Test Bank for Rodak's Hematology 6th Walenga

2. Chapter 02-02
A patient's white blood cells (WBCs) are counted on an automated cell counter 10 times. The mean white count is 8000/mL, and the standard deviation (SD) is 300. What is the coefficient of variation (CV)?

a. 0.04%
b. 2.6%
*c. 3.8%
d. 26%

General Feedback:
% CV = (SD/mean) × 100 = (300/8000) × 100 = 3.8%.

3. Chapter 02-03
What does the CV calculated in Question 2 describe about the white cell counts?

a. Accuracy
b. Reliability
c. Proper calibration
*d. Precision

General Feedback:
The CV is a measure of precision, or how well a result can be reproduced. It allows comparisons of assays with different means and is a unitless number, although usually expressed as a percentage. Accuracy is how close a result is to the true value; proper calibration is required to obtain accuracy. Reliability is how well a method holds both accuracy and precision over time.

4. Chapter 02-04
A patient specimen is analyzed on an instrument known to be in control from previous assays performed on a calibrated instrument and gives a hemoglobin result of 13.2 g/dL. Two hours later it is evaluated on another instrument that is being evaluated for purchase by the laboratory. The result is 11.8 g/dL. This result, when compared with the first, is:

a. acceptable agreement.
b. reportable.
c. precise agreement.
*d. inaccurate.

General Feedback:
This result is inaccurate compared with the first because it is significantly different. Precision is not known, because multiple results are needed to determine precision; in addition, precision must be determined using the same instrument, not between instruments. Because it is not accurate, it cannot be reported.

5. Chapter 02-05
Which is true regarding reference ranges?

a. Should be derived from reference books
b. Need to be determined only for adults
c. Can be established by running the test procedure on 10 healthy people
*d. Are ranges of values for an analyte in normal healthy people

General Feedback:
Reference ranges should be determined by evaluating a group of perhaps as many as 120 normal healthy people for the same analyte. If the analyte differs in different groups, based on data such as age and sex, it must be determined for each group if at all possible.

6. Chapter 02-06
A test that is positive in all patients who have the disease but also in some who do not have the disease is:

*a. sensitive.
b. specific.
c. precise.
d. reliable.

General Feedback:
Sensitivity (diagnostic) is defined by the number of people with the disease who test positive. In this case, all patients with the disease have a positive result, so the test is very sensitive. The test, however, is not *specific* because it is also positive in some people who do not have the disease. *Reliability* refers to the performance stability of a test over time. *Precision* evaluates reproducibility of the result if repeated multiple times on a specimen.

7. Chapter 02-07
The antinuclear antibody (ANA) test is positive in almost all people who have systemic lupus erythematosus (SLE). It is also positive in some patients who do not have SLE. The antideoxyribonucleic acid (anti-DNA) test is positive only in people with SLE but not in all who do. Which of the following is true?

*a. The ANA test is a good screening test, and anti-DNA test is a good confirmatory test.
b. The anti-DNA test is a good screening test, and the ANA test is a good confirmatory test.
c. Both are good screening tests for SLE.
d. Neither of these tests is valid.

General Feedback:
Because almost all patients with SLE have a positive ANA test, it is a good screening test (if the result is negative, it practically rules out this diagnosis for a patient). However, because the ANA test is also positive in other patients, the anti-DNA test is a good confirmatory test, because only patients with SLE have a positive result. In practice, the ANA test is done first; if it is positive, then the anti-DNA test is done as follow-up. If a patient is positive with both tests, then his or her diagnosis is SLE.

8. Chapter 02-08
A purchased hemoglobin standard is used to adjust a hemoglobinometer. This standard is being used as a:

a. control.
b. precision check.
c. delta check.
*d. calibrator.

General Feedback:
Standards are used to calibrate instruments. Controls are used to routinely evaluate the accuracy of a method once it is calibrated. Precision is a measure of reproducibility, whereas delta checks compare a patient result with a previous result (same test on the same patient). This can only be done for a test result that essentially does not vary significantly from testing time to testing time.

9. Chapter 02-09
The tubing that brings the lyse reagent to the hemoglobin cuvette on an automated cell counter is pinched and not delivering any reagent. All hemoglobin values are greater than 20 g/dL. This represents what type of error?

a. Random
b. Imprecision
*c. Constant systematic
d. Proportional systematic

General Feedback:
A constant systematic error is one in which the magnitude of the error remains the same throughout the range of the test measurement. The error is proportional if the magnitude varies relative to the result. This is not a random error, which happens only infrequently and is not predictable. Precision requires multiple measurements of the same specimen and evaluates the ability to consistently reproduce the result.

10. Chapter 02-10
One of two controls that have been evaluated over the last 28 days gives a result on day 29 between 2 and 3 SDs of the mean; the other control is within 2 SDs of its mean. What is the correct procedure to follow?

a. Ignore the result unless it happens again the next day.
*b. Rerun the control and, if acceptable, continue with patients.
c. Recalibrate the instrument.
d. Open new vials of controls and repeat both controls.

General Feedback:
One control is acceptable, whereas the other is a warning that the method may be going out of control. The test option in this case is to repeat the analysis of the control, and if it is acceptable, continue with patient analysis, reporting the results. The instrument

does not appear to need recalibration because one control is acceptable and the other is within 3 SDs (1 result of 20 can acceptably be within ±3 SDs). If the repeat on the "out of control" vial is still out between 2 and 3 SDs, then a new vial of that control should be opened and analyzed. The control that was acceptable does need to be repeated.

11. Chapter 02-11
The control values for both controls for the prothrombin test were ranging between the mean and ±1 SD for the first 19 days of use. Starting on day 20, the values for both were consistently between +1 and +2 SDs. This is an example of a:

*a. shift.
b. trend.
c. random error.
d. predictable error.

General Feedback:
If all results are consistently different from the previous in the same direction, it indicates a shift in the methodology has occurred. A trend would show a gradual change over time. This is neither a predictable error nor a random error because it is consistent.

12. Chapter 02-12
Which would most likely be associated with the situation described in Question 11?

a. Operator error
b. Fading light source
c. Miscalibrated instrument
*d. Starting a new lot number of thromboplastin reagent

General Feedback:
Shifts can occur when a new reagent is introduced. A fading light source would lead to trend error. If the instrument were calibrated incorrectly, both controls should be out; likewise, operator error would result in both controls being unacceptable.

13. Chapter 02-13
Which group of patients should *not* be included in establishing moving averages using red cell indices?

*a. Chemotherapy patients
b. Female patients
c. Obstetric patients
d. Surgical patients

General Feedback:
The moving average method works well in institutions that assay specimens from generalized populations that contain minimal numbers of sickle cell or oncology patients. This method is not restricted in female, obstetric, or surgical patients.

14. Chapter 02-14
A laboratory comparing its results to those of other laboratories on the same specimen is an example of:

a. precision monitoring.
b. internal quality assessment.
*c. external quality assessment.
d. delta checks.

General Feedback:
When results are compared with those of another laboratory, this is part of external quality assessment. Internal quality assessment is done totally within one laboratory. Delta checks compare a patient result with a previous result on the same patient. Precision is determined by multiple analysis of the same specimen.

15. Chapter 02-15
The *best* way to prevent errors in the laboratory is to:

a. purchase high-quality instruments from reputable vendors.
*b. hire professionals with integrity.
c. have quality management.
d. perform external quality control procedures.

General Feedback:
Competent professional staff that act with integrity can ensure that the best-quality results are routinely obtained for patients. A high-quality instrument is effective only when it is correctly calibrated and maintained. Management, although ultimately responsible, relies on the laboratory personnel to be aware of potential problems in assays. External quality control programs do not guarantee the daily validity of patient results.

16. Chapter 02-16
A laboratory gets numerous complaints regarding the length of time it takes hematology results to get to the emergency department. What would be an appropriate response?

*a. Make this a quality assurance project.
b. Ignore the complaints.
c. Explain why it takes so long.
d. Tell the employees to work faster.

General Feedback:
Quality assurance evaluates the process from the time a test is ordered until it is reported to the correct patient chart. One of the responsibilities of a clinical laboratory is to get results to physicians and other caretakers in a timely manner; the acceptable turnaround time for a particular procedure will vary depending on the reason it is ordered. Obviously, an emergency department has a need for rapid turnaround time. Complaints from caregivers should never be ignored; it probably is not reasonable to tell employees to work

faster, and explaining why it takes so long will not help provide good patient care.

17. Chapter 02-17
The precision limits of a method are defined by:

a. the mean.
*b. the SD.
c. sensitivity.
d. specificity.

General Feedback:
Evaluating the same specimen multiple times and applying statistics to the results determine precision or reproducibility. The SD describes the precision. The mean is the average result (assuming a gaussian distribution). Sensitivity describes how well a test identifies positive patients, whereas specificity is how well it identifies only positive patients.

18. Chapter 02-18
A clinical laboratory scientist performs 30 replicate hemoglobin determinations on a single blood sample. When statistics are used to determine the precision of the method, the mean is 13.8 g/dL and 1 SD is 0.1 g/dL. This means that 95.5% of the results on this specimen lie:

a. between 13.4 and 14.2 g/dL.
*b. between 13.6 and 14.0 g/dL.
c. between 13.5 and 14.1 g/dL.
d. between 13.7 and 13.9 g/dL.

General Feedback:
Because 1 SD is 0.1 g/dL, 2 SD = 0.2 g/dL. Thus 95.5% of the results lie between 13.6 (±2 SDs) and 14.0 (+2 SDs).

19. Chapter 02-19
The following hemoglobin results, reported in g/dL, are obtained on a hospitalized patient on 3 consecutive days:

	Day 1	Day 2	Day 3
	14.3	11.5	14.4

The SD for this hemoglobin method was calculated in Question 18. A delta check was obtained on day 2. Controls were run as appropriate each day and were all within limits for this procedure.

What is the most probable reason for the day 2 result when compared with those for days 1 and 3?

a. It is within the 95.5% confidence levels for this test.
*b. It may represent an error in patient identification.
c. The patient had a major blood loss between days 1 and 2.
d. It is within the 99% confidence levels for this test.

General Feedback:

The results for days 1 and 3 are statistically the same result (i.e., they are within the 95.5% confidence levels for this procedure and are therefore precise). The result for day 2 is clearly very significantly different, thus giving a delta check (the only possible explanation of those given here is that a patient identification error occurred and the specimen on day 2 is from a different patient). Delta checks are designed to help pick up this kind of critical error. If it had been within the 99% confidence limits, it would have been within 3 SDs, or no less than 14.0 g/dL. Because the results from day 1 and day 3 are the same, blood loss with a drop in hemoglobin cannot explain the day 2 results.