

Usefulness Of Routine Preoperative Laboratory Tests In Elective Surgical Patients

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Citation

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Abstract

Introduction: Routine preoperative laboratory investigation is still a common practice in some parts of the world despite numerous national/international guidelines and individual efforts discouraging this trend. The purpose of this study is to remind again that laboratory tests without indications can be safely eliminated from preoperative assessment of elective surgical patients.

Settings: King Fahad Medical City, Riyadh, Saudi Arabia.

Methods: All patients who underwent elective surgery at our institution in the year 2009 were reviewed retrospectively. Results of Complete Blood Count (CBC), Electrolytes and Coagulation profile were documented and characterized. Patients were divided in two groups based on indication or no indication for a specified test. Indications for tests were identified from preoperative notes taking assistance from The Canadian Anesthesiologists Society (CAS) guidelines and Harvard Medical School study as reference. Change of management due to the abnormal results was labeled as intervention. Fisher's exact test was used to compare rate of intervention between the groups.

Results: A total of 1930 patients met the inclusion criteria. In comparison to 30 (3.58%) interventions in 839 patients who were indicated for CBC before surgery, interventions were observed in only 2 (0.18%) patients among 1091 patients who actually were not requiring this test for pre-operative evaluation and the difference was highly significant ($P < 0.01$).

No intervention was identified in 1621 routinely done coagulation profiles. However, the management plan was changed in 17 (5.5%) of 309 patients having indications for coagulation profile test ($P < 0.01$).

Similarly, in electrolytes tests, of the indicated group 33 (4%) of 825 patients required intervention in comparison to 12 (1.08%) interventions of the not-indicated (1105 patients) group ($P < 0.01$).

Conclusion: Routine preoperative laboratory tests do not change patient management significantly. We hope that concerned physicians and authorities will adopt the evidence-based practice in this regard, to ensure more efficient preoperative care of patients.

INTRODUCTION

Laboratory investigation is a common element of preoperative evaluation of patients presenting for elective surgery. Pre-anesthesia evaluation consists of information from multiple sources that may include the patient's medical records, interview, physical examination and findings from the medical tests and evaluations.¹ In the past, a series of "routine" tests were performed to determine a patient's fitness for surgery. Critical evaluation of "routine" tests suggested that preoperative tests ordered in the absence of clinical indications, while frequently abnormal, fail to predict postoperative outcomes. These routine tests seldom change clinical management but generate unnecessary costs for the health care system.² Evidence-based guidelines on the use of pre-operative tests before elective surgery have been published by the National Institute for Clinical

Excellence (NICE), a government organization in the UK, in 2003, where preoperative tests were not recommended routinely either in adults or in children before elective procedures in the absence of clinical indication.³ The ASA (American Society of Anesthesiologists) has published an advisory in 2002 stating similar recommendations.¹ The Canadian Anesthesiologist Society (CAS) also published a guideline to assist in judicious preoperative testing.⁴ A prospective study showed proper history taking can safely and effectively supplement preoperative screening tests for coagulopathy.⁵

Despite these guidelines and evidence, clinicians are still asking for the routine preoperative tests for several reasons that include detecting unsuspected abnormalities that might influence the risk of operative morbidity and mortality;

establishing a baseline value for a test that has a likelihood of being monitored and changing after the surgical procedure; for medico-legal reasons; and as a tradition in individual institutional practices. Following an abnormal test result clinicians may go for correction of it, whereas a serious abnormality may suggest the surgery to be cancelled or delayed. But commonly most abnormalities are simply ignored. Literature shows that clinicians ignore more than 60% of abnormalities discovered on routine preoperative tests, while the frequency of abnormality is in any case rare in healthy individuals.⁶

Here in Saudi Arabia we found that most hospitals are following more or less some guidelines regarding routine ECG and Chest X-ray, but Complete Blood Count (CBC), Electrolytes and Coagulation profiles are routinely ordered for all patients. A numbers of institutions include sickle-cell screening and hepatitis serology in their routine workup. In our institution, a tertiary referral hospital in the capital drawing a general catchment from all over the country, preoperative CBC, electrolytes and coagulation profiles is routine practice for all elective surgical patients. No study was found which dealt with the benefits of these routine investigations in this Gulf area and it remained as a regular work-up before all operative procedures regardless of age, sex and overall patient’s condition unless missed accidentally.

The aim of our study is to look for the effectiveness of CBC, electrolytes and coagulation tests done in absence of any indications, and also to search for any factors that may justify the need of these tests in this region as compared to the international standards.

MATERIALS AND METHODS

Following approval from our hospital ethics board, all patients who underwent elective surgery in 2009 were identified. An elective surgery was defined as one that appeared on the published surgery schedule. Exclusion criteria were: patients less than 16 years of age, as well as emergency, obstetrical, cardiovascular and neurosurgical operations. Charts were reviewed retrospectively. We grouped the patients into “indicated test” group and “test not indicated” group, with the assistance of CAS guidelines and the Harvard Medical School study⁷. We formulated an individual questionnaire for CBC, Electrolytes and Coagulation profiles (Table 1). Depending on these questionnaires, records were reviewed and patients were divided as “indicated test” group and “not indicated test”

group. Indicated tests were those that might be expected to be abnormal based on their indications listed in Table 1.

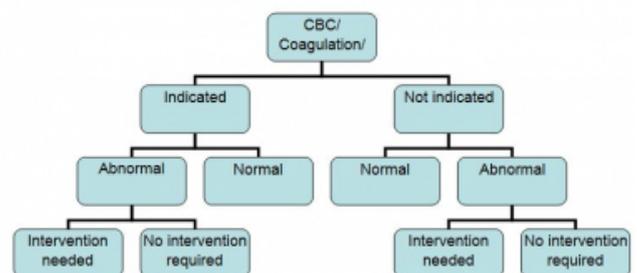
Table 1
Indications for complete blood count, coagulation profile, and electrolyte tests in elective surgical patients

| Test | Indications |
|------------------------------------|---|
| Complete blood count | <ul style="list-style-type: none"> • Patient more than 60 year of age • Major surgery requiring “group and screen” or “group and match” • Chronic cardiovascular, pulmonary, renal or hepatic disease • Malignancy • Known or suspected anemia, bleeding diathesis or myelo-suppression • Anticoagulant therapy |
| Coagulation profile | <ul style="list-style-type: none"> • Anticoagulant therapy • Bleeding diathesis, family history of bleeding disorder • History of DVT or pulmonary embolism • Liver disease, renal failure • Malignancy with concurrent radio-chemotherapy |
| Electrolytes and creatinine levels | <ul style="list-style-type: none"> • Age more than 60 years • Hypertension • Renal disease • Diabetes • Pituitary or adrenal disease • Digoxin or diuretic therapy, or other drug therapies affecting electrolytes |

The results of Complete Blood Count (CBC), Electrolytes and Coagulation profiles were recorded and classified as normal or abnormal. We documented if there were any changes in the management based on the results, such as cancellation or delaying of the surgery, requirements of blood, blood products, vitamin K, or fresh frozen plasma, dialysis, Na/K infusion, and further blood tests.

We used the Fisher’s exact test to determine significance with the level of significance taken as P<0.05.

Figure 1
Study scheme showing group differentiation



RESULTS

A total of 1930 patients met the inclusion criteria.

839 patients were found to have indications for ordering CBC, of them 458 (54.58%) had abnormal results (Table 2). An intervention was required in 30 (3.58%) patients in the preoperative period. 1091 patients did not need a CBC test.

250 (22.92%) of them were found to have abnormal results, changing management for only two patients. Interventions were significantly less in the “test not indicated” or routine group in comparison to the “test indicated” group (P<0.01).

Table 2

Summary of the complete blood count results (P<0.01)

| Test Indicated | | | Test Not Indicated | | |
|--------------------------------|----------------|----------------------------|---------------------------------|----------------|----------------------------|
| Normal | Total Abnormal | Abnormal with Intervention | Normal | Total Abnormal | Abnormal with Intervention |
| 381 | 458 | 30 | 841 | 250 | 2 |
| 45.41% | 54.58% | 3.58%* | 77.08% | 22.92% | 0.18%* |
| Total number of patients = 839 | | | Total number of patients = 1091 | | |

*The difference of interventions between the “test indicated” group (30 [3.58%] among 839 patients) and the “test not indicated” group (2 [0.18%] among 1091 patients) was highly significant (p<0.01).

For the coagulation profile data; among the 309 patients in whom the coagulation profile was indicated, 43 (13.9%) patients had abnormal results, requiring intervention preoperatively for 17 (5.5%) patients (Table 3). 1621 patients were in the “not indicated test” group. Of those, 98.21% patients were found to have normal results. Even the 29 (1.79%) patients with abnormal results did not require any intervention. The difference in the change of management between the two groups was highly significant (P<0.01).

Table 3

Summary of the coagulation profile results (P<0.01)

| Test Indicated | | | Test Not Indicated | | |
|--------------------------------|----------------|----------------------------|---------------------------------|----------------|----------------------------|
| Normal | Total Abnormal | Abnormal with Intervention | Normal | Total Abnormal | Abnormal with Intervention |
| 266 | 43 | 17 | 1592 | 29 | 0 |
| 86.08% | 13.92% | 5.5%* | 98.21% | 1.79% | - |
| Total number of patients = 309 | | | Total number of patients = 1621 | | |

*The difference of interventions between the “test indicated” group (17 [5.5%] among 309 patients) and the “test not indicated” group (0 among 1621 patients) was highly significant (p<0.01).

Similarly, 825 patients of the total 1930 had indicated electrolyte tests, of them 366 (44.36%) patients had abnormal results requiring intervention in 33 (4%) patients preoperatively (Table 4). On the other hand, 1105 patients had electrolytes done which were not indicated. Of them, 282 (25.52%) patients had some abnormality in the results, but intervention was required in only 12 (1.08%) patients. The number of interventions was significantly lower in the “test not indicated” group (P<0.01).

Table 4

Summary of the electrolytes results (P<0.01)

| Test Indicated | | | Test Not Indicated | | |
|--------------------------------|----------------|----------------------------|---------------------------------|----------------|----------------------------|
| Normal | Total Abnormal | Abnormal with Intervention | Normal | Total Abnormal | Abnormal with Intervention |
| 459 | 366 | 33 | 823 | 282 | 12 |
| 55.64% | 44.36% | 4%* | 74.48% | 25.52% | 1.08%* |
| Total number of patients = 825 | | | Total number of patients = 1105 | | |

*The difference of interventions between the “test indicated” group (33 [4%] among 825 patients) and the “test not indicated” group (12 [1.08%] among 1105 patients) was highly significant (p<0.01).

DISCUSSION

To follow established guidelines is usually the exception and not the rule in the majority of health institutions in the World. The results of our study show that most tests ordered at our institution are incompatible with the applicable published guidelines. This failure to convert recommendations into practice is often not related to the content or quality of the guidelines themselves but is more related to difficulty changing established behavior of clinicians and institutions⁸ in addition to failure of dissemination, cost, and doubt of guideline's applicability in local populations.

Dzankic et al. demonstrated that patients above 70 years of age usually have an abnormal laboratory result. However, only surgical risk and ASA classification were associated with adverse outcome⁹. He also found that patients 60 years or older had more abnormal electrolytes and CBC results but again noticed that age-based inclusion or exclusion criteria were inconsistent between testing guidelines. We therefore used the lower age limit of 60 years as the threshold to request routine preoperative investigations. We found that the patient comorbidities and extent of surgery are the most relevant and consistent criteria in different guidelines. For example in the NICE guideline, surgery types were divided in 4 categories according to the extent of it. This is combined with five ASA grades to determine the indications of tests. So the same surgery might require a preoperative test in a patient and not another. On the other hand some operations are graded differently in different areas. For example, thyroidectomy is labeled as grade three (of four) in the UK whereas it is classified as a day case in some centers in North America. In our study we followed the simplest definition of test indications yet kept a very low threshold for classifying the blood test as needed, guided by the Harvard medical school study⁷ and CAS4 guidelines. This would simplify the task on surgeons and anesthesiologists, and include potentially vague populations for testing or not. We excluded pediatric surgery, neurosurgery & cardiovascular

surgery patients to make the population more homogenous, and we did not include pregnant women as their physiology is different, and the guidelines are different for these populations. We excluded the emergency patients in the very beginning as most of the mentioned investigations are performed as a part of their diagnosis and clinical assessment.

We found two instances when the CBC result did in fact generate a major change in the management plan (table 2). Those two patients in the “test not indicated” CBC group had their operations cancelled due to low hemoglobin (<8 gm/dl). However, we found that the preoperative documentation showed a lack of anemia related enquiries, which would have been probably positive showing these two patient clinically anemic, and would have shift them to the indicated for CBC testing group.

Coagulation Profile was found most unnecessary in absence of specified reasons, which was shown even 30 years back in a study⁷, but still is in practice. None of the patients of the “test not indicated” group had any change of management based upon its result and the number of marginal derangements was also very low (29 in 1621 patients).

Electrolytes were found to have frequent abnormal results in our study (table 4), and most of them were minor fluctuations of the potassium level. Very few patients were actually treated by supplementation, which is consistent with other studies.¹⁰ Moreover, potassium infusions were ordered by physicians at varying thresholds as seen in a number of cases when the result is considered by some studies to be safe. We had 7 patients given potassium with their level being between 3.2-3.5 mEq/L. This caused an increased number of interventions in the “test not indicated” electrolyte group in our observations. However, studies showed that preoperative hypokalemia does not appear to be a risk factor for adverse events. In the report of Turnbull and Buck, there were 14 abnormal results of serum potassium among 995 patients during routine screening; only four of them were given potassium supplements before surgery but none of the 14 patients had any cardiac complications¹⁰. Hirsch et al. did not find any association between pre-operative K level and intraoperative arrhythmia in a cohort of 447 patients who underwent major cardio-vascular surgery¹¹.

Our study is retrospective; our control study groups were not matched in number, age, sex or by grade of surgery which could have influenced our test of significance. We found a

relatively high number of abnormal results in the “test not indicated” groups, because we followed our local hospital definitions of abnormal results, rather than the more practical “action limits”. We also considered total test result as abnormal when any component of the test breached the reference value. For instance, we labeled CBC as abnormal when any one of hemoglobin, WBC or platelet count was abnormal. As such, very few actual interventions were needed for these abnormal results. On the other hand, non-standardization of intervention increased the number of observed changes of management in the electrolyte group.

In summary, grossly we could not appreciate any special clue or danger in our population (Saudi Arabia and Gulf region) to carry on with the same traditional practice and our results should once again remind the entire world to be rational in ordering pre-operative laboratory investigations.

CONCLUSION

It can be suggested based on our findings that routine preoperative laboratory tests can be eliminated by careful history and clinical examinations without endangering patient’s life or adversely affecting the outcome. We hope that concerned physicians and authorities will adopt the evidence-based practice in this regard, to ensure more efficient preoperative care of patients.

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