

Urinalysis and Its Significance in Clinical Trials

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Abstract

Urinalysis is simply an analysis of the urine. It is a very common test that can be performed in many health care settings, including doctors' offices, urgent care facilities, laboratories, hospitals, and even at home.

A urinalysis test is performed by collecting a urine sample from the patient in a specimen cup. Usually only small amounts (30-60 mL) may be required for urinalysis testing. The sample can be either analyzed in the medical clinic or sent to a laboratory to perform the tests. Urinalysis is abbreviated UA.

Introduction

Interpretation of urinalysis is generally based on reviewing all the components of the test and correlating it with the clinical signs and symptoms of the patient and the physical examination. The results are reviewed and interpreted by the doctor who ordered the test.

Urinalysis is done by collecting a urine sample from a patient. The optimal sample tends to be an early morning urine sample because it is frequently the most concentrated urine produced in the day. Typically, no fasting is required before the collection of urine sample and routine medications can be taken before the test, unless otherwise instructed by the ordering physician.

Methods of collection are slightly different for female and male patient.

- For females, the patient is asked to clean the area around the urethra with a special cleansing wipe, by spreading the labia of the external genitals and cleaning from front to back (toward the anus). The cleansing hand is then used to maintain the spread while the cup is held by the other hand to collect the sample.
- For men, the tip of the penis may be wiped with a cleansing pad prior to collection.
- The urine is then collected in a clean urine specimen cup while the patient is urinating. It is best to avoid collecting the initial stream of urine. After the initial part of urine is disposed of in the toilet, then the urine is collected in the urine container provided. Once about 30 mL to 60 mL (roughly 3 to 5 tablespoons) are collected in the container for testing, the remainder of the urine may be voided in the toilet again. This is called the midstream clean catch urine collection.

The collected urine sample should be taken to the laboratory for analysis, typically within one hour of collection. If transportation to the lab could take more than one hour, then the sample may be refrigerated.

In some patients who are unable to void spontaneously or those who are not able to follow instructions other methods may be used, such as placing a catheter (a small rubber tube) through the outside opening to the bladder (urethra) to collect the sample directly from the bladder.

Urine dipstick method

Urine dipstick is a narrow plastic strip which has several squares of different colors attached to it. Each small square represents a component of the test used to interpret urinalysis. The entire test strip is dipped

in the urine sample and color changes in each square are noted. The color change takes place after several seconds to a few minutes from dipping the strip. If read too early or too long after the urinalysis strip is dipped, the results may not be accurate.

Each color change on a particular square may indicate specific abnormalities in the urine sample caused by a certain chemical reaction. The reference for color changes is posted on the plastic bottle container of the urine test strips. This makes for easy and quick interpretation of the urinalysis results by placing the strip next to the container and comparing its color changes to the reference provided.

The squares on the dipstick represent the following components in the urine:

- Specific gravity (concentration of urine)
- Protein in the urine (mainly albumin)
- Ketones (products of fat metabolism)
- Acidity of the urine (pH)
- Glucose in the urine (sugar)

Hemoglobin

- /blood in the urine
- Nitrite (suggestive of bacteria in urine)
- Urobilinogen (possible liver disease or etodolac [Lodine] medication)
- Leukocyte esterase (suggestive of white blood cells in urine)
- Bilirubin (possible liver disease or red blood cell breakdown)

Presence or absence of each of these color changes on the strip provides important information for clinical decisions.

After the UA test strip is dipped in urine briefly and completely, the reading is done within a few minutes. Each one of the squares on the box has next to it the time which is recommended for its interpretation (for example, whether there is a change in color on the square). The squares are placed in similar order on the box, from the ones requiring the shortest time to read of 30 seconds to the ones with the longest time to read of two minutes. This arrangement is based on result time and makes it easier to quickly read and interpret any color changes by simply scanning the strip from the shortest (glucose) to the longest (leukocytes).

Detection in urine

Epithelial (flat cells), red and white blood cells may be seen in the urine.

Sometimes cells, cellular debris, and casts are seen in the microscopic urinalysis. Epithelial cells (cells in the lining of the bladder or urethra) may suggest inflammation within the bladder, but they also may originate from the skin and could be contamination.

Casts and cellular debris originate from higher up in the urinary tract, such as in the kidneys. These are material shed from kidney cell lining due to injury or inflammation and travel down through the urinary tubes. These usually suggest an injury to the kidney from an inflammation or lack of blood flow to the kidneys. Rarely, tumor cells can be in the urine suggesting a urinary tract cancer.

A high count of red blood cells in the urine can indicate infection, trauma, tumors, or kidney stones. If red blood cells seen under microscopy look distorted, they suggest kidney as the possible source and may arise due to kidney inflammation (glomerulonephritis). Small amounts of red blood cells in the urine are sometimes seen in young healthy people and usually are not indicative of any disease.

Other Urine tests

Other commonly performed urine tests are drug tests, pregnancy tests, specific chemicals and proteins in the body, which are not a part of routine urinalysis.

Urine drug screen is done routinely to check for drugs or their byproducts in the urine. There are many purposes for these tests including athletic screening, emergency rooms settings, drug detoxification programs, school and employment screening. This test detects the presence of commonly used drugs such as

- cocaine
- amphetamines
- methamphetamines, marijuana
- phencyclidine, barbiturates
- benzodiazepines, and
- opiates.

Urine pregnancy test is very common and it measures a hormone in the urine associated with pregnancy (beta-HCG or beta- human chorionic gonadotropin). This test can be done in medical settings, but numerous kits are available for home use.

Other urine tests can also be used in evaluation of many medical conditions. Examples include

- urine culture (in determining the bacterial cause of urine infection),
- urine creatinine (in assessing kidney disease),
- urine total protein and albumin (in assessing kidney disease and protein loss from kidney),
- urine cytology (in evaluating for possible bladder or other urinary tumors),
- urine calcium (in evaluating elevated blood calcium levels),
- 24-hour urine collection for proteins (in diagnosing causes of kidney impairment, diabetic related kidney disease, lupus related kidney disease),
- 24-hour urine collection for protein electrophoresis (for measuring different components of proteins in urine in evaluating multiple myeloma, kidney inflammation with increased protein loss), or
- 24-hour urine collection of catecholamine metabolites (in evaluating adrenal gland disease, difficult to treat high blood pressure).

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References

1. Simerville JA, Maxted WC, Pahira JJ (March 2005). "Urinalysis: a comprehensive review". American Family Physician. 71 (6): 1153–62. PMID 15791892.
2. Harper, Douglas. "Urinalysis". Online Etymology Dictionary. Retrieved 26 September 2011. "Reference Ranges and What They Mean"
3. . Lab Tests Online (USA). Retrieved 22 June 2013.
https://reference.medscape.com/slideshow/discolored-urine-6008332?src=wnl_critimg_171117_mscpref_v2&uac=20524DV&impID=1486503&faf=1#18
4. Medscape, 12 Causes of Discolored Urine.
https://reference.medscape.com/slideshow/discolored-urine-6008332?src=wnl_critimg_171117

- _mscpref_v2&uac=20524DV&impID=1486503&faf=1#18
5. Medscape, 12 Causes of Discolored Urine.
<http://jama.jamanetwork.com/article.aspx?articleid=183837>
 6. https://reference.medscape.com/slideshow/discolored-urine-6008332?src=wnl_critimg_171117_mscpref_v2&uac=20524DV&impID=1486503&faf=1#18
 7. Medscape, 12 Causes of Discolored Urine. <http://www.mayoclinic.org/diseases-conditions/urine-color/basics/causes/con-20032831>
 8. <http://www.mayoclinic.org/symptoms/urine-odor/basics/causes/sym-20050704>
 9. Normal Reference Range Table Archived
 10. December 25, 2011, at the Wayback Machine. from The University of Texas Southwestern Medical Center at Dallas. Used in Interactive Case Study Companion to Pathologic basis of diseases