

Preventive Medicine



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CSAM Addiction Medicine Board Review Course

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CONFLICT OF INTEREST DISCLOSURE

I, *Warren Yamashita*, have nothing to disclose, and I will not be discussing “off label” use of drugs or devices in this presentation.

EDUCATIONAL OBJECTIVES

After attending this presentation, participants will be able to:

1. Understand the basic principles of epidemiology that one must know to be prepared to take the Addiction Medicine Board Exam
1. Understand Primary, Secondary & Tertiary prevention strategies
1. Understand common health conditions related to substance use, their screening recommendations and interventions to decrease morbidity & mortality

PREVENTIVE MEDICINE

Question 1: The Institute of Medicine classifies prevention strategies based on the targeted population. All of the following prevention strategies are correctly paired, except:

- A. Selective Prevention – Substance use education in primary schools.
- B. Universal Prevention – Public smoking bans.
- C. Indicated Prevention – Drug treatment for youth involved with the juvenile justice system.
- D. Selective Prevention – HCV screening at a MOUD clinic for patients with Opioid Use Disorder.

PREVENTIVE MEDICINE

1) Answer is A. Selective Prevention – Substance use education in primary schools

- Universal Prevention focuses on the entire population as the target of the intervention.
 - The target population can be an entire nation, local community, school or neighborhood. Public smoking bans target the entire community where the bans are in effect. Education campaigns target the entire school.
- Selective Preventive targets high risk groups.
 - Screening for HCV among patients with OUD would be appropriate given the increased risk of HCV in this population.
- Indicated Prevention specifically addresses symptomatic high risk individuals.
 - Indicated individualized strategies are appropriate for individuals with high risk behaviors such as youth in the juvenile justice system.

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Question 2: In 2013 the Advisory Committee on Immunization Practices (ACIP) of the CDC published updated recommendations regarding TDAP vaccination for pregnant women. All the following are true EXCEPT:

- A. TDAP vaccination should be given during every pregnancy regardless of the interval between pregnancies.
- B. TDAP vaccination should be given during pregnancy provided the prior vaccination was 2 years ago or longer.
- C. The ideal time for TDAP vaccination during pregnancy is between 27 & 36 weeks of gestation, the closer to 27 weeks the better.
- D. If a pregnant woman, who is less than 27 weeks gestation, has a wound where a tetanus booster is indicated, TDAP should be given promptly & does not need to be repeated during the 27 to 36-week window.

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2) Answer is B. TDAP vaccination should be given during pregnancy provided the prior vaccination was 2 years ago or longer.

- TDAP should be administered by the treating provider if:
 - **Patient is 27+ weeks pregnant & has not started prenatal care or is attending erratically.**
 - **Patient is newly delivered & did not receive TDAP during the pregnancy or after delivery.**
- There has been an ongoing increase in pertussis in the U.S. and TDAP during pregnancy prevents neonatal pertussis. Most of the morbidity & mortality associated with pertussis occurs in **infants 3 months old & younger**
- Maternal anti-pertussis antibodies are short-lived; vaccination during a prior pregnancy will not provide high enough levels of antibody to protect the newborn during a subsequent pregnancy.
- Vaccinating between gestational weeks 27 & 36 maximizes maternal antibody response, passive antibody transfer, & adequate levels of antibody in the newborn.

PREVENTIVE MEDICINE

Question 3: Primary & Secondary syphilis cases in the U.S. have surged reaching a 20-year record high & cases of congenital syphilis have more than doubled in the past 4 years. All the following are true about syphilis EXCEPT:

- A. Screening for syphilis requires use of a nontreponemal test (e.g. VDRL or RPR) or a treponemal test (e.g. EIA, FTA-ABS, TPPA, or MHA-TP), but not both.
- B. Known risk factors for syphilis include: multiple sex partners, substance use disorders, poverty, exchanging sex for drugs, money, or housing, & a history of incarceration.
- C. Up to 40% of pregnancies with untreated syphilis will result in miscarriage, stillbirth, or early infant death.
- D. Neonatal symptoms of congenital syphilis include deformed bones, severe anemia, hepatosplenomegaly, neurological problems, meningitis, & skin rashes.

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3) Answer is A. Screening for syphilis requires use of a non-treponemal test (e.g. VDRL or RPR) or a treponemal test (e.g. EIA, FTA-ABS, TPPA, or MHA-TP), but not both

- **BOTH a nontreponemal test AND a treponemal test are required. The treponemal test will be positive in patients with current or past infection. The nontreponemal test may be positive for conditions other than syphilis; when syphilis is present, this test will differentiate current infection needing treatment from prior, treated infection.**
- **Patients with SUDs are in a high-risk group for syphilis.** Screening for syphilis is a required part of admission to opioid treatment programs. Repeated testing is recommended for pregnant woman at increased risk. Up to 40% of pregnancies with untreated syphilis result in miscarriage, stillbirth, or early infant death.

PREVENTIVE MEDICINE

3 continued) Answer is A. Screening for syphilis requires use of a nontreponemal test (e.g. VDRL or RPR) or a treponemal test (e.g. EIA, FTA-ABS, TPPA, or MHA-TP), but not both.

- Potential symptoms of congenital syphilis include deformed bones, severe anemia, hepatosplenomegaly, jaundice, neurological problems, meningitis, & skin rashes. Usually, symptoms emerge within the first few weeks of life, but baby may be asymptomatic only to have symptoms occur years later, causing serious problems (such as those listed above), developmental delay, seizures, or death.
- The global pooled syphilis prevalence amongst men having sex with men has risen to unacceptable levels and was estimated at 7.5% (95% CI 7.0–8.0, 345 data points; n=606, 232) between 2000 and 2020.

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Question 4: Mr. Rogers is a 65 year-old male with a past medical history of opioid use disorder sees you for a follow up for his buprenorphine-naloxone treatment. He is stable on 12 mg of buprenorphine daily. He asks you if he needs any cancer screening although he quit smoking 5 years ago. Upon further history, he shares that he started smoking at age 20 and smoked 1-5 cigarettes per day on average until he quit. According to the United States Preventive Services Task Force, you recommend:

- A. Yearly low dose computed tomography.
- B. 1-time abdominal ultrasound
- C. Yearly PSA screening for prostate cancer
- D. Nothing, he quit over 5 years ago.

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4) Answer is B. 1-time abdominal ultrasound

- It is important to know the U.S. Preventative Services Task Force recommendations, particularly related to smoking related screening recommendations.
- The USPSTF recommends a **1-time screening for abdominal aortic aneurysm (AAA) with ultrasoundography in men aged 65 to 75 years who have ever smoked (Grade B).**
- This question also reviews additional USPSTF guidelines.
 - Prostate Cancer Screening: Individualized decision making for men aged 55-69 years old with periodic PSA-based screening (Grade C). Recommends against PSA-based screening in men over 70 years and older (Grade D).
 - Lung Cancer Screening: annual screening for lung cancer with low-dose computed tomography (LDCT) in adults **aged 50 to 80 years who have a 20 pack-year smoking history and currently smoke or have quit within the past 15 years.**
 - Screening should be discontinued once a **person has not smoked for 15 years** or develops a health problem that substantially limits life expectancy or the ability or willingness to have curative lung surgery (Grade B).
- Lung cancer is the **2nd most common** cancer.
- Lung cancer leading cause of cancer death among both men and women: **25% of all cancer deaths**. Each year, more people die of lung cancer than of colon, breast, and prostate cancers combined.
- 80%-90% of lung cancer cases are the result of smoking; increasing age & cumulative exposure to tobacco smoke are the 2 most common risk factors.

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Question 5: The rate of tuberculosis (TB) infection in the U.S. is 2.9/100,000. The prevalence of tuberculosis in persons who inject drugs (PWID) has been estimated to be 15,000-39,000/100,000. Which of the following is FALSE regarding TB prevention?

- A. Treating patients for latent TB is SECONDARY prevention, because it provides treatment before TB progresses from latent to active.
- B. Treating patients with active TB is TERTIARY prevention, stopping disease progression & limiting the spread of infection to others.
- C. Many countries with higher rates of endemic TB utilize vaccinations for TB prevention.
- D. Screening for TB using the tuberculin skin test or QuantiFERON-TB Gold is an example of PRIMARY prevention, identifying people at risk of active TB before they are sick.

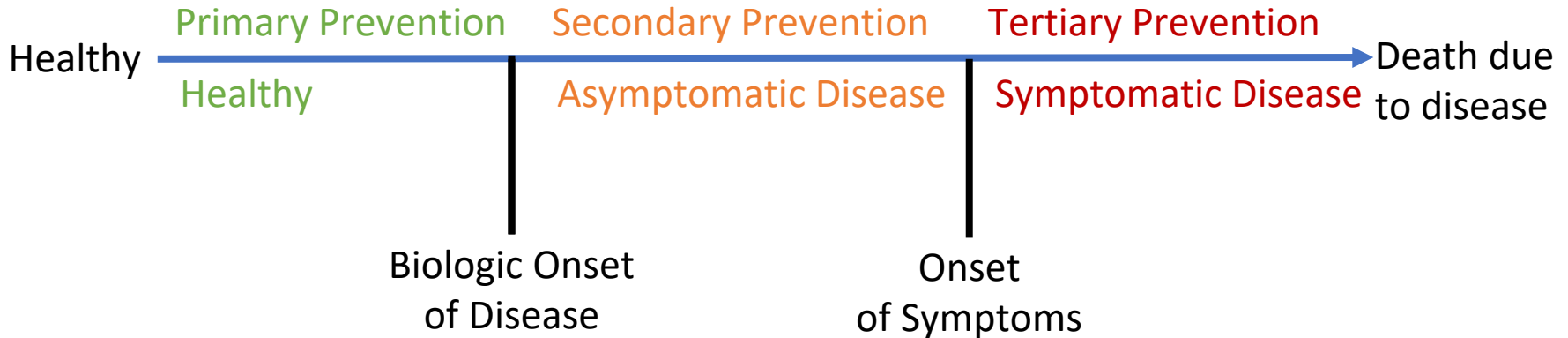
PREVENTIVE MEDICINE

5) Answer is D. Screening for TB using the tuberculin skin test or QuantiFERON-TB Gold is an example of PRIMARY prevention, identifying people at risk of active TB before they are sick.

	PRIMARY Prevention	SECONDARY Prevention	TERTIARY Prevention
Definition	Action implemented before disease onset through behavior modification, policy, or medical intervention, such as vaccines.	Screening to detect diseases early before onset of signs and symptoms.	Disease management post diagnosis or to stop disease progression and screen for complications.
Goal	Risk Reduction	Screening	Diagnosis and Treatment
Example	PRIMARY TB prevention: environmental controls, such as use of adequate ventilation and decreasing overcrowding. Countries with high rates of infection vaccinate with BCG. 25% of the world's population is infected with TB.	Screening for latent TB infection & treatment of latent TB infection are both examples of SECONDARY prevention—the infection has already occurred—it has not been prevented.	TERTIARY PREVENTION is what we often think of as medical treatment, decreasing morbidity/mortality of diseases which are already symptomatic

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5) Answer is D. Screening for TB using the tuberculin skin test or QuantiFERON-TB Gold is an example of PRIMARY prevention, identifying people at risk of active TB before they are sick.



PREVENTIVE MEDICINE

Question 6: Given the table below, what is the SENSITIVITY of the test?


	Disease +	Disease -	Total
Test +	25	10	35
Test -	5	60	65
Total	30	70	100

- A. 25 divided by 35
- B. 25 divided by 30
- C. 5 divided by 30
- D. 5 divided by 65

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6) Answer is B. 25 divided by 30 (.83)

	Disease +	Disease -	Total
Test +	25=TP	FP	TP + FP
Test -	5=FN	TN	TN + FN
Total	30=25TP + 5FN	FP + TN	



$$25 \text{ TP} / 30 \text{ TP+FN}$$

PREVENTIVE MEDICINE

6) Answer is A. 25 divided by 30 (.83)

- The sensitivity and specificity reflect the **TEST** and is **NOT dependent on the population**.
- The measure of sensitivity describes how well the proposed screening test performs against an agreed “Gold Standard” test, Gold Standard, meaning a diagnostic test that is regarded as definitive.
- In drug testing, sensitivity is the ability of the test to detect those who have consumed the substance. For instance, if I know that a patient used cocaine, how likely is that test going to come back positive for cocaine? If it were a perfectly sensitive test, it would 100% pick up every person who used cocaine.
- Sensitivity is the ability of a test to detect disease in those who have the disease and is expressed as the proportion of those **with disease** correctly identified by a positive screening test result.
- Mathematically it is **True Positives / (True Positives + False Negatives)**
- Highly **SeNsitive** tests when Negative rule OUT disease or use: “SN(-)OUT”² Prevalence dependent

PREVENTIVE MEDICINE

Question 7: Given the table below, what is the SPECIFICITY of the test?

	Disease +	Disease -	Total
Test +	25	10	35
Test -	5	60	65
Total	30	70	100

- A. 25 divided by 70
- B. 5 divided by 65
- C. 60 divided by 70
- D. 60 divided by 65

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7) Answer is C. 60 divided by 70 (.86)

	Disease +	Disease -	Total
Test +	TP	10= FP	TP + FP
Test -	FN	60=TN	TN + FN
Total	TP + FN	70=10FP + 60TN	


$$60 \text{ TN} / 70 \text{ FP+TN}$$

PREVENTIVE MEDICINE

7) Answer is C. 60 divided by 70 (.86)

- Again, the sensitivity and specificity reflect the TEST and are NOT dependent on the population
- The measure of specificity describes how well the proposed screening test performs against an agreed “Gold Standard” test, meaning a diagnostic test that is regarded as definitive.
- In drug testing, **specificity is the reliability of the test to be negative in those who have not used the tested drug.**
- Specificity is the ability of the test to identify correctly those free of disease in the screened population and is expressed as the proportion of those without disease correctly identified by a negative screening test.
- Mathematically, it is **True Negatives/(True Negatives + False Positives)**
- A **POSITIVE** test for a highly **SP**-ecific test rules **IN** disease or use: “**SP(+)**IN”  Prevalence dependent

PREVENTIVE MEDICINE

Question 8: Does the prevalence of the disease affect the sensitivity and specificity of the screening test?

- A. Yes. As the prevalence of the disease increases, the sensitivity of the test increases, & the specificity decreases.
- B. No. Sensitivity & specificity are independent of prevalence of disease.
- C. Yes. As the prevalence of the disease increases, the sensitivity of the test decreases, & the specificity increases.
- D. Yes. As the prevalence of the disease increases, sensitivity & specificity increase, & as the prevalence of the disease decreases, sensitivity & specificity of the disease decrease.

PREVENTIVE MEDICINE

8) Answer: B. No, sensitivity & specificity are independent of prevalence of disease.

- Again, the sensitivity and specificity are NOT dependent on the population, they are TEST dependent
- Sensitivity & specificity describe how well the test performs against the gold standard. This performance does not change with a change in disease prevalence, as it is an inherent property of the test itself.
- Prevalence refers to the total number of individuals in a population who have a disease or health condition at a specific interval of time, usually expressed as a percentage of the population

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Question 9: Given the table below, what is the POSITIVE PREDICTIVE VALUE of the test?

	Disease +	Disease -	Total
Test +	25	10	35
Test -	5	60	65
Total	30	70	100

- A. 25 divided by 30
- B. 25 divided by 35
- C. 35 divided by 65
- D. 25 divided by 70

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9) Answer: B. 25/35 (.71) PPV

	Disease +	Disease -	Total	
Test +	25 TRUE POS	10 FALSE POS	35 Total Test POS	25/35 (.71) PPV
Test -	5	60	65	
Total	30	70	100	

PREVENTIVE MEDICINE

Question 9: Answer: B. 25/35 (.71) continued

- The positive predictive value (PPV) describes the probability or odds of having the disease given a positive screening test result in the screened population.
- This is expressed as the proportion of those with disease among all screening test positives.
- Mathematically, it is $\text{True Positives} / (\text{True Positives} + \text{False Positives})$

PREVENTIVE MEDICINE

Question 10: Given the table below, what is the NEGATIVE PREDICTIVE VALUE of the test?


	Disease +	Disease -	Total
Test +	25	10	35
Test -	5	60	65
Total	30	70	100

- A. 60 divided by 65
- B. 60 divided by 70
- C. 65 divided by 70
- D. 70 divided by 100

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10) Answer: A. 60/65 (.92) NPV

	Disease +	Disease -	Total	
Test +	25	10	35	
Test -	5 FALSE NEG	60 TRUE NEG	65 Total Test NEG	60/65 (.92) NPV
Total	30	70	100	



PREVENTIVE MEDICINE

Question 10: Answer: A. 60/65 (.92) continued

- The negative predictive value (NPV) describes the probability or odds of not having the disease given a negative screening test result in the screened population.
- This is expressed as the proportion of those without disease among all screening test negatives.
- Mathematically, it is $\text{True Negatives} / (\text{True Negatives} + \text{False Negatives})$

PREVENTIVE MEDICINE

Question 11: Does the prevalence of the disease in the population being screened affect the positive predictive value (PPV) & negative predictive value (NPV) of the screening test?

- A. No. PPV & NPV are independent of the prevalence of disease.
- B. Yes. As the prevalence of the disease increases, the PPV decreases, & the NPV increases.
- C. Yes. As the prevalence of the disease increases, the PPV increases, & the NPV decreases.
- D. As the prevalence of the disease increases, PPV & NPV increase, & as the prevalence of the disease decreases, PPV & NPV decrease.

PREVENTIVE MEDICINE

11) Answer: C. Yes. As the prevalence of the disease increases, the PPV increases & the NPV decreases.

- Positive predictive value (PPV) & negative predictive value (NPV) are disease prevalence dependent, meaning they are population specific. The denominator is the entire population of those with and without disease.
- PPV & NPV give information on how well a screening test will perform in each population with a known prevalence.

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Prevalence = Disease+ / (Disease+ plus Disease-) = 50/1000 = 5%

	Disease +	Disease -	Total	
Test +	40	95	135	PPV = 40/135 = 29.6%
Test -	10	855	865	NPV = 855/865 = 98.8%
Total	50	950	1000	

Sensitivity = 40/50 = 80% Specificity = 855/950 = 90%

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Prevalence = Disease+ / (Disease+ plus Disease-) = 200/1000 = **20% goes up**

	Disease +	Disease -	Total
Test +	160	80	240
Test -	40	720	760
Total	200	800	1000

PPV = $160/240 = 66.6\%$
Goes up as well

NPV = $720/760 = 94.7\%$
Goes down slightly

Sensitivity = $160/200 = 80\%$

Specificity = $720/800 = 90\%$

PREVENTIVE MEDICINE

Question 12: What does the number needed to treat (NNT) refer to?

- A. NNT is the number of physicians needed in a given specialty area and given geographical area to ensure adequate care for the number of patients with specific diagnoses
- B. NNT is the number of patients that would need to be treated for one person to improve because of the active treatment.
- C. NNT is the number of participants needed in a study to have adequate power to detect a real effect of the treatment
- D. NNT is the number of patients that would need to be treated for a treatment to be considered cost effective.

PREVENTIVE MEDICINE

Question 12: Answer: B. NNT is the number of patients that would need to be treated for one person to improve because of the active treatment.

- **More effective treatments have lower NNTs. The ideal NNT is 1, meaning that everyone benefits from the treatment.**
- **NNT from clinical trials is usually calculated for active treatment relative to a control (often placebo) condition:**

First calculate the absolute risk reduction (ARR) which is the amount by which a treatment reduces risk of a bad outcome

If 50% of participants respond in the active arm and 30% respond in the placebo arm, the
 $ARR = 0.5 - 0.3 = \underline{0.2}$ (or 20%)

The NNT is the inverse of the absolute risk reduction (ARR), i.e. $NNT = 1/ARR$. In the example above, NNT is $1/\underline{0.2} = \underline{5}$, **people needed to treat to get one person to benefit from that treatment**

PREVENTIVE MEDICINE

CALCULATING (Number Needed to Treat NNT)

Active treatment arm ☐ 50% response

Placebo arm ☐ 30% response

First calculate the absolute risk reduction (ARR)

$ARR = 50\% - 30\% = 20\%$ ☐ difference in response to real treatment

$ARR = 0.5 - 0.3 = \underline{0.2}$

Then calculate the number needed to treat (NNT)

$NNT = 1/ARR - 1/0.2$
 $= 5$

5 people needed to treat to get one person to benefit from that treatment

PREVENTIVE MEDICINE: NEED TO KNOW

- Basic principles of epidemiology
 - Incidence vs. prevalence
 - Period prevalence vs. point prevalence
 - Sensitivity & specificity
 - Positive & negative predictive value
 - Absolute risk reduction & number needed to treat
 - Relative risk, odds ratio, & confidence interval

PREVENTIVE MEDICINE: NEED TO KNOW

Preventive health issues

Common health conditions related to substance use, modality of use (smoking, injecting, etc.), social situation, & lifestyle choices. Examples include:

ID: Hepatitis, TB, HIV, STDs, soft tissue infection

Smoking: lung cancer, abdominal aortic aneurysm

Medical: Poor dentition, reactive airway, unplanned pregnancy, Cardiomyopathy, QTc prolongation, COPD, cervical cancer, laryngeal cancer

Screening recommendations

Interventions to decrease morbidity & mortality

Primary, secondary & tertiary prevention strategies, **IOM definitions of universal, selective and indicated prevention**

PREVENTIVE MEDICINE: References

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<https://www.thennt.com/thennt-explained/>
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Thank you and Best Wishes!