

Guidelines for Liver Clinic Staff Adult Liver Patient Laboratory Values and Imaging

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Abnormal Adult Liver Patient Laboratory Values

Alfa FetoProtein (AFP)- *Could be time sensitive*

Normal Laboratory Values: 0-9.

Description-AFP is a protein made by the liver. A high level can be a sign of liver injury or possible liver cancer.

Abnormal Laboratory Values: *One value is not as important as a trend of these lab tests. This test is checked about every 6 months and is used in conjunction with liver imaging (i.e. ultrasound, CT-scan, MRI) to detect for early treatable liver cancer.*

>9- 250: Contact your provider to determine if follow-up testing is necessary

≥ 250: Contact your provider

Use and Potential Actions:

1. AFP and Imaging (Ultrasound, CT Scan, and MRI) at least every 6 months.
2. If AFP ≥ 250 *or* an if there is AFP rising trend of the last 3 AFPs or with a 5-fold increase since last value notify the Provider

Albumin- *Not a Time Sensitive Test*

Normal Laboratory Values: 3.4-4.9 g/dl

Description:

This is a protein made by the liver.

It reflects your state of nutrition and the liver's ability to actually work.

In liver disease it is almost always below 3.9.

Laboratory Results:

In liver disease the albumin is almost always below 3.9 g/dl

>4.9: High levels are not a concern.

2-3.4: Suggests malnutrition and liver disease.

<2.0: Indicates severe malnutrition or liver disease.

Use and Potential Actions:

1. If albumin >2.0-3.4 nutrition will be addressed-calorie counts, supplementation, dietary consults, IV albumin infusions, and possible small bowel feeding tube.
2. If albumin <2.0 notify the provider for further instructions.

See: Diet recommendations and 'IV Albumin' protocol.

α -1 Anti-Trypsin- *Not A Time Sensitive Test*

Normal Laboratory Values: 90-200 g/l

Description-This is a blood test for a particular protein important to liver and lung function. Concern only occurs when levels of this protein are low.

Abnormal Laboratory Values:

>200: This means that you have an elevated level of this protein.

No worries.

A level > 200 means you have more than enough of this protein.

<90: This means that your level for this protein is low.

A low level may be the cause of your liver and/or lung disease.

If you have a low level, your doctor will order another blood test called the '*A1A genotype*' to determine if you have a genetic disorder that is responsible for your low α -1 Anti-Trypsin.

Actions:

1. If A1A < 90.
 - a. Further evaluation with serum '*A1A genotype*'.

See: A1A genotype

α -1 Anti-Trypsin Genotype (A1A Genotype)- *Not A Time Sensitive Test*

Normal Laboratory Values: 90-200.

Normal Laboratory Values:

MM (100% normal level)

MS (80% of normal)

SS (60% of normal)

Description- There are several genotype “patterns/types”.

The pattern predicts the possible level of a normal A1A trypsin.

A1A trypsin is an enzyme that is important in the function of both the liver and the lungs.

Some patterns/types are normal, while some are associated with pulmonary and liver disease

Abnormal Laboratory Values:

MZ (60% of normal)

SZ (40% of normal)

ZZ (10-15% of normal)

Use and Potential Actions:

If MZ, SZ, or ZZ please alert the provider and request further recommendations.

Alkaline Phosphatase- *Not A Time Sensitive Test*

Normal Laboratory Values: 47-175

Description- This is a liver enzyme measured with a blood test. This is an enzyme found in the liver, bone and the placenta during pregnancy. In the liver the alkaline phosphatase resides in the cells lining the bile ducts and the drainage system of the liver.

Abnormal Laboratory Values:

<47: Low levels might represent a poorly functioning liver or it may be a due to an inherited copper storage disease

>175: In liver disease the alkaline phosphatase becomes elevated when the bile ducts or the drainage system of the liver are inflamed or blocked.

Use and Potential Actions:

1. If ≥ 350 , contact the provider to determine which of the following tests are required.
 - a. Blood Tests: GGT, Ca19-9, or AMA serology
 - b. Imaging: Ultrasound, CT-Abdomen, MRI or ERCP

See: GGT, Ca19-9, AMA, ERCP, Endoscopy

GGT (gamma-glutamyl transpeptidase)- *Not A Time Sensitive Test*

Normal Laboratory Values: 9-36

Description:

This is a liver enzyme measured with a blood test.

This enzyme is found in the bile ducts.

The GGT when elevated represents either a blockage, inflammation or infection in the bile ducts.

Elevation may also be related to alcohol use or a variety of medication.

Abnormal Laboratory Values: > 36

Potential Actions:

If GGT < 9-this is not clinically important

If GGT \geq 3 x normal:

Contact the provider to determine if further testing in order

Blood Tests: Ca19-9, or AMA serology

Imaging: Ultrasound, CT-Abdomen, MRI or ERCP

Review current list of meds -especially narcotics, benzodiazepines, sleeping

Alanine Aminotransferase (ALT)- *Not A Time Sensitive Test/ Could be time sensitive*

Normal Laboratory Values: 5-60

Description-

This is a liver enzyme measured with a blood test.

ALT is an enzyme within liver cells.

When the liver cell dies normally the contents and enzymes are released into the blood.

Anything that irritates the cell causing faster cell death and turnover releases enzymes faster thereby raising blood levels accordingly

Abnormal Laboratory Values:

2X normal: Occurs in fatty liver disease, hepatitis C chronic alcohol use

5X normal: Occurs with liver inflammation or infection

10X normal or > 1000 units: Occurs with significant liver cell death due to viral or autoimmune hepatitis or drug induced injury.

***Even in disease, ie in fatty liver, hepatitis C, chronic alcohol use the enzyme can be in a normal.**

Ammonia- *Time sensitive test*

Normal Laboratory Values: 0-30

Description-This is a chemical that becomes elevated after absorption from the gastrointestinal tract following the digestion of a meal. Normally the liver removes ammonia from the blood and turns it into urea, where it is subsequently excreted in the urine.

Abnormal Laboratory Values:

>30: Suggest liver is having trouble removing ammonia from the blood. and can be associated with the presence of “**brain fog**” Requires treatment with ammonia removing medications.

If elevated and the patient has normal mental function no treatment is used.

If elevated the patient may develop a sense the brain is “foggy”

Excess ammonia can lead to a change in personality, increasing fatigue, difficulties with memory and in severe cases can cause coma.

Use and Potential Actions:

If the patient is experiencing “Brain Fog” there are several tests that are often ordered and several possible treatments.

The tests evaluate potential infection:

cbc with differential,

culture of the blood, urine, and fluid from the abdomen.

Tests for possible kidney failure: Urinalysis, urine output, and serum BUN/creatinine

Medical Treatments:

1. Lactulose Syrup

15-30 ml dose - 1 to 6 doses / day to create 2 to 3 loose Bowel Movements

2. Rifaximin 550 mg BID

Needs pre -authorization

Can be over 500.00 dollars / month without pre-authorization

Aspartate Aminotransferase (AST)-*Not A Time Sensitive Test* (Also called SGOT) */Could be time sensitive*
Normal Laboratory Values: 16-40

Description:

This is a liver enzyme measured with a blood test.

This is made by the liver that resides within actual liver cells, and also within muscle cells.

High levels of AST can you represent liver cells dying too quickly, or even muscle cells dying too quickly.

Very high levels can reflect significant cell death AST > 10x normal or > 1000 units (ex: viral, autoimmune hepatitis, drug induced injury as in acetaminophen overdose, etc.)

Abnormal Laboratory Values:

2X normal: Occurs in fatty liver disease, hepatitis C, chronic alcohol use

5X normal: Occurs with liver inflammation or infection

10X normal or > 1000 units: Occurs with significant liver cell death due to viral or autoimmune hepatitis or drug induced injury.

***** Even in disease, ie in fatty liver, hepatitis C, chronic alcohol use the enzyme can be in a normal**

Bilirubin-*Not A Time Sensitive Test/Could be time sensitive*

Normal Laboratory Values:

Total: 0.2-1.4

Direct: 0.1-0.5

Description-

This is a chemical that is measured with a blood test.

The serum Total Bilirubin is made up of 2 types of bilirubin.

Bilirubin is mainly a breakdown product of old oxygen carrying red blood cells in the blood.

70-80% of normal production is from breakdown of hemoglobin in old RBCs.

It is processed in the liver for elimination-either excretion in the urine (indirect bilirubin) or excretion in the bile/intestine (direct bilirubin.)

Almost 100% of bilirubin in healthy people is indirect bilirubin

Abnormal Laboratory Values:

Total Bilirubin: >1.5

Direct Bilirubin: >0.5

Use and Actions:

1.If total bilirubin is greater than 1.5 often a total/direct bilirubin is ordered.

2.If Level newly elevated > 2 times normal.

a. Additional tests might be ordered:

- i. GGT, Ca 19-9, or AMA serology
- ii. Ultrasound, CT, or MRI
- iii. Endoscopy

If primarily direct this represents either:

liver disease or

bile duct blockage

If primarily Indirect Bilirubin this represents either:

A simple genetic variant called Gilbert's syndrome(that is not a disease) or

Accelerated red cell breakdown such as with hemolytic anemia or

A simple blood clot breaking down as with a big bruise

Ca 19-9 (carbohydrate antigen also called cancer antigen)

Not A Time Sensitive Test/Could be time sensitive

Normal Laboratory Values: less than 37 U/ml

Description:

This is a tumor marker measured with a blood test.

A nonspecific blood tumor marker used for screening or a variety of cancers.

This marker is secreted by a variety of cells-that are either cancer cells or cells that are inflamed.

In the liver clinic we primarily use it to screen for bile duct cancers.

Abnormal Laboratory Values:

It can be elevated in cirrhosis, pancreatitis, and blocked bile ducts.

Use and Potential Actions:

1. Regardless of a normal level < 37 or an abnormal > 37 , the trend over time in association with xray imaging determines the importance of the value.
2. If the level is greater than 75
a current MRCP or ERCP may be recommended.
3. If there is a new rise 3x over last value
notify the provider and ask for recommendations.
A current MRCP or ERCP may be recommended.
4. If the level is greater than 250 notify the provider

LDH (Lactate dehydrogenase):

Normal Laboratory Values: 122 to 222U/L.

Description:

This is a liver enzyme measured with a blood test.

Known as LD or LDH (Lactate dehydrogenase)

This enzyme resides in many different cells-muscles, liver, blood, may be elevated in many types of diseases, including liver disease, muscle disease, and a variety of blood diseases particularly in red blood cells.

Abnormal Laboratory Values:

Less than 122: of no concern

Greater than 122: liver cells, blood cells (red blood cells are too fragile and will self-destruct), and muscle cells might be dying too soon.

the cells would release their contents that include the LDH enzyme contents

MA Actions:

If there is new rise greater than 2x normal and it represents a trend, or

The new level is greater than 400 notify provider

Glucose-

Normal Laboratory Values:

Fasting- 1 less than 100mg/dl

Description:

This is a sugar in the blood and a most important source of energy.

A healthy liver helps maintain a normal blood glucose level.

An elevated blood glucose is seen with either a lack of insulin (insulin dependent Diabetes) or blocked insulin effect (as in type 2 Diabetes).

A low blood glucose can be seen with significant liver disease.

Abnormal Laboratory Values:

Critical low-less than 40 mg/dl

Critical high-greater than 600 mg/dl

Use and Potential Actions:

1. If critical either high or low-It is important to know if the patient is having symptoms of confusion, weakness, or excessive urination
Notify provider or refer to ED
2. If fasted and a new reading is elevated greater than 200 have patient contact PCP primary care provider

CBC (complete blood count)

This is a test that measures all the parts of the blood.
This includes red blood cells, white blood cells, and platelets.
They have produced primarily by the bone marrow and can be abnormally low with bone marrow disease or with liver disease

Normal Laboratory Values:

Hemoglobin/Hematocrit - (Red blood cells):

male: 14.6-17.8 / 40.8-51.5

female: 12.1-15.9 / 34.3-46.6

WBC-(white blood cells):

5,000 to 10,000

Platelets:

180,000 - 400000

Description:

CBC (complete blood count)

This is a test that measures all the parts of the blood.
This includes red blood cells, white blood cells, and platelets.

Red Blood Cells-RBC:

RBC's carry oxygen through the body

White Blood Cells-WBC:

WBC's are part of the immune system and fight infection.

Platelets-PLTS:

PLTS are cells that help clot blood.

They have produced primarily by the bone marrow.

Platelets can be abnormally low with bone marrow disease,

or with liver disease with an enlarged spleen.

Abnormal Laboratory Values:

Hgb/Hct-Hemoglobin/Hematocrit:

commonly low in liver disease

Also known as “anemia”

Caused by Bone Marrow Disease, or

a loss of blood (internal bleeding-bleeding ulcer, blood vessels, cancer)

vitamin deficiencies

WBC:

Above normal:

Infections

Prednisone/steroid therapy

Leukemia-Bone Marrow Cancer

Low due to medications, infections, and chronic disease states including liver disease.

Platelets:

Below 150,000 suggest there might be significant liver disease.

Below 100,000 strongly suggest liver disease.

Use and Actions:

Notify the provider if:

Hgb/Hct: less than 23 and is a new change

Total WBC

Greater than 15,000

Less than 1,000

Platelets

less than 50,000 and active bleeding

less than 30,000

INR (International normalized ratio)-and the Prothrombin Time (PT)-

Normal Laboratory Values:

INR 1.2

Prothrombin-PT:120 to 15.5

Description:

These are blood test that measure the ability of the blood to form clots.

The liver makes proteins that help with the clotting.

In liver disease there is less clotting protein.

This causes the INR and PT to be elevated.

Abnormal Laboratory Values:

Not on warfarin:>1.5

On warfarin:>4.0

Use and potential Actions:

**If INR or P.T. is elevated and the patient is bleeding
Contact the Provider**

See: Jobs of the Liver

Creatinine: *Not A Time Sensitive Test/Could be time sensitive*

Normal Laboratory Values: 0.4-1.2 mg/dl

Description:

This is a blood test
It is an important indicator of kidney health.
It is a breakdown product
of muscle metabolism and is excreted in the urine.

In Liver Disease with muscle loss the creatinine underestimates true renal function

Kidney health is affected by liver health.

Effected by the muscle mass of the patient

Abnormal Laboratory Values:

Greater than 1.5

The trend over time is more important than a single value.

Use and Potential Actions:

1. Determine if have reason to be dehydrated:

Use of diuretics, poor oral fluid intake, severe diarrhea

2. Determine if experiencing GI bleeding

3. Determine if exposed to chemicals that injure the kidneys:

IV Contrast, Non-steroidal anti-inflammatories-Ibuprofen, Naproxene

1. Greater than 1.5-Check to see if a value is unchanged overtime and there are comments in the provider notes addressing a chronic condition
2. If a creatine has doubled over baseline in less than a 2-week period check with patient to see if dehydrated, eating and drinking appropriately, has developed a diarrheal illness, or is taking any new medication and report to provider.

BUN-BLOOD UREA NITROGEN-not a time sensitive test/**can be a time sensitive test**

Normal: 7 -20 mg/dl

Description:

This is a blood test used to determine how well your kidneys are working.

It does this by measuring the amount of urea nitrogen in the blood.

Urea nitrogen is a waste product that's created in the liver when the body breaks down proteins

Abnormal:

Greater than 20 mg/dl

There are other causes than renal disease:

Dehydration

Bleeding into the GI Tract

Accelerated muscle breakdown

Use and Potential Actions:

1. Determine if have reason to be dehydrated:

Use of diuretics, poor oral fluid intake, severe diarrhea

2. Determine if experiencing GI bleeding

3. Determine if exposed to chemicals that injure the kidneys:

IV Contrast, Non-steroidal anti-inflammatories-Ibuprofen, Naproxene

4. Check Creatinine

Guidelines/Purpose for Liver Imaging

The Main Purpose of Imaging X Rays is to:

- 1 Detect early tumor growths-benign (non-cancerous) and cancerous
- 2 Detect new portal vein thrombosis (clot) and health of the liver's blood vessels
- 3 Observe the shape of the liver which is suggestive of liver damage and scar tissue
- 4 Comment on the abnormal accumulation of fat in the liver called hepatic steatosis or "fatty liver"

Abdominal Ultrasound:

With and without Doppler:

Detects small tumor growth/benign and cancerous

Detects the integrity of the gallbladder and the biliary ducts

Detects Portal Vein Thrombus

Comments on the Integrity of the Blood vessels as they enter or leave the liver.

Use and Action:

If impression comments on:

Gallstone or Gallbladder Disease, early tumor growth, portal vein thrombus, or issues with flow into or the outflow

Notify the Provider

Abdominal CT SCAN

Able to visualize early tumor growth/ benign and cancerous

Able to document Portal Vein Thrombosis

Able to identify scarring, excessive fat, abnormal blood vessels

Use and Action:

If impression comments on early tumor growth, portal vein thrombus, or issues with flow into or the out of the liver

If the impression documents arterial enhancement, portal venous washout, or peripheral rim enhancement

Notify the Provider

MRI scan (MRCP)-

Able to visualize early tumor growth/ benign and cancerous

Able to document Portal Vein Thrombosis

Best modality to assess the bile ducts

Use and Action

If impression comments on early tumor growth, portal vein thrombus, or issues with flow into or the out of the liver

If the impression documents arterial enhancement, portal venous washout, or peripheral rim enhancement

Notify the Provider

Fibro Scan:

Description:

A special XRay machine that shoots ultrasound waves into the liver.

The machine can measure:

1. CAP-an abnormal accumulation of fat in the liver, and document the kPa or the stiffness of the liver.

The higher the CAP the larger the amount of fat in liver cells.

2. kPa-A marker describing liver stiffness-“how fast waves travel through the liver”

The higher the kPa, the stiffer the liver

Ultrasound waves travel faster in a stiff liver possibly caused by buildup of fibrous scar tissue

3. IQR -measures the technical accuracy of the exam

Normal Results:

CAP: less than 248

Greater than 248: less than or equal to 10% fat accumulation

Greater than 268: less than or equal to 33% fat accumulation

Greater than 280: greater than 66% fat accumulation

kPa (liver stiffness): normal F0

F0 to F1-suggests no or minimal fibrosis (scar tissue)

F2 to F4-suggests advancing fibrosis(scar tissue)

IQR: < 30%

Action:

Notify Provider on completion of scan with CAP, kPa, and IQR

