NOSOCOMIAL OR HEALTH CARE ASSOCIATED INFECTIONS

THOMAS CESARIO

DEFINITION

INFECTIONS OCCURRING 48 HOURS OR MORE AFTER ADMISSION TO A HEALTH CARE FACILITY OR WITHIN 30 DAYS AFTER DISCHARGE

IMPACT OF HEALTH CARE ASSOCIATED INFECTIONS

- IN US 35,000,000 PATIENTS/7,000 ACUTE HOSP.
- AFFECTS APPROXIMATELY ONE PATIENT IN 10 TO 1 IN 20
- AFFECTS UP TO 2 MILLION PATIENTS PER YEAR AND 85,000 DEATHS (EPIC STUDY 1995)
- 2011 NCDC ESTIMATES 722,000 HAI AND 75,000 DEATHS
- COST ESTIMATED AT 28 TO 33 BILLION/YEAR
- EXTENDS LENGTH OF STAY 4 TO 5 DAYS
- 70% CONSIDERED PREVENTABLE

MEANS OF TRANSMISSION

- CONTACT
  - DIRECT (PERSON TO PERSON)
  - INDIRECT (CONTAMINATED OBJECT TO PATIENT)
- DROPLET
- AIRBOURNE
- VECTOR BOURNE
PREDISPOSING FACTORS

- COMPROMISED STATE OF PATIENTS
- INVASIVE DEVICES (ESTIMATED OVER 50% ASSOCIATED WITH DEVICES)
- TYPES OF TREATMENTS

GENERAL PREVENTIVE MEASURES

- HAND HYGIENE
- BEFORE TOUCHING THE PATIENT
- BEFORE CLEAN/ASEPTIC PROCEDURES
- AFTER BODY FLUID EXPOSURE
- AFTER TOUCHING THE PATIENT
- AFTER TOUCHING PATIENT ENVIRON.
- PROHIBIT ARTIFICIAL NAILS
- GLOVES: EXPOSURE TO BLOOD/BODY FLUIDS

GENERAL PREVENTIVE MEASURES

RESPIRATORY HYGIENE/COUGH ETIQUETTE (6 FOOT RULE)
MASKS
- EXPOSURE TO RESPIRATORY SECRETIONS
- FOR PATIENTS UNDERGOING STERILE PROCEDURES
- ISOLATION PROCEDURES:
  - 1. CONTACT
  - 2. DROPLET
  - 3. AIRBOURNE

MAJOR TYPES OF INFECTIONS

- URINARY TRACT INFECTIONS
- PNEUMONIA
- SKIN OR SOFT TISSUE INFECTIONS, SSI
- INTRAVASCULAR ACCESS INFECTIONS
- GASTROINTESTINAL INFECTIONS
- VIRAL INFECTIONS
HAI URINARY TRACT INFECTIONS
- ACCOUNTS FOR 20% OF HAI
- 80% FOLLOW INSTRUMENTATION OF GU TRACT MAINLY CATHETERIZATION
- 10% MORTALITY ASSOCIATED WITH THIS CONDITION
- SYMPTOMATIC VS ASYM BACTERURIA

HAI UTI
1. PROLONGS HOSPITAL STAY (5 DAYS)
2. INCREASES COST
3. ASSOCIATED WITH WORSE OUTCOMES
4. 10 TO 20% DEVELOP SYMPTOMS
5. E COLI MOST COMMON BUT OTHER ORGANISMS FREQUENT
6. MAY BE ANTIBIOTIC RESISTANT
7. CAN LEAD TO SEPSIS

RISK FACTORS FOR HAI UTI
- FEMALE GENDER
- OLDER AGE
- SURGERY ON ALIMENTARY TRACT
- COMORBIDITIES
- DEPENDENT STATUS
- HIGHER ASA CLASS
- CATHETERIZATION

RISK OF CATHETER ASSOCIATED HAI UTI
- NEARLY 10% OF HOSPITALIZED PATIENTS CATHETERIZED
- PATHOGENESIS: EXTRALUMINAL VS INTRALUMINAL
- MAJOR FACTOR IS INSERTION TECHNIQUE
- RISK RELATES TO DURATION OF CATHETER PRESENCE (3 TO 10%/DAY)
FACTORS THAN DECREASE RISK

- DO NOT CATHETERIZE
- STERILE PRECAUTIONS AT INSERTION
- PREVENT CONTAMINATION OF BAG, TUBES
- PREVENT BACKWARD FLOW OF URINE
- REMOVE CATH ASAP
- KEEP SYSTEM CLOSED

DECREASE CATHETER RISKS

- CAUTION PATIENT NOT TO PULL THE CATHETER
- AVOID RAISING THE BAG ABOVE THE BLADDER OR CLAMP TUBE BEFORE HAND
- EMPTY URINE ASEPTICALLY
- WASH URETHRAL MEATUS IF FECAL SOILING
- CHANGE CATHETER WHEN NECESSARY

HAI UTI

- TREAT ONLY SYMPTOMATIC CONDITION UNLESS PATIENT PREGNANT OR UNDERGOING GU PROCEDURE
- CULTURE FROM PORT OR BY STERILE SEPARATING CATHETER FROM DRAINAGE SYSTEM (NOT FROM THE BAG)
- PYURIA NOT A GOOD PREDICTOR
- DO NOT ROUTINELY SCREEN

HAI PNEUMONIA

- FIRST OR SECOND MOST COMMON HAI
- MAY BE VENT ASSO OR HOSPITAL ASSO
- INCIDENCE 4.2 TO 7.7/1000 PATIENT DAYS
- 75% FOLLOW SURGICAL PROCEDURES
- MORTALITY 30 TO 33%
- VAP INC HOSP STAY 11 TO 13 DAYS, HAI PNEUMONIA 4 TO 9 DAYS
- ANNUAL COST: 3 TO 10 BILLION DOLLARS
HAI PNEUMONIA

- PATHOGENESIS: MICROASPIRATION
- MAYBE BY INHALATION OR BACTEREMIA
- 45% OF HEALTHY PATIENTS ASPIRATE DURING SLEEP. INCREASED IN SICK PT
- ET TUBES PERMIT ASPIRATION FROM STOMACH
- UP TO 75% VERY ILL COLONIZED IN 48 H
- STERILITY OF STOMACH CAN BE LOST

MICROBIOLOGY

- 50% DUE TO GRAM NEGATIVE RODS INCLUDING PSEUDOMONADS, ENTEROBACTER, KLEBSIELLA ETC
- FREQUENTLY POLYMICROBIAL
- MAY NEED BRONCH OR TRACHEAL ASPIRATE TO DEFINE

RISK FACTORS

- FOR VAP LONGER INTUBATION INCREASES RISK (RISK INCREASES 1% DAY)
- INFANTS AND OVER 65 YEARS
- SEVERE UNDERLYING DISEASE
- DECREASED MENTAL STATE
- CARDIOPULMONARY DISEASE
- THORACOABDOMINAL SURGERY
- DECREASED GASTRIC ACID
- NG TUBE
- ADMIT TO ICU

CLINICAL CRITERIA

- FEVER, COUGH
- PURULENT SECRETIONS
- PROGRESSIVE INFLTRATE
- RISING WBC COUNT
- SUGGESTIVE GRAM STAIN/ CULTURE
PREVENTIVE MEASURES

- MEASURES TO DECREASE ASPIRATION
- DECONTAMINATE HANDS
- STERILIZE OR CLEAN RESPIRATORY EQUIPMENT
- VACCINES
- STAFF EDUCATION
- USE OF SUCRALFATE
- MEASURES TO IMPROVE RESPIRATION: DEEP BREATHING EXERCISE, INCENTIVE SPIROMETRY, CHEST PHYSIO

PREVENTIVE MEASURES VAP

- WITH VENTILATOR USE CARE TO PREVENT CONDENSATE DRAINING TO LUNG
- CHANGE TUBING NO MORE THAN EVERY 48HR
- DISINFECT EQUIPMENT
- CARE NOT TO INFECT EQUIPMENT
- SEMIRECUMBANT POSITION
- SUCRALFATE INSTEAD OF PPI

TREATMENT

- INCREASED RISK FOR MULTI DRUG RESISTANCE IN VAP
- IV ANTIBIOTICS WITHIN 90 DAYS
- 5 OR MORE DAYS HOSP BEFORE VAP
- SEPTIC SHOCK AT TIME OF VAP
- ARDS BEFORE VAP
- RENAL REPLACEMENT
- UNIT WITH >10% RESIST TO DRUG
- UNK RESISTANCE IN UNIT

TREATMENT VAP OR HA PNEUMO

- IF NO RESISTANCE FACTORS: ONE GRAM NEGATIVE DRUG: IE PIP/TAZO, CEFIPIME. MEROPENEM.
- IF RESISTANCE FACTORS PRESENT USE;
- DRUG FOR MRSA (VANCO ETC), PLUS TWO GRAM NEG DRUGS TO COVER PSEUDOMONAS: ONE OF ABOVE PLUS EITHER CIPRO, AMINOGLYCOSIDE, POLYMYXIN, COLISTIN, AZTREONAM
WOUND INFECTION

- Defined within 30 days of operation
- Have at least one of following:
  - Purulent discharge
  - Organisms isolated aseptically
  - At least one sign of infection
- Other signs:
  - Delayed healing
  - Discoloration
  - Abnormal odor
  - Abnormal bleeding
  - Lymphangitis

SURGICAL SITE INFECTIONS

- Constitutes 12% of nosocomial infections
- Adds 7 to 10 days to LOS
- Infection risk relates to status of the field
  - Clean <2%
  - Clean/Contam. <10%
  - Contam. 7 to 15%
  - Dirty Up to 40%

OTHER RISK FACTORS

- Age
- Obesity
- Malnutrition
- Endo/Metab. Disorders
- Hypoxia
- Anemia
- Malignant disease
- Immune suppression

OTHER RISK FACTORS

- Wound characteristics
  - Non viable tissue in wound
  - Foreign bodies
  - Tissue ischemia
  - Hematoma
  - Operative characteristics
  - Surgical technique
  - Long or time
  - Intraop contam.
  - Prolonged stay
  - Hypothermia
CAUSES OF SITE INFECTIONS

- DIRECT CONTACT FROM EQUIPMENT OR PERSONEL
- AIRBOURNE
- SELF CONTAMINATION BY PATIENT

MICROORGANISMS

- COAG POSITIVE STAPH
- MRSA
- STREP PYOGENES
- ENTEROCOCCI
- PSEUDOMONAS
- E COLI
- FOR CLEAN SURG USUALLY GM POS
- FOR CLEAN/CONTAM GRAM - OR GRAM+
- SURG NEAR VISCOUS: POLYMICROBIAL

PREVENTIVE STRATEGIES IN THE OR

- MAINTAIN POSITIVE PRESSURE
- ?LAMINAR FLOW FOR HI RISKS
- STERILIZE EQUIP. AS RECOMMENDED
- SURGICAL TEAM
- EDUCATION
- APPROPRIATE SCRUB AND ATTIRE

PREVENTIVE STRATEGIES HAIR REMOVAL WITH CLIPPERS OR DEPILATORY AGENT

- SKIN PREP: CHLORHEXIDINE
- APPROPRIATE PROPHYLAXIS
- BOWEL SURG PREP
- OTHER: IV antibiotics, within 30 minutes of incision and stopped by 12 hours after procedure
- ?STAPH DECOLON, THERMOREG, O2,
INTRAVASCULAR ACCESS SITE INFECTIONS

- 31 MILLION ICU PATIENT DAYS ANNUALLY IN USA
- 48% HAVE CENTRAL LINES
- 5.3 CENTRAL LINE INFECTIONS/1000 DAYS OF LINE IN PLACE
- 80,000 CENTRAL LINE INFECT/YEAR IN USA ICUs
- 250,000 TOTAL CENTRAL LINE INFECTIONS IN ALL HOSPITAL BEDS
- 12 TO 25% MORTALITY
- COST: $3700 TO $45,000

TYPES OF INTRAVASC ACCESS INFECTIONS

- LOCAL COLONIZATION
- EXIT OR INSERTION SITE INFECTIONS
- PHLEBITIS
- PORT OR RESERVOIR INFECTIONS
- TUNNEL INFECTIONS
- SYSTEMIC CATH RELATED
- BLOOD STREAM INFECTIONS
- CONTAMINATED INFUSATE
- SUPPURATIVE THROMBOPHLEBITS

SOURCES OF INFECTION

- COLONIZATION OF INTRACUTANEOUS OR INTRAVASC PORTIONS OF CATHETER
- SECONDARY SEEDING FROM BLOOD
- CONTAMINATED INFUSATE

RISK FACTORS FOR ACCESS INFECTIONS

- FEMORAL SITE
- REPEATED CATH INSERTIONS
- PRESENCE OF SEPTIC FOCUS
- USE OF SUB MAX BARRIER PRECAUTION
- NON TUNNELED CATH
- NON SURGICAL INSERTION
- EMERGENCY INSERTION
PREVENTIVE STRATEGIES

- Full barrier precautions during insertion with aseptic technique
- Sub cut tunneling if possible
- Chlorhexidine prep to insertion of cath
- Specialized nursing teams for cath care and insertion change dressing q week.
- Avoid routine placement, remove asap
- Silver, sulfa or mino/rfp impregnated caths if infect rate is high
- Choose site but avoid femoral site
- Inspect at least qod

INDICATIONS TO REMOVE IV CATHETER

- Severe sepsis
- Hemodynamic instability
- Endocard or metastatic infection
- Suppurative thrombophlebitis
- Persistent bacteremia 24 hr after start of antibiotics
- Short term catheter
- Infection with coag pos staph, pseudomonas, fungi, gram neg inf.

TREATMENT

- Check for metastatic infections
- IV antibiotics for 14 days after catheter removal both staph and gnr

SALVAGE THERAPY

- For very sensitive organisms usually coag neg staph
- Use antibiotic lock plus IV antibiotics
- Usually vanco plus heparin
- Change q 48 hrs
- Duration 7 to 14 days
NOSOCOMIAL GASTROENTERITIS

- Problem especially for children's hospitals
- In children's hospitals it is the third most common nosocomial infection
- Common pathogens include noroviruses, C Diff, rotaviruses, adenoviruses
- Rate of 11 to 20/10,000 discharges
- Add to LOS by 7 to 20 days

C Diff

- Gram positive spore forming rod (Bleach destroys spores)
- Transmitted person to person via fecal oral route
- Commensal bacteria in 2 to 5% normal people
- Produces toxins
- Chemotherapy and antibiotics predispose

C Diff Risk Factors

- Age
- Hospitalization
- Prior antibiotics

C Diff

- Treatment with Flagyl or Vancomycin
- Fidaxomicin or fecal transplant for recurrences
- Spore precautions
- Use gloves gown handling patient or their eliminations
- Careful hand washing between patients
- No alcohol handwipes
“Research has shown when healthcare facilities, care teams, individual doctors and nurses are aware of infections problems and take specific steps to prevent them, rates of targeted HAI can decrease more than 70%.

NCDC

Progress

- 50% reduction central line infections 2008 to 2014
- 17% reduction in surg site inf
- 17% reduction in surg site inf after ABD hysterectomy 2008-14
- 8% reduction in hospital onset C Diff 2011-14
- 13% reduction in onset MRSA 2011-2014
- No progress cath related UT

Multi drug resistant hospital organisms

- Vancomycin resistant enterococci
- Extended spectrum beta lactamase gram negative bacteria
- Carbapenemase gram negative organisms
- Acinetobacter
VRE

- E. faecium now over 50% Vanco resistant
- Can survive on desk tops 5 to 7 days, bedrails 60 min
- Risk factors: prior antibiotics, serious illness, surface contam, LTCF residence
- Rx: linezolid, quin/dalfo, tigecycline

ESBL Gram Negative Rods

- Resistant to third generation cephalosporins
- Common in Klebsiella
- Excess mortality unclear
- Rx: carbapenems

Carbapenemase Gram Negative Rods

- Several different types
- Can be on plasmids or chromosomes
- May consider: polymyxin, tigecycline

Acinetobacter

- Non fermenting Gram negative rod
- Problem in ICU
- Resistant to most antibiotics
- Treat: carbapenems