

# How to decrease routine and repetitive blood tests in hospitalized patients

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## Clinical question

How can ordering of routine and repetitive blood tests in hospitalized patients without clinical indications be reduced in a safe, evidence-based manner?

## Bottom line

Blood tests are foundational investigations that help physicians with several clinical activities including diagnosis, prognosis, and monitoring patient response to treatments. However, in upward of 60% of hospitalized patients, blood tests are ordered on a routine and repetitive basis without clinical indication.<sup>1-4</sup> This practice is associated with negative patient outcomes including need for blood transfusion, longer stays in hospital, and sleep disruption.<sup>5</sup> It is also costly and a poor use of laboratory resources and medical laboratory technician time. Fortunately, testing practices can be improved with targeted interventions that either avoid unnecessary testing altogether or minimize the blood volume phlebotomized for laboratory tests. This approach can safely reduce testing without increasing readmission rates, length of stay, missed biochemical diagnoses, or mortality.<sup>6,7</sup>

## Evidence

**Scope and impact of routine and repetitive laboratory testing.** Health care providers order blood tests to diagnose patients, prognosticate the course of their conditions, and monitor their responses to treatments. They are nearly always indicated when patients are first admitted to hospital. However, it is common for clinicians to order routine blood tests on a repetitive basis without ongoing clinical indications. While no validated criteria exist for what constitutes routine and repetitive blood tests, Choosing Wisely Canada considers complete blood count, electrolyte levels, liver enzyme levels, and coagulation parameters as being routine blood tests.<sup>5,8</sup> Routine blood tests are undertaken in upward of 60% of patients.<sup>1-4</sup> Ordering blood tests on a routine and repetitive basis in a patient without clinical indications has several consequences. More frequent blood tests are associated with reductions in hemoglobin and hematocrit levels and increased likelihood of blood transfusions.<sup>9-12</sup> Patients are also exposed to pain, bruising, and vascular injuries related to phlebotomy.<sup>13</sup> Routine phlebotomy interrupts sleep<sup>14-16</sup>: A study of data from adult patients at a large teaching hospital in the United States indicated nearly 40% of blood draws were performed between 4:00 AM and 7:00 AM.<sup>16</sup> More frequent

blood tests are also associated with increased lengths of stay, readmission rates, and mortality rates.<sup>9,17,18</sup> This practice is generally of low diagnostic yield, seldom changes management, and can trigger a cascade of further unnecessary investigations for various abnormalities including hemoglobin reductions or spurious results (eg, hyperkalemia in hemolyzed samples, pseudothrombocytopenia due to platelet clumping).<sup>9,10,19,20</sup> Unnecessary blood tests are also expensive; an Israeli study published in 2006 found reducing blood tests through more thoughtful, unbundled ordering at will see how it resulted in close to \$2 million (US) in savings over 3 years.<sup>21</sup> Unnecessary tests also amplify health human resource shortages affecting laboratory medicine. Finally, more frequent blood tests contribute to the climate crisis; the production, distribution, and disposal of plastic products such as blood sample tubes contribute substantially to the health care sector's greenhouse gas emissions.<sup>22,23</sup>

**Initiatives that decrease the incidence and impact of routine and repetitive blood tests.** The incidence and impact of ordering routine and repetitive blood tests for hospitalized patients can be attenuated through targeted initiatives that either improve ordering practices to avoid unnecessary phlebotomy or minimize the volume of blood that is phlebotomized for blood tests. Evidence supporting the first approach originates from single-centre controlled before-and-after quality improvement initiatives, nonrandomized controlled trials, and randomized controlled trials.<sup>7</sup> These demonstrate that usage can be reduced safely without increasing hospital length of stay, readmission rates, missed biochemical diagnoses, or mortality.<sup>6,7,21,24,25</sup> Evidence supporting strategies to reduce the volume of phlebotomized blood is derived from 2 systematic reviews, 1 scoping review, and 1 narrative review.<sup>26-29</sup> These reviews include randomized controlled trials, interrupted time-series analyses, and retrospective and prospective cohort studies. Volume of blood drawn can be reduced effectively by changing sampling approaches.

## Approach

Quality improvement initiatives that enhance ordering practices to avoid unnecessary blood tests target both individual provider practices and structural changes to health systems. The 5 categories of interventions that address inappropriate laboratory usage include education, audit-and-feedback interventions, changes to electronic medical record (EMR) systems, cost display, and

policy changes.<sup>6,7</sup> The most impactful individual change strategy is altering EMR systems, while leveraging a multimodal approach is most likely to sustain success.<sup>6,7</sup> Educational initiatives are most successful when they are endorsed by institutional leadership and target clinicians involved in ordering, drawing, and testing. They should emphasize appropriate indications for testing, potential adverse effects of routine and repetitive blood tests, and that testing can be reduced without increasing the risk of missed or delayed diagnoses.<sup>6</sup> Audit-and-feedback interventions provide clinicians with data on personal ordering patterns as they relate to institutional benchmarks and to practices of their peers.<sup>30-32</sup> Changes to EMRs that reduce testing include removing the ability to order daily laboratory tests, limiting ordering periods to defined time frames, and creating alerts that display prior stable results for the test being ordered.<sup>7</sup> Cost display strategies involve providing laboratory test costs to providers at the time of ordering.<sup>7</sup> Policy changes are defined as institutional modifications (eg, workflow change) without altering the EMR<sup>7</sup>; an example is requiring providers to justify ordering blood tests for clinically stable patients before the test is performed.<sup>33,34</sup>

Blood loss can be minimized through use of pediatric-size blood collection tubes, blood sampling conservation devices (eg, ways to reinfuse the patient with unused blood taken for testing), laboratory add-ons (additional tests performed on existing specimens), and noninvasive testing (eg, point-of-care testing of blood glucose levels rather than taking serum samples).<sup>26-28</sup> Use of small-volume blood collection tubes may decrease the need for red blood cell transfusions without affecting the fidelity of laboratory analysis.<sup>35</sup>

## Implementation

Specific ways individual clinicians can improve ordering practices include ordering daily morning laboratory tests for only specified durations, obtaining laboratory tests only on the day of discharge if waiting for a specific result to determine discharge suitability (eg, improvement of an acute kidney injury), regularly asking whether the test result would change the patient's treatment plan, or adding on tests rather than drawing a new sample when possible. As noted, while these individual interventions meaningfully reduce laboratory usage, multipronged approaches that leverage several strategies are more effective and more likely to sustain improvements.<sup>6,7</sup>

The 4 Es is one such multimodal framework modelled after the hierarchy of effectiveness that incorporates 4 change concepts: education, embedded reminders, empowerment of interprofessional health care professionals, and enforcement.<sup>36</sup> The lower rungs on the hierarchy (education and embedded reminders) are the easiest and necessary first steps but they are unlikely to sustain change.<sup>37</sup> Each step to the higher rungs (empowerment of interprofessional health colleagues

and enforcement) is more effective in reducing unnecessary laboratory testing but is also harder to implement.<sup>37</sup> We encourage clinicians who are interested in decreasing routine and repetitive blood tests in hospitalized patients to adopt this stepwise approach to increase their odds of success. Multimodal approaches have reduced blood testing by as much as 8% to 32% in various settings and have been shown to yield cost savings.<sup>21,25,38-40</sup> In a Canadian study published in 2023, a bundle that included education, discussing necessity of laboratory tests during daily rounds, electronic order set modifications, an electronic test add-on tool, and audit and feedback resulted in a 17% reduction in mean daily blood testing volume per patient without affecting patients' lengths of stay or mortality rates.<sup>40</sup>

## Conclusion

Foundational to the success of these interventions are institutional cultures that promote patient-centred care, value, safety, and efficiency.<sup>36</sup> Clinicians interested in getting started can participate in Choosing Wisely Canada's Using Labs Wisely campaign,<sup>41</sup> which helps health systems develop annual quality improvement plans and implement interventions to reduce blood tests while providing tools, mentorship, and comparative reports on hospital performance with peer hospitals.<sup>42</sup> Individuals interested in quality improvement can also take advantage of tool kits, such as *Pause the Draws*, for in-depth implementation instructions on how to decrease routine and repetitive blood tests in hospitalized patients.<sup>8</sup>

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**Competing interests**  
None declared

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Choosing Wisely Canada is a campaign designed to help clinicians and patients engage in conversations about unnecessary tests, treatments, and procedures and to help physicians and patients make smart and effective choices to ensure high-quality care is provided. To date there have been 13 family medicine recommendations, but many of the recommendations from other specialties are relevant to family medicine. Articles produced by Choosing Wisely Canada in *Canadian Family Physician* are on topics related to family practice where tools and strategies have been used to implement one of the recommendations and to engage in shared decision making with patients. If you are a primary care provider or trainee who has used Choosing Wisely recommendations or tools in your practice and you would like to share your experience, please contact us at [info@choosingwiselycanada.org](mailto:info@choosingwiselycanada.org).