Are We Justified in Doing Blood Tests 'Routinely' For All Neurosurgical Patients?

Abstract:

J O'Grady, C McCarthy, C Kaliaperumal, J Marks, G Kaar, M O'Sullivan
Neurosurgery Department, Cork University Hospital, Wilton, Cork

To ensure continuing patient care in a cost effective and efficient manner and to determine the importance of routine pre-op bloods in patients undergoing spine surgery, a retrospective audit of 170 patients was carried out in the Neurosurgery Department at Cork University Hospital. There were 94 males and 76 females. No test had less than 87.4% normal results. 17 (10.7%) abnormal haemoglobin levels, 13 (8.2%) abnormal white cell count levels, 14 (8.9%) abnormal creatinine levels and of sodium and potassium levels, 5 (3.2%) and 3 (2%) were abnormal respectively. Of the abnormal results, the majority fell close to reference range. 95% of the total cost incurred in performing the procedure was attributed to normal blood results. Abnormal blood results in this cohort of patients did not alter management. We conclude that routine blood tests, including coagulation screen, may not be necessary in healthy individuals undergoing elective spine surgery.

Introduction

Patients undergoing surgical intervention require medical work up and evaluation prior to a planned procedure. This is wide and varied starting from the need for the surgery to general fitness of the patient. Anaesthetists play a key role as a part of the team and also in planning the modality of anaesthesia for a specific procedure with the adjunct of relevant investigations. While there are often protocols in place to determine the need for tests such as electrocardiograms and chest radiographs, blood tests are often carried out as a routine investigation as a part of pre-assessment for surgery. Delahunty et al three decades ago began questioning the need for pre operative blood test for patients undergoing surgery. Pre operative bloods and the difference they make to management were analysed in their study. While there were abnormal results detected, it was found that the management was not altered in any case due to the blood testing. Greer et al suggested that routine pre operative bloods are not required for those patients who are clinically well and asymptomatic. They also recommended guidelines should be developed based on international best practice standards with adjustment for local comorbidities in order to reduce the incidence of over investigation.

Rohrer et al have shown that preoperative screening tests for clotting disorders that were not suspected on the basis of detailed history and examination are unnecessary and not recommended to be carried out routinely. This should not lead to an incidence of under investigation however.

Further studies have shown that performing routine screening tests in patients who are otherwise healthy is invariably of little value in detecting diseases and in changing the anaesthetic management or outcome. In paediatric age group, it has been shown that the value obtained from pre operative blood testing in some procedures is small when compared with the stress caused by obtaining these bloods. Rather than carrying out routine blood testing, the emphasis should be placed more on thorough history taking and examination with follow up of positive answers in detail. It may be more appropriate to carry out blood tests based on estimated surgical blood loss and the patients healthcondition. Thorough clinical assessment is a prime factor inpatient’s preoperative assessment and this is followed by investigations in necessary patients established from the study by Shah et al. It has been shown, by Kumar et al., that tests ordered when abnormal are not helpful in predicting peripertative complication and seldom influence anaesthetic management. It is suggested that abnormal results, when detected, are often ignored and clinicians proceed without pursuing them. This audit has been carried out to evaluate how often these preoperative blood tests reveal abnormalities, defined as those that fall outside the standard reference ranges. It was aimed to evaluate the cost incurred in performing blood tests which were essentially normal.

Methods

For the purposes of this audit, 170 patients who underwent elective spine surgery in Cork University Hospital during a three month period were analysed. This was so as to have a sufficient data set to provide data. All of those who underwent a spinal operation during this period were first admitted to the neurosurgery ward where they were worked-up for theatre. This included a thorough history taking followed by physical examination, an ECG, a chest X-ray and blood tests to include full blood count, urea, creatinine and electrolytes and a coagulation screen. While there were criteria for performing a 12-lead ECG and ordering a chest X-ray, blood analysis was performed as a routine procedure.

This audit looks specifically at the pre-operative blood results from the samples obtained from our patient cohort. The blood results were gathered from the computer system used to report blood results in the hospital. These patients ranged in age, and as only gender and age were used as demographic variables for this audit, blood results that were recorded include haemoglobin, white cell count, platelet count, urea, creatinine, potassium level, sodium level and INR (international normalised ratio). The INR was chosen for ease of understanding. It should be noted that this takes only certain clotting factors into account, namely factors II, VII, IX, X and fibrinogen. Also of note is that the references ranges used, while standard, are based on 95% confidence intervals. These definitions suggest that up to 5% of patients would be abnormal for any of these tests and vice versa (?). Statistical analysis was carried out using SPSS software. As previously stated, gender and age were the only demographic variables recorded to ensure patient anonymity. The other variables were categorised according to the standard references ranges, some being gender dependant.

Results

Among the 170 patients analysed 94 were male and 76 were female. Their age ranged from 19 to 84 years. The representation according to age group is depicted in Fig.1. Of the sample, 11 patients did not have a full blood count taken, 13 did not have samples for urea and electrolyte and 17 patients had no coagulation screen done. Table.1 summarises the investigations performed.

Age

The data showed that younger patients were less likely to have a coagulation screen performed. In this category, 12 patients under 50 years of age did not have this test compared with 5 over the age of 50. No statistical difference was detected when the lab values were compared according to age for any of the lab investigation carried out.

Figure 1
Gender
No statistical differences were detected for white cell count, platelet count, INR, potassium or sodium levels. Males tended to have a higher urea count than females, with 14 of the males having a urea level above the reference range compared with 5 of the females. The reason for this abnormality in both the sexes may be because of their admission on the day of the procedure following fasting from mid-night.

Full Blood Count
A total of 159 full blood counts were carried out. Haemoglobin results are shown based on reference range according to gender. Of the 94 males, 79 fell within the reference range, with 8 recording levels below the standard reference range. 7 had no FBC performed. The lowest haemoglobin level for the male group was 9.3 g/dl. Of the 76 females, 63 fell within the reference range, with 8 below and 1 above the reference range. 4 had no FBC performed. The lowest value for the female group was 9 g/dl. The results for white cell counts showed, of the 159 performed, 146 within the normal reference range. 11 results were greater than the reference range with 2 results below this level. The lowest value recorded was 3.9 x10^9 while the highest was 16.1 x10^9. Of the 159 platelet results, 1 was not suitable for platelet evaluation according to the laboratory. 153 fell within the reference range with 3 results less than this and 2 greater than. The lowest value was 131 x10^9 and the highest recorded 477 x10^9.

Urea, Creatinine and Electrolytes
A total of 157 biochemistry blood tests were performed among the study group. Creatinine results are divided according to gender due to the different reference ranges for males and females. There were 87 males and 70 females with valid creatinine levels. Of the male group, 76 had normal test results, with 11 abnormal values. The range of values was 54 to 144 µmol/L. For the female group, there were 67 creatinine levels that fell within the normal range, with 3 outside this. The range of values was 42 to 100 µmol/L. Urea results showed 138 within normal range, with 19 above this range. The highest value found was 13.1mmol/L. Sodium levels, of the 157 tests performed, show 152 results within the normal range while the other 5 were below this range. The lowest value was 132mmol/L. Of the potassium levels, 154 were found to be within the normal range. Of the other results, 1 was below the reference range and 2 above it. The lowest and highest values were 3.4mmol/L and 6.6mmol/L. The other abnormal value was 5.6mmol/L.

Coagulation screen
Of the sample of patients, 17 did not have a coagulation sample analysed. Of the others all 153 had an INR result within the normal range. It should be noted that his study did not look at the number of patients on anticoagulants and looked only at the number of normal versus abnormal INR results.

Financial Statistics
The cost of the laboratory tests performed was € 6115. The cost of performing full blood count at the CUH is € 16, a biochemistry sample costs €13 and an INR test is € 10. Of the tests performed, the cost of the essentially normal results was € 5805, which is 95% of the total cost spent for the lab investigation. This excludes the cost of the necessary equipment needed to perform the tests and also the unnecessary waste of time and effort in performing the tests.

Discussion
This study shows that, of all tests performed, between 87.4% and 100% displayed results within the normal reference range. Of the abnormal results, the majority fall close to standard reference ranges. Few of the abnormal results would have required further treatment at the time. But all the patients underwent surgical procedure successfully irrespective of the abnormality as they remained clinically well. We also would like to emphasise the need for thorough clinical examination for the preoperative patients and by doing so the patients can be chosen appropriately for the necessary hematological investigations. It is difficult to stop performing the essential investigations by formulating strict a clinical guideline as patients disease and presentation varies. Based on the results of this audit, we have changed our departmental practice of not doing routine hematological investigations unless there is a need to perform one. This is backed up by results of referenced studies and recommendations of American Society of Anesthesiologists’. A re-audit is planned in 6 months time to see if the changes have affected the clinical outcome. Alterations to the guidelines as to who warrants blood testing could be introduced on a trial basis to evaluate if any adverse patient
outcomes are detected and if money can indeed be saved in this way. This study suggests that routine coagulation screen may not be indicated for elective spine surgery unless there is a strong indication for performing one.

Correspondence: J O'Grady
Neurosurgery Department, Cork University Hospital, Wilton, Cork
Email: jogrady@live.ie

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