American Proficiency Institute

CLIA '88 AND GRADING

The Clinical Laboratory Improvement Amendments of 1988 (CLIA '88) were established by the federal government (CMS) to regulate clinical laboratories and proficiency test providers like API. One of the subjects regulated by CLIA '88 is the way proficiency test results are graded.

Results are graded in comparison to a group of participants reporting on the same sample and analyte. The comparison group may be all laboratories reporting the same analyte, or a subset of laboratories (peer group) using the same method (e.g., instrument, reagent, or kit) or method principle. The comparison group must have at least 80% consensus (defined below for each type of analyte) and contain at least 10 laboratories. For regulated analytes, if participants do not reach consensus a group of referee laboratories with a history of successful performance is used.

Further details depend on whether the test is qualitative (e.g., a blood sample reactive / nonreactive for Syphilis), semi- quantitative (e.g., color comparison tests on a urine dipstick), or quantitative (e.g., the amount of Cholesterol in a blood sample).

HOW YOUR RESULTS ARE GRADED (QUALITATIVE)

For qualitative results, "consensus" is at least 80% of participants giving the intended response or a clinically consistent response. Immunohematology requires 95% consensus for regulated analytes.

For non-regulated analytes, if a group of participants reaches consensus but contains fewer than 10 laboratories, the group may be graded if the consensus answer is supported by independent sample documentation. If such documentation is not available, results are evaluated using a comparable group of 10 or more laboratories.

Once appropriate comparison groups are determined, results agreeing with the consensus of the group are graded “Acceptable”; other results are “Unacceptable.” If the necessary consensus or number of participants is not reached, referees are used or results are not graded.

Individual microbiology analytes are graded as described above, but scores for regulated microbiology tests are reported to regulatory agencies at the sub-specialty level (e.g., bacteriology or virology).

HOW YOUR RESULTS ARE GRADED (SEMI-QUANTITATIVE)

For semi-quantitative results, "consensus" is at least 80% of participants giving the intended response or a clinically consistent response. For most analytes, the group of correct answers is the most common response plus one response lower and higher, to accommodate differences in interpretation that will not affect patient care. For regulated titer analytes (Rheumatoid Factor, Rubella, and Anti-Streptolysin O), CLIA requires the most common response ± two dilutions be considered acceptable. In either case, both negative and positive responses are not accepted on the same sample.

For non-regulated analytes, if a group of participants reaches consensus but contains fewer than 10 laboratories, the group may be graded if the consensus answer is supported by independent sample documentation. If such documentation is not available, results are evaluated using a comparable group of 10 or more laboratories.

Once appropriate comparison groups are determined, results agreeing with the consensus of the group are graded “Acceptable”; other results are “Unacceptable.” If the necessary consensus or number of participants is not reached, referees are used or results are not graded.

HOW YOUR RESULTS ARE GRADED (QUANTITATIVE)

For quantitative results, “consensus” is at least 80% of participants reporting results within the expected range for an analyte and sample. The expected range is based on a target value (mean) ± a fixed amount (grading criteria). The target value is the mean (average) value of the results in the comparison group. Grading criteria are listed below as a percentage of the mean, a specific quantity, or a number of standard deviations, and are determined by CLIA '88 for regulated analytes.

Results within the expected range are graded “Acceptable”; other results are “Unacceptable.” If the necessary consensus or number of participants is not reached, referees are used or results are not graded.

Quantitative Grading Criteria for CMS Regulated Analytes

CHEMISTRY	Allowed variance from the Target Value
Albumin	± 10 percent
Alkaline Phosphatase	± 30 percent
ALT/SGPT	± 20 percent
Amylase	± 30 percent
AST/SGOT	± 20 percent
Bilirubin, Total	± 0.4 mg/dL or ± 20 percent, whichever is greater
Calcium	± 1 mg/dL
Chloride	± 5 percent
Cholesterol	± 10 percent
Creatine Kinase (CK), total	± 30 percent
Creatine Kinase, Isoenzyme (CK-MB)	± 3 SD or ± 3 (ng/mL or U/L), whichever is greater
Creatinine	± 0.3 mg/dL or ± 15 percent, whichever is greater
Glucose	± 6 mg/dL or ± 10 percent, whichever is greater
HDL, Cholesterol	± 30 percent
Iron	± 20 percent
LDH	± 20 percent
Magnesium	± 25 percent
pCO_2	± 5 mmHg or ± 8 percent, whichever is greater
pH	± 0.04
pO_2	± 3 SD
Potassium	± 0.5 mmol/L
Sodium	± 4 mmol/L
Total Protein	± 10 percent
Triglycerides	± 25 percent
Urea Nitrogen (BUN)	± 2 mg/dL or ± 9 percent, whichever is greater
Uric Acid	± 17 percent

ENDOCRINOLOGY	Allowed variance from the Target Value
Cortisol	± 25 percent
Free Thyroxine (Free T4)	± 3 SD
HCG - Quantitative	± 3 SD or ± 10 mIU/mL, whichever is greater
T-Uptake	± 3 SD
Thyroid Stimulating Hormone	± 3 SD
Thyroxine (T4)	± 1 µg/dL or ± 20 percent, whichever is greater
Triiodothyronine (T3)	± 3 SD

TOXICOLOGY	Allowed variance from the Target Value
Alcohol	± 10 mg/dL or ± 25 percent, whichever is greater
Blood Lead	± 4 µg/dL or ± 10 percent, whichever is greater
Carbamazepine	± 25 percent
Digoxin	± 0.2 ng/mL or ± 20 percent, whichever is greater
Gentamicin	± 25 percent
Lithium	± 0.3 mmol/L or ± 20 percent, whichever is greater
Phenobarbital	± 20 percent
Phenytoin	± 25 percent
Theophylline	± 25 percent
Tobramycin	± 25 percent
Valproic Acid	± 25 percent

HEMATOLOGY and COAGULATION	Allowed variance from the Target Value
White Blood Cell Automated Differential (includes Neutrophils, Lymphocytes, Monocytes, Eosinophils, Basophils)	± 3 SD or ± 1, whichever is greater
Erythrocyte (Red Blood Cell) Count	± 6 percent
Fibrinogen	± 20 percent
Hematocrit	± 6 percent
Hemoglobin	± 7 percent
Leukocyte (White Blood Cell) Count	± 15 percent
Partial Thromboplastin Time (APTT)	± 15 percent
Platelet Count	± 25 percent
Prothrombin Time (PT)	± 15 percent
Alpha-1-Antitrypsin	± 3 SD
Alpha-fetoprotein	± 3 SD
Complement C3	± 3 SD
Complement C4	± 3 SD
IgA	± 3 SD
IgE	± 3 SD
IgG	± 25 percent
IgM	± 3 SD

Quantitative Grading Criteria for Non-Regulated Analytes

Quantitative analytes not regulated by CMS are graded using the Target Value ± 2 SD. **Exceptions** are noted below:

Non-regulated analyte	Allowed variance from the Target Value
Acetaminophen	± 3 SD or ± 2.5 µg/mL, whichever is greater
ACT	± 3 SD
Allergen Specific IgE	± 3 SD
Ammonia	± 2 SD or ± 10 µmol/L, whichever is greater
Anti-CCP	± 3 SD or ± 5 U/mL, whichever is greater
Anti-HBs (Quant)	± 3 SD or ± 3 mIU/mL
Anti-Streptolysin O, quant	± 2 SD or ± 25 IU/mL, whichever is greater
Antithrombin III Activity	± 3 SD
Anti-Xa (Hybrid, LMWH, UFH curves)	± 3 SD
Aspirin Induced Inhibition	± 3 SD or ± 50 ARU, whichever is greater
Bacteria (Urine Microscopic System)	± 3 SD or ± 5 cells/µL, whichever is greater
Basophils (CSF/Body Fluid)	± 3
Beta-Hydroxybutyrate	± 3 SD or ± 0.2 mmol/L, whichever is greater
Bilirubin, Direct	± 2 SD or ± 0.4 mg/dL, whichever is greater
BNP	± 3 SD or ± 10 pg/mL, whichever is greater
Body Fluid Albumin	± 3 SD or ± 10 percent, whichever is greater
Body Fluid ALP	± 30 percent
Body Fluid Amylase	± 30 percent
Body Fluid Bilirubin, Total	± 0.4 mg/dL or ± 20 percent, whichever is greater
Body Fluid Calcium	± 1 mg/dL
Body Fluid Chloride	± 2 SD or ± 5 percent, whichever is greater
Body Fluid Cholesterol	± 3 SD
Body Fluid Creatinine	± 0.3 mg/dL or ± 15 percent, whichever is greater
Body Fluid Glucose	± 6 mg/dL or ± 10 percent, whichever is greater
Body Fluid LDH	± 20 percent
Body Fluid Lipase	± 2 SD or ± 30 percent, whichever is greater
Body Fluid pH (color comparison)	± 1
Body Fluid Potassium	± 0.5 mmol/L
Body Fluid Sodium	± 4 mmol/L
Body Fluid Total Protein	± 3 SD or ± 10 percent, whichever is greater
Body Fluid Triglycerides	± 3 SD or ± 10 mg/dL, whichever is greater
Body Fluid Urea Nitrogen	± 2 mg/dL or ± 9 percent, whichever is greater
Body Fluid Uric Acid	± 17 percent
C-Reactive Protein (hs)	± 2 SD or ± 0.2 mg/dL, whichever is greater
C-Reactive Protein (quant)	± 2 SD or ± 0.3 mg/dL, whichever is greater
Calcium, Ionized	± 3 SD or ± 0.05 mmol/L, whichever is greater
Carboxyhemoglobin	± 3 SD or ± 3, whichever is greater
Casts (Urine Microscopic System)	± 3 SD or ± 1 /µL, whichever is greater

Non-regulated analyte	Allowed variance from the Target Value
CEA	± 3 SD
CO_2 (serum)	± 3 SD
Conductivity	± 3 SD
Creatinine (UAD quant)	± 2 SD or ± 20 percent, whichever is greater
Crystals (Iris-quant)	± 10
CSF Glucose	± 6 mg/dL or ± 10 percent, whichever is greater
CSF Lactic Acid	± 3 SD or ± 0.4 mmol/L whichever is greater
CSF Total Protein	± 3 SD or ± 20 percent, whichever is greater
Cystatin C	± 3 SD
D-Dimer	± 3 SD
Eosinophils (CSF/Body Fluid)	± 6
Epithelial Cells (Urine Microscopic System)	± 3 SD or ± 1 cell/µL, whichever is greater
Estriol (unconjugated	± 2 SD or ± 0.5 ng/mL, whichever is greater
Factor II, IX, V, VII, VIII, X, XI	± 3 SD
Ferritin	± 3 SD
Folate	± 3 SD
Free PSA	± 3 SD or ± 0.4 ng/mL, whichever is greater
Fructosamine	± 2 SD or ± 0.2 mmol/L, whichever is greater
FSH	± 3 SD
GGT	± 20 percent
Glucose (Whole Blood - waived)	± 10 mg/dL or ± 20 percent, whichever is greater
Glycohemoglobin (HbA1c)	± 3 SD or ± 20 percent, whichever is greater
Growth Hormone	± 3 SD or ± 0.2 ng/mL, whichever is greater
Haptoglobin	± 3 SD
HBV Viral Load	± 3 SD
HCV Viral Load	± 3 SD
Hematocrit (Waived)	± 6 percent
Hemoglobin (Waived)	± 7 percent
Hemoglobin F, quantitative	± 2 SD or ± 0.6, whichever is greater
HIV-1 RNA Viral Load	± 3 SD
Homocysteine	± 3 SD
IG absolute	± 3 SD
IG percent	± 3 SD
Immature Platelet Fraction	± 3 SD
INR	± 3 SD
Insulin	± 3 SD
IRF	± 3 SD
Lactate (Lactic Acid)	± 3 SD or ± 0.4 mmol/L, whichever is greater
Lamellar Body Count	± 25 percent
Lidocaine	± 3 SD or ± 10 percent, whichever is greater

Non-regulated analyte	Allowed variance from the Target Value
Lipase	± 2 SD or ± 30 U/L, whichever is greater
Luteinizing Hormone	± 3 SD
Lymphocytes (CSF/Body Fluid)	± 20
Magnesium, Ionized (Blood Gas)	± 3 SD or ± 0.1 mmol/L, whichever is greater
MCH	± 3 SD
MCHC	± 3 SD
MCV	± 3 SD or ± 3 fL, whichever is greater
Methemoglobin	± 2
Microalbumin	± 3 SD or ± 30 percent, whichever is greater
Monocytes (CSF/Body Fluid)	± 20
Mononuclear (CSF/Body Fluid)	± 25
MPV	± 3 SD
Myoglobin	± 2 SD or ± 15 ng/mL, whichever is greater
Neutrophils (CSF/Body Fluid)	± 20
Nitrite	± 2 SD or ± 30 µg/mL, whichever is greater
Non-Squamous Epithelial Cells (Iris, quant)	± 10
NT-pro-BNP	± 2 SD or ± 10 pg/mL, whichever is greater
NUCL (Body Fluid - Iris)	± 3 SD
Nucleated RBCs (Hem - 5C)	± 3 SD or ± 1, whichever is greater
Nucleated RBCs (Hem - 5D & Heme - 5S)	± 3 SD or ± 0.01 x 10^9/L, whichever is greater
Osmolality	± 3 SD
Oxidants	± 2 SD or ± 30 µg/mL, whichever is greater
Oxyhemoglobin	± 3 SD or ± 3, whichever is greater
P2Y12 Inhibition	± 3 SD or ± 30 PRU, whichever is greater
PAP	± 2 SD or ± 30 percent, whichever is greater
Plasminogen	± 3 SD
Polymorphonuclear (CSF/Body Fluid)	± 25
Prealbumin	± 5 mg/dL or ± 25 percent, whichever is greater
Procalcitonin	± 3 SD
Protein C Activity	± 3 SD
Protein S- Activity, Free Antigen, and Total Antigen	± 3 SD
Progesterone	± 3 SD
Prolactin	± 3 SD
PSA	± 3 SD or ± 0.4 ng/mL, whichever is greater
RBC (Body Fluid automated)	± 3 SD
RDW (including CV and SD)	± 3 SD
Reticulocyte Count	± 3 SD
Reticulocyte Hgb	± 3 SD
Rheumatoid Factor, quant	± 3 SD or ± 20 IU/mL, whichever is greater
Rubella, quant	± 3 SD or ± 10 IU/mL, whichever is greater

Non-regulated analyte	Allowed variance from the Target Value
Salicylates	± 3 SD or ± 2.8 mg/dL, whichever is greater
Sedimentation Rate	± 2 SD or ± 3 mm/hr, whichever is greater
Sex Hormone Binding Globulin	± 3 SD
Specific Gravity	± 0.01
Sperm Count (Post- Vasectomy) (manual and automated)	± 3 SD
Sperm Morphology	± 20 percent normal
Sperm Viability	± 2 SD or ± 2 percent viable, whichever is greater
TCO_2	± 3 SD
Testosterone	± 3 SD
Thrombin Time	± 3 SD
Thromboelastometry (all analytes)	± 3 SD
Thyroglobulin Ab (Anti-TG)	± 2 SD or ± 20 IU/mL, whichever is greater
Thyroid Microsomal Ab (Anti-TPO)	± 2 SD or ± 20 IU/mL, whichever is greater
TIBC (all)	± 20 percent
Total Nucleated Cell Count	± 3 SD
Transferrin	± 20 percent
Troponin I	± 3 SD or ± 0.3 ng/mL, whichever is greater
Troponin T	± 2 SD or ± 0.1 ng/mL, whichever is greater
Urine Amylase	± 3 SD
Urine Calcium	± 3 SD
Urine Chloride	± 3 SD
Urine Creatinine	± 20 percent
Urine Glucose	± 3 SD
Urine Magnesium	± 25 percent
Urine Microalbumin	± 3 SD or ± 30 percent, whichever is greater
Urine Osmolality	± 3 SD
Urine Phosphorus	± 3 SD
Urine Potassium	± 3 SD
Urine Sodium	± 3 SD
Urine Total Protein	± 3 SD
Urine Urea (BUN)	± 3 SD
Urine Uric Acid	± 3 SD
Vancomycin	± 2 µg/mL or ± 20 percent, whichever is greater
Vitamin B-12	± 3 SD
WBC (Body Fluid automated)	± 3 SD