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ABL90 FLEX PLUS creatinine and urea/BUN testing: Improving workflow in the ED

Why test in the Emergency Department

With acute kidney injury presenting in 13-18% of hospital admissions and carrying an estimated cost between £434 million and £620 million in the UK, fast intervention is vital to reduce mortality and complications. Early recognition in the Emergency Department (ED) supports time-critical decisions [1].

In this paper, we look at how creatinine and urea/BUN measurement at the point-of-care (POC) has helped reduce patient waiting times for contrast-enhanced computed tomography (CT), reduced turnaround time, reduced patient overcrowding, and improved door-to-disposition time.

Renal adverse reactions

Renal adverse reactions can occur when a patient with undiagnosed renal impairment undergoes a procedure requiring the administration of contrast media for contrast-enhanced CT or nephrotoxic medications such as aminoglycosides for treating infections [2,3].

Post-contrast acute kidney injury (PC-AKI), also known as contrast-induced nephropathy (CIN), is defined as an increase in creatinine of >26.5 µmol/L (0.3 mg/dL) or >1.5 times baseline within 48–72 hours after intravascular administration of a contrast agent [2,3].

To prevent the development of PC-AKI or CIN, it is recommended that all patients considered for contrast-enhanced CT are screened for pre-existing kidney function impairment. The estimated glomerular filtration rate (eGFR), calculated from creatinine, is the recommended method to evaluate renal function [2,4].

Urgent and non-urgent inpatient and community settings

In emergencies where patients require contrast-enhanced CT imaging, guidelines recommend evaluating patients for renal impairment.

In life-threatening situations, guidelines [1] recommend not delaying a contrast-enhanced CT scan if the risk of delay is likely clinically significant.

In non-emergency settings, if an eGFR from within the past six months is available, this can be used to support decision-making [1]; however, with a POC creatinine test, a current eGFR will always be readily available.

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Reducing patient waiting times for contrast-enhanced CT

For patients without a prior known eGFR, or those presenting in emergencies, access to a POC creatinine test can quickly provide an assessment of renal function [5].

Bargnoux *et al* show a significant reduction in patient waiting time for contrast-enhanced CT scans after implementing creatinine measurements on a blood gas analyzer in the ED. After implementing point-of-care testing (POCT) creatinine measurements, the waiting time was reduced from 2.57 [1.53–3.48] hours to 1.73 [0.75–3.01] hours. Central lab creatinine results were available in 1.95 [1.68–2.48] hours, whereas median time to obtain creatinine result after patient arrival was found to be 0.52 [0.23–1.13] hours with POCT.

The significant reduction in patient waiting time for CT scan is obtained by removing transportation (1.12 [0.75–1.84] hour), and centrifugation and central lab analyzer turnaround time after arrival in the laboratory (0.83 [0.74–0.97] hour) [6].

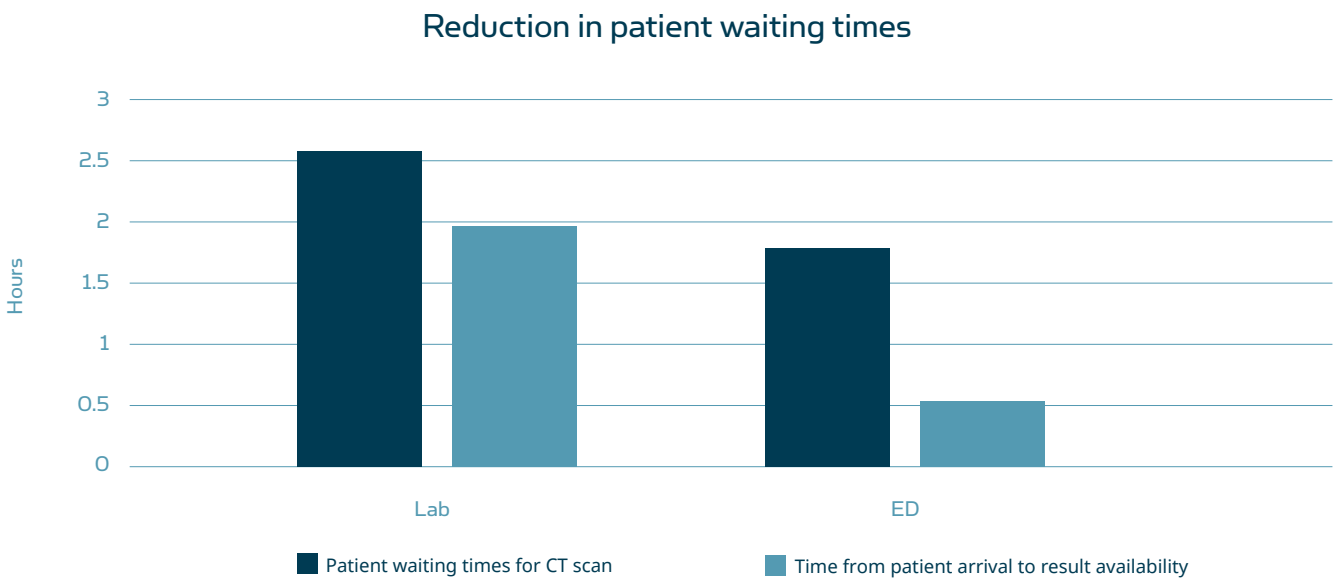

Figure 1: Adapted from ***Bargnoux*** *et al* [6]

Reducing turnaround time

The ***Je Sung You*** *et al* retrospective study, including 276 patients with suspected acute stroke, showed time from arrival at the ED to the reporting of the results was significantly reduced by using POC creatinine and urea/BUN. Time to result was 11.4 (4.9) minutes for POC creatinine and urea/BUN and 46.8 (38.5) minutes for the serum laboratory test [7].

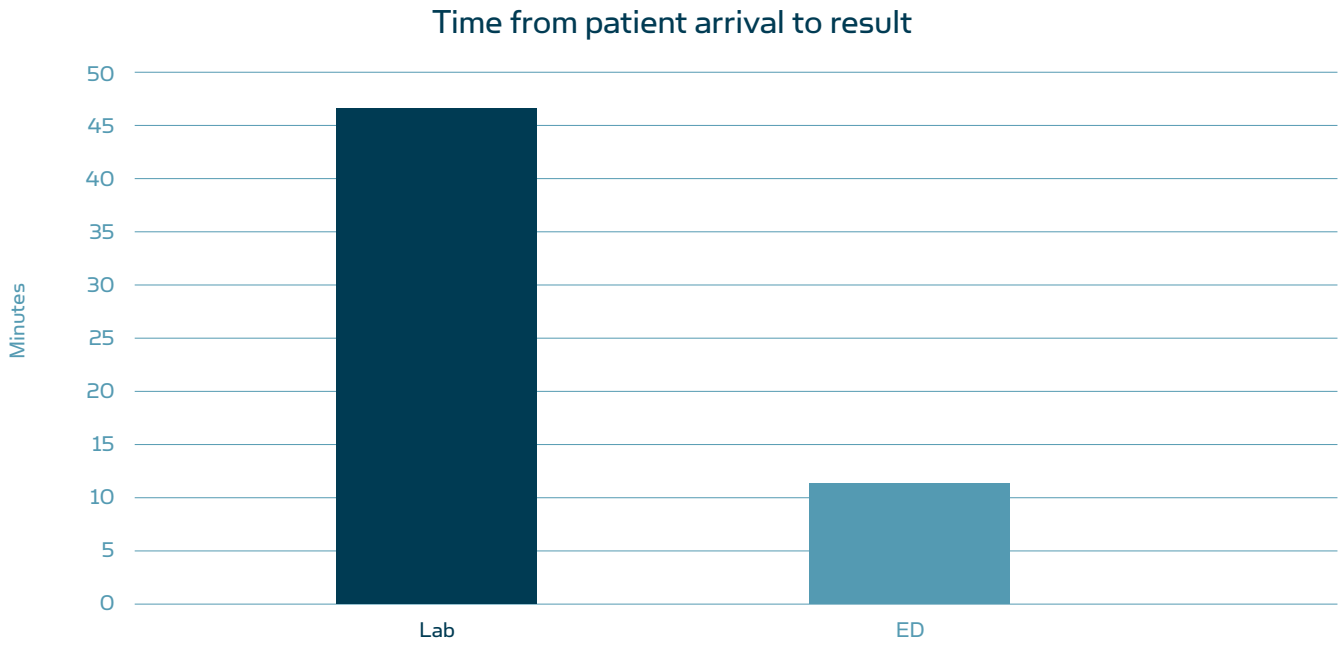

Figure 2: Adapted from ***Je Sung*** *et al* [7]

Reducing patient overcrowding

ED crowding is widespread, and one way to manage this is the implementation of POC testing. One effective intervention to alleviate patient accumulation is the implementation of point-of-care testing. POCT reduces result turnaround time significantly [7] and improves patient flow by expediting clinical decision-making and reducing patient queuing and bottlenecks [8].

A recent prospective multicenter cluster randomized study from Spain demonstrated that POCT benefits timeliness of care in the ED [9]. A cohort of 3,200 ED patients were included in the study with 1,575 in the POCT arm and 1,625 in the Central Lab arm. In the POCT arm the following analytes were available for testing on different POC analyzers:

a. Blood gas analyzer: pH, pO_2, pCO_2, HCO_3^-, potassium, sodium, calcium, glucose, lactate, creatinine, and urea/BUN

b. Hematology analyzer: 17 clinical parameters with a 3-part whole blood cell differential

c. Urine analyzer

d. Coagulation analyzer: INR

With the different POC tests available, subgroup analysis was performed based on the complaint expressed by the presenting patients and the disposition decision.

The subgroup analysis for trauma patients, where creatinine could be requested for an eGFR prior to a contrast-enhanced CT scan, shows a significant reduction between the use of POCT (“ED”) and Central Lab testing (“Lab”):

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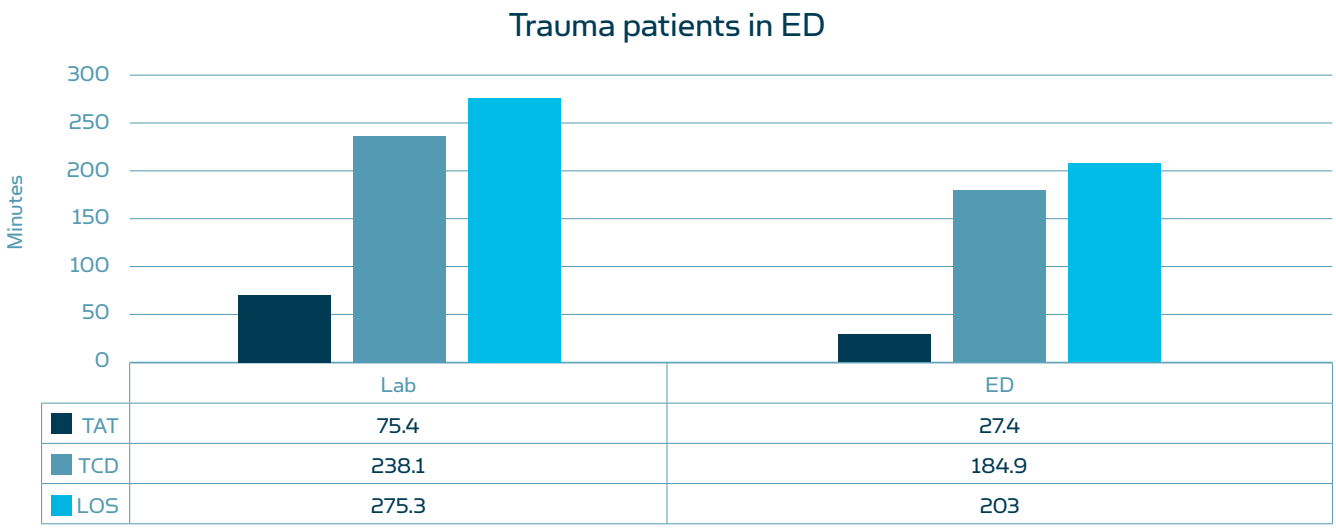
TAT: The time interval between the placement of an order for laboratory testing and the time that the results are available.

TCD: The time interval between the first medical intervention and the disposition decision.

LOS: The time interval between patient registration and disposition decision.



	Lab	ED
TAT	75.4	27.4
TCD	238.1	184.9
LOS	275.3	203

Figure 3: Adapted from ***Leon-Justel*** [8]

Reducing door-to-disposition time using POC creatinine testing

In a pre-post interventional ED pilot study, adding POCT creatinine expedited care. The study was non-randomized and included patients presenting to a tertiary care ED with chest pain, abdominal pain, or shortness of breath [9].

The ED door-to-disposition time was reduced by a significant 41 minutes in the ED arm versus the Lab arm. Secondary analysis showed that creatinine order-to-result turnaround time was reduced significantly by 51.5 minutes in the ED arm [9].

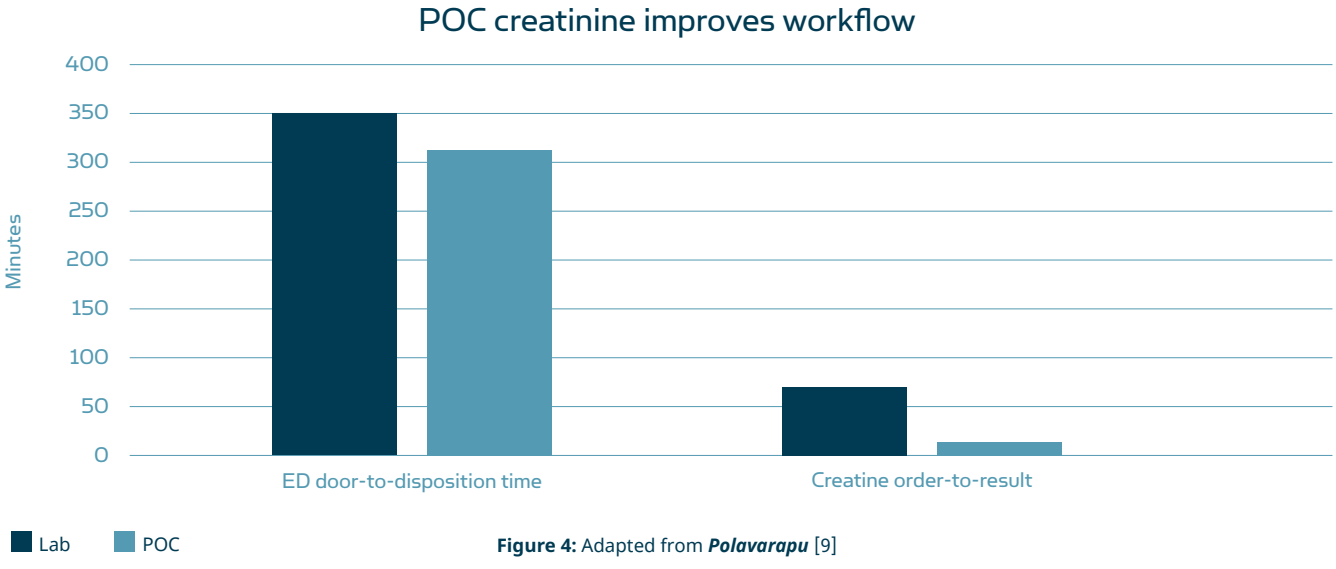


Figure 4: Adapted from ***Polavarapu*** [9]

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Conclusion

Across multiple ED settings, these studies show that introducing POC creatinine testing is associated with shorter wait to contrast CT, faster result reporting, and improved patient throughput—translating in a smoother workflow and, by extension, better patient care [9].

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