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Study Schedule Table:

Due Date	Section	Number of Questions
☐	Education and Research	11
☐	Cleaning Disinfection, Sterilization, and Asepsis	15
☐	Employee Health	11
☐	Management and Communication	13
☐	Preventing and Controlling Transmission of Infectious Agents	25
☐	Environment of Care	14
☐	Surveillance and Epidemiologic Investigation	24
☐	Identification of Infectious Disease Process	22
	TOTAL	150
Due Date	PRACTICE EXAMS	SCORE
☐	APIC Module Practice Exam	
☐	Mometrix Practice Exam	
☐	Practice Exam 1	
☐	Practice Exam 2	
☐	Practice Exam 3	

Resources

Name	Link
Washington CIC Study Group	Webinar Registration - Zoom
Florida Study Group Workbook	 [Updated] CIC Study Plan and Wor
Google Drive	https://drive.google.com/drive/folders/1dQP6eMcF7WNH1WxyYvj7G2HQ1yxN35FB
YouTube Channels	CIC Epidemiologists - YouTube Kern Rivers CIC Review - YouTube
Quizlet Flash Cards	https://quizlet.com/_a0e68s?x=1jqt&i=26jhca
Infection Prevention Education	Prevention CHKC LearningCE @ SHEA (shea-online.org) Infection Prevention in Nursing Homes Coursera Learn About Infection Control in Health Care Project Firstline CDC
APIC CIC Study Manuel 6 th Edition	 Certification Study Guide.pdf
Shared Study Guides and Notes	 CIC Study Guide  Debbie_s Notes.pdf  Melanis Notes 2018.pdf  Nikki Ripplinger Notes.pdf
APIC Text	www.apic.org/text/peacehealth

Practice Exams	Links
APIC CIC Practice Exams	   Practice Exam 1.pdf Practice Exam 2.pdf Practice Exam 3.pdf
Practice Exam Spreadsheet	 CIC Practice Exam Assessment Blank.xl:
Mometrix Practice Test	 Mometrix Practice Test.pdf

CIC Workshop Practice Test	 CIC Workshop Practice Test.pdf
Practice Exam Answers and Rationales	 Practice Exam 1  Practice Exam 2  Practice Exam 3  APIC_CertificationPr Answers and RationAnswers and RationAnswers and RationepCourse_MiniExam

Florida CIC Study Group Webinar Recordings:

Video Number	Order	Topics	Link
1	 1	Research Study Designs and Quality Concepts	https://attendee.gotowebinar.com/recording/3057528925667259654
2	 1	Education and Research	https://attendee.gotowebinar.com/recording/4521955270576299532
3	 2	Cleaning, Disinfection and Sterilization	https://attendee.gotowebinar.com/recording/820081038034457863
4	 2	Sterile Processing Part I	https://attendee.gotowebinar.com/recording/367633104574158348
5	 2	Sterile Processing Part II	Unavailable
6	 2	Endoscopy	https://attendee.gotowebinar.com/recording/6782447824119735048
7	 3	Enterobacteriaceae, Legionella, and Hepatitis	https://attendee.gotowebinar.com/recording/781949973543623942
8	 3	Occupational Health	https://attendee.gotowebinar.com/recording/863650286106362627
9	 3	Pregnant Healthcare Personnel	https://attendee.gotowebinar.com/recording/8521820241932605704
10	 3	Occupational Health and CIC Registration	https://attendee.gotowebinar.com/recording/1220909101916293387
11	 3	Bonus Questions Occupational Health	https://attendee.gotowebinar.com/recording/7114856575886629896
12	 4	Infection Prevention and Control Programs	https://attendee.gotowebinar.com/recording/6088285450028099586
13	 4	Chpt. 18 Patient Safety	https://attendee.gotowebinar.com/recording/7246114075182663692
14	 4	Bonus Questions Management and Communication	https://attendee.gotowebinar.com/recording/8295798035165923587

15	☐ 4	Accrediting and Regulatory Agencies	https://attendee.gotowebinar.com/recording/3138201195167696643
16	☐ 5	Chapters 21 & 22	https://register.gotowebinar.com/recording/1290409229739483148
17	☐ 5	Microbiology Basics	https://attendee.gotowebinar.com/recording/1824660830319092483
18	☐ 5	Chapters 25 & 26	https://attendee.gotowebinar.com/recording/7653825079133815047
19	☐ 5	HH and Isolation Precautions	https://attendee.gotowebinar.com/recording/7786995729483329793
20	☐ 5	Ophthalmology, surgical services and general review	https://attendee.gotowebinar.com/recording/3492283520335789581
21	☐ 5	Water systems and Waterborne Pathogens	https://attendee.gotowebinar.com/recording/9179000542005633032
22	☐ 5	Construction and Renovation	https://attendee.gotowebinar.com/recording/8410289082228758275
23	☐ 6	General Epidemiology Principles	https://attendee.gotowebinar.com/recording/4808489097962983174
24	☐ 6	Use of Statistics in Infection Prevention Part I	https://attendee.gotowebinar.com/recording/6626699799924473099
25	☐ 6	Use of Statistics in Infection Prevention Part II	https://attendee.gotowebinar.com/recording/4389906121042477825
26	☐ 6	Bioterrorism and IVDA BSIs	https://attendee.gotowebinar.com/recording/3752042042576579596
27	☐ 6	Environmental Services	https://attendee.gotowebinar.com/recording/8849330671941849345
28	☐ 8	TB and <i>C.diff</i>	https://attendee.gotowebinar.com/recording/5433022697346394125
29		Introductory webinar	https://attendee.gotowebinar.com/recording/7851450199222021122

90 Day Study Schedule

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

Section Study Points:

Education and Research – 11 Questions		
Due Date	Name	Links
	Luz Videos/Recorded Webinars	i. https://attendee.gotowebinar.com/recording/3057528925667259654 Research Study Designs and Quality Concepts ii. https://attendee.gotowebinar.com/recording/4521955270576299532 Education and Research
	APIC Module - 8	http://apic.mycrowdwisdom.com/diweb/home
	APIC Chapters	3 Education and Training 5 Infection Prevention and Behavioral Interventions 13 Use of statistics in Infection Prevention 19 Qualitative Research Methods 20 Research Study Design 27 HH  Education and Training.pdf  Quality Concepts.pdf  Research Study Design.pdf
	CIC Study Guide Practice Questions	
	Additional Resources	

Cleaning, Decontamination, sterilization, and Asepsis - 15 Questions		
Name	Links	
Luz Videos/Recorded Webinars	i. https://attendee.gotowebinar.com/recording/820081038034457863 Cleaning, Disinfection and Sterilization ii. https://attendee.gotowebinar.com/recording/367633104574158348 Sterile Processing Part I iii. https://attendee.gotowebinar.com/recording/6782447824119735048 Endoscopy	
APIC Module	http://apic.mycrowdwisdom.com/diweb/home	
APIC Chapters	32 Reprocessing Single Use Devices 55 Endoscopy 30 Aseptic technique  30. Aseptic Technique _ Basic  32. Reprocessing Single-Use Devices  56. Endoscopy _ Infection Prevention	

Study Guide Practice Questions	
Additional Resources	 Back to Basics Instrument Cleaning  Back to Basics Endoscope Reprocessing  ASHRAE-170-2013_ Ventilation (1).pdf  ASC Sterilization and Disinfection Manual  AORN TASS.pdf  Advantages and Disadvantages of Steam Sterilization  CJD Perioperative care 2014.pdf  Chemical Sterilants and HLD.pdf  Back to Basics Surgical Attire.pdf  Back to Basics Sterile Technique.pdf  Back to Basics Prevention Surgical Sterilization, Disinfection  Cleaning, Sterilization, and Disinfection  New developments in processing semi-critical instruments  Rutalla Weber Assessing Risk of Disinfection  Surface disinfection Rutalla.pdf  Sterile Processing.pdf

Employee Health – 11 Questions		
Due Date	Name	Links
	Luz Videos/Recorded Webinars	i. https://attendee.gotowebinar.com/recording/863650286106362627 - Occupational Health ii. https://attendee.gotowebinar.com/recording/8521820241932605704 - Pregnant Healthcare Personnel iii. https://attendee.gotowebinar.com/recording/1220909101916293387 - Occupational Health and CIC Registration iv. https://attendee.gotowebinar.com/recording/7114856575886629896 - Bonus Questions Occupational health v. Hepatitis B Serology YouTube Videos - CaseMed - Medical StudyBuddy- Interpreting Hepatitis B Serology Made Easy (with Audio)
	APIC Module	
	APIC Chapters	 106. Pregnant Healthcare Personnel  Occupational Health.pdf
	Study Guide Practice Questions	

	Additional Resources				
		Hepatitis B interpretation table	MMWR Immunization of Health-care Workers	Week V Employee Occupational Health	Vaccine storage-handling-temperature

Management and Communication – 13 Questions		
Due Date	Name	Links
	Luz Videos/Recorded Webinars	i. https://attendee.gotowebinar.com/recording/6088285450028099586 - IP and Control Programs ii. https://attendee.gotowebinar.com/recording/7246114075182663692 - Patient Safety iii. https://attendee.gotowebinar.com/recording/3138201195167696643 - Accrediting and Regulatory Agencies iv. https://attendee.gotowebinar.com/recording/8295798035165923587 - Bonus Questions Management and Communication
	APIC Module	
	APIC Chapters	 Patient Safety.pdf  Accrediting and Regulatory Agencies.pdf  Product Evaluation.pdf
	Study Guide Practice Questions	
	Additional Resources	 Healthcare Informatics and Info.pdf  Becca Bartles Staffing.pdf  Staffing.pdf  Legal Issues.pdf

Preventing/Controlling Transmission of Infectious Agents – 25 Questions		
Due Date	Name	Links
	Luz Videos/Recorded Webinars	https://attendee.gotowebinar.com/recording/9179000542005633032 Water systems and Waterborne Pathogens https://attendee.gotowebinar.com/recording/8410289082228758275 - Construction and Renovation https://attendee.gotowebinar.com/recording/8849330671941849345 - EVS
	APIC Module	

	APIC Chapters	 TB.pdf	 Intravascular Device Infection.pdf	 Infection Prevention and Con	 Healthcare textiles.pdf
		 Behavioral Health.pdf	 Transmission Based Precautions.pdf		
	Study Guide Practice Questions				
	Additional Resources	 Preventing-and-Co	 Michigan	 Links to Infection	ntrolling-TransmissiAppropriateness GuPrevention Sites.doc

Environment of Care – 14 Questions				
Due Date	Name	Links		
	Luz Videos/Recorded Webinars	https://attendee.gotowebinar.com/recording/9179000542005633032 Water systems and Waterborne Pathogens https://attendee.gotowebinar.com/recording/8410289082228758275 - Construction and Renovation https://attendee.gotowebinar.com/recording/8849330671941849345 - EVS		
	APIC Module	 Environment of Care - 5 Core Areas.i		
	APIC Chapters	 Environment-of-Car Heating Ventilation e.pdf	 Cooling.pdf	
	Study Guide Practice Questions			
	Additional Resources	 20091215_ashraed2 830120060711.pdf	 3_GA HAI Policy Statement Cdiff 22 A	 Construction and Renovation.pdf
		 AIA-Guidelines-patient-care-construction	 min. air exchanges.pdf	 Heating Ventilation Cooling.pdf
				 ASHRAE-170-2013_Ventilation.pdf

Surveillance and Epidemiologic Investigation – 24 Questions		
Due Date	Name	Links
	Luz Videos/Recorded Webinars	i. https://attendee.gotowebinar.com/recording/4808489097962983174 - General Epi Principles ii. https://attendee.gotowebinar.com/recording/6626699799924473099 Use of Statistics in Infection Prevention Part I iii. https://attendee.gotowebinar.com/recording/4389906121042477825 Use of Statistics in Infection Prevention Part II iv. https://attendee.gotowebinar.com/recording/3752042042576579596 - Bioterrorism and IVDA BSIs
	APIC Module	
	APIC Chapters	 Surveillance.pdf  Statistics in Infection Prevention
	Study Guide Practice Questions	
	Additional Resources	 6-Steps to a Successful CAP to R  9-Steps to a Successful Outbreak  Epidemic Curves - General Principles Explained & How-To of Epidemiology.pdf   Infection Prevention EpiNotes  Surveillance Parameter Matching  Statistics - Constructing a Cont

Identification of Infectious Disease Processes – 22 Questions		
Due Date	Name	Links
	Luz Videos/Recorded Webinars	https://attendee.gotowebinar.com/recording/5433022697346394125 TB and c diff
	APIC Module	

	APIC Chapters	 Bacterial Taxonomy.pdf  Common Commensals.pdf  Bordetella Pertussis.pdf  Microbiology Basics.pdf  Identification-of-InfgramPosOrganisms.ectious-Diseases-Proc.pdf  pdf  The Immunocompromise  Viral Hepatitis.pdf  gramNegOrganisms.pdf
	Study Guide Practice Questions	
	Additional Resources	 serologicchartv8.pdf  Risk factors Facilitating Transmis  MMR.pdf  Microbial Pathogenicity and H  Meningitis Table final.pdf  TB and other Mycobacteria.pdf  Foodborne Illness what you need to k

☐ Sterilization steps

☐ Type A Strep

- Group A Strep can cause:
 - Strep throat
 - Scarlet Fever
 - Impetigo
 - Erysipelas
 - Puerperal fever
 - Rheumatic fever

☐ EH

☐ Meningitis

☐ Hep B Prophecy

☐ Risk Assessments

☐ TB -> latent test results

☐ Ventilators

☐ Biological Indicators

☐ Empiric Antibiotics

☐ Hypochlorite

☐ Construction

☐ Employee Negative titers

☐ Meningitis

☐ Process Improvement

☐ Sterilization - Semicritical items

☐ Faucet organisms

☐ Incidence v Prevalence

☐ Risk Assessments

☐ TB Latency

- Persons with LTBI are asymptomatic and are not infectious
- An asymptomatic employee with a newly positive TST of 10mm induration in a medium to high risk setting = LTBI = Non-infectious

☐ Biological indicators - organisms

- Bis are test systems containing viable microorganisms providing a defined resistance to a specific sterilization process.
- Endospores or Bacterial Spores are the microorganism primarily used in Bis
- Additionally, bacterial spores are chosen for a specific sterilization process based on their known resistance to that process
 - For example:

- *Geobacillus stearothermophilus* spores demonstrate high resistance towards steam and vaporized hydrogen peroxide and are therefore used specifically for Steam and Vap Hydrogen Peroxide sterilization
 - Heat and Steam Sterilization = *Geobacillus stearothermophilus*
 - Ethylene Oxide (EtO) = *Bacillus atrophaeus*
- ☐ Circuit vents
 - Ventilators
 - Heated and Non-Heated circuits
 - Inhalation and Exhalation sides
 - Inhalation side always has a temp probe port on it
 - HVAC
- ☐ Mean, Median, Mode
- ☐ Education
- ☐ Case
- ☐ Cohort
- ☐ SSI Surveillance
- ☐ Hep B
- ☐ TB TST (Mantoux test = PPD = TST)
 - PPD = purified protein redivided
 - Collect at time of hire and only repeated if exposure is identified
 - 0.1 mL solution intradermal injection
 - Prior TB Exposure???
 - NO = Negative Test
 - Flat skin - PPD eaten by macrophages
 - Maybe some redness
 - No bulge or bump
 - **YES = Positive Test**
 - Macrophage signals T-cells and recognizes the PPD
 - Chemokines trigger more macrophages into the area
 - Creates a large bulge - Hypersensitivity Reaction - Type 4
 - Creates induration = bump under skin
 - Measured perpendicularly
 - Do not measure redness
- ☐ Prophylaxis
- ☐ Empiric Treatment - 98% world wide use
 - Unknown pathogen and no resistance pattern
 - CAP - Community Associated Pneumonia
 - Abx strep
 - Abx for atypical
 - Resistant Organism
 - MRSA
 - Vanco
 - Resistant Gram Neg
 - 2 abx for pseudomonas
 - ESBL

☐	☐	MDRO
☐	☐	Carbapenem
☐	Definitive Therapy	
☐	☐	Known pathogen and resistance pattern
☐	P dialysis	
☐	Organism to infect	
☐	Aspergillus	
☐	Legionella	

Learning Objective

1. Discuss a rational approach to disinfection and sterilization.
2. Identify best practices for low level disinfection, high level disinfection, and sterilization.
3. Describe at least two unresolved issues/controversies related to disinfection and sterilization.

Best Practices:

1. Sterilization of Critical Items

1. Biological indicators

2. Cleaning indicators

- a. **Cleaning** - Physically removing any bioburden on the instrument.
- b. Cleaning all instruments at the point of use is required.
- c. Cleaning within SPD includes utilization of a detergent to remove all organic and non-organic materials.

3. Washer/Disinfector - Very effective in removing and inactivating microorganisms from surgical instruments

a. 5 chambers

i. Pre-Wash

- **Water/enzymatic is circulated over the load for 1 minute.**

ii. Wash

- **Detergent wash solution (150F) is sprayed over the load for 4 minutes**

iii. Ultrasonic cleaning

- **Basket is lowered into an ultrasonic cleaning tank with detergent for 4 minutes.**

iv. Thermal and lubricant rinse

- **HOT WATER (180F) is sprayed over the load for 1 minutes**
- **Instrument milk lubricant is added to the water and is sprayed over the load.**

v. Drying

- **Lower starts for 4 min and temperature in the drying chamber is 180F**

b. Cleaning indicators - AAMI recommends weekly (preferably daily) to monitor the automated washer and instrument cleaning chemistry functionality.

- i. Indicator includes proteins, lipids, and polysaccharides to mimic common challenging test soils.
- ii. Washer indicators are CHEMICAL indicators imprinted with a dried test soil formula and a dye.

2. High-Level disinfection for semi-critical items

1. Endoscope reprocessing issues

- a. GI endoscopes contamination during use (10^9 in/ 10^5 out)
- b. Complex channels that need to be cleaned
 - Require low temperature disinfection
 - Long narrow lumens

- Right turn angles
- Heavily contaminated with pathogens
- Cleaning and HLD required
- c. Inappropriate cleaning and disinfection has led to cross-transmission.
- d. In the inanimate environment, although the incidence remains very low, endoscopes represent a significant risk of disease transmission.
- e. Reprocessing:
 - **Preclean**
 - **Point-of-use (bedside):** Remove debris by wiping exterior and aspiration of detergent through air/water and biopsy channels; leak testing
 - **Clean**
 - Mechanically cleaned with water and enzymatic cleaner
 - **HLD/Sterilize**
 - Immerse scope and perfuse HLD/sterilant through all channels for exposure time
 - >2% glutaraldehyde at 20 min at 20C
 - If AER used, review model-specific reprocessing protocols from both the endoscope and AER manufacturer
 - **Rinse**
 - Scope and channels rinsed with sterile water, filtered water, or tap water.
 - Flush channels with alcohol and dry
 - **Dry**
 - Use forced air to dry insertion tube and channels
 - **Store**
 - Hang in vertical position to facilitate drying
 - Stored in a manner to protect from contamination.
- 2. Laryngoscopes
- 3. Germicides
 - a. Glutaraldehyde
 - b. Ortho-phthalaldehyde
 - c. Accelerated hydrogen peroxide
 - d. Peracetic acid

3. Low Level disinfection of Non-Critical Items

1. New low-level disinfectants
2. Curtain decontamination
3. Selecting a disinfectant

4. D/S and Emerging Pathogens

1. MERS-CoV
2. Enterovirus D68
3. Ebola

EH Spaulding believed that how an object will be disinfected depended on the objects intended use.

CRITICAL	○ Objects which enter normally sterile tissue or the vascular system or through which blood flows should be <u>STERILE</u>. • Surgical Items ▪ Sterilization Methods • Heat • Steam Sterilization • Stem formaldehyde • Gas • Hydrogen Peroxide gas plasma • Vaporized Hydrogen Peroxide • Ethylene oxide (ETO) • Ozone • Chemical - Takes a long time and must be rinsed after • Hydrogen peroxide • Peracetic acid • Glutaraldehyde • Ortho-phthalaldehyde (OPA)
SEMI-CRITICAL	○ Objects that touch mucous membranes or skin that is not intact require a disinfection process, • High-level disinfection (HLD) ○ That kills all microorganisms except for high numbers of bacterial spores ○ New Developments in Reprocessing • Endoscopes • Laryngoscopes • Infrared coagulation device • Nasopharyngeoscopes • Endocavitary probe • Prostate biopsy probes • Tonometers
NON-CRITICAL	Objects that touch only intact skin require low-level disinfection.

CSF Interpretation for Meningitis Tables

	VIRAL	BACTERIAL	TB	FUNGAL
GLUCOSE	NORMAL	↓	↓	↓
PROTEIN	NORMAL / ↑	↑	↑	↑
CELLS PRESENT	LYMPHOCYTES	NEUTROPHILS	LYMPHOCYTES	LYMPHOCYTES
OPENING PRESSURE	NORMAL	↑	↑	↑
APPEARANCE	CLEAR & COLOURLESS	TURBID	CLOUDY	CLOUDY

	Viral	Bacterial	Fungal	TB
Glucose	Normal	Decrease ↓	Decrease ↓	Decrease ↓
Protein	Normal to ↑	Increase ↑	Increase ↑	Increase ↑
Cells Present	Lymphocyte	Neutrophil	Lymphocyte	Lymphocyte
Opening Pressure	Normal	Increase ↑	Increase ↑	Increase ↑
Appearance	Clear & Colorless	Turbid	Cloudy	Cloudy

Additional Study Materials:

1. USMLE Step 1 Epi YouTube Video

Types of Epidemiological Studies

1. Descriptive

- a. Simplest of observation studies
- b. Basic quantitative terms such as the number of occurrences of an outcome broken down into Person, Place, and Time
- c. Examples:
 - i. Case Reports
 - ii. Case Series as Data Sources
- d. NO CONTROL GROUP

2. Analytical Studies

a. Cross-Sectional

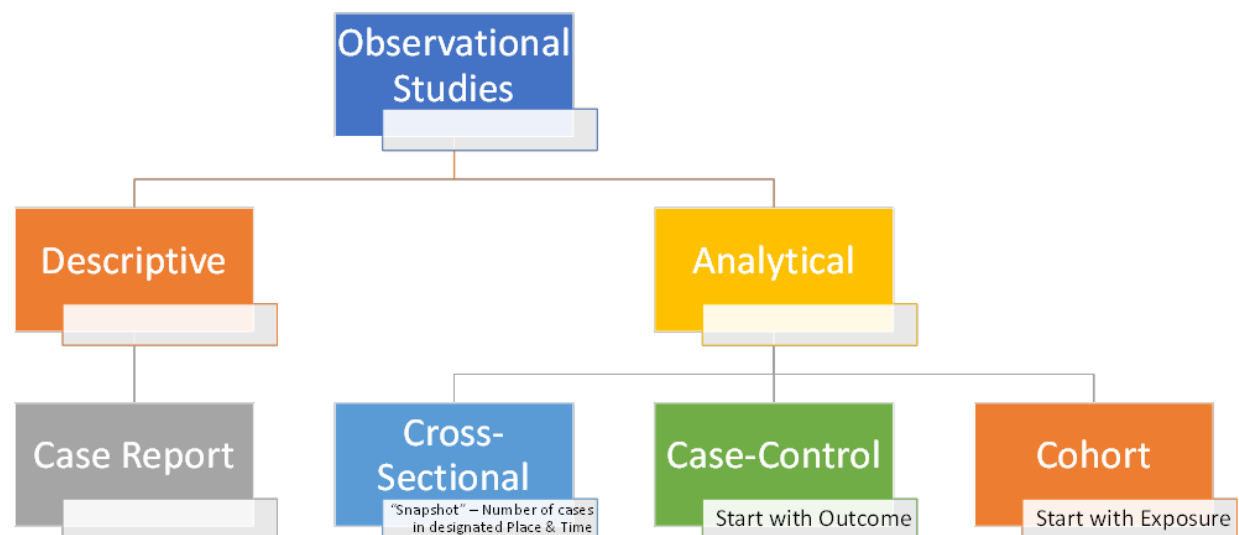
- i. Snapshot
 1. Number of cases at a specified Place and Time
- ii. Prevalence - not incident cases
- iii. Used for Hypothesis generation

b. Case-Control

- i. Start with an identified group that has the **OUTCOME** of interest.
 1. Exposures are assessed and evaluated
- ii. **More Timely**
- iii. **LESS Expensive** than Prospective Cohort studies
- iv. Good for **RARE OUTCOMES**, or outcomes that develop over a LONG time.

c. Cohort

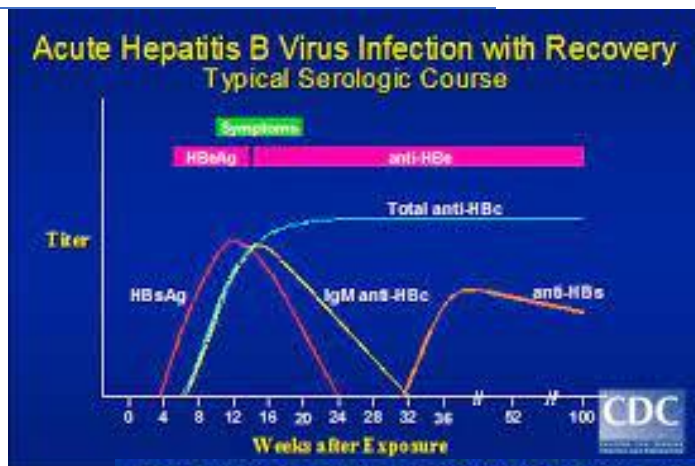
- i. Groups are defined regarding their **EXPOSURE** to a factor of interest
- ii. Prospective - Cohort
 1. GOLD STANDARD - events are recorded as they occur
 2. Reflects Cause-Effect temporal sequence of events
 3. **VERY EXPENSIVE**
- iii. A group of persons followed or traced over a period of time = "Cohort"
- iv. Retrospective



Criteria	Cross-Sectional	Case-Control	Cohort
Cost and Time	Low	Low	High
Population Size	Large	Small	Large
Rare Exposure	No	No	YES
Rare Outcome	No	YES	No
Recall Bias	Low	High	Low
Completeness of information	YES	low	HIGH
Loss to Follow-up	None	Low	High
Changes in characteristics Of Participants	None	Low	High
Assessment of Temporal Relationship	None	Difficult	High
Starting Data/Information	Survey, Records	OUTCOME	EXPOSURE2
Why?	Determine Prevalence	Determine if the two groups Differ in exposure(s)	Followed over time to see what the Outcome is due to the exposure
Name	Taking a cross-section of data from a period in time	The way in which the study Groups are assembled	Group of people followed over time
What data Is calculated with the results?	Prevalence	Relative Risk (Odds Ratio)	Incidence rates, Relative Risk, and Attributable Risk

Hepatitis B Serology

HBsAg anti-HBc anti-HBs	negative negative negative	Susceptible
HBsAg anti-HBc anti-HBs	negative positive positive	Immune due to natural infection
HBsAg anti-HBc anti-HBs	negative negative positive	Immune due to hepatitis B vaccination
HBsAg anti-HBc IgM anti-HBc anti-HBs	positive positive positive negative	Acutely infected
HBsAg anti-HBc IgM anti-HBc anti-HBs	positive positive negative negative	Chronically infected
HBsAg anti-HBc anti-HBs	negative positive negative	Interpretation unclear; four possibilities: 1. Resolved infection (most common) 2. False-positive anti-HBc, thus susceptible 3. "Low level" chronic infection 4. Resolving acute infection



Memorize this

If **HBsAg** is present, that means you currently have **infection** (regardless of acute or chronic)

If **IgG-HBsAg** is present, you have won the battle; either you are **Cured or Vaccinated**

A CVC is also an option for hemodialysis treatment. It's important to note that while a CVC can be used for dialysis, an arteriovenous (AV) fistula is considered the first and best choice in dialysis access.

CVC - Pros v Cons

Pros	Cons
Immediate access • good for urgent or emergent dialysis needs	Serious infections • 30-60% of removal is due to infections
Long-term access • Pts with long-term treatment	Risk of clots • blood clots on and/in the internal opening of the catheter can slow or entirely block the blood flow. ◦ clots need to be dissolved with medicine
No needles • Blood can be drawn from the CVC • Treatment injection site	Damage to blood vessels • Over time CVC can lead to stenosis (narrowing) of the veins ◦ Damage to the walls and may prevent blood from flowing adequately

<<https://www.azuravascularcare.com/infodialysisaccess/difference-between-cvc-and-picc/>>

Centrally Inserted Catheter

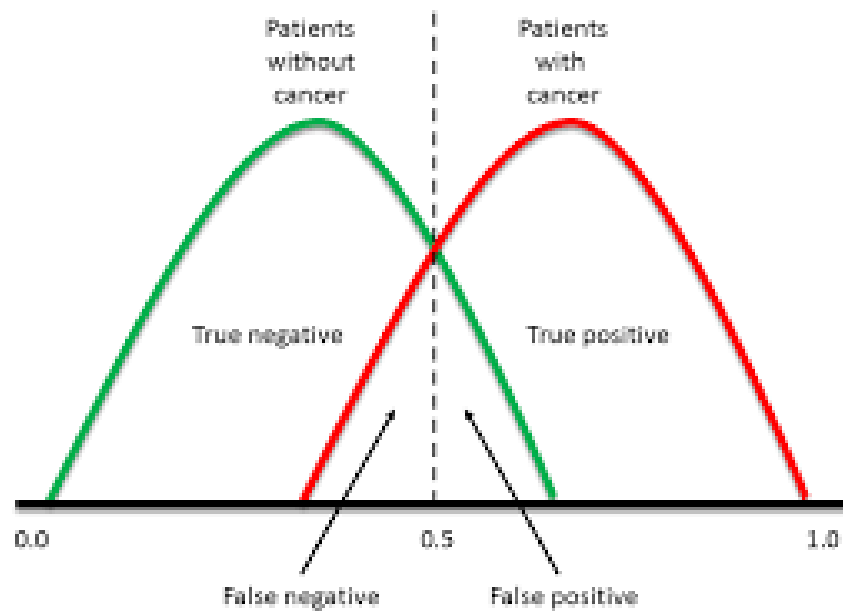
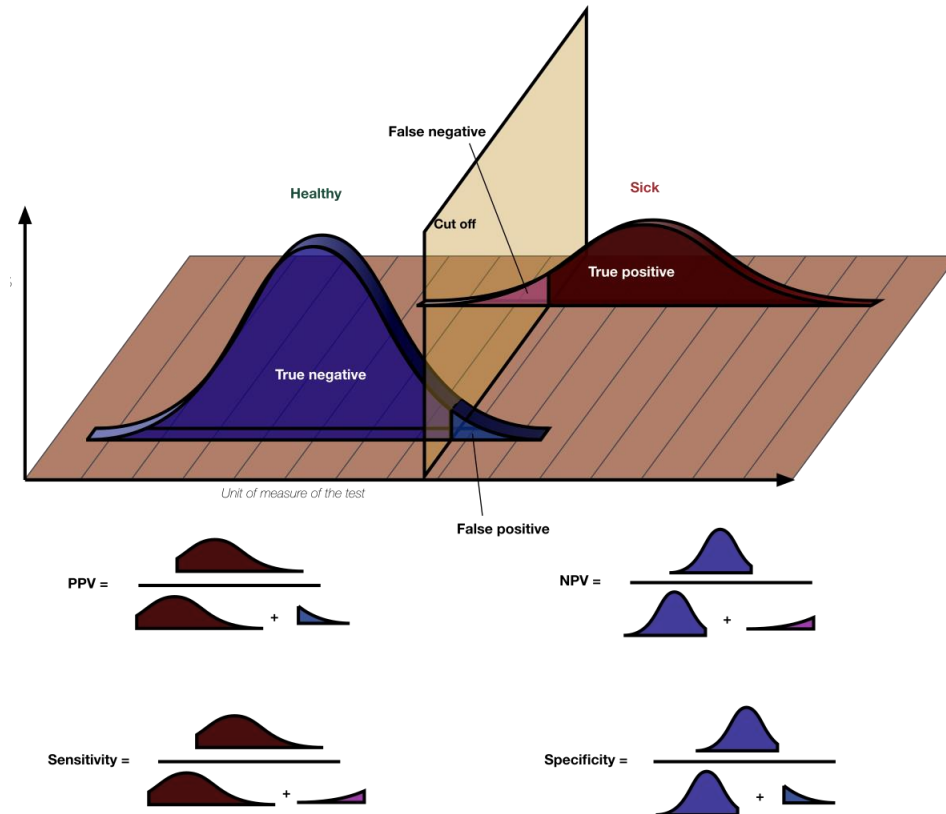
- **Non-Tunneled CVC (no cuff)**
 - Short term, Acute care, percutaneous catheters
 - Typically used for days – weeks for all types of IV therapy, blood draws, monitor central venous pressure in ICUs
 - Example: PICCs, Acute single/dual/triple/Quad CVCs, Dialysis/aPheresis catheters
- **Tunneled CVC (cuffed)**
 - Long term therapies – TPN, chemo
 - Oncology, Cardiac, GI patients
 - Dacron cuff provides catheter stability and serves as a barrier to prevent infection
 - Examples: Cuffed PICCs, Chronic Dialysis/aPheresis catheters, Hickman, Broviac,



SlideServe

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Sensitivity vs Specificity



Antimicrobial Resistance

To have an impact on antimicrobial use so as to reduce resistance, IPs need a working knowledge of the following:

- ☐ Available antimicrobials
- ☐ Principles for their appropriate use
- ☐ Mechanisms by which these drugs inhibit microbial growth
- ☐ Mechanisms by which the organism develops resistance

3 Types of Antimicrobial Mechanisms:

1. Antifungals - Alter permeability of fungal membrane; inhibit membrane biosynthesis or DNA synthesis
2. Antivirals - Inhibit information of DNA precursors, DNA polymerase, and HIV reverse transcription. They interfere with viral uncoating or confer resistance on uninfected cells.
3. Antibacterial - Interfere with cell wall biosynthesis, inhibit bacterial ribosomes, interfere with DNA replication or RNA transcription, or inhibit metabolic pathways.

Chapter 107 in APIC text

Pathogen	Survival Time
Staphylococcus aureus (including MRSA)	7 days to >12 months
<i>Clostridium difficile</i>	> 5 months
Norovirus	8 hours to > 2 weeks

Cleaning, Sanitizing, and Disinfection

Cleaning is the removal of foreign material (e.g., soil, dust, organic material) from objects, and it is normally accomplished using water with detergents or enzymatic products.

Sanitizing is the reduction in microbial population on an inanimate object to a safe or relatively safe level.

Disinfection is the elimination of many or all pathogenic organisms with the exception of bacterial spores. Surfaces must be cleaned before they can be properly disinfected.

Cleaning-disinfection is a one-step process, unless the surface is heavily contaminated.

Detergents and Disinfectants

Detergents

- More environmentally friendly, and produce less offensive odors
- Cost less than disinfectants
- Do not effectively remove microorganisms from surfaces

Disinfectants

- Disinfectants are divided into low, intermediate and high levels
- Have different kill capabilities based on the levels

Organic Materials and Disinfectants

Organic materials such as blood and protein inactivate many disinfectants. Organic matter **must** be removed from surfaces before applying the disinfectant.



Infection Control and Environmental Services

The person responsible for the infection control program should have a thorough knowledge of cleaning agents and disinfectants used by the EVS department.

In addition to product names, the following should also be known:

- Active ingredient in the product
- Directions for use
- Where and how it is used in the facility
- How to contact the manufacturer's with questions

Cleaning Procedures

Cleaning schedules and procedures progress from the least soiled areas to the most soiled (patient zones) and from high surfaces to low ones.

To ensure that all surfaces are reached cleaning should be performed in a **systematic manner**.

After selecting a starting point, such as the door or window, work typically progresses from that point in either a clockwise or counterclockwise direction.

Cleaning Equipment- Mops

- CDC recommends changing floor mopping solutions every three rooms and at least every 60 minutes.
- Used mops and cleaning cloths should never be returned to containers of cleaning solution. They should be laundered or discarded after use.
- Handles and poles for mops, dusters, and other items should also be wiped with a disinfectant after use.
- A disinfectant **must** be used to clean floors in critical areas, such as isolation rooms.

APIC. 2014. APIC Text of Infection Control and Epidemiology 4th Edition

Environmental Services and Hand Hygiene

Examples of when EVS personnel should perform HH:

- Before gloving and entering a patient's room to clean
- After cleaning a patient's room and gloves were removed
- Before handling clean linens
- After bagging soiled linen and placing it in a linen cart
- After collecting and bagging trash and placing it in a trash cart
- After handling soiled equipment (mops, cloths, buckets)
- After using the bathroom
- Before and after eating or going on break

Performance Improvement

- Frequent re-education programs on the same topics, especially thoroughness of cleaning for high-touch surfaces, may be beneficial.
- EVS leadership should develop evaluation tools to study and measure their activities.
- Topics for performance improvement:
 - Determining thoroughness of cleaning (highest priority)
 - Appropriate use of PPE
 - Adhering to Isolation Precautions
 - Complying with HH
 - Evaluating staff knowledge of cleaning policies and procedures

Evaluating Effectiveness of Cleaning

- Visual Inspection
 - Written checklist
 - Helps determine if room is aesthetically pleasing and in assessing whether EVS personnel completed their tasks.
 - Not considered a reliable indicator of cleaning efficacy
- ATP Bioluminescence Test
- Fluorescent Markers

Cleaning Grid

Item	Picture	By Whom	Frequency
ABHR		EVS	Daily and as needed
BP Cuff		After use- Nursing Terminal Clean- EVS	Between individual patients

Active Ingredient	Use	Disinfectant Level
Alcohol	Alcohols are not recommended for sterilizing medical and surgical materials principally because they lack sporicidal action and they cannot penetrate protein-rich materials.	
Chlorine/Bleach	Hypochlorites are widely used in healthcare facilities in a variety of settings. Inorganic chlorine solution is used for disinfecting tonometer heads and for spot-disinfection of countertops and floors. A 1:10–1:100 dilution of 5.25%–6.15% sodium hypochlorite (i.e., household bleach) or an EPA-registered tuberculocidal disinfectant has been recommended for decontaminating blood spills. For small spills of blood (i.e., drops of blood) on noncritical surfaces, the area can be disinfected with a 1:100 dilution of 5.25%–6.15% sodium hypochlorite or an EPA-registered tuberculocidal disinfectant. Because hypochlorites and other germicides are substantially inactivated in the presence of blood, large spills of blood require that the surface be cleaned before an EPA-registered disinfectant or a 1:10 (final concentration) solution of household bleach is applied	
Chlorine	Chlorine long has been used as the disinfectant in water treatment. Hyperchlorination of a <i>Legionella</i> -contaminated hospital water system ²³ resulted in a dramatic decrease (from	

	30% to 1.5%) in the isolation of <i>L. pneumophila</i> from water outlets and a cessation of healthcare-associated Legionnaires' disease in an affected unit	
Formaldehyde	Although formaldehyde-alcohol is a chemical sterilant and formaldehyde is a high-level disinfectant, the health-care uses of formaldehyde are limited by its irritating fumes and its pungent odor even at very low levels (<1 ppm). For these reasons and others—such as its role as a suspected human carcinogen linked to nasal cancer and lung cancer , this germicide is excluded from Table 1. When it is used, , direct exposure to employees generally is limited; however, excessive exposures to formaldehyde have been documented for employees of renal transplant units , and students in a gross anatomy laboratory	
Glutaraldehyde	Glutaraldehyde is used most commonly as a high-level disinfectant for medical equipment such as endoscopes , spirometry tubing, dialyzers, transducers, anesthesia and respiratory therapy equipment , hemodialysis proportioning and dialysate delivery systems, and reuse of laparoscopic disposable plastic trocars. Glutaraldehyde is noncorrosive to metal and does not damage lensed instruments, rubber. or plastics. Glutaraldehyde should not be used for cleaning noncritical surfaces because it is too toxic and expensive.	high-level disinfectant
Hydrogen Peroxide	Commercially available 3% hydrogen peroxide is a stable and effective disinfectant when used on inanimate surfaces. It has been used in concentrations from 3% to 6% for disinfecting soft contact lenses (e.g., 3% for 2–3 hrs) , tonometer biprisms, ventilators , fabrics, and endoscopes 456. Hydrogen peroxide was effective in spot-disinfecting fabrics in patients' rooms. Corneal damage from a hydrogen peroxide-soaked tonometer tip that was not properly rinsed has been reported.	
Ortho-phthalaldehyde (OPA)	OPA has several potential advantages over glutaraldehyde. It has excellent stability over a wide pH range (pH 3–9), is not a known irritant to the eyes and nasal passages, does not require exposure monitoring, has a barely perceptible odor, and requires no activation. OPA, like glutaraldehyde, has excellent material compatibility. A potential disadvantage of OPA is that it stains proteins gray (including unprotected skin) and thus must be handled with caution. However, skin staining would indicate improper handling that requires additional training and/or personal protective equipment (e.g., gloves, eye and mouth protection, and fluid-resistant gowns). OPA residues remaining on inadequately water-	high-level disinfectant

	rinsed transesophageal echo probes can stain the patient's mouth. Meticulous cleaning, using the correct OPA exposure time (e.g., 12 minutes) and copious rinsing of the probe with water should eliminate this problem. In an automated endoscope reprocessor with an FDA-cleared capability to maintain solution temperatures at 25°C, the contact time for OPA is 5 minutes	
Peracetic Acid	An automated machine using peracetic acid to chemically sterilize medical (e.g., endoscopes, arthroscopes), surgical, and dental instruments is used in the United States. As previously noted, dental handpieces should be steam sterilized.	
Peracetic Acid and Hydrogen Peroxide	The combination of peracetic acid and hydrogen peroxide has been used for disinfecting hemodialyzers	
Phenolics	Many phenolic germicides are EPA-registered as disinfectants for use on environmental surfaces (e.g., bedside tables, bedrails, and laboratory surfaces) and noncritical medical devices. Phenolics are not FDA-cleared as high-level disinfectants for use with semicritical items but could be used to preclean or decontaminate critical and semicritical devices before terminal sterilization or high-level disinfection.	
Quaternary Ammonium Compounds	The quaternary ammonium compounds are widely used as disinfectants. Health-care-associated infections have been reported from contaminated quaternary ammonium compounds used to disinfect patient-care supplies or equipment, such as cystoscopes or cardiac catheters The quaternaries commonly are used in ordinary environmental sanitation of noncritical surfaces, such as floors, furniture, and walls. EPA-registered quaternary ammonium compounds are appropriate to use for disinfecting medical equipment that contacts intact skin (e.g., blood pressure cuffs).	