BACKGROUND

Urinalysis, one of the most common laboratory tests, is the physical, chemical, and microscopic examination of a urine specimen. The dipstick or reagent strip examination allows for determination of the pH and specific gravity of urine and the detection of byproducts of metabolism that herald disease. Microscopic examination of the urine allows for the detection of the pathologic presence of cells or particles.

Urinalysis can detect an array of diseases and is part of the general laboratory examination of adult patients undergoing physical examination or hospital admission. It is also the cornerstone of the workup of patients with complaints of urinary symptoms. Additionally, the examination of urine is useful to monitor chronic medical conditions including kidney disease, diabetes mellitus, and liver disease. Urinalysis is a key clinical tool for the early identification of disease in certain populations of patients including pregnant women and febrile infants.
The macroscopic analysis of a urine specimen includes an observation of specimen color. Changes from the normal yellow color do not always result from disease states. Red discoloration of the urine, for example, may result from something as innocuous as beet ingestion to something as life-threatening as a transfusion reaction, where hemoglobinuria is one of the most frequent signs of ABO incompatibility.¹

Chemical urinalysis is achieved through dipstick testing. The normal urinary pH is acidic. Because of the kidneys’ role in acid-base balance, urine is more acidic in metabolic acidosis and alkaline in metabolic alkalosis. Clinical manipulation and monitoring of the urine pH is important for some disease states such as the treatment of renal calculi.² The specific gravity of urine is a reflection of the ability of renal tubules to dilute or concentrate urine. Low values are observed in diabetes insipidus and high values can be seen in heart and liver disease in addition to volume depletion.

Dipstick testing can also detect metabolic byproducts that indicate disease states. While transient proteinuria can be caused by stress, exercise, fever, and dehydration, a diagnosis of persistent proteinuria is of serious consequence and must be confirmed and worked up. In pregnant women, proteinuria is a diagnostic criterion for pre-eclampsia, but isolated gestational proteinuria affects 10% of all pregnant women.³ Persistent proteinuria can be a sign of renal disease. In spite of onset in childhood, Fabry’s disease, an X-linked lysosomal storage disorder, may not be diagnosed until middle age when kidney damage has already occurred. Proteinuria in a patient with a history of limb pain, angiookeratomas and cardiomyopathy may prompt a workup for Fabry’s disease with testing to detect mutations in the GLA gene.⁴

Bilirubinuria may indicate liver disease or biliary obstruction. Elevated levels of urobilinogen, a byproduct of bilirubin metabolism, can be seen in the urine of patients with hepatitis, cirrhosis, and hemolytic conditions. Glucose can be detected in the urine when blood levels exceed 180 mg/dL.⁵ Causes of glycosuria include diabetes mellitus, liver and kidney disease, and certain medications. Ketone bodies indicate the presence of a gluconeogenic state such as a low carbohydrate diet, fever, or poorly managed diabetes mellitus.

Even though urinalysis reports the presence or absence of protein in the urine, in the case of some disease states, further testing may be indicated to exclude the pathologic presence of protein. Albumin is the most common protein to cause proteinuria, but urinalysis may not be sensitive enough to detect low but dangerous concentrations of albumin. Because clinically significant levels of albumin can be below the level of detection of the standard urine dipstick, the albumin to creatinine ratio is another assay that is often used for detecting microalbuminuria in diabetes patients who are at risk for cardiovascular death and nephropathy.⁶ Bence Jones proteins are not always identified by the dipstick test, and electrophoresis may be necessary for the diagnosis of multiple myeloma.

Leukocyte esterase provides an indirect test for the presence of white blood cells. Alkaline urine may cause leukocytes to lyse in the specimen before microscopy can be performed; for this reason, there can be a positive leukocyte esterase result with negative microscopy. Vaginal contamination can cause a positive result. Bacteria that cause urinary tract infections can reduce nitrate to nitrite, and consequently the detection of nitrite on dipstick testing may be indirectly indicative of infection. A negative nitrite result does not rule out urinary tract infection in children.⁷
Normally urine is not a very cellular specimen, but the microscopic examination of the urinary sediment allows for the observation of any erythrocytes, leukocytes, hyaline casts, crystals and organisms that may be present. Urinary sediment microscopy was introduced into clinical practice in the 1830s. Quantitative automated urinalysis systems have been developed to replace manual microscopy, and studies have compared these methodologies for examining urinary sediment.

While it is normal for 0-5 red blood cells to be observed in a high power field, red blood cells in urine can indicate urinary tract pathology including medullary sponge kidney, glomerulonephritis, renal papillary necrosis, renal infarction, calculi, cystitis, and carcinoma. Microscopic hematuria can be one of the first signs of bladder cancer. Hematuria is one of the criteria for the diagnosis of Alport’s syndrome, a hematuric nephropathy that results in kidney failure. Additionally, prostatitis, coagulation defects and sickle cell disease can cause hematuria. Trauma, burns, and poisonings may cause hemoglobinuria. The dipstick does not discriminate between hemoglobin and myoglobin so other tests are necessary to make a diagnosis of rhabdomyolysis. Normally 0-10 white blood cells may be seen per high power field in urinary sediment. Higher numbers are seen in specimens contaminated with vaginal exudates and urinary tract infections. Urinary tract infection is the most common bacterial infection in women. Symptoms of dysuria and urinary frequency are common but may not always be present. Not every urinary tract infection has a typical presentation, and clinicians are watchful for atypical presentations in certain patient populations. In febrile infants and children 2-24 months, diagnosis of urinary tract infection requires both urinalysis and urine culture according to guidelines established by the American Academy of Pediatrics. In the elderly, the symptoms of urinary tract infection can include new-onset incontinence and confusion. It has been reported that the elderly may have a delay in diagnosis when urinary tract infections present with symptoms of chest cold. In spinal cord injury patients, symptoms of urinary tract infection may include costovertebral angle or suprapubic pain, incontinence, fever, increased spasticity, malaise, lethargy or restlessness. Patients with urinary tract tuberculosis may only have sterile pyuria and hematuria on urinalysis, and additional testing (AFB culture or PCR) is usually necessary for a definitive diagnosis. Urinalysis is often ordered to exclude urinary tract infection from the list of diagnoses that must be considered before appendectomy is performed.

Bacturia, when accompanied by leukocyturia, can represent a urinary tract infection or contamination from genital secretions. Urinary schistosomiasis can be diagnosed by finding the characteristic eggs in urinary sediment. When yeasts, Trichomonas vaginalis and pinworms are identified by urine microscopy, they typically indicate contamination.

Epithelial cells that may be seen in urine include renal tubular epithelial cells, transitional cells from the bladder and squamous cells from vaginal contamination. Renal tubular epithelial cells may indicate tubular damage or glomerular disease. Transitional cells may be seen in bladder carcinoma and in benign conditions including ureteric calculi and hydronephrosis.

Hyaline casts can be a normal finding in the urinary sediment, but when present in large numbers, they may indicate a disease state. Coarse granular casts may be seen in renal parenchymal disease. Fatty casts may indicate nephrotic disease, or tubular damage, like that seen with heavy metal poisoning. Red cell casts often signal glomerular disease. White cell casts can indicate pyelonephritis, glomerulonephritis or renal infection. With infection, bacteria can be identified in addition to white cell casts. Brown hematin casts may be seen with acute tubular injury or chronic renal failure.
Historically, crystals were the first elements to be described in urine, and during the 1700s were the only elements noted in urinary sediment. Most of the time, the precipitation of crystals in the urine can be attributed to the ingestion of certain foods or changes that occur to the specimen after collection.\(^8\) Cholesterol crystals typically accompany proteinuria and nephrotic syndrome. Cystine crystals are seen in cystinuria, an inborn metabolic disease that causes nephrolithiasis.\(^18\) Calcium phosphate crystals are seen in stone formers, as are calcium oxalate crystals. Calcium oxalate nephrolithiasis is common in cystic fibrosis patients. Patients with gout also frequently experience nephrolithiasis, and they may have uric acid crystals in their urine. Calcium oxalate crystals can also be seen after ingestion of foods such as chocolate and spinach. Triple phosphate crystals, which have a characteristic coffin lid appearance, are found in the urine of some patients with urinary tract infections. Pharmacologic agents, including sulphasalazine and acyclovir, can also cause crystalluria.

**POLICY**

For the following CPT code(s) in Table 1, the patient should have a diagnosis (ICD-10-CM) code(s) listed in the attached files below.

**Table 1. HCPCS Codes (Alphanumeric, CPT\(^\circ\) AMA)**

<table>
<thead>
<tr>
<th>HCPCS Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>81000</td>
<td>Urinalysis, by dipstick or tablet reagent for bilirubin, glucose, hemoglobin, ketones, leukocytes, nitrite, pH, protein, specific gravity, urobilinogen, any number of these constituents; non-automated, with microscopy</td>
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<tr>
<td>81001</td>
<td>Urinalysis, by dipstick or tablet reagent for bilirubin, glucose, hemoglobin, ketones, leukocytes, nitrite, pH, protein, specific gravity, urobilinogen, any number of these constituents; automated, with microscopy</td>
</tr>
<tr>
<td>81002</td>
<td>Urinalysis, by dipstick or tablet reagent for bilirubin, glucose, hemoglobin, ketones, leukocytes, nitrite, pH, protein, specific gravity, urobilinogen, any number of these constituents; non-automated, without microscopy</td>
</tr>
<tr>
<td>81003</td>
<td>Urinalysis, by dipstick or tablet reagent for bilirubin, glucose, hemoglobin, ketones, leukocytes, nitrite, pH, protein, specific gravity, urobilinogen, any number of these constituents; automated, without microscopy</td>
</tr>
<tr>
<td>81005</td>
<td>Urinalysis; qualitative or semiquantitative, except immunoassays</td>
</tr>
<tr>
<td>81007</td>
<td>Urinalysis; bacteriuria screen, except by culture or dipstick</td>
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<tr>
<td>81015</td>
<td>Urinalysis; microscopic only</td>
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**ICD-10 Diagnosis Codes (Proven)**

CMP-040 Urinalysis
ICD10 v1.0
REFERENCES


POLICY HISTORY/REVISION HISTORY

<table>
<thead>
<tr>
<th>Date</th>
<th>Action/Description</th>
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<tbody>
<tr>
<td>01/21/2017</td>
<td>Updated ICD10 codes as per CMS recommendations. Removed ICD9 code file.</td>
</tr>
<tr>
<td>10/01/2015</td>
<td>Removed ICD9 table. Embedded ICD9/ ICD10 PDF files.</td>
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