Pneumonia

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Learning Objectives:
- pathogenesis of infection
- community- vs. hospital-acquired
- early vs. late onset hospital-acquired
- pathogens for CAP, HAP, VAP, HCAP
- diagnosis pneumonia

Pathogenesis
- lower respiratory tract (trachea, bronchus, brochioles, alveoli)

3 Modes of Entry:
1) aspiration of normal flora
2) inhaled foreign particles
3) bloodstream (RARE)

Causes of Development:
- overwhelming exposure
- highly virulent
- weak defenses (mechanical/immune)

Mechanical Defenses
- EPITHELIAL CILIA - traps large particles (>10um)
- TRACHEA - traps small particles (2-10 um)
- MUCUS - leads to expulsion

Immune Defenses

Upper (local)	- MUCUS - contains antibacterial peptides, complement, & Abs
Lower (alveoli)	- MACROPHAGES - primary defense against - *no mucus, cilia*

Impairment of Defenses

↓ Transport Debris Out	↓ Cough Reflex (aspiration)	↓ Immune
- smoking - COPD - asthma - CF - >65 - toxic inhalations	- alcohol - narcotics - seizures - stroke - altered consciousness - CNS drugs - anesthesia - laying (supine) position during feeding	- alcohol - age - DM - sickle cell - malnutrition - cancer - autoimmune (HIV/AIDS) - immunosuppressants - lack of Abs - flu*

**flu can make patient get SECONDARY PNEUMONIA*
**30% H1N1 deaths had bacterial co-infection*

Evaluation/Management of Pneumonia
1) Clinical Presentation
2) Lab Tests
3) Likely Organisms
4) Antibiotic Therapy
5) Monitor

Clinical Presentation
- Symptoms:
  - fever/chills (>100.4)
  - dyspnea (SOB)
  - chest pain
  - productive cough (sputum)
- Signs:
  - ↑HR, RR
  - diminished breath sounds/restricted airflow/ ↓O_2 (>92%)

Lab Tests

Chest Xray	Infiltration, Consolidation
Sputum Gram Stain/Culture	dependent on good sample *Good Sample:* - primary pathogen - WBCs - LOW epithelial cells
Blood Culture	hospitalized patients, low positivity rate: 7-16%

INFILTRATION - *fluid in discrete region*
CONSOLIDATION - *fluid in larger portion*

Types of Pneumonia

COMMUNITY	CAP	- not hospitalized - no recent HC exposure	*Strep pneumonia* - G(+) cocci (pairs/chains) *Legionella* - G(-) bacilli	Additional Testing: Urine Bacterial Ag Test
HOSPITAL	HAP	> 48 hrs after hospital - EARLY < 5 days - LATE > 5 days	*Staph aureus* - G(+) cocci (clusters) *Pseudo aeruginosa* - G(-) bacilli	
VENTILATOR	VAL	> 48-72 hrs after intubation		
HEALTHCARE	HCAP	90 days: hospitalization 30 days: antibiotics, chemo, wound care current: nursing home, hemodialysis clinic		

Strep pneumoniae	*Legionella*
G(+) cocci - pairs/chains - capsule	G(-) bacilli - not in cultures
- CAP - sinusitis - otitis media - meningitis	- CAP - inhalation - water
Vaccine: - > 65 - 6mo-64 + risk factors	Atypical Presentation: - gradual onset (*lethargy, cough*) - progression (*fever, productive*)

Staph aureus	*Pseudo aeruginosa*
G(+) cocci - clusters	G(-) bacilli - non-lactose fermenting
- HAP/VAP - bacteremia/endocarditis - surgical	- HAP/VAP - UTI, bacteremia - meningitis

CAP Additional Testing

URINE BACTERIAL AG TESTING - detect bacteria in urine during acute phase (*Streptococcus & Legionella*)

Pros	Cons
- fast (15 mins) - remains + after antibiotics - helps diagnose	- NO antibiotic sensitivity info - Legionella serogroup 1 only

- bone &joint - (CAP) - skin & soft tissue	- hot tubs
multi-drug resistant	multi-drug resistant