

Urine Specimens: An Overview (Part 1)

This In Focus topic is the first of a two-part series on urine specimen collection. Part 2 will cover sources of preanalytical artifact that may arise during urine collection, handling and transportation.

Urine has a long history as a specimen for analysis in clinical laboratories. After blood, urine is the most commonly used specimen for diagnostic testing, monitoring of disease status and detection of drugs. As with all clinical laboratory specimens, preanalytical error in urine specimens is often difficult to detect. Because of this, it is important for laboratories to have processes in place to ensure compliance with best practice in specimen collection, handling and transport – including the use of preservatives where appropriate.

Types of Urine Collection Methods

Urine specimens may be collected in a variety of ways according to the type of specimen required, the collection site and patient type.

Randomly Collected Specimens are not regarded as specimens of choice because of the potential for dilution of the specimen when collection occurs soon after the patient has consumed fluids.

First Morning Specimen is the specimen of choice for urinalysis and microscopic analysis, since the urine is generally more concentrated.

Midstream Clean Catch Specimens are strongly recommended for microbiological culture and antibiotic susceptibility testing because of the reduced incidence of cellular and microbial contamination.

Timed Collection Specimens may be required for quantitative measurement of certain analytes, including those subject to diurnal variation. Analytes commonly tested using timed collection include creatinine, urea, potassium, sodium, uric acid, cortisol, calcium, citrate, amino acids, catecholamines, metanephrines, vanillylmandelic acid (VMA), 5hydroxyindoleacetic acid, protein, oxalate, copper, 17-ketosteroids, and 17-hydroxysteroids.

Collection from Catheters (e.g. Foley catheter) using a syringe, followed by transfer to a specimen tube or cup. Alternatively, urine can be drawn directly from the catheter to an evacuated tube using an appropriate adaptor.

Supra-pubic Aspiration may be necessary when a non-ambulatory patient cannot be catheterized or where there are concerns about obtaining a sterile specimen by conventional means.

Pediatric Specimens present many challenges. For infants and small children, a special urine collection bag can be adhered to the skin surrounding the urethral area.

Urine Collection Devices

An extensive array of urine collection products is available on the market. Information on features, intended use and instructions for use should be obtained from the device manufacturer and reviewed before being incorporated into a specimen collection protocol.

Urine Collection Containers (cups for collection and transport)

Urine collection container cups are available in a variety of shapes and sizes with lids that are either ‘snap-on’ or ‘screw-on’. Leakage is a common problem with low quality products. To protect healthcare workers from exposure to the specimen and protect the specimen from exposure to contaminants, leak-proof cups should be utilized. Some urine specimen containers have closures with special access ports that allow closed-system transfer of urine directly from the collection device to the tube.

Urine Collection Containers for 24-hour Collection

Urine collection containers for 24-hour specimens commonly have a 3-liter capacity. As for the previously mentioned urine collection cups, closure types vary with some containers featuring an integrated port for transfer of an aliquot of the specimen to an evacuated urine collection tube. This provides the option for the laboratory to receive only the aliquot tube and specimen weight (with the large 24-hour container and contents discarded at the point of collection). Additional precautions need to be taken when a preservative is required.

Urine Specimen Tubes

Urine specimens may be poured directly into tubes with ‘screw-on’ or ‘snap-on’ caps. Additionally, evacuated tubes, similar to those used in blood collection, are available.

Urine Specimen Collection and Transportation Guidelines

As for any type of clinical laboratory specimen, specified guidelines for collection and transportation of urine specimens must be met to ensure high quality specimens, which are free from preanalytical artifact, are obtained consistently. Without adhering to these guidelines, accurate test results cannot be guaranteed.

Urine Specimen Preservation

For urinalysis and culture and sensitivity testing, CLSI Guidelines recommend testing within two hours of collection. Different time limits may apply to specimens required for molecular testing of infectious agents (e.g., testing for *Neisseria gonorrhoeae*, *Chlamydia trachomatis*). For this type of testing, laboratories should ensure they are able to comply with specimen transportation conditions prescribed by the assay manufacturers. If compliance with these and/or CLSI recommendations is not possible, consideration should be given to the use of a preservative. Specimen collection tubes with preservatives for chemical urinalysis and culture and antibiotic susceptibility are available.

Urine Specimen Reception in the Laboratory

In addition to routine checks and precautions taken for all specimens received in the clinical laboratory, the following additional 'check items' apply to urine specimens: Labels, volume, collection date and time, collection method, specimen preservation, light protection.

Resources:

- CLSI. Urinalysis; Approved Guideline – Third Edition. CLSI Document GP16-A3. Wayne, PA: Clinical and Laboratory Standards Institute; 2009.
- Preanalytical requirements for urinalysis. Delanghe J, Speeckaert M. *Biochem Med* 2014;24:89-104.