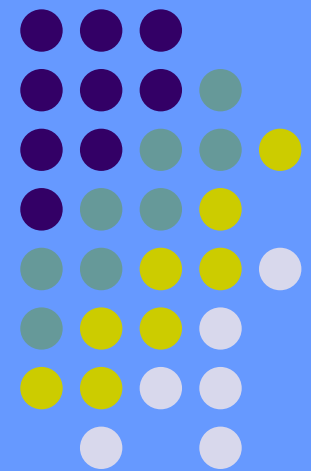
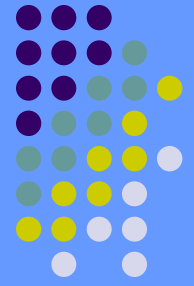


BASIC CONCEPTS OF INFECTION CONTROL

Prevention of Lower Respiratory Tract Infections

International Federation of
Infection Control





Prevention Measures

- Raise the head of the bed to facilitate chest movement
- Use gloves when handling respiratory secretions
- Proper use, cleaning and disinfection of respiratory equipment

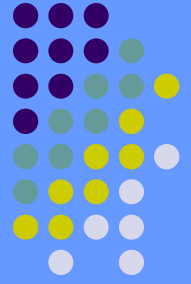


Clearing of Micro-organisms from the Respiratory Tract



- Cough reflex
- Ciliary epithelium
- Antimicrobial secretions
- Phagocytosis
- Local immunity

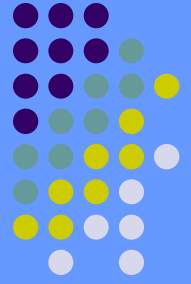




Risk Factors - Condition of Patient

- Severely ill, e.g., septic shock
- Age (elderly or neonate)
- Surgical operation (chest\abdomen)
- Major injuries
- Chronic obstructive lung diseases
- Existing cardiopulmonary disease
- Cerebrovascular accidents
- Coma
- Heavy smoker





Risk Factors - Therapy

- Sedation
- General anaesthesia
- Tracheal intubation
- Tracheostomy
- Prolonged artificial ventilation
- Enteral feeding
- Broad-spectrum antibiotic therapy
- H2 blockers
- Immunosuppressive and cytotoxic drugs





Ventilator - Associated Pneumonia

- In 8-28% of patients treated with mechanical ventilation
- Up to 50% mortality
- Risk increases by about 1% for every day on ventilation



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P. Dircks



Early Onset Nosocomial Pneumonia

- Within one week of admission
- After surgery, in intensive care, trauma patients
- Present in nasopharynx, colonizing the pharynx and giving rise to micro-aspirations via the inside and outside of the endotracheal tube

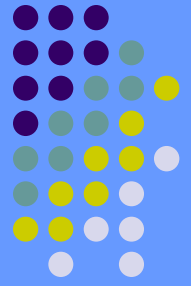


Etiology of Early Onset Nosocomial Pneumonia



- The same organisms as community -acquired pneumonia
 - *Streptococcus pneumoniae*
 - *Staphylococcus aureus*
 - *Hemophilus influenzae*



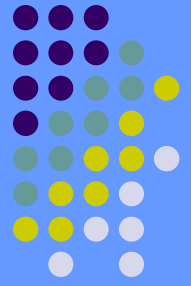


Late Onset Nosocomial Pneumonia

- After 3-7 days or more of mechanical ventilation
- From the mucous membranes of the patient, where the normal flora has now been changed by antibiotic therapy
- By transmission from other patients or the environment



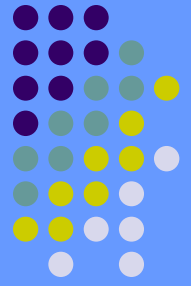
Etiology of Late Onset Nosocomial Pneumonia



- Gram-negative bacilli
 - *Klebsiella pneumoniae*
 - *Escherichia coli*
 - *Pseudomonas aeruginosa*
 - *Serratia marcescens*
 - *Enterobacter* species
 - *Acinetobacter*
- MRSA



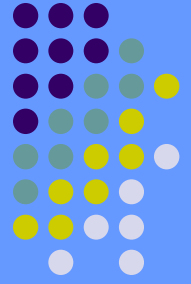
Criteria for Pneumonia



- New or changing X-ray infiltrate +
 - Fever >38.5
 - CRP >50
 - Blood leukocyte count $> 12 \times 10^{12}$
 - Purulent sputum and
 - quantitative culture protected brush
 - same organism in blood culture and tracheal aspirate
 - same organism in pleural fluid and tracheal aspirate
 - Pneumonia on autopsy



Cultures

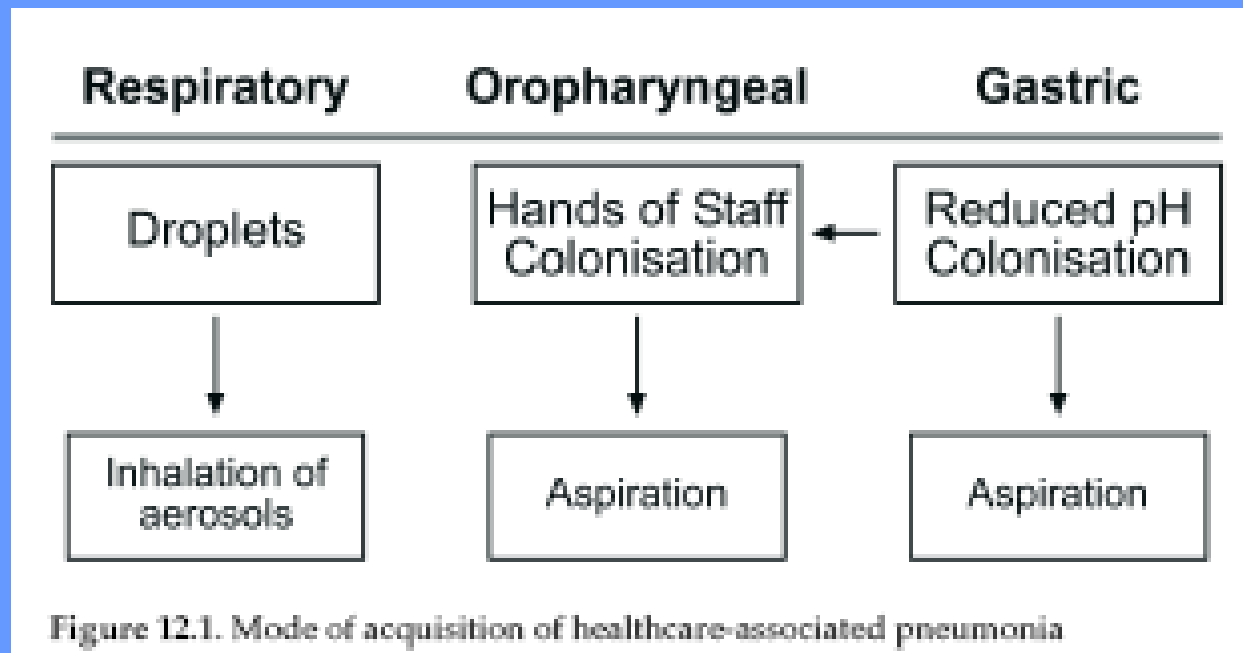


- Tracheal secretions often grow several possible pathogens – bacteria and fungi
 - If all these are to be covered by empirical therapy, the risk of overuse is imminent
- Protected specimen brush (PSB) has high sensitivity & specificity
 - Performed by the ICU doctor (don't wait for the ENT consultant) and cost \cong one dose of antibiotic
- Bronchoalveolar lavage (BAL) is also useful, particularly for Legionella





How Pneumonia is Acquired



Cleaning and Disinfection of Respiratory Equipment



Endotracheal tubes, face masks, ambu-bags, tubing

- thermal disinfection
- cleaning and chemical disinfection
- (disposable)

Autoclaving without cleaning will create a crust of secretions ...

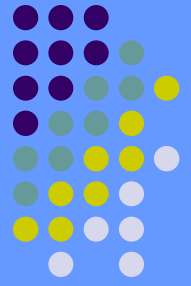


Maintenance of the Ventilator



- Change tubings once a week and between patients
- Place no filters in the patient circuit
- Protect the ventilator by a filter near the machine
 - Change filter with the tubings
 - Disinfect the ventilator only when serviced

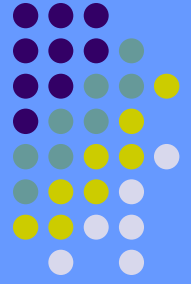




Prevention of Aspiration

- Raise the head end of the bed by 30 degrees
- Use orotracheal intubation
- Clean the oral cavity at least daily
- Suction secretions above the cuff before decanulation/extubation
- Consider feeding by gastro- or jejunostomy when recurrent aspirations

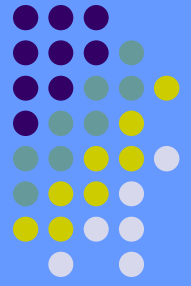




Prevention of Inhalation

- Do not change ventilator tubings more than once a week
- Change heat-moisture exchangers daily
- Clean cups of nebulizers with detergent and water after each use or daily. Rinse with sterile water or 70% alcohol

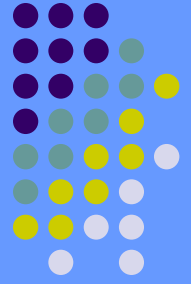




Prevention of Colonisation

- Alcohol hand disinfection before and after every patient contact is mandatory
- Gloves and disposable aprons are used when handling secretions
 - Do NOT use gowns, caps, masks, etc., when entering the room
- Have local written procedure manuals for prevention of VAP. Make sure that everybody knows and follows them





Prevention of Colonisation

- Do not suction lower airways routinely but only when large amounts of secretions are collected
 - Use a sterile catheter
- For prevention of gastric ulcer in ventilated patients, sucralfate or histamin type 2-blockers can be used



Prophylactic Antibiotics NO



Prophylactic antibiotics in the ICU

- Increase the risk of superinfection with multiresistant organisms
- Do not prevent but possibly delay nosocomial infection





Minimal Requirements

- Adequately decontaminated equipment
- Hand hygiene before and after patient contact
- Gloves (non-sterile) and disposable suction catheters for tracheal aspiration if available
 - Change gloves between patients and procedures
 - Dispose of or decontaminate suction catheters between patients



The Most Important Measures



Elevate the head of the bed at an angle of 30°-45°

Alcohol hand rub

Always ask : does the patient need mechanical ventilation?



Key Points



- Pneumonia is the health care associated infection that results in the highest mortality
- Prevention is therefore vital



References and Further Reading



- Johanson Jr WG, Dever LL. Nosocomial pneumonia. *Intensive Care Med* 2003; 29(1):23-9
- Isakow W, Kollef MH. Preventing Ventilator-Associated Pneumonia: An Evidence-Based Approach of Modifiable Risk Factors. *Sem Resp Crit Care Med* 2006; 27:5-17
- Craven DE. Preventing Ventilator-Associated Pneumonia in Adults. Sowing seeds of change. *Chest* 2006;130:251-260

