

Detecting Anti-IIa and Anti-Xa Direct Oral Anticoagulant (DOAC) Agents in Urine using a *DOAC Dipstick*

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Abstract

The assessment of the anticoagulant effect of direct oral anticoagulants (DOACs) can be important for rapid medical decision-making, especially in patients needing immediate management. An assay that screens for the absence or presence of a DOAC would help accelerate treatment in these situations. Chromogenic and coagulation methods have several limitations, including limited accuracy, long turnaround time, and their need of specialized laboratories. Oral factor Xa and thrombin inhibitors are also eliminated by the kidneys and can be detected in patient urine samples using a single, rapid, sensitive, and patient-specific qualitative assay. In these tests, the presence or absence of a DOAC in urine can be identified by visually observing specific colors after a few minutes. Several studies have demonstrated the robustness and repeatability of these assays. The specific colors of the test strip also detect creatinine in the urine, which shows whether DOAC excretion is reduced, thus suggesting renal impairment. Persons with amblyopia may use a specific reader. Current indications for using the *DOAC Dipstick* test include emergency medical situations with severe bleeding and thrombotic events or before urgent major surgical interventions to accelerate medical decision-making.

Keywords

- ▶ direct oral anticoagulants
- ▶ anticoagulants
- ▶ methods
- ▶ mass spectrometry
- ▶ urine

Direct oral anticoagulants (DOACs) such as dabigatran, rivaroxaban, apixaban, and edoxaban are approved in many countries for the prevention of ischemic stroke in patients with atrial fibrillation, prophylaxis of postoperative venous thromboembolism following elective knee or hip replacement surgery, treatment of acute venous thromboembolism, prolonged prophylaxis to prevent recurrent thromboembolic events, and even management of acute coronary syndrome.¹

For all indications, DOACs can be administered in fixed doses, without the need for routine laboratory-guided dose adjustment. Consequently, routine plasma samples were not collected to assess anticoagulation status in the pivotal studies but were only drawn in specific patient subgroups. However, it is important to measure anticoagulation in some patient populations, such as prior to surgery, when renal function deteriorates, during bleeding or thrombotic episodes, and to

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