence of epi data
    - Costly
    - May implicate the wrong organism/person
    - May be colonisation rather than true infections
Check on the laboratory support

- Laboratory process
  - Accurate pathogen identification
  - Antimicrobial sensitivity testing
  - Assessment for similarity (clonality)
    - Phenotypic typing
      - Often lacks discriminatory features
    - Genotypic methods
      - Highly discriminatory
  - Organism the same clone
    - Supports evidence of a common source
    - Link between infected patients and reservoir
    - Link between all patients (clonally related)
    - The number and distribution of strains
    - Likely environmental source and mechanism of transmission

All suspected CPE isolates should be referred to the MDU PHL for confirmatory testing and genomic analysis, unless excluded below.

Line listings

- A line listing helps identify common exposures
  - Include:
    - Name of each patient
    - Date/s of illness
    - Location of patient
    - Initial demographic and exposure data
      - Gender/age
      - Underlying diagnosis
      - Invasive procedures and devices
      - Medical/surgical unit
  - Data helps formulate a hypothesis
  - Possible mode/s of transmission
  - A line listing can help organize this crucial information and get below the “tip of the iceberg”
All line listings should include the components of the case definition.
### Line Listing for Gastroenteritis in an Institution (page 1)

**Name of Facility:** [Name of Facility]

**Total No. residents at facility:** [Total No. residents at facility]

**Type of Aged Care Facility:**
- [ ] Hostel
- [ ] Nursing Home

**Contact Person:** [Contact Person]

**Position Title:** [Position Title]

**Telephone No.:** [Telephone No.]

**Fax No.:** [Fax No.]

**Email:** [Email]

**PHU Notified**
- [ ] Date
- [ ] Reported to PHU:

**Date First Case:** [Date First Case]

**Unique name/number for outbreak:** [Unique name/number for outbreak]

### CASE DETAILS

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Full Name</th>
<th>DOB &amp; Age (yrs)</th>
<th>Gender (M or F)</th>
<th>Staff (S) or Resident (R)</th>
<th>Current Ward or Room</th>
<th>Date of Onset</th>
<th>Time of Onset</th>
<th>Length of Illness (hrs)</th>
<th>Symptoms (see key below)</th>
<th>Specimen Collected (Y/N) If Yes, specify type</th>
<th>Date Specimen Collected</th>
<th>Result (specify name of bacteria, virus, parasite or toxin)</th>
<th>Seen by Dr (Dr)</th>
<th>Hospitalised (H)</th>
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How to evaluate your hypothesis

- Seek advice/assistance
  - Statistician
  - Epidemiologist/epidemiology experience
- Utilise statistical packages
  - Epi-Info
- Control for confounding
  - Can affect the strength ($p$-value)
  - Can affect the magnitude of the measure of association
How to evaluate your hypothesis - Cohort Study

- **The cohort study**
  - People exposed to a particular factor and a comparison group that was not exposed
  - Measures and compares the incidence of disease in the two groups
  - A higher incidence of disease in the exposed group suggests an association
  - Generally a good choice when dealing with an outbreak in a relatively small, well-defined source population
  - Particularly if the disease being studied was fairly frequent
How to evaluate your hypothesis - Case control study

- **Case Control study**
  - In some outbreaks the population may not be well defined
    - Cohort studies not feasible
    - Use Case Control
  - Ask the same questions in relation to cases and controls
  - The mathematical measure of association to quantify the relationship between exposure and disease is:
    - “Odds ratio (OR)”
      - Contrasts the odds of exposure among cases with the odds of exposure among controls
    - Does not prove the exposure caused the disease
    - Helpful in evaluating the source of the disease
How to evaluate your hypothesis - Case control study

- **Case Control study**
- Identifies a group of individuals who had developed the disease (the cases) and a comparison of individuals who did not have the disease of interest
- The cases and controls are then compared with respect to the frequency of one or more past exposures
- If the cases have a substantially higher odds of exposure to a particular factor compared to the control subjects, it suggests an association
- This strategy is a better choice when the source population is large and ill-defined, and it is particularly useful when the disease outcome was uncommon
How to evaluate the hypothesis - testing statistical significant

- The mathematical measure of association to quantify the relationship between exposure and disease is:
  - “Odds ratio (OR)”
    - Contrasts the odds of exposure among cases with the odds of exposure among controls
  - Does not prove the exposure caused the disease
- Test for statistical significance
  - Chi-square and Fishers Exact test
  - Common cut off point .05
  - When the p-value is below .05
    - Statistically significant
    - The smaller the p-value the stronger the significance

Online statistical calculators
http://www.graphpad.com/quickcalcs/
Interventions/control measures

- Control measures
  - Need to be flexible
  - May need to be changed/revised as the situation unfolds

- Implementation:
  - Before all information is available or studies completed

- Isolation
  - Designated room/area separating cases from non-cases

- Cohorting
  - Cases sharing rooms
  - Designated staffing

- Support of local administration/management
  - Authority to investigate and enforce control measures
  - Resources
    - staffing
    - funding
Interventions/control measures

- Observe/review infection control practices and procedures
  - Hand washing
  - Isolation precautions
  - Sterilisation and disinfection
  - Suspend certain procedures
  - Removal or disposal of certain equipment or medications
- Decisions to close a ward should be on a case-by-case basis
  - Risk from the outbreak vs the benefits of continued care (i.e. ICU)
- Reporting/notification requirements
  - Local, state or federal government
- Government and non government organisations
  - Provide guidance
  - Provide personnel for onsite assistance
Assess the efficacy of interventions/control measures

- Ongoing surveillance and follow-up
  - Confirm the end of the outbreak
  - Establish a new baseline
    - Comparison for the future

- Evaluate
  - Outbreak investigation process
  - Control measures
  - Cost
  - Compliance
  - Acceptability of intervention
Communicating findings

- Those who need to know
  - Oral briefings
  - Written reports
    - Describe what you did
    - What you found
    - What you think should be done
  - Be scientific and objective
  - Should be able to defend your conclusions and recommendations

- Outbreak reports
  - What we did
  - What we found
  - What we learned
  - Consider publishing your outbreak and findings
Communicating findings

- Written report
  - Introduction
  - Background
  - Methods
  - Results
  - Discussion
  - Recommendations

- Outcome
  - Blueprint for action
  - Record of performance
  - Documentation for potential legal actions
  - Reference for others who experience similar problems in the future

- Publication
  - Contributes to the scientific knowledge base

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**Herbert S et al. ICHE 2007; 28:98-101**
WHAT IS ROOT CAUSE ANALYSIS (RCA)?

A root cause is a factor that caused a non conformance and should be permanently eliminated through process improvement.

Root cause analysis (RCA) is a tool that seeks to identify the origin of a problem using a specific set of steps:

- Determine what happened
- Determine why it happened
- Figure out what to do to reduce the likelihood that it will happen again

By repeatedly asking the question “why?” you can peel away the layers of an issue and get to the root cause of the problem. Keep asking why until you reach an actionable level.
WHAT IS ROOT CAUSE ANALYSIS (RCA)?

- You'll usually find three basic types of causes:
  - Physical causes
    - Tangible, material items failed in some way
  - Human causes
    - People did something wrong, or did not do something that was needed
  - Organizational causes
    - A system, process, or policy that people use to make decisions or do their work is faulty
Understanding a problem

- **Steps:**
  - Problem understanding
  - Problem cause brainstorming
  - Problem cause data collection
  - Problem cause data analysis
  - Root cause identification
  - Route cause elimination
  - Solution implementation
Understanding a problem

- Multidisciplinary team
  - Small team supplemented by line manager with decision authority
    - QI expert if other members of the team have limited experience
  - Trained in RCA methodology
  - Use RCA tools
    - Brainstorming
    - Flowchart
    - Cause & effect diagram (Fishbone)

- Involve those who know the problem best in solving the problem!

- Map the process to illustrate where problems occur and which problems should be solved

- Drill down

- Rank improvement actions/ideas
  - Objective, measurable

- Implement your improvement plan

APIC Guide to Preventing Clostridium difficile Infections [https://apic.org](https://apic.org)
ROOT CAUSE ANALYSIS TO SUPPORT INFECTION CONTROL

- ICT that correctly uses RCA implements:
  - More effective prevention measures
  - Improves practice and collaborative working
  - Enhances teamwork and
  - Reduces the risk of HCAI

Venier AG. Root cause analysis to support infection control in healthcare premises. JHI April 2015. Volume 89, Issue 4, Pages 331-334
RCA - Key points to remember

- It is unproductive to apply a complicated problem solving process to common place problems we already know how to solve.
- If you perceive the problem as important and don’t know the nature or causes, attack it systematically to ensure that you find the root causes and ultimately eliminate the problem for good.
- The goal is to be proactive rather than reactive.
- To be credible, root cause analysis requires rigorous application of established qualitative techniques.
- Good for sentinel events.

[Image: The Joint Commission](https://www.jointcommission.org)
Outbreaks investigation summary

- **Step 1:** Prepare yourself for outbreak investigations
- **Step 2:** Establish the existence of an outbreak
- **Step 3:** Verify the diagnoses
- **Step 4:** Identify and count cases
- **Step 5:** Describe and orient the data in terms of time, place and person
- **Step 6:** Develop hypothesis
- **Step 7:** Evaluate hypothesis
- **Step 8:** Refine hypotheses and carry out additional studies
- **Step 9:** Implementing control and prevention measures
- **Step 10:** Communicate your findings
Thankyou

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