Patients undergoing blood tests before minor/moderate trauma surgery: a retrospective review

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Summary

Objective The aim of this study was to establish the number of unnecessary preoperative blood tests undertaken on ASA Grade 1 patients undergoing minor/moderate orthopaedic trauma surgery.

Design Review of all ASA1 patients who had been operated on the trauma lists for three consecutive months.

Setting UK Teaching Hospital.

Participants Patients with ages ranging between 16 and 60 years, and undergoing a minor or moderate trauma operation.

Main outcome measures The type and number of blood tests were established and any abnormal results were checked for clinical significance and whether the result altered patients’ management. The cost of each blood test was calculated so that potential savings could be identified.

Results A total of 127 patients (60 males, 67 females, average age 34) fulfilled our inclusion criteria. Ninety-five patients (75%) had either one or more preoperative blood tests of which 41% were abnormal but of no clinical significance.

Conclusion From the results of our study, we conclude that preoperative blood tests are unnecessary in Grade 1 ASA patients undergoing minor/moderate orthopaedic trauma surgery. Unnecessary blood tests can waste time, money, resources and overburden laboratory staff.

Introduction

Although the National Institute for Health and Clinical Excellence (NICE) has published recommended guidelines for the use of preoperative blood tests for elective surgery,1–3 no such guidelines exist for patients undergoing orthopaedic trauma surgery.1

Several studies have investigated the role of preoperative laboratory tests in elective
surgery. However, less evidence is available in regard the use of these tests in minor emergency or trauma surgery.

We believe that blood tests requested for patients undergoing orthopaedic trauma surgery are often requested from the Accident and Emergency Unit by junior staff with little thought to their relevance, producing unnecessary work for the laboratories, and a significant cost to the hospital.

Our study concentrated on ASA (Physical Classification System of the American Society of Anaesthesiologists) Grade 1 patients as we believe these patients are subjected to the majority of unnecessary blood tests. The aim of this study was to establish the number of unnecessary pre-operative blood tests undertaken on ASA Grade 1 patients undergoing minor or moderate orthopaedic trauma surgery.

Patients and Methods

A retrospective review of all Grade 1 ASA patients undergoing preoperative blood test prior to receiving minor or moderate orthopaedic trauma surgery was carried out. We included patients with ages ranging between 16 and 60 years, and undergoing a minor or moderate trauma operation on the trauma lists for three consecutive months. ASA1 is defined as ‘a normal healthy patient i.e. without any clinically important comorbidity and without a clinically significant past/present medical history’. The classification of operation complexity of minor or moderate surgery was based on our theatre operative classification system. The exclusion criteria are summarized in Table 1.

The interpretation of the tests results was based on the range of normal values recommended by the Laboratory Medicine Department of our hospital. The type and number of blood tests were established and any abnormal results were checked to see whether the result were significant. A significant abnormal result was defined as that which led to a change in patient management or related to a postoperative adverse event.

The cost of the blood tests has been calculated by the Business and Administration Department of Laboratory Medicine Department in our hospital. The calculated cost includes both the cost of processing these tests and the cost of the manpower. It was not possible to calculate the additional costs of consumables such as syringes, bottles and needles due to the retrospective nature of the study. But it is presumed if included, this would increase the total estimate of cost.

Results

We reviewed 494 patients of which 127 (60 males, 67 females, average age 34) fulfilled our inclusion criteria. The types of operations are summarized in Table 2.

| Type of operation                                            | Number of patients |
|--------------------------------------------------------------|--------------------|
| Open reduction and internal fixation (ORIF) of an ankle fracture | 27 patients        |
| Open reduction and internal fixation (ORIF) of the distal radius fracture | 16 patients        |
| Manipulation under general anaesthetic (MUA) with k-wire fixation of either metacarpal bone or phalanx fractures | 22 patients        |
| Repair of a rupture Achilles tendon                          | 7 patients         |
| Open reduction and internal fixation (ORIF) of clavicle fracture | 9 patients         |
| ORIF elbow, ORIF tibia plateau, carpal tunnel decompression, incision and drainage of abscess, MUA with plaster application for ankle, repair of tendon, ORIF Patella and ORIF ulna | 46 patients        |
| Total                                                        | 127 patients       |
Ninety-five patients (75%) had either one or more preoperative blood tests (Figure 1). It can be seen from Figure 2 that 67% of Full Blood Counts and 93% of the Urea and Electrolyte tests were normal.

The thirty-two patients (25%) who did not have preoperative blood tests proceeded with their operations. None of the patients had an adverse event or a delay in the course of the treatment due to the lack of the routine preoperative investigations.

The total cost of processing the requested tests including the cost of staff working in performing these investigations was £3961.

**Discussion**

In our study, 75% of Grade 1 ASA patients undergoing minor/moderate orthopaedic trauma surgery had a preoperative blood test of which 59% were normal and any abnormal results (41%) did not change patient management nor required treatment. Other studies have also shown that a high percentage of preoperative blood tests do not change medical management.9–12

The abnormal results from the blood counts tests were mildly raised white blood cells or platelets. No patient was found to have anaemia, coagulopathy or infection. The abnormal biochemistry results were very marginal from the normal values and did not help in establishing new medical diagnosis for any of the patients.

The explanation of these abnormal results in ASA1 patients are due to several factors; first the normal range of values of most blood tests includes only 95% of the healthy population. Based on this fact, Valchanov and Steel explained that as more tests are performed on healthy individuals, more abnormal results will be seen.8 The false positive results are another reason beyond these abnormal results.8

Munro, Booth and Nicholl conducted a systematic review on the evidence of routine preoperative testing. They concluded that the probability of identifying adverse outcomes in asymptomatic patients through routine preoperative investigation is either weak or non-existent. They also suggested that the clinical value of the abnormal results is uncertain and might never change the clinical management.4

While the results from our study advise to avoid the use of a routine investigation for ASA1 patients who are undergoing minor surgery, the clinical judgement will always be required.7,13 For instance, the ASA1 patient who looks pale or has a family history of haemophilia might need investigations to assess their medical condition and their fitness prior to surgery.

A previous prospective study by Roux et al assessed the value of preoperative tests on fifty trauma patients. They concluded that beside the clinical examination, the arterial blood gas is the most useful test. However, in their review they included patients with variable ASA grades and different complexity of surgery.14

Large numbers of unnecessary blood test can waste time, money, resources and overburden the laboratory staff. Time waiting for unnecessary blood tests can interfere with the smooth running of theatres and delay patients.5 We have calculated that £3961 could have been saved in the 3-month time period of our study. In addition to the cost saving above, staffing levels in the laboratories could be reduced if only indicated blood tests were carried out.

A blood test is an invasive procedure and as well as patient morbidity, unnecessary venesection increases the chance of needle stick injuries amongst clinical staff.2,8

The main limitation of our study is the retrospective nature which implies abnormal results might lead to a change in the patient management pathway without being necessary documented in the medical notes. We have also not included those patients with possible sickle cell disease in whom a specific test might decrease perioperative
morbidity. However, patients who are known to have sickle cell disease are classified as ASA2 or 3 and have thus been excluded from the cohort of this study.

**Conclusion**

From the results of our study, we conclude that preoperative blood tests are unnecessary in Grade 1 ASA patients undergoing minor orthopaedic trauma surgery. However, a large sample size prospective trial is recommended in order to establish national guidelines.

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