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Figure 1-2. Calculating Incidence and Prevalence

#### **Crude, Specific, and Standardized Rates**

- 1. <u>Crude rate</u>: actual measured rate for whole poul to
- 2. <u>Specific rate</u>: actual measured rate to **cuogroup of population**, e.g., "age-specific" or "ex-specific" acte. A crude rate can be expressed as a weighted succoff agr-specific rates. Fact component of that sum has the following form:

IIK

every for the specified age group) × (age-specific rate)

3. <u>Standardized rate (or adjusted rate)</u>: adjusted to make groups equal on some factor, e.g., age; an "as if" statistic for comparing groups. The standardized rate adjusts or removes any difference between two populations based on the standardized variable. This allows an "uncontaminated" or unconfounded comparison.

- a. Prospective; subjects tracked forward in time
- b. Can determine incidence and causal relationships
- c. Must follow population long enough for incidence to appear



Figure 1-6. Differentiating Study Types by Time

#### Analyzing observational studies

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- 1. For cross-sectional studies: use *chi*-square  $(x^2)$
- 2. For cohort studies: use relative risk and/or attributable risk
  - <u>Relative risk (RR)</u>: comparative probability asking "How much more likely?"
    - a. Incidence rate of **exposed group divided by** the incidence rate of the **unexposed group**
    - b. How much greater chance does one group have of contracting the disease compared with the other group?
    - c. E.g., if infant mortality rate in whites is 8.9 per 1,000 live births and 18.0 in blacks per 1,000 live births, then the relative risk of blacks versus whites is 18.0 divided by 8.9 = 2.02. Compared with whites, black infants are twice as likely to die in the first year of life.
    - d. For statistical analysis, yields a *p*-value
  - <u>Attributable risk (AR)</u>: comparative probability asking "How many more cases in one group?"
    - a. Incidence rate of **exposed group minus** the incidence **rate** of **the incidence rate** of **the incidence <b>rate** of **the incidence rate** of **the incidence rate** of **the incidence <b>rate** of **the**
    - b. Using the same example, attributible text is equal to 18.0 minus 8.9 = 9.1. Of every 1.0.9 states mants, there were 9.1 more deaths than were oble verified, 0.000 white infinits. In this case attributable richter view is the excess mortality.

c. Note that both relative it so and attributable risk tell us if there are differences, but at not tell us why those differences exist.

Never Need to Treat (NNT) = Inverse of attributable risk (if looking at treatment)

How many people do you have to do something to stop one case you otherwise would have had?

Note that the Number Needed to Harm (NNH) is computed the same way. For NNH, inverse of attributable risk, where comparison focuses on exposure.

NNH = Inverse of attributable risk (if looking at exposure)

- 18/1,000 8/1,000 = 10/1,000 = AR
- Inverse of 10/1,000 = 100 = NNT or NNH
- Interpretations: for every 100 people treated, 1 case will be prevented

#### **Cohort Study**

	Disease	No Disease
Risk Factor	60 A	240 B
No Risk Factor	60 C	540 D

- 3. For case-control studies: use odds ratio (OR)
  - Odds ratio: looks at the increased odds of getting a disease with exposure to a risk factor versus nonexposure to that factor
    - a. Odds of exposure for cases divided by odds of exposure for controls
    - b. The odds that a person with lung cancer was a smoker versus the odds that a person without lung cancer was a smoker

#### Table 1-6. Case-Control Study: Lung Cancer and Smoking

	Lung Cancer	No Lung Cancer
Smokers	659 (A)	984 (B)
Nonsmokers	25 (C)	348 (D)

c. Odds ratio = 
$$\frac{A/C}{B/D} = \frac{AD}{BC}$$

- d. Use OR = AD/BC as working formula
- e. For the above example:

$$OR = \frac{AD}{BC} = \frac{659 \times 348}{984 \times 25} = 9.32$$

- f. Interpretation: the odds of having been a smoker are more than nine times greater for someone with lung cancer compared with someone without lung cancer.
- g. Odds ratio does not so much predict disease as estimate the strength of a risk factor.

Note	Practice Question How would you and wer	the data from this case-	control study? <b>cer and Family H</b>	istory Practice
from No.	263	No Colorectal Cancer	Colorectal Cancer	TOTALS
eview page 25	Family History of Colorectal Cancer	120	60	180
<b>F G S</b>	No Family History of Colorectal Cancer	200	20	220
	TOTALS	320	80	400
	ANSWER:	AD BC	(60)(200) (120)(20)	OR = 5.0

Interpretation: this means that the odds of having a family history of colorectal cancer are five times greater for those who have the disease than for those who do not.

i.	The computed <i>p</i> -value is compared with the <i>p</i> -value
	criterion to test statistical significance. If the computed
	value is less than the criterion, we have achieved statistical
	significance. In general, the smaller the <i>p</i> the better.

- ii. The *p*-value criterion is traditionally set at  $p \le 0.05$ . (Assume that these are the criteria if no other value is explicitly specified.) Using this standard:
  - If  $p \le 0.05$ , reject the null hypothesis (reached statistical significance)
  - If *p* > 0.05, do not reject the null hypothesis (has not reached statistical significance).

Possible Outcome #2	p = 0.13 (computed <i>p</i> value) Do NOT Reject Null Hypothesis $\therefore$ Risk of type II, $\beta$ error	
		$p \le 0.05$ ( $\alpha$ -criterion)
Possible Outcome #1	p = 0.02 (computed $p$ value) Reject Null Hypothesis $\therefore$ Risk of type I, $\alpha$ error	

#### Figure 2-8. Making Decisions Using p-Values

- If *p* = 0.02, reject the null hypothesis, i.e., decide that the drug works
- If *p* = 0.13, fail to reject the null hypothesis, i.e., decide that the drug does not work

#### Types of errors

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Just because we reject the numbro thesis, we are not certain that we are correct, locs increason, the results given by the sample may be a consistent with the full population. If this is true, any decision we make on the basic oxide sample could be in error. There are tropposible types of errors that we could make:

> Type I error ( $\alpha$  error): rejecting the null hypothesis when it is really true, i.e., assuming a statistically significant effect on the basis of the sample when there is none in the population, e.g., asserting that the drug works when it doesn't. The chance of type I error is given by the *p*-value. If *p* = 0.05, then the chance of a type I error is 5 in 100, or 1 in 20.

ii. Type II error ( $\beta$  error): failing to reject the null hypothesis when it is really false, i.e., declaring no significant effect on the basis of the sample when there really is one in the population, e.g., asserting the drug does not work when it really does. The chance of a type II error cannot be directly estimated from the *p*-value.

#### Note

We never accept the null hypothesis. We either reject it or fail to reject it. Saying we do not have sufficient evidence to reject it is not the same as being able to affirm that it is true.

#### Note

- If the null hypothesis is rejected, there is no chance of a type II error.
   If the null hypothesis is not rejected, there is no chance of a type I error.
- Type I error (error of commission) is generally considered worse than type II error (error of omission).

#### **Review Questions**

- 1. A recent study found a higher incidence of SIDS for children of mothers who smoke. If the rate for smoking mothers is 230/100,000 and the rate for nonsmoking mothers is 71/100,000, what is the relative risk for children of mothers who smoke?
  - (A) 159
  - (B) 32
  - (C) 230
  - (D) 3.2
  - (E) 8.4
- 2. A researcher wishing to demonstrate the efficacy of a new treatment for hypertension compares the effects of the new treatment versus a placebo. This study provides a test of the null hypothesis that the new treatment has no effect on hypertension. In this case, the null hypothesis should be considered as
  - (A) positive proof that the stated premise is correct
  - (B) the assertion of a statistically significant relationship
  - (C) the assumption that the study design is adequate
  - (D) the probability that the relationship being studied is the result of random factors
  - (E) the result the experimenter hopes to achieve
- 3. A standardized test was used to assess the level of depression in a group of patients on a cardiac care unit. The results yielded a mean of 14.60 with confidence limits of 14.55 and 14.65. This presented confidence limit is

(C) less pecies out has a lower confidence than 14.20 and 15.00 (C) less pecies out has a lower confidence than 14.20 and 15.00 (E) indeterminate, because the degree of confidence is not specified (E) indeterminate, because the degree of confidence is not specified 263 4. A recently published report explored of subjects' self-remotion

A recently published report explored the relationship between height and subjects' self-reported cholesterol levels in a sample of 44- to 65-year-old males. The report included a correlation of +0.02, computed for the relationship between height and cholesterol level. One of the possible interpre-

- (A) The statistic proves that there is no definable relationship between the two specified variables.
- (B) There is a limited causal relationship between the two specified variables.
- (C) A real-life relationship may exist, but the measurement error is too large.
- (D) A scatterplot of the data will show a clear linear slope.
- (E) The correlation is significant at the 0.02 level.

- 16. A study is conducted to examine the relationship between myocardial infarctions and time spent driving when commuting to and from work. One hundred married males who had suffered infarcts were selected and their average commuting time ascertained from either the subject, or if the infarct had been fatal, their spouse. A comparison group of 100 married males who had not suffered infarcts was also selected and their average commuting time recorded. When examining this data for a possibly causal relationship between commuting time and the occurrence of myocardial infarcts, the most likely measure of association is
  - (A) odds ratio
  - (B) relative risk
  - (C) incidence rate
  - (D) attributable risk
  - (E) correlation coefficient
- 17. A particular association determines membership based on members' IQ scores. Only those people who have documented IQ scores at least two standard deviations above the mean on the Wechsler Adult Intelligence Scale, Revised (WAIS-R), are eligible for admission. Out of a group of 400 people randomly selected from the population at large, how many would be eligible for membership in this society?
  - (A) 2
  - (B) 4
  - (C) 6
  - (D) 8
  - (E) 10
- 18. A physician wishes to study whether moderate alcohol consumption is associated with heart disease. If, in reality, moderate alcohol consumption leads to a relative risk of heart disease of 0.60, the physician wants to have a 95% chance of detecting an effect this large in the planned study. This statement is an illustrative of specifying



- (1) alphaerir B (2) alphaerir B (3) etaerror (C) a null hypothesis (D) diterion odds (D) diterion 19. Public health officials were examining a suspicious outbreak of diarrhea in an inner city community child-care center. Center workers identified children with diarrhea and all children at the center were studied. Officials discovered that children who drank liquids from a bottle were more likely to have diarrhea than children who drank from a glass. They concluded that drinking from unclean bottles was the cause of the outbreak. The use of bottles was subsequently banned from the center. The outbreak subsided. Which of the following is the most likely source of bias in this study?
  - (A) Recall bias
  - (B) Lead-time bias
  - (C) Measurement bias
  - (D) Confounding
  - (E) Random differences as to the identification of diarrhea

Marital Status	Well-Being Index Score
Married	68.8
Single	65.0
Windowed	63.5
Domestic Partner	63.3
Divorced	59.7
Separated	55.9
National Adults	66.2

#### 2011 Latest U.S. Separation, Divorce and Married Data

#### Age at marriage for those who divorce in America (2011)

Age	Women	Men
Age < 20	27.6%	11.7%
Age 20 to 24	36.6%	38.8%
Age 25 to 29	16.4%	22.3%
Age 30 to 34	8.5%	11.6%
Age 35 to 39	5.1%	6.5%

#### SOCIOECONOMIC STATUS (SES)

- 1. SES: weighted combination of occupation and education. Income is not used as a direct determinant of SES.
- 2. In general, there is a positive correlation between SES and good things

#### **Statistics**

- a. Annually, more than 35,000 commit suicide in the United States and more than one million worldwide.
- b. Annually, as many as 600,000 (2.9% of those older than 18) attempt suicide.
- c. Suicide rate in the U.S. is nearly 12 per 100,000
- d. Between 10 and 20 suicide attempts for every one that succeeds
  - i. Men commit suicide 4 times as often as women
  - ii. Women attempt suicide 3 times as often as men



- b. Suicide threats are the clearest reason to hospitalize someone for psychiatric reasons.
- c. IMPORTANT: Suicide often occurs when a person is feeling better after coming out of a deep depressive episode (more likely just after admission to hospital for psychiatric reasons).
- d. Suicide is common in patients faced with chronic, painful, or hopeless condition

#### HEALTH CARE UTILIZATION

#### **General Trends**

- a. Recent years have seen a rise in chronic conditions, decline in the number of patients with acute conditions.
- b. Since 1960, the death rate for heart disease has declined, while the rate for cancer has increased.
- c. People age >65 visit the physician about twice as often as those age <45. This pattern is strongest for men because women see physicians for gynecologic reasons.
- d. The most common principal diagnosis resulting in an office visit to a physician
  - i. For men: essential hypertension
  - ii. For women: pregnancy
- e. The average length of hospital stay has been declining slowly but steadily since 1970. Now 4.9 days.

wen point for a hospital. Largest portion of hospital budget is for personnel g. White have the mess the number of physician visits as blacks. h. Mor Thabactice suits involve breast cancer than any other diag-these. i. Physicians are regulated by State Medical Boards; hoemit credited by the Joint Commission for Ac-Organizations (JCAHO) Mental III

- b. Admissions have not changed: stays are shorter; more outpatient treatment and serial admissions.
- c. Reasons for shorter stays:
  - i. Development of medication
  - ii. Movement to deinstitutionalize people
- d. Most psychiatric care hospitals are run by states.
- e. One in 10 persons will be hospitalized at some time in their lives for psychiatric reasons (includes substance-related disorders).



#### Table 3-5. U.S. Mortality Rates per 100,000

Cause of Death	Rate per 100,000
Heart disease	191
Cancer	184
Chronic lower respiratory disease	41.4
Stroke (cerebrovascular diseases)	46.0
Accidents (unintentional injuries)	39.4 (approx. 50% vehicles)
Alzheimer's disease	27.2
Diabetes mellitus	23.5
Nephritis, nephrotic syndrome, and nephrosis	14.7
Influenza and Pneumonia	17.2
Intentional self-harm (suicide)	12.3

#### U.S. Deaths and Mortality

- Number of deaths: 2,468,435
- Death rate: 799.5 deaths per 100,000 population
- Life expectancy: 78.7 years
- Infant Mortality rate: 6.15 deaths per 1,000 live births

#### Number of deaths for leading causes of death:

- Heart disease: 597,689
- Cancer: 574,743
- Chronic lower respiratory diseases: 138,080 •
- Stroke (cerebrovascular diseases): 129,476
- Accidents (unintentional injuries): 120,859

Table	<b>۲۲Ο۲</b> ع-6. 74	n N 2.6.2	otes of auses of De	Alzha Diab Alzha Diab Alzha Influ Zonte eath by Age	eimer's dise etes 69 0 ditis, neph enza and P tional self-	ease: 13492 rotic syndr meumonia: harm (suic	4 ome, and ne 50,097 :ide): 38,364	phrosis: 50,4	76	
Rank	Le 6 31-1	1 to 4	4 to 9	10 to 14	15 to 24	25 to 34	35 to 44	45 to 54	55 to 65	over 65
#1	Congenital anomalies	Unintended injuries	Unintended injuries	Unintended injuries	Unintended injuries	Unintended injuries	Neoplasia	Neoplasia	Neoplasia	Heart disease
#2	Short gestation	Congenital anomalies	Neoplasia	Neoplasia	Homicide	Suicide	Unintended injuries	Heart disease	Heart disease	Neoplasia
#3	SIDS	Neoplasia	Congenital anomalies	Suicide	Suicide	Homicide	Heart disease	Unintended injuries	Bronchitis, asthma, emphysema	Cerebro- vascular

# **Substance-Related Disorders**

## **Learning Objectives**

- Use knowledge of physiology of substance-related disorders
- Use knowledge of alcohol and alcoholism
- Demonstrate understanding of common abused substances
- Explain information related to other abused substances
- Demonstrate understanding of substance-abusing physicians

#### PHYSIOLOGY OF SUBSTANCE-RELATED DISORDERS

The addiction pathway in the brain is a dopamine pathway. Activation of this pathway accounts for the "positive reinforcement" feeling and makes us want to repeat the action that triggered that feeling.

#### Mesolimbic pathway

Stimulus  $\rightarrow$  Cerebral Cortex  $\rightarrow$  Ventral Tegmental Area  $\rightarrow$  Nucleus Accumbens

- food
- drugs

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- sex
- kindness

Dopamiro C di Siro Tor stimulus) Lin nucleus accumbens 263 64 olonin (gives body the impression of satisfaction so cravings are reduced)

TCH РСР

Nicotine

Druks vo k

Ketamine

Drugs working in ventral tegmental area Opiates Alcohol

Barbiturates

Benzodiazepines

#### **Review Questions**

- 33. Suicide has increased incidence in a wide range of psychiatric disorders. In others, the association is closer to that of the general population. The suicide rate for which of the following disorders is most likely to be closest to that of the general population?
  - (A) Schizophrenia
  - (B) Alcoholism
  - (C) Schizoid personality disorder
  - (D) Major affective disorders
  - (E) Borderline personality disorder
- 34. A 39-year-old divorced Hispanic woman presents with lethargy and fatigue. When questioned, she complains of diffuse physical aches, although her health appears to be generally good. She confesses that she finds herself crying "for no reason." She reports not really feeling like seeing any of her usual friends and has difficulty sleeping, especially waking up early in the morning. She is given a preliminary diagnosis of uni-polar depression. In addition to this diagnosis, the strongest risk factor for suicide in this patient would be the patient's
  - (A) age
  - (B) gender
  - (C) marital status
  - (D) overall health
  - (E) visit to the physician
  - (F) fatigue
- Annuself last month when he in cold him to kill himself. He was hospitalized and giving regnosis of a major psychiatric disorder. When questioner the reported having "given up." Upon further questioning, you manufact he has a 10-year history of alcoholism. Which of the following would pose the greatest risk for future completed suicide? 2(a) Gelings of helplessness 2(b) Marital status (c) Affective discol 35. Mr. Jones has been complaining of a depressed mood for several months.

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**KAPLAN**) MEDICAL

- The medical record of a 65-year-old white male details a long list of medi-36. cal conditions, including diabetes, gastric ulcer, recurrent headaches, and peripheral neuropathies. In addition, the record indicates that the patient has a history of substance-related disorder, although no specifics are provided. When interviewing the patient, the physician is most likely to discover that the substance abused by the patient most likely was
  - (A) alcohol
  - (B) cocaine
  - (C) caffeine
  - (D) ecstasy
  - (E) hallucinogens
  - (F) inhalants
  - (G) opiates
  - (H) sedative hypnotics
- 37. A 21-year-old male patient is brought to the emergency department by his parents, who are concerned because he was stumbling around their house, waving his arms in the air, and would not respond verbally to their questions. When examined, the patient appears anxious, with elevated heart rate and clammy skin. A slight tremor is evident in his hands and his pupils are dilated. Over time, he becomes verbal and reports that he felt like he was floating out of his body and that words spoken to him seemed like insects that should be swatted away. He also admits to having recently taken an illegal substance. The patient's behavior and physiology are most consistent with intoxication due to
  - (A) cocaine
  - (B) inhaled paint thinner
  - (C) marijuana
  - (D) mescaline
  - (E) phencyclidine
  - (F) phenobarbital

Notesale.co.uk g a 22-year-old white male to the emergency department. The police of From the outset, he is belige ent, aggressive, and violent, requiring the morts of several officers or restrain him. When questioned, the patient is proposed Object exam shows him to have muscle rigidity and pupils that more up and down rapidly. The patient had previously been treated for opiate overdose. What neurochemical mechanisms are most likely to account for the patient's current behavior?

- (A) Reduction in levels of GABA
- (B) Antagonism of the glutamate receptors
- (C) Partial agonist of the postsynaptic serotonin receptors
- (D) Antagonism of the locus cerelose pathway and blocking of substance P
- (E) Increases in GABA and inhibitory G protein

- 4. Male-male relationships are less stable than are female-female relationships
- 5. Over 50% of homosexuals have children
- 6. Distinguish between ego-syntonic and ego-dystonic homosexuality
  - a. Ego-syntonic: agrees with sense of self, person is comfortable
  - b. Ego-dystonic: disagrees with sense of self, makes person uncomfortable
  - c. If ego-dystonic: sexual orientation distress. NOT considered pathologic unless ego-dystonic
- 7. Increasing evidence of biologic contribution. Higher concordance rates for MZ twins (52%) than for DZ (22%)
- 8. Preference well established by adolescence
  - a. Feelings of preference emerge 3 or more years before first encounter
  - b. Describe duration of feelings with "As long as I can remember"
- 9. Similar number of heterosexual experiences reported in childhood and adolescence
  - a. Report experiences as "ungratifying"
  - b. 30 to 40% of all people report at least 1 same-gender sexual experience

#### **SEXUALITY AND AGING**

- 1. Sexual interest does not decline significantly with aging.
- 2. Continued sexual activity means sexual activity can continue.
- 3. Best predictor of sexual activity in the elderly is availability of a partner.
- 4. After myocardial infarction (MI), sexual position that puts least strain on the heart: partner on top
- 5. Changes in men:
- b. Jong Prefixetory period b. Jong Prefixetory period 6. Changes in women: 2639. Vaginal dryness b. Vaginal thinning C. C. c. Can be reduced by estrogen replacement

# **Learning and Behavior Modification**

# **Learning Objectives**

- Describe the major learning theories and explain how they predict behavior change
- Explain information related to behavior therapy and behavior modification

#### **LEARNING AND BEHAVIOR**

In the behaviorist model of learning and behavior modification, internal states, subjective impressions, and unconscious processes are not relevant. All that matters is the objective data, i.e., only what can be seen, observed, and measured. The behaviorist definition of learning: a relatively permanent change in behavior, not due to fatigue, drugs, or maturation.

The two main types of learning paradigms are classical (elicited) conditioning and operant (emitted) conditioning.

# **Classical Conditioning**



- 3. Stimulus generalization: the tendency for the conditioned stimulus to evoke similar responses after the response has been conditioned. If a salivation response had been conditioned to a tone of 1,000 CPS, an 800 CPS tone will elicit a similar response. Or, in the second example, generalization will have occurred if any hospital, or even meeting a physician, comes to elicit nausea from the patient.
- 4. Extinction: after learning has occurred, removal of the pairing between the UCS and the CS results in a decreased probability that the conditioned response will be made. For example, breaking the pairing between chemotherapy and the medical setting by giving chemotherapy at home. The nausea-eliciting properties of hospitals will be extinguished.

#### **Operant or Instrumental Conditioning**

- 1. In operant conditioning, a new response is emitted, perhaps randomly at first, which results in a consequence.
  - a. The consequence acts as reinforcement and changes the probability of the response's future occurrence.
  - b. In the Skinner experiment, pressing a lever resulting in the delivery of food. After receiving food, the bar-pressing behavior increased. Because it changed behavior, the food is a reinforcing event.
- 2. A new response occurs to an old stimulus. Note the triggering stimulus (reinforcement) occurs after the response.



- a. A <u>positive reinforcer</u> is a stimulus that, when applied following an operant response, strengthens the probability of that response occurring.
  - i. E.g., increased pay leads to increased work from an employee
  - ii. E.g., increased complaining leads to increased attention from the nursing staff
- b. A <u>negative reinforcer</u> is a stimulus that, when removed following an operant response, strengthens the probability of that response occurring.
  - i. E.g., a child learns that he can stop his parents' nagging by cleaning up his room.

- A 32-year-old Irish male appears at the clinic complaining of "a slight pain" 62. on his left side. Upon examination, he is found to have two broken ribs. When informed of this, the man insists that it cannot be that serious and asks only for some medication for the pain. This is best characterized as the defense mechanism of
  - (A) displacement
  - (B) denial
  - (C) depression
  - (D) isolation
  - (E) reaction formation
- A father, who has lost his daughter as the result of a traffic accident involv-63 ing a drunk driver, organizes a local chapter of a national group campaigning to stop the sale of liquor to minors and to legislate mandatory jail time for anyone convicted of drunk driving. "If I can't have my girl back, at least I can make sure it doesn't happen to some other father," he says. The defense mechanism that most likely accounts for this behavior is
  - (A) acting out
  - (B) suppression
  - (C) reaction formation
  - (D) displacement
  - (E) sublimation
- A 64-year-old male factory worker is hospitalized after barely surviving a 64. serious myocardial infarction. His life was saved by the administration of emergency balloon angioplasty. The following day his primary care physician visits the patient's hospital room. Much to his surprise, he finds the patient, who never did much exercise before, on the floor doing pish-ups patient, who never did much exercise before, on the floor doing pasi-ups and saying, "Time to get in shape, doc!" The patient's word and pohavior in this instance are most likely the result of the defence monanism of
  (A) denial
  (B) dissociation
  (C) acting out
  (B) undoing
  (E) reaction formation

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- c. The correlation between stressful life events and developing illness is a small but significant positive correlation between +0.30 and +0.40.
- 3. Why individuals react differently to the same objective stressors
  - a. The individual's appraisal of the meaning of the stressor
  - b. Hardy personality type: clear sense of values, goals, and capabilities; an unshakable sense of the meaningfulness of life; and a strong sense of control over one's own fate
  - c. Social support
    - i. Belief is more important than objective support.
    - ii. Having one significant person to turn to is key.
    - iii. Women use support more effectively than do men.
    - iv. Presence of a familiar person lowers blood pressure in a person under stress.
    - v. Widows and widowers have higher rates of heart attacks in the year just after a spouse dies.
- 4. Physiologic changes in response to stress
  - a. Key stress response pathway: hypothalamic-pituitary-adrenal axis
  - b. Cortisol levels rise then fall within 24 hours after stressor.
  - c. Secondary spike in cortisol levels 48 to 72 hours after stressor

## **INTELLIGENCE QUOTIENT (IQ)**

- 1. Definition: a general estimate of the functional capacities of the person
- 2. 70% inherited, recent studies suggest most from mother
- 3. IQ is not an absolute score but a comparison among people.
- 4. Distribution mean: 100; standard deviation: 15

#### **Table 8-1.** Distribution of IQ Scores in the General Population

Range	Label	Distribution
Less than 69	Intellectual disability	About 2.5% of the population
20.07.0	Borderline	
80 to 89	Low average	
90 1 10	Average	About 50% of the population
110 to 119	High average	
120 to 129	Superior	
over 130	Very superior	About 2.5% of the population

5. Scaling intelligence: calculating an intelligence quotient

- a. Mental age method
  - i. Mental age (MA) = median test score for a given age
  - ii. Chronological age (CA) = actual age of the person taking the test
  - iii. Formula: (MA/CA)  $\times$  100 = IQ score
  - iv. Example: A 10-year-old child got a test score of 25. If 25 is the median score of 13-year-olds, then MA = 13, CA = 10, and  $(13/10) \times 100 = 130$



- iii. Intermediate phase (grief, disorganization)
  - 3 weeks to 1 year
  - Sadness, yearning, somatic symptoms
  - Obsessional review, searching for deceased
  - May believe they see or hear deceased
  - Confronting reality
- iv. Recovery (or reorganization) phase
  - Reinvestment of energies and interests
  - Begins second year after death, memories fade in intensity

#### Table 9-3. Normal Grief versus Depression

Normal Grief	Depression
Normal up to 1 year	After 1 year, sooner if symptoms severe
Crying, decreased libido, weight loss, insomnia	Same but more severe
Longing, wish to see loved one, may think they hear or see loved one in a crowd (illusion)	Abnormal overidentification, personality change
Loss of other	Loss of self
Suicidal ideation is rare	Suicidal ideation is common
Self-limited, usually less than 6 months	Symptoms do not stop (may persist for years)
Antidepressants not helpful	Antidepressants helpful
Dealing with Dying Patien a. Stages of adjustual Denial ii. Anger iii. Bagaming	Its Besale.co.uk Mubrer-Ross) of 263

eview

Depression

Acceptance

b. People move back and forth through the stages. Not everyone passes through all stages or reaches adequate adjustment.

- c. Similar stages for dealing with loss or separation
- d. Rules for dealing with the dying:
  - i. Tell the patient everything.
  - ii. Do not give false hope.
  - iii. Allow person to talk about feelings.
  - iv. Keep involved in activities.
  - v. Avoid social isolation.

- iii. Not mandatory reportable offense. If confronted with a case, give the victim information about local shelters and counseling.
- iv. Number of attacks has held steady since mid-1970s.
- v. Domestic violence is the #1 cause of injury to American women (for men, traffic accidents and other unintentional injuries are #1).
- vi. Occurs in all racial and religious backgrounds, and across all SES groups
- vii. More frequent in families with drug abuse, especially alcoholism
- viii. If one attack occurs, more are likely.
- ix. Male more likely abuser if:
  - Considers wife his belonging
  - He is jealous or possessive.
  - There are verbal assaults to his self-esteem.
- x. Female more likely abused if:
  - Grew up in a violent home (about 50%)
  - Married at a young age
  - Perceives self as unable to function alone (dependent)
  - Abused spouses tend to blame themselves for the abuse, identification with the aggressor.
  - Pregnant, last trimester (highest risk)

#### **Elder Abuse**

tesale

- i. Elder abuse is a mandatory reportable offense.
- ii. Prevalence rate 5 to 10%
- iii. Includes physical, psychological, financial, or neglect

iv. Neglearis the most common type (50% of all reported

v. Caretaker is the most likely source of abuse; spouses are often caretakers.

	IN From	Chil (2) se	Elder Abuse	Domestic Abuse
VÍE	Aimual cases	Over 2 million	5 to 10% in population	Over 4 million
	Mo. Por a bi-d pe	Physical battery/neglect	Neglect	Physical battery
	Likely gender of victim	Before age 5: female After age 5: male	63% Female	Female
	Likely gender of perpetrator	Female	Male or Female	Male
	Mandatory reportable?	Yes	Yes	No
	Physician's response	Protect and report	Protect and report	Counseling and information

Ο

Table 9-4. Types

- 69. A 5-year-old child is referred to a mental health practitioner for evaluation. The practitioner wants to gain insight into the conscious and unconscious preoccupations of the child. To accomplish this objective, the practitioner is most likely to make use of
  - (A) Luria Nebraska Battery
  - (B) Halsted-Reitan Battery
  - (C) Minnesota Multiphasic Personality Inventory
  - (D) Projective Drawing Test
  - (E) Rorschach test
  - (F) Wechsler Intelligence Scale for Children
- 70. A 3-year-old boy talks when his parents are talking in spite of being repeatedly told not to do so. His parents become frustrated with his behavior and ask his physician about the reason for this behavior pattern. The physician should advise the parents that this tendency of children to test the extremes of behavior that their parents will tolerate
  - (A) is indicative of later maladjustment
  - (B) persists with partial parental reinforcement
  - (C) results from the action of classic conditioning
  - (D) can be resolved by a clear, reasoned explanation to the child
  - (E) is more commonly observed in boys than girls
- 71. A 5-month-old and a 12-month-old infant observe their mothers leaving the room. Which one will most likely begin to cry?
  - (A) The 5-month-old
  - (B) The 12-month-old

A ride a tricycle (B) eter.

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- (D) build a tower of three blocks
- (E) play peek-a-boo

# **Sleep and Sleep Disorders**

# **Learning Objectives**

- Demonstrate understanding of sleep architecture
- Explain information related to developmental aspects of sleep
- □ Answer questions about biochemistry of sleep
- Describe common sleep disorders

#### SLEEP ARCHITECTURE

Sleep consists of two distinct states: NREM and REM.

#### NREM: Non-rapid Eye Movement Sleep

- a. Divided into 4 stages on the basis of EEG criteria
- b. Alternates with REM sleep throughout the sleep period and is characterized by:
  - i. Slowing of the EEG rhythms
  - ii. Higher muscle tone
  - iii. Absence of eye movements
  - ale.co.uk iv. Absence of "thoughtlike" mental activity

o tter

c. Is an idling brain in a movable body

### **REM: Rapid Eye Moverne**

An arou

a. Characterized b

eview

- ii. Sarua
- Saccadic eye movements

1 EE

- Elaborate visual imagery (dreaming)
- v. Associated with pons
- b. Is an awake brain in a paralyzed body.

10

- c. Release is inhibited by daylight, and, at nighttime, levels rise dramatically
- d. Likely mechanism by which light and dark regulate circadian rhythm
- e. Responsible for "jet lag"
- f. Responsible for seasonal affective disorder (SAD)
- g. Adjust melatonin with bright light therapy, not pills

#### **DEVELOPMENTAL ASPECTS OF SLEEP**





#### Sleep Apnea

- 1. Types:
  - a. Obstructive (upper airway) sleep apnea
    - i. Middle-aged
    - ii. Overweight
    - Rasping snoring
  - b. Central (diaphragmatic) sleep apnea
    - i. Elderly
    - ii. Overweight
    - iii. Cheyne-Stokes (60-second hyperventilation, followed by apnea)
  - c. Mixed sleep apnea
- 2. Clinical presentation and features:
  - a. High risk of sudden death during sleep, development of severe nocturnal hypoxemia, pulmonary and systemic hypertension (with elevated diastolic pressure)
  - b. Nocturnal cardiac arrhythmias (potentially life-threatening)
  - c. Bradycardia, then tachycardia
  - d. Males outnumber females by 8 to 1
  - e. EDS and insomnia often reported
  - f. Heavy snoring with frequent pauses
  - g. Kicking, punching of sleeping partner
  - h. Obesity is often part of the clinical picture, but not always
  - i. Short sleep duration, frequent waking, insomnia, decreased Stage 1, decreased delta and REM
- 3. Treatment:
  - a. Weight loss (if applicable)
  - Nioning to change sleep position b. Behavioral co
  - Contradus positive airway pressure (CPAP). Most likely medical intervention
  - . For severe obstructive and mixed apnea: tonsillectomy or tracheostomy

# eview from Notesale page 139 of 263 Sudd Sudden Infant Death Syndrome (SIDS): Unexplained Death in Children Age <1

- 1. 3,000 deaths annually
- 2. 50% reduction in incidence if baby placed on back, rather than on stomach
- Avoid overstuffed toys and pillows
- 4. Rate is two to three times higher in families where someone smokes
- 5. 5-HT levels 26% below normal
- 6. Fetal exposure to maternal smoking also strong risk factor





• Early morning waking

#### **Bipolar disorder**

i. Symptoms of major depression plus symptoms of mania: a period of abnormal and persistent elevated, expansive, or irritable mood

- ii. Alternates between depression and mania
- iii. Subtypes
  - Bipolar I: mania and major depression
  - Bipolar II: major depression plus hypomanic episodes
- iv. Manic symptoms
  - Increased self-esteem or grandiosity
  - Low frustration tolerance
  - Decreased need for sleep
  - Flight of ideas
  - Excessive involvement in activities
  - Weight loss and anorexia
  - Erratic and uninhibited behavior
  - Increased libido
- v. Neurochemical changes
  - Increased norepinephrine (NE)
  - Increased serotonin
- vi. Sleep correlates
  - Multiple awakenings
  - Markedly decreased sleep time
- vii. Most genetic of all psychiatric disorders

#### Table 12-4. Epidemiology of Mood Disorders

Table	<b>• 12-4.</b> Epidemic	ology of Mood Disorders	o.uk	
		Depression eSa		Bipolar
Point	prevalence.	Men. 2 to 3%, women 515.9%		Men and women less than 1%
iew	len li fer aces	Women 2× men (stress of childbirth, a. 1. ed as children)	hormonal effects,	Rates are effectively equal
Lifu	1 Tto Balance	Men 10%, women 20%		Men and women 1%
Onse	et	Mean age 40		Mean age 30
SES		Low SES more likely		Higher SES more likely
Relat	ionships	More prevalent among those with no separation, divorce	close relationships,	More prevalent among single and divorced (causal?)
Fami	ly history	Higher risk if parents depressed or al parental loss before age 11	coholic; increased risk if	Higher risk if parent has bipolar



## **OBSESSIVE-COMPULSIVE DISORDER AND RELATED** DISORDERS

#### **Obsessive–Compulsive Disorder**

- i. Obsession: thoughts which are repetitive, intrusive, and senseless
- ii. Compulsion: act which controls the thought, time consuming
- iii. Common defenses: undoing, reaction formation
- iv. Epidemiology
  - 1.5% have disorder, 3% lifetime prevalence
  - 50% remain unmarried
  - Males = females
  - Major depression among 70% over lifetime
- v. Increased frontal lobe metabolism
- vi. Increased activity in the caudate nucleus
- vii. Treatment
  - SSRIs

#### **Hoarding Disorder**

Characterized by persistent difficulty with parting of one's possessions regardless of their value. This typically leads to changes in functioning.

Treatment is SSRIs.

#### **Body Dysmorphic Disorder**

- iii. Predictivation disrupts day-to-day life Not accounted for by other disorder (e.g., anorexia ner-vosa) v. May seek multiple plastic surgeries or con-interventions
  - b. Avoidance of associated stimuli
  - c. Diminished responsiveness to external world
  - d. Sleep disruption or excess
  - e. Irritability, loss of control, impulsivity
  - f. Headaches, inability to concentrate
  - 2. Symptoms must be exhibited for >1 month; if less, diagnose as acute stress disorder

- c. Average survival from onset to death is 4.2 months
- d. Early signs of HIV-related neurocognitive disorder: dysphoric mood, apathy, social withdrawal
- e. Often misdiagnosed at first as depression
- f. HIV levels in the spinal fluid are good predictors of onset

#### **HEMISPHERIC DOMINANCE**

- 1. Left hemisphere
  - a. Language
  - b. Dominant in 97% of population, 60 to 70% in left-handed persons
  - c. Calculation-type problem solving
  - d. Stroke damage to left is more likely to lead to depression
  - e. Larger in size than is the right side and processes information faster
- 2. Right hemisphere
  - a. Perception, artistic, visual-spatial
  - b. Activated for intuition-type problem solving
  - c. Stroke damage to right is more likely to lead to apathy and indifference

#### **APHASIAS**

#### Broca (nonfluent)

- a. Lesion of frontal lobe (Brodmann area 44)
- b. Comprehension unimpaired
- c. Speech production is telegraphic and ungrammatical.
- d. Often accommand by depressive symptoms
- modes" instead of "I went to the movies"
- F. Trouble repeating statements
  - Muscle weakness on the right side

#### Note

# ernicke (fluent)

Notesa

- a. Lesions of superior temporal gyrus (Brodmann area 22)
- b. Comprehension impaired
- c. Speech is fluent but incoherent.
- d. Trouble repeating statements
- e. Verbal paraphasias (substituting one word for another, or making up word)
- f. No muscle weakness
- g. Resembles formal thought disorder
- h. Mania-like, rapid speech hyperactivity

- ut specific move nt when asked to
  - Agnosia: failure to recognize sensory stimuli, e.g., visual agnosia, unable to recognize object when shown but able to recognize when touched
  - Alexia: acquired disorder of reading ability; often accompanied by aphasia. Distinguish from dyslexia (developmental reading problem)
  - Agraphia: acquired inability to write

- 7. Associated with erections in males
- 8. Muscarinic and nicotinic receptors
- 9. In the corpus striatum, ACh circuits are in equilibrium with dopamine neurons.

#### Norepinephrine (NE)

- 1. One of the catecholamine neurotransmitters
- 2. Transmitter of the sympathetic nerves of the autonomic nervous system, which mediate emergency response
  - a. Acceleration of the heart
  - b. Dilatation of the bronchi
  - c. Elevation of blood pressure
- 3. Implicated in altering attention, perception, and mood
- 4. Key pathway: locus ceruleus in upper pons
- 5. Implicated in monoamine hypothesis of affective disorders:
  - a. Depletion of NE leads to depression
  - b. Excess of NE (and serotonin) leads to mania
  - c. Based on two observations:
    - i. Reserpine depletes NE and causes depression.
    - ii. Antidepressant drugs block NE re-uptake, thus increasing the amount of NE available postsynaptically.
- 6. Receptors:
  - a. Alpha-1: sympathetic (vasoconstriction)
  - b. Alpha-2: on cell bodies of presynaptic neurons, inhibit NE release
  - c. Beta-1: excitatory for heart, lungs, brain
  - d. Beta-2: excitatory for vasodilatation and bronchodilatation

- Book and the second seco
  - - - Blockade leads to tremors, muscle rigidity, bradykinesia
    - b. Meso-limbic-cortico pathway
      - Blockade leads to reduction of psychotic symptoms
    - c. Tuberoinfundibular system
      - Blockade leads to increases in prolactin (Dop = PIF)

# Gamma Amino-butyric Acid (GABA)

- 1. One of the amino-acid transmitters in the brain
- 2. Occurs almost exclusively in the brain
- 3. Reduces the firing of neurons; principle inhibitory neurotransmitter in the brain
- 4. The transmitter present at 25 to 40% of all synapses in the brain
- 5. Quantitatively, the predominant transmitter in the brain
- 6. Associated with anxiety, cannabis, benzodiazepines

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- Urinary retention
- Delirium
- Memory aid: "blind as a bat, dry as a bone, red as a beet, mad as a hatter"
- Especially frequent in the elderly
- ii. CNS effects: from antagonism of H1 receptors
  - Weight gain
  - Sedation very common
  - Impaired memory
- iii. Extrapyramidal (EP) reactions: due to decreased dopamine; appear in one-half of all patients in first few months
  - Treat with benztropine, trihexyphenidyl, diphenhydramine

Table 14-1.	Extrapyramidal	Reactions	to Antips	chotic Medications
-------------	----------------	-----------	-----------	--------------------

Side Effects	Peak		
Dystonic reactions (jerky movements, trouble speaking)	1 week (younger are more at risk)		
Akinesia	2 weeks		
Rigidity	3 weeks		
Tremors	6 weeks		
Akathisia	10 weeks		
Pisa and Rabbit syndromes	18+ weeks		



- (versus cerebellar disease tremor, which worsens with intentional movement)
- Stress and movements in other body parts aggravates
- No treatment, focus on prevention: pimozide or loxapine has less chance of inducing TD, clozapine not associated with TD at all

#### • Choreiform: jerky movements Athetoid: slow, continuous

Extrapyramidal reactions:

movements

Note

Rhythmic: stereotypical movements

- 116. **Answer: A.** Because of the risk of agranulocytosis with clozapine, blood must be monitored weekly.
- 117. **Answer: A.** The patient is suffering from a hypertensive crisis that is likely the result of consuming tyramine-containing food while on MAOIs for his depression. Tyramine can be acquired from cheese, dried fish, sauerkraut, sausage, chocolate, or avocados.

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#### **Review Questions**

- 118. A 7-year-old girl is brought to the hospital by a woman who has been entrusted with her care while the girl's parents are in Mexico for vacation. The girl has sustained a non-life-threatening but serious injury during play that has almost completely severed one of her fingers from her left hand. The consensus of the physicians is that with prompt action the finger can be reattached with minimal permanent loss of movement for the child. Without prompt action, the use of the finger is likely to be lost. However, the attending physician is concerned about proceeding without the permission of the parents. The best course of action would be to
  - (A) try to contact the parents to get their permission to perform the procedure
  - (B) seek a legal injunction allowing the operation
  - (C) operate at once, citing the doctrine of therapeutic privilege
  - (D) seek the consent for the operation from the woman in whose care the girl was left
  - (E) seek further confirmation from additional specialists in this type of surgery
- 119. During the second year of residency training, you discover that the chief resident on your rotation is using amphetamines on a regular basis in order to stay alert when on call. When you mention your concern to the resident, he tells you, "Mind your own business. I'm not one of your patients." At this point, your best action would be to
  - (A) monitor the chief resident over the next few weeks to be sure that there is no danger to patient care
  - (B) talk with other residents and see if they share your concern

(E) seek legal counter (E) seek legal counter (F) schedule or eeting to speak with the residency program director (H) ach the nursing staff if they have noticed anything unusual about the Churf resident

- 120. While riding the hospital elevator to visit one of his patients, an internal medicine physician overhears two residents discussing a surgical case. The case involves a 45-year-old male who received a lymph node biopsy. The biopsy was negative. However, during the procedure, the resident performing the surgery nicked the large intestine. The mistake was noticed and quickly corrected. The resident was overheard to say, "It's all taken care of. We didn't think we needed to worry the patient by mentioning this little glitch." After overhearing this conversation, what action should the physician take?
  - (A) Ask the nurse for the patient's chart to confirm that the mistake was benign
  - (B) File a formal complaint with the hospital ethics committee
  - (C) File a formal complaint with the state licensing board
  - (D) Look up the patient and check on how he is doing
  - (E) Reprimand the residents on the spot and demand to speak with their supervisor
  - (F) No harm was done, the physician need do nothing
  - (G) Speak with the chairman of internal medicine
  - (H) Speak with the chairman of surgery
  - (I) Tell the residents that they need to inform the patient and suggest the best method to have the discussion
- 121. A 42-year-old woman has an annual physical exam, including a mammogram. She announces with great excitement that she will be getting married in 3 months and invites her physician to attend the wedding. A week later, the results of the mammogram reveal a previously undetected mass. At this point, what action should the physician take?
  - (A) Call the patient immediately and inform her of the findings of the mammogram
  - (B) Have a nurse with experience in this area call the patient and discuss the findings
  - (C) Make an appointment to discuss the mammog n fi th the patient within a week of receiving the
  - indings until after the wedding (D) Postpone informing the pa so as not to upset

Scheduct le patient for a confirmator amogram after the wedding eview Schedule an appoint of to discuss the findings with the patient and

efor, the wedding

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#### Answers

- 118. **Answer: C.** The physician may exercise therapeutic privilege and assume *in locum parentis* responsibility.
- 119. **Answer: F.** The program director is the one with the authority and responsibility to address the substance use issues.
- 120. **Answer: I.** The dual goals of training the residents and making sure the patient gets the information need to be met here. The issue is not to reprimand, but to better teach the residents.
- 121. **Answer: C.** <u>You</u> need to deliver the bad news, in a timely manner, and in person.
- 122. **Answer: C.** Confidentiality is absolute. You are not to discuss the case with her without the husband's explicit permission.
- 123. **Answer: E.** The patient makes medical decisions, not the physician. The options and consequences have been explained and the patient has made his choice. Begin treatment. Note that the surgical option is still available should the patient change his mind.
- 124. **Answer: C.** The patient likely suffers from narcolepsy, which can be debilitating and certainly makes him dangerous behind the wheel of a bus. There is a clear risk, so confidentiality must be breached to prevent harm. This is not a negotiation with the patient. The physician is obligated to act.
- 125. **Answer: F.** Patients must be told about all available options for informed consent to be valid. The resident should complete the job he started and go back to talk to the patient again. Getting the attending physician involved complicates the relationship with the patient and undermines the resident's confidence for handling this and similar situations.

vii. Providers may "bid for patients," seeking greater volume by offering deeper discounts.

#### GOVERNMENT METHODS OF PAYMENT FOR SERVICES

- a. Medicare: Federal government program that makes health care payments to those on Social Security
  - i. Program pays health care costs for the:
    - Elderly (age >65)
    - Disabled
    - Dependents of disabled
  - ii. Part A pays for hospital care; part B pays for physician services.
  - iii. Annual deductibles and copayments are applicable.
  - iv. Patient can use up Medicare benefits.
  - v. If providers accept "assignment," they must accept Medicare-set fees only.
  - vi. Covered services include: hospital stays; laboratory workups; non-self-administered drugs; ambulatory surgery; physical, speech, and occupational therapy; rehabilitation; kidney dialysis; ambulance transport; diabetes testing equipment; pneumococcal and hepatitis B vaccination. Some prescription coverage is available for an added fee.
  - vii. Services not covered: routine physicals; eye/ear examinations for glasses/hearing aids; immunizations; routine foot care; custodial (nursing home) care; most self-administered drugs.

#### b. Medicaid: health care payments for those on welfare

- i. Joint state/federal program
- ii. Covers all care, including hospital stays, physi es, medication, and nursing home. However, Medicaid really far below standard payments to providers fees

are is first used, then eview fro

#### avments, or fees

ate sets eligibility, services covered, and administration, hence wide differences across the United States.

#### Diagnostic-related groups (DRGs)

DRGs are payment categories used to classify patients (especially Medicare patients) for the purpose of reimbursing hospitals for each case in a given category, There is a fixed fee, regardless of the actual costs incurred, since patients within each category are clinically similar and are expected to use the same level of hospital resources. DRGs have been used in the United States since the early 1980s to determine how much Medicare pays the hospital for services. They are assigned based on diagnosis, procedure, age, sex, discharge status, and presence of complications or comorbidities (see below).

#### SCOPE OF THE PROBLEM

In 1999 the Institute of Medicine (IOM) published its landmark publication, 'To Err is Human: Building a Safer Health System,' reporting that at least 44,000 people—and perhaps as many as 98,000—die in hospitals each year as a result of medical errors that could have been prevented. This exceeds deaths attributed to breast cancer, motor vehicle collisions, and HIV. Approximately 1 in 10 patients entering the hospital will suffer harm from an adverse event.

Patient harm from preventable medical errors is a serious concern in health care. The impact of these errors can have dramatically negative effects on patients, their families, and the health care personnel involved. In addition to the toll on human suffering, medical errors also present a significant source of inefficiency and increased cost in the health care system.

Medical errors are the eighth leading cause of wrongful death in the United States. The problem is not limited to this country, however; medical errors are a global problem.

Some of the more common contributors to medical errors and adverse patient events are as follows:

Medication errors represent one of the most common causes of preventable patient harm. An estimated 1.5 million deaths occur each year in the United States due to medication error. The IOM estimates that 1 medication error occurs per hospitalized patient each day.

Common causes of medication error

- Poor handwriting technique on a prescription pad or order form, resulting in a pharmacist or nurse administering the wrong drug or wrong dose
- Dosing or route of administration errors
- · Failure to identify that a given patient is allergic to a prescribed medication
- Look-alike or sound-alike drugs (e.g., rifampin/rifiximin)



Figure 17-1. 'Look-Alike' Medications

Strategies that help to reduce or prevent medication errors are as follows.

- The 5 Rs help to confirm several key points before the administration of any medication.
  - Right drug
  - Right patient
  - Right dose



#### Note

Approximately 80% of medical errors or adverse patient events are system-derived.

#### SYSTEMS APPROACH TO FAILURE

An understanding of medical error requires an understanding of the systems failures underlying the majority of adverse patient events. Health care is a complex system. Errors that harm patients tend to have multiple causes that are ingrained in this complex system. James Reason, a pioneer and leader in the research area of human error and organizational processes, describes the **Swiss Cheese Model** of accident causation; it is a model used in risk analysis and risk management in complex systems including health care.

The Swiss cheese model encompasses the understanding that patient harm often results from multiple, upstream or proximal errors. In the Swiss cheese model, each 'slice' represents a barrier, and each hole is a failure in the system due to either active or latent failures. Under normal circumstances one of the barriers works to prevent patient harm (e.g. the nurse catches that the medication ordered is the wrong dose before giving it to the patient); however, occasionally the perfect storm scenario arises where the holes line up and allow an error to reach the patient resulting in harm.

For example, if the hazard were wrong-site orthopedic surgery, slices of cheese might include policies for identifying sidedness on radiology imaging, a protocol for signing the correct site when the surgeon and patient meet in the preoperative area, and a second protocol for reviewing the medical record and checking the previously marked site in the operating room. Many more layers exist but the point is that no single barrier is foolproof. They each have "holes," hence, the Swiss cheese.

In some serious events such as wrong site surgery, even though the holes will only align infrequently, the result is still unacceptable patient injury. For instance, in an emergency situation, all 3 of the surgical identification safety checks mentioned above may fail or be bypassed, resulting in the surgeon meeting the patient for the first time in the operating room already under anesthesia. A hurried x-ray technologist might mislabel a film (or simply hang it backward and a hurried surgeon may not notice), confirming the surgical site with the patient may not take place at all (e.g. if the patient is unconscious) or, if it takes place, be rushed and offer no real protection.

Under the blane offen in raditionally present in health care, a person may be reprised a control in real protection. Under the blane offen an error but the holes in the system are not addressed; making it the system are not addressed; making it the eading to more patient harm. The goal is to examine the system and develop method to obtain a control of the holes are removed. Some balas it



Figure 17-3. Successive Layers of Defenses, Barriers, and Safeguards

Lean (also called Lean Enterprise or Toyota Production System) is an improvement process that seeks to improve value from the patient's perspective, by reducing waste in time and resources that do not enhance patient outcomes. This includes certain lab tests, imaging studies or care services that may be commonly performed, but in reality do not actually help the patient. For example, a preoperative EKG obtained on a healthy 21 year-old with no cardiac symptoms undergoing a small outpatient procedure can be considered a wasteful test that does not help the patient.

Flowcharts allow health care teams to understand the steps involved in the delivery of patient care service. A flowchart is a visual illustration of all the steps or parts of a process in patient care. There are 2 types of flowcharts: high-level flowcharts (more conceptually focused, 'big picture') and detailed flowcharts (more focused on specific, fine points).

Flowcharts are more accurate and effective when all representative members of a health care team actively participate in their design. They help health-care providers achieve a shared understanding of a clinical process and use that knowledge as the basis for designing new ways to improve services. Specifically, they can help to identify steps that do not add value to the process (e.g. unnecessary duplication of services), to determine areas of delay in care, and to discover failure points in the system.

**Pareto charts** are used to describe a large proportion of quality problems being caused by a small number of causes. It is based on the classic 80/20 rule from economics, where 80% of the world's wealth is described to be in the hands of an elite 20% of the population.

The Pareto principle applied to health care states that the **majority of patient** safety errors stem from only a few recurring contributing factors, which should serve as the focus the problem-solving efforts. In essence, it is a method of prioritizing problems, highlighting the fact that most problems are affected by a few factors and indicating which problems to solve and in what order. A Pareto chart includes the multiple factors that contribute to an effect arranged in

Run charts for time plots) are graphs of data collected over time which can help determ of whether an intervention or enhancement in the patient care process has resulted in true improvement over time or rather if it simply represents a random fluctuation (that might be incorrectly interpreted as a significant im provement). Run charts are created by plotting time uter here it infections, wait times, falls). The median (or 50th percentile) is measured using baseline historical data and then compared to outcomes measured following the quality improvement intervention.

> Run charts help identify whether there is a true trend vs. a random-pattern. A shift in the process signaling a significant change in quality can be identified, for example, by observing  $\geq 6$  consecutive points above or below the median, or by  $\geq 5$ consecutive points all increasing or decreasing.

Goals should be SMART (specific, measurable, achievable, realistic, and timesensitive). Good leaders are able to organize a team, articulate clear goals, manage conflict resolution, and make decisions based on the input of team members. Good leaders also lead by example and model good patient safety behavior.

#### **KEY DEFINITIONS**

- Adverse event: any injury caused by medical care
  - An adverse event results in unintended harm to a patient by an act of commission or omission, rather than by the underlying disease or condition of the patient. Identifying something as an adverse event does not imply error, negligence, or poor quality care. It simply indicates that an undesirable clinical outcome resulted from some aspect of diagnosis or therapy, not an underlying disease process.
- Adverse reaction: occurs when unexpected harm results from a justified action
  - An adverse drug reaction occurs when the correct process was followed for the context in which the medication was used.
- Authority gradient: command hierarchy of power or balance of power, measured in terms of steepness
  - First used in aviation to describe the phenomenon where pilots and copilots failed to communicate effectively in stressful situations due to the significant difference in their perceived expertise or authority. Hierarchies which exist in medicine are also subject to causing errors. Most health care teams require some degree of authority gradient; otherwise roles are blurred and decisions cannot be made in a timely fashion. However, within a hierarchy, tools of effective clinical communication and teamwork can overcome risks to patient safety.
- Brief: short planning region prior to the start of a clinical activity, in

roplem, at John for contingencies roplem, at John well-oriented and that evidence-based standards known to reduce complications are followed (e.g. use of pre-operative antibiotics).

- **Closed-loop communication:** a type of communication whereby, when a request is made of team members, someone specifically affirms out loud that he or she will complete the task and states out loud when the task has been completed
  - For example, during a cardiac resuscitation a physician orders a medication to be given intravenously and the nurse verbally confirms receipt of the order and verbally confirms when the medication has been administered as requested.

128. Answer: B. The PDSA Cycle is a systematic series of steps for gaining valuable learning and knowledge for the continual improvement of a product or process The PDSA cycle consists of developing a plan to test an intervention (Plan), carrying out the intervention (Do), observing and measuring the impact of the intervention (Study), and determining what modifications should be made to the system or process as a result of the study observations (Act). These interventions are small scale, rapid tests of new initiatives. Interventions with promising results are then selected for larger scale implementation. They do not require the rigor of randomized controlled trials. These 4 steps are repeated over and over as part of a never-ending cycle of continual improvement.



- 129. **Answer: C.** The event described is a near miss; there was an error which fortunately did not result in patient harm. Most near misses need not be disclosed to patients or families; however, they should be reported to the hospital in order for the error to be studied in an attempt to learn how to prevent it in the future. A sentinel event is an adverse event resulting in serious or permanent injury to a patient.
- 130. Answer: A. The root cause analysis is a retrospectice approach to error analysis. It is typically performed for error stress ting in significant patient harm, but can be performed for the accesse event that a team wishes to review. The RCA processes usually involves the individual(s) involved in the event as well a consistent members of the same process relate bot the stent withough the details such as the numeror the individual involved in the event are not shared publically, the general findings of the RCA can be shared throughout the system in order to the process.
- 131. **Answer: D**. The number of infections over 3 months following implementation of the new protocol is an outcomes measure. Compliance rates in following guidelines are a process measure. The number of infectious disease specialists would be a structure measure. The number of patients prematurely self-extubating would be a balancing measure. Wait times for starting antibiotics is another process measure.



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