



Quantitative Urinalysis (Quant UA) is the New Gold Standard for Urinalysis

**Overview of the Needed Vital Change
From Dipstick Use To Doc Lab Quantitative Urinalysis**

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Why Doc Lab Quant UA and not dipsticks?

Dipsticks have been the only limited technology that we used for the past 70 years.

Limitations of Dipsticks:

- 1** Dipsticks are severely limited in their scope of detection. The amount of reagent on each pad is the extent to which an analyte can be evaluated. Therefore, they are limiting reagents to accurate information! This limitation considerably decreases the early detection of disease processes, especially diabetes, as the cutoffs for micro-albumin and glucose can be undetected at their earliest stages. AKD and CKD occur, and dipsticks are unable to report their presence.
- 2** Dipsticks do not normalize urine and thereby cannot point to a diluted or concentrated urine analyte. Again, this often leads to missed detection of the beginning of diseases like diabetes. For example, normalized (creatinine-adjusted value) urine can reveal glucosuria or ketonuria that would otherwise go undetected on a dipstick (lacking sensitivity).
- 3** Dipsticks are qualitative, not quantitative. With dipsticks, the exact amounts are unknown, and they cannot aid in determining the severity of the disease or improvements in the patient's health (lacking specificity).
- 4** Dipsticks are fraught with human error via subjective interpretation/evaluation of color based upon precise timing, reading, and attempting to match colors and senescent strips. Additionally, different readers frequently report different results from the same sample. This puts the patient at risk for unnecessary treatment and alterations in medication dosage. (lacking efficiency and reproducibility).
- 5** Dipsticks are financially depletive. Due to their limited capacity and low technology, CMS reimburses dipsticks for approximately \$2.25. After subtracting the expenses incurred to run the test, dipsticks cost the clinic approximately \$1.50 per test.
- 6** Dipsticks can only detect the ketone acetoacetate(AcAc). AcAc is only seen in the later stages of the disease process, often after kidney, fetal, and end-organ damage has begun. The first ketone to form in DKA and gestational diabetes is beta-hydroxybutyrate (BOHB). Dipsticks DO NOT have the ability to detect BOHB, missing the opportunity to diagnose and treat diabetes and gestational diabetes.

Dipsticks are **inaccurate, inconsistent, inefficient, costly, and do not detect small amounts of urine early enough.**

To properly care for our patients, we need Quantitative UA.



Doc Lab Quantitative Urinalysis (Quant UA) provides the accuracy and thoroughness essential for evaluating urine. With the polydipsia seen in patients with diabetes, the top five reasons to choose Doc Lab Quant UA are easy to remember with the mnemonic D.R.I.N.K. (Diabetes detection, Renal protection, Income, Normalization correction, Ketone BOHB detection).

Top Advantages of Doc Lab Quant UA - **DRINK** (Diabetes detection, Renal protection, Income, Normalization correction, Ketone BOHB detection):

Diabetes Mellitus Detection

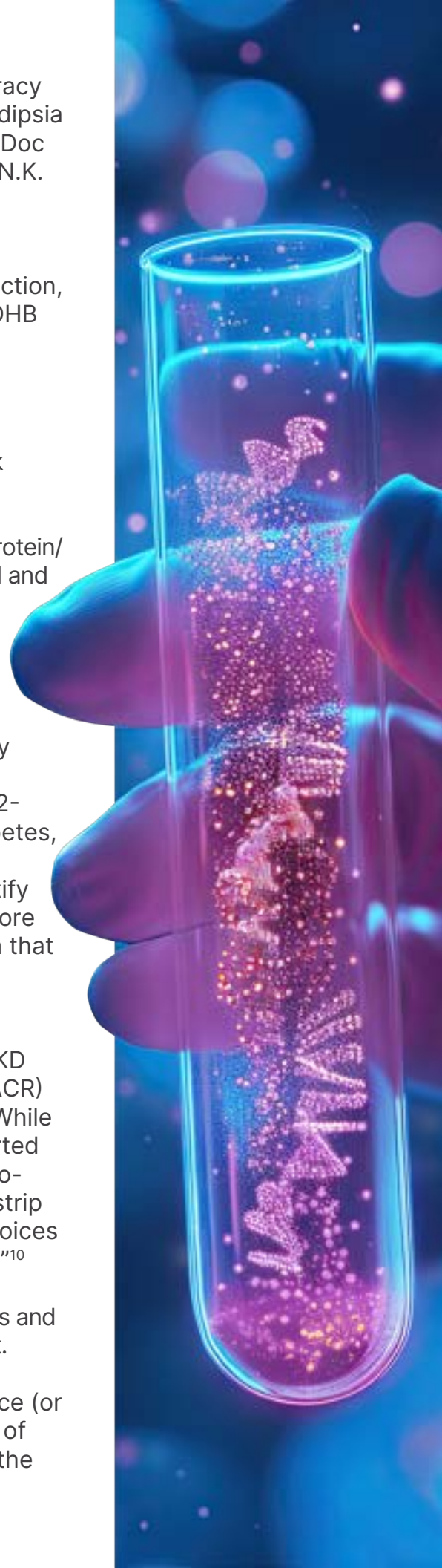
Diabetes is one of the most prevalent disease processes. It is responsible for multiple organ damage and carries two cardiac risk factors. Therefore, more lives will be saved when this disease is detected earlier. Doc Lab Quant UA first detects trace amounts of micro-albumin, glucose, proteinuria, and ketones and calculates protein/creatinine and albumin/creatinine ratios. These can all be detected and addressed at the earliest stages of this all-consuming disease.

“This information can only be provided with a quantitative analysis, which allows the clinician to see the actual concentration of these extremely important values. For example, protein levels detected by a dipstick can be highly specific, but this is only for detecting low-end but clinically significant proteinuria, the sensitivity of a dipstick is only 32-46%. Therefore, in people with or suspected of having diabetes, a much more sensitive test like ACr (Albumin/ Creatinine Ratio) must be used.”¹ “Additionally, we must always quantify proteinuria when eGFR or serum albumin is low.”¹ (Much more sensitive than a protein/creatinine is the amount of albumin that is excreted in the majority of kidney diseases.)

“The 2012 Kidney Disease: Improving Global Outcomes (KDIGO) guideline on the evaluation and management of CKD recommends the spot urine albumin-to-creatinine ratio (UACR) as the preferred test for both initial and follow-up testing. While the UACR is typically reported as mg/g, it can also be reported in mg/mmol.¹ Other options include the spot urine protein-to-creatinine ratio (UPCR) and a manual reading of a reagent strip (urine dipstick test) for total protein. Only if the first two choices are unavailable should a provider consider using a dipstick.”¹⁰

Proper referrals and care can be initiated much sooner, saving lives and avoiding the morbidity and mortality that diabetes can bring with it.

DocLab Quant UA reports the quantitative value of the presence (or absence) of urobilinogen, which can lead to a direct diagnosis of common bile duct blockade. However, dipsticks cannot show the absence of urobilinogen.



Renal Protection

Doc Lab Quant UA measures an analyte's exact amount, i.e., creatinine, microalbumin, glucose, and trace hematuria.

Quant UA promotes far superior information about the kidney earlier in a disease process, allowing for life-saving interventions and avoiding emergencies. Diagnosis of gestational diabetes and acute renal injury are just two examples. Dipsticks do not detect microalbumin, leaving the diseased kidney and the patient untreated.

Income/Bottom Line

Using CMS-approved and widely accepted billing codes, the complete panel has enhanced reimbursement commensurate to the enhanced diagnostics, allowing the clinician to provide the best care without losing money. Therefore, practicing the best medicine and using the most accurate, efficient, sensitive, and specific patient tests can add positive revenue per test to a bottom line, compared to losing \$1.50 per dipstick, which literally "strips" accuracy, early detection, sensitivity, and specificity.

Example: 50 Dipstick tests done in one day = loss of \$75 per day (lack of information)

Normalization of the Urine

Definition: This is the process of evaluating the actual relative concentration of an analyte (e.g., glucose) in the urine by dividing its concentration by the UCr (Urine Creatinine) obtained in the same urine sample.

$$\text{Normalization to creatinine} = \frac{\text{Measured value of analyte. (ex. glucose)} \times \text{reference creatinine level}}{\text{Creatinine measured in the urine}}$$

The most widely accepted method to calculate normalization is the creatinine value. Creatinine normal does vary by age and gender. The data used in the calculations is outlined below.

Doc Lab Quant UA Normalization Table

AGE (YEARS)	MALE	FEMALE
6-11	104.4	99.48
12-19	163.6	159.3
20-29	183	141
30-39	157.9	118.8
40-49	149.7	100.6
50-59	131.8	86.06
60-69	126.4	87.91
>70	117.5	84.51

Urinary Creatinine concentrations (mg/dL) in the NHANES III (1988-1994) study population in persons 6-90 years of age



Normalization of urine analytes corrects for variation in urine concentration, with a direct proportion to the same urine specimen's creatinine concentration. Therefore, this calculation can correct for dilution and concentration variances. For example, a urine dipstick may show a 3+ ketone. However, once the quantitative value is normalized, the ketone level is evaluated to be within the normal range because of the urine concentration. The converse is also true; very dilute urine may look completely normal on a dipstick for glucose, but once it is normalized, the normalized quantitative value can detect a very high glucose level. Doc Lab Quantitative UA provides this normalization process, which negates the value of dipsticks.

Urine dipsticks do not accurately diagnose or aid in providing the best patient care. They are over- and under-detect vital disease processes because they cannot report normalized values, detect concentration variability, or sense dehydration. Therefore, it is crucial for safe and effective patient care to use Doc Lab Quant UA.

Ketones

With obesity, keto diets, and diabetes at an all-time high, an accurate measurement of the ketone bodies present in urine provides an essential and vital diagnostic tool to aid in preventing diabetic ketoacidosis (DKA) and other ketone-related episodes. Detection of ketones in the general population and those with Gestational Diabetes (DKA) is highly critical. Quantitative Urinalysis provides evaluation and detection of ketones in their earliest form by the presence of beta-hydroxybutyrate (BOHB), allowing for interventions and the best prenatal care. A typical patient can present with BOHB in a 1:1 ratio with Acetoacetate. However, in diabetic pregnant patients, these values can be 3:1 or up to 10:1 in late DKA. BOHB is the predominant ketone (approx. 80% of ketones during gestation). Acetoacetate (AcAc) is seen later in the disease progression, and when AcAc is finally detected with a urine dipstick, it can present with an obstetrical emergency.⁴

"Beta-hydroxybutyrate accounts for about 75 percent of ketones in ketoacidosis, and when available, it is preferred for monitoring DKA over the nitroprusside method, which only measures acetoacetate."⁶

Patients who are not pregnant benefit significantly from early detection of BOHB, as correction in their diabetic treatment and plan can protect against end-organ damage and obviate severe disease. Dipsticks cannot detect (BOHB) and can only detect Acetoacetate AcAc (which only makes up 20% of ketones). This happens only later in the disease process.⁹

Research has shown that:

- A. excretion of BOHB causes renal damage.⁸
- B. After the start of ketosis, BOHB rises rapidly, far before AcAc.
- C. The more severe the ketosis, the steeper the percentage of Beta-hydroxybutyrate. (BOHB)⁷
- D. DocLab Quant UA detection of BOHB is essential as it detects the disease in its earliest stages and can lead to intervention, decreasing morbidity and mortality.

Urine dipsticks detect only AcAc and can report an increase in Acetoacetate as the patient undergoes DKA treatment. Consequently, this can lead to an errored perception of worsening disease. Thus, dipsticks are not the advised test of choice.



Conclusion

The literature confirms that this quantitative evaluation of urine, mentioned above, is essential in evaluating metabolic disease processes across the medical field, spanning all specialties. Early detection is critical in protecting renal function and preventing DKA, especially in pregnancy, and helps avoid medical emergencies in all patients. Doc Lab Quant UA provides this gold standard to detect these warning signs early, protect renal function, increase bottom-line revenue, normalize the urine, and detect the ketone beta-hydroxybutyrate, none of which dipsticks can do.

Urine dipsticks can no longer be considered the standard of care. Quantitative Urinalysis provides better patient care. It is consistent, reproducible, and places patient health first. For these reasons, Doc Lab Quant UA is an irreplaceable diagnostic necessity.



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Dr. Winn, M.P.H., D.O., F.A.C.O.F.P., is a United States Army and Medical Corps veteran and has been involved in the medical field for over 34 years. He has a Masters in Public Health (M.P.H.), with concentrations in health services, international health, and environmental health. Dr. Winn has training in Podiatric Medicine, a medical degree in Osteopathic Medicine, and 24 years of postdoctoral experience as an osteopathic physician in his private clinical practice. He is a fellow of the American College of Osteopathic Family Practice. Dr. Winn has been a diabetes educator, teaching people about treatments, best practices, nutrition, and evaluation. He now speaks on topics of addiction, pain treatment, osteopathic manipulative medicine, and the critical importance of Quantitative Urinalysis.