



Figure 1 - UTS™

# The Evolution of Urinalysis: From Dipsticks to Digital Solutions

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Urinalysis by dipstick testing began in the 1950s with the invention of Clinistix<sup>1</sup> by Miles Laboratories<sup>1</sup>. Glucose and protein tests were developed first, followed by ketones, haemoglobin, bilirubin, urobilinogen, nitrite, leucocytes, pH and specific gravity (Fig. 2). Since the 1960s, these multi-test strips (Fig. 3) have changed little in appearance, with only minor innovations in impregnation techniques, colour indicator stability, and colour gradation<sup>2</sup>. A study by Crolla et al.<sup>3</sup>

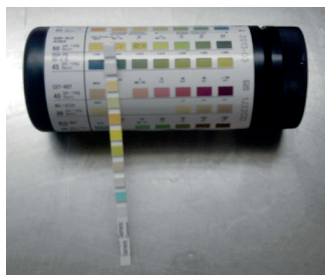


Figure 3 - Multistix

highlighted that the accuracy of urinalysis depends upon the integrity of the test strips used. False results and diagnoses can arise from degradation of test strip reagents through humidity, agnostic to brand. Simerville et al.<sup>4</sup> noted that “False-positive and false-negative results are not unusual in dipstick urinalysis”. Moreover, errors can arise due to human factors such as incomplete dipping (Fig. 4), imprecise read time, and uncontrolled documentation of results. Indeed, Bacărea<sup>5</sup> highlighted that “It has been shown that urine samples are not properly collected in more than half of cases...especially in elderly patients”. It is time now for urinalysis to move forward and become standardised, controlled, automated, and digitised.



Figure 2 - Urine test strip

## UTS™ - A Paradigm Shift in Urinalysis

Urinalysis is used in every care setting, and billions of tests are conducted globally. Given that modern healthcare demands are putting extreme strain on healthcare systems and that there are over 2.8 billion urinalysis tests conducted annually<sup>6</sup>, improvements in urinalysis can make a significant improvement in clinical efficiency and patient care. By removing the intrinsic problems associated with traditional dipsticks (whether read manually or by an electronic apparatus), and by automating analysis and reporting, the Urine Testing System (UTS™; Fig. 1) from Clinical Design Technologies provides this paradigm shift. UTS allows point-of-care urinalysis with laboratory-quality accuracy and reproducibility, with test results automatically uploaded onto the electronic patient record.

## Observing Current Urinalysis Practices

We conducted a 3-day observation of urinalysis practices within a Urology Centre to understand how current practices can be improved upon by implementation of the UTS. This study provides a snapshot of current methods and highlights the potential benefits of the Urine Testing System™ (UTS). The parameters evaluated included dip time, read time, total processing time, transcription accuracy, and documentation security.

Improper handling (inadequate blotting, and contact with contaminated surfaces) and inconsistent dip times (1–9 seconds) contributed to unreliable results. Reflecting previously described errors, observed average times were often



Figure 4 - Dipping

outside of manufacturer-recommended intervals, potentially affecting test accuracy. HCPs showed inconsistent timing for reagent readings, with readings taken at random intervals (6–187 seconds), often missing the specified timeframes for each reagent. Interpretation of colour results was highly subjective, leading to variability and potential inaccuracies. Overall processing time of 40–293 seconds indicated both out-of-specification testing and inefficient processing of tests. Furthermore, distractions during the manual process further increased risk of errors, and surface cleaning protocols were minimal.

These challenges in processing of urine tests highlighted several opportunities for improvement through use of the semi-automated UTS. These included:

- ✓ Timing and Protocol Consistency: Standardised testing intervals to increase accuracy.
- ✓ Objective Result Interpretation: Remove subjectivity through consistent digital interpretation.
- ✓ Enhanced Productivity: Standardised processes can improve productivity and support reproducible outcomes.
- ✓ Resource Optimisation: A streamlined testing protocol can reduce unnecessary repeat tests and lab referrals.
- ✓ Improved Infection Control: Minimise contamination risks through a closed urine testing system.
- ✓ Flexible Testing Locations: Testing near the patient can reduce sample handling time and prevent sample confusion.
- ✓ Minimised Transcription Errors: Digital recording can secure accurate result recording of all tests.

Further benefits of using digital urinalysis with the UTS include:

- ✓ Connectivity and Traceability: Digital devices allow real-time visibility of test results across patient touchpoints and align with Electronic Health Records (EHR) for data accuracy.
- ✓ Standardised testing: Laboratory-standard test results are produced using the UTS at the point of care and are consistent across all clinical settings.
- ✓ Data Trend Analysis: Consistent data capture enables insights into individual patient trends and broader health demographics, supporting research and care quality.
- ✓ Comprehensive Record Keeping: Digitally recorded results, including patient/HCP identifiers, ensure quality control and traceability.
- ✓ Reduced Litigation Risk: Enhanced record-keeping reduces risks associated with undocumented or misplaced diagnostic results.

## A Future-Ready Approach to Urinalysis

In conclusion, adopting the digital UTS solution represents a transformative step towards addressing the persistent challenges of dipstick urinalysis, whether interpreted manually or digitally. Common pitfalls such as improper handling, inconsistent dip times, subjective interpretation, and inefficient processes have long undermined diagnostic



accuracy and healthcare efficiency. UTS not only eliminates these issues but also delivers tangible benefits of enhanced accuracy, reduced HCP workload, and seamless integration of reliable data into patient care pathways. These advantages translate into streamlined workflows, improved patient outcomes, and a future-ready approach to healthcare.

Reflecting on the challenges outlined in this report, how does your organisation approach dipstick testing? We invite you to share your experiences and explore how UTS can revolutionise your testing processes, enhancing both efficiency and patient management.

Share your experience and register your interest in UTS™ at [www.alphalabs.co.uk/contact](http://www.alphalabs.co.uk/contact)

## References:

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