

To: Gazi Medical Journal

Dear editor,

Our manuscript entitled “Remembering the importance of an old friend: History taking in preoperative evaluation of children” has been revised according to the reviewers’ suggestions. The changes have been presented throughout the text in red coloured and the marked copy has been sent seperately. The changes, answers and explanations could be found below. The authors are thankful to the reviewers and believe that their comments have been very helpful in improving the manuscript.

Reviewer 1:

Önerileriniz için çok teşekkür ederiz.

3. Başlık önerildiği gibi değiştirilmiştir.

4-5. Preop tetkiklerin cerrahlar tarafından istenip pediatri tarafından değerlendirildiği yöneme eklenmiştir ve bu nedenle grade 1 hastalarda da tetkiklerin tamamı yapılmıştır.

6. Bu nokta özellikle üzerinde durmak istediğimiz kısım olduğundan vurgulamanız için teşekkür ederiz, bu vurgu tartışmaya eklenmiştir.

7. BK ve idrar tetkiklerinin yeri preop tetkiklerde yoktur, ancak bunlar ne yazık ki hastalarda tüm tetkikler baştan sona istendiği için istenmiştir. Bu durum da tartışma kısmında vurgulanmıştır.

8. Tablo 1 önerildiği gibi değiştirilmiştir.

9. Konu ile ilgili ulusal çalışmalar eklenmiştir.

10. Sonuç kısmı özellikle gereksiz tetkik ve maliyet vurgusu ile net haline getirilmeye çalışılmıştır.

Reviewer 2:

Thank you for your suggestions.

As all the preop lab tests had been used to be ordered by the surgeons, especially hepatitis markers were ordered to be safe during surgery.

Ulker Kocak, M.D.

**Remembering the importance of an old friend: History taking in preoperative evaluation of healthy children- A Single Center Experience**

Şule Toprak M.D\* Pediatrician

Ülker Kocak M.D\*\* Professor of Pediatric Hematology

Emine Dibek Mısırlıoğlu M.D\*\*\* Associate Professor of Pediatrics

Cihat Şanlı M.D\*\*\*\* Assistant Professor of Pediatric Cardiology

Meryem Albayrak M.D\*\*\*\* Associate Professor of Pediatric Hematology

Hülya Başar M.D\*\*\*\*\* Associate Professor of Anesthesiology

From Kırıkkale University, Medical School, Departments of Pediatrics and Anesthesiology

The authors are currently working in;

\* Nevşehir State Hospital, Nevşehir, Turkey

\*\* Gazi University, School of Medicine, Department of Pediatric Hematology, Ankara, Turkey

\*\*\* Sami Ulus Çocuk Hastanesi, Turkey

\*\*\*\* Kırıkkale University, School of Medicine Department of Pediatrics

\*\*\*\*\* Ministry of Health, Ankara State Hospital, Ankara, Turkey

**CORRESPONDENCE TO:**

Ulker Kocak, M.D.

Mail Address: Ozvatan Sok. Terasevler 31/3, Cankaya, Ankara, 06540, Turkey

Phone: 90-312-2026015

Fax: 90-312-2134970

E-mail: [ulkerkocak@gazi.edu.tr](mailto:ulkerkocak@gazi.edu.tr)

## **ABSTRACT**

**Objective:** To investigate, the consequences of routine laboratory tests that lead to surgical delay or high cost in patients with normal medical history and physical examination who undergo minor surgical interventions.

**Patients and Method:** Files of 1322 patients aged between 0-16 years that had undergone elective surgical intervention within 6 years were reviewed.

**Results:** One thousand two hundred and forty six children (94.3 %) had normal physical examination and laboratory findings. Seventy six children, who had abnormalities in laboratory findings and physical examination, were referred to pediatrics. Forty two (55.3 %) of 76 children were reevaluated and had been diagnosed with upper respiratory tract infection (n: 23; 30.2 %), iron deficiency anemia (n: 5; 6.5 %), innocent murmur (n: 4; 5.3 %), thalassemia minor (n: 2; 2.6 %), lower respiratory tract infection (n: 2; 2.6 %), urinary tract infection (n:1; 1.3 %), mumps (n: 1; 1.3 %), acute gastroenteritis (n: 1; 1.3 %), minimal aortic and tricuspid valve insufficiency (n: 1; 1.3 %), minimal aortic stenosis (n: 1; 1.3 %), atrial septal defect (n: 1; 1.3 %). Surgical interventions were delayed, until the recovery of infectious diseases. In 25 patients repeated tests showed normal ranges for the second time, however in 9 patients increased or decreased numbers of white blood cell counts were constantly found in whom medical history and physical examination revealed signs and symptoms related to infection

**Conclusion:** Routine laboratory tests contribute little to preoperative evaluation of children with normal history and physical examination undergoing low grade surgery.

**Key Words:**

Preoperative evaluation, children

## **INTRODUCTION**

Preoperative evaluation should be performed by a pediatrician and/or specialized anesthesiologist before surgery. The objectives of preoperative evaluations are to determine and decrease anesthetic and surgical risk, to admit patients for surgery in the most appropriate conditions to lessen morbidity and mortality, to know baseline functions in order to compare with intraoperative and postoperative ones, to decrease the cost of postoperative care with increased quality, and to help patients return to their normal function in the shortest time and the best possible condition (1 - 10).

Laboratory test packages vary according to each clinic (1-7). However, limited use, costs and in particular false positive results lead to repetition of tests that also augment the costs. There is still no consensus about routine preoperative laboratory evaluations particularly in children with normal medical history and physical examination who undergo minor surgical interventions. Hemoglobin concentration, hematocrite, urine tests, serum electrolyte levels, coagulation tests, electrocardiography (ECG) and postero-anterior chest radiography are routinely ordered for preoperative evaluation in many clinics without any inquiry (1 - 7).

**The aim of this study is to find out the consequences of these routine laboratory tests that lead to surgical delay or high cost in patients with normal medical history and physical examination who undergo minor surgical interventions.**

## **PATIENTS AND METHOD**

Files of 1322 patients that had electively undergone grade 1 (skin biopsy, tooth extraction, simple suture) and grade 2 surgical intervention (gastrointestinal endoscopic evaluation, surgical tooth extraction, adenoidectomy, tonsillectomy, ear drum repair, circumcision) within 6 years were reviewed. This ~~arbitrary~~ time point was selected as this was the period that the majority of the authors (ST, UK, EDM, HB) worked in that center. The study was approved by the institutional review board of Kirikkale University School of Medicine (# 2011/0065).

Before these elective interventions complete blood count (CBC), blood chemistry, urinalysis, urine culture, throat culture, hepatitis markers, blood group, PT, aPTT, bleeding time, electrocardiography (ECG), postero-anterior chest radiography were ~~performed~~ **used to be** routinely ~~ordered~~ **ordered** in every children **by the surgical departments** in our center **and referred to pediatrics where eventual evaluation was performed.** Medical history and physical examination findings, diagnoses, results of the preoperative laboratory tests and repeated tests **done in pediatrics** were recorded. Blood samples were tested by autoanalyzers. Electrocardiography (ECG) (Standard 12 derivations and V4R) performed with Cardioline Digital Electrocardiograph. A pediatric cardiologist performed echocardiography in children with a heart murmur.

Descriptive statistics were used to analyze data in computerized SPSS program version 12.0.

## RESULTS

Mean age of 1322 patients [793 male (59.9 %), 529 female (40.1 %)] was  $5.7 \pm 2.3$  years (5 months- 16 years).

One thousand two hundred and forty six children (94.3 %) had normal physical examination and laboratory findings. The rest of the patients (n: 76, 5.7 %) were consulted to pediatrics either with complaints (fever, ear pain, sore throat, nasal discharge, cough, diarrhea or vomiting) or pathologic findings in physical examination (oral aftous lesions, lymphadenopathy, tonsillar-oropharyngeal hyperemia and/or presence of crypts, rales, ronchi, murmur) or abnormal laboratory findings [low hemoglobin level, thrombocytopenia, leukocytopenia, leukocytosis, increased bilirubine, alkaline phosphatase, alanine aminotransferase (ALT) and aspartate aminotransferase (AST) levels, abnormalities in urinalysis, slightly prolonged prothrombine time (PT) and prolonged activated partial thromboplastin time (aPTT)]. In our study 76 patients with abnormal physical findings and/or laboratory results were referred to pediatrics. **When** leukopenia or leukocytosis, thrombocytopenia, elevated liver function tests, proteinuria and prolonged PT and aPTT were examined again, the results of repeated tests confirmed normal ranges in 25 patients (Table 1). Of the remaining 9 patients increased or decreased numbers of white blood cell count or **decreased hemoglobin** were found. However, medical history and physical examination of these patients, revealed signs and symptoms related to infection. ~~More sophisticated~~ Further tests were performed to diagnose iron deficiency anemia, cardiac disease and thalassemia minor. Surgical interventions had been delayed because of these tests. The diagnoses that were determined before surgery had not caused any complications during the postoperative period (Figure 1, Table 1).

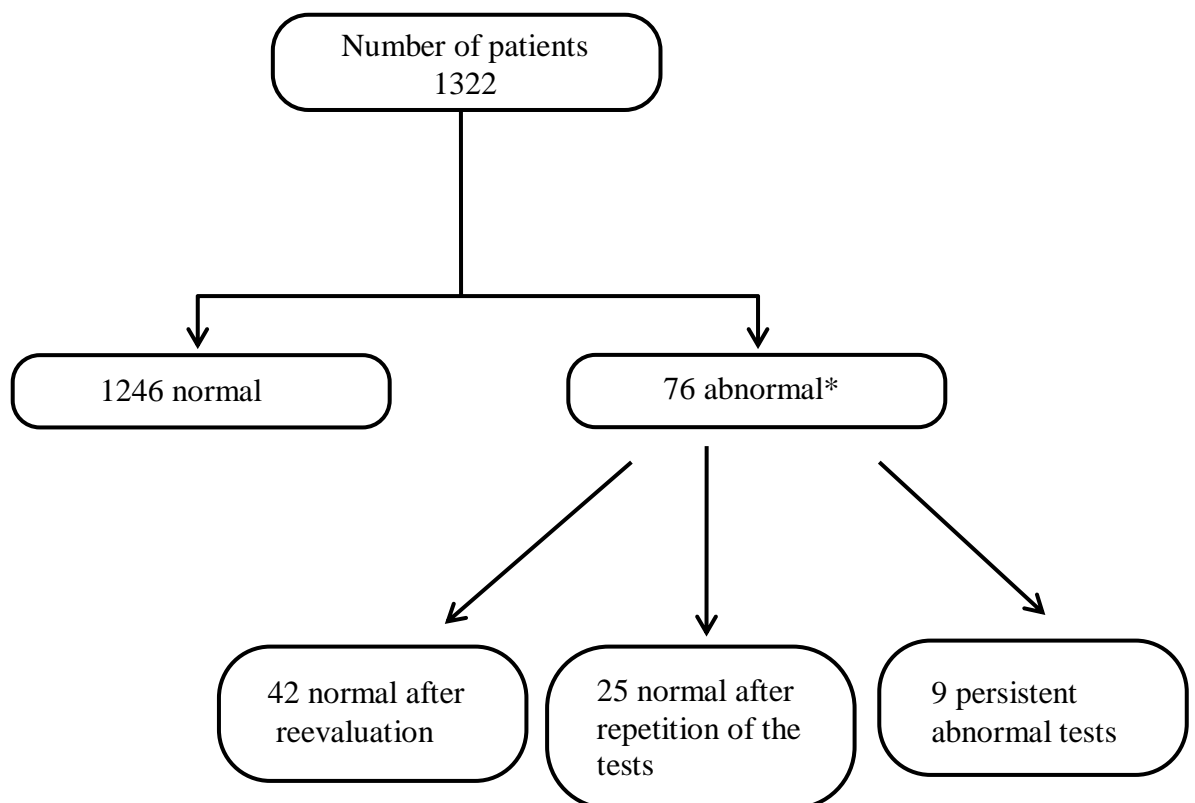


Figure 1. Flow diagram illustrating the patients.

\*Abnormal physical examination and/or laboratory results

**Table 1:** Diagnoses of patients consulted to pediatrics (n: 76)

<b>Diagnosis</b>	<b>n*</b>	<b>%**</b>	<b>%***</b>
Upper respiratory tract infection	23	30.3	1.73
Lower respiratory tract infection	2	2.6	0.15
Mumps	1	1.3	0.07
Acute gastroenteritis	5	6.6	0.37
Urinary tract infection	6	7.8	0.45
Cardiac findings****	7	9.2	0.5
Iron deficiency anemia	12	15.7	0.9
Thalassemia minor	2	2.6	0.15
Total	42	55.3	3.2
<b>Laboratory test †</b>	<b>n † †</b>	<b>Abnormalities † † †</b>	
Hemoglobine (gr/dl)	6	10.8 -11	
WBC (x10 <sup>3</sup> /ml)	10	< 3.5 or > 11	
Number of platelets (x10 <sup>3</sup> /ml)	1	120	
Urine Analysis	1	Proteinuria (trace)	
AST (U/L)	1	58	
ALT (U/L)	1	61	
Total and direct bilirubine (mg/dl)	1	2.08 /1.1	
Alkaline phosphatase (U/L)	1	821	
Prothrombin Time (sec)	1	14.4	
Activated thromboplastine time (sec)	2	42.8	
Total	25		
<b>Persistently Abnormal Tests</b>			
WBC (x10 <sup>3</sup> /ml)	7	< 3.5	
WBC (x10 <sup>3</sup> /ml)	2	> 11	
Hemoglobine (gr/dl)	2	10.8 -11	
Total	9		

\*Some patients have more than one abnormalities either on physical examination or laboratory

\*\*Percentage of the patients according to diagnoses

\*\*\* Percentage of patients among the study group

\*\*\*\*Aortic and tricuspid valve insufficiency, aortic stenosis, atrial septal defect, innocent murmur

† Results of repeated tests.

† † Number of all patients who had abnormalities in laboratory tests

† † † Results of patients who had been consulted due to abnormalities in laboratory tests

## DISCUSSION

Preoperative evaluation is essential in patients who would undergo anesthesia or sedation. However the evaluation should be based on medical history and physical examination findings rather than laboratory tests particularly in minor surgeries as the usefulness of the routine laboratory tests are uncertain. However most surgeons continue to order them in order to ~~stay in the safe side~~ be safe although routine tests are expensive and rarely change perioperative management. Abnormalities are frequently insignificant or cause delay in admittance to surgery (8 - 13).

In our study 76 patients with abnormal physical findings and/or laboratory results were referred to pediatrics. Forty two patients were found to be suitable for minor surgery at the time of referral since diagnoses like iron deficiency anemia, aortic and tricuspid valve insufficiency, atrial septal defect and thalassemia minor or laboratory abnormalities like trace proteinuria or slightly elevated liver function tests had no effect on the decision of neither anesthetic methods nor surgery. When leukopenia or leukocytosis, thrombocytopenia, elevated liver function tests and prolonged PT and aPTT were examined again, the results of repeated tests confirmed normal ranges in 25 patients (Table 2). Of the remaining 9 patients increased numbers of white blood cell count ( $>11 \times 10^3/\text{ml}$ ) were repeatedly found in two patients. Both of these patients had cryptic tonsillitis and in one of them, beta-hemolytic streptococci were isolated. Surgery was postponed in these patients until the end of penicillin treatment. Leukopenia ( $< 3.5 \times 10^3/\text{ml}$ ) was also persistently noticed in seven patients who had been diagnosed with either respiratory tract infections or acute gastroenteritis probably of viral origin. Although these patients had been treated before they were admitted to surgery, no substantial delay was recorded as, medical history and physical examination of these patients, revealed signs and symptoms related to infection. O'Connor et al (14) retrospectively reviewed the records of 486 elective surgeries in children to determine the role of abnormal preoperative laboratory test results in the perioperative management. Only in five children (1 %) surgery was cancelled due to abnormal laboratory tests: two due to anemia, two to an abnormal urine analysis (UA), and one because of a prolonged partial thromboplastin time. Both children with anemia had been treated with iron throughout two months and subsequently underwent surgery without any complication. Of the abnormal urine analyses, one had been contaminated, and the cancellation of surgery resulted in a complication requiring emergency surgery. The other abnormal UA was a probable asymptomatic bacteriuria, and the infant later underwent surgery uneventfully (14).

American Academy of Pediatrics disapproves the order of a routine chest X-ray before surgery, since considerable information is rarely possible when there are no positive findings in history and physical examination. This approach also saves children getting exposed to radiation and helps saving time and money (14). Our findings are also consistent with them.

INAHTA (International Network of Agencies for Health Technology Assessment) synthesis report limits preoperative tests to special age groups which are almost always beyond childhood or conditions deserving particular attention (chest X-ray for patients over 60 years of age or with a body mass index over 30 and for patients smoking over 20 cigarettes a day; ECG for patients over 60 years of age, or for those between 40-60 years who had never had an ECG; CBC for newborns, patients over 60 years, fertile women and those who are expected to bleed more than 500 ml during the operation; coagulation tests for those who had a history of coagulation problems; and BUN, creatinine and glucose levels for patients over 40) (15). Van Klei et al suggested that routine preoperative tests for patients below 60 years is not necessary because of its so limited usefulness and that false positive outcomes lead to repetition of tests which produce extra problems (16).

In a retrospective study, the data of 10656 patients between 15 days and 17 years of age who were admitted to minor surgery were reviewed. The study group was divided into two groups



in which group A includes 1884 children who underwent routine preoperative laboratory tests whereas group B includes 8772 children in whom preoperative, selected laboratory tests were performed only when the child's history and/or clinical examination suggested any abnormalities. Complications in group A were not related to abnormal test results and in children with normal history and physical examination, it seems that costs and anxiety of the family and the child could be reduced if unnecessary preoperative tests are not performed (147).

In Mayo Clinic, preoperative tests are not performed in healthy patients (by history and physical examination) since 1994 (18).

NICE (National Institute for Clinical Excellence) published clinical guidelines for preoperative evaluation in 2004. They suggested that for ASA class 1 and Grade 1-2 surgical groups, chest X-ray, ECG, CBC, coagulation and renal function tests, determination of glucose level, urine analysis for patients aged between 0 and 16 years are not necessary. However, for ASA class 1 and grade 3-4 surgical groups, NICE recommends preoperative chest X-ray, ECG, coagulation tests, however they suggest that CBC, renal function tests, determination of glucose level, urine analysis should be performed by the clinician's decision. If patients are admitted for neurosurgery, preoperative chest X-ray, ECG, measurement of glucose level are not suggested, however renal functions should be examined. On the other hand, if a cardiovascular surgery would be performed preoperative chest X-ray, ECG, CBC, renal function tests must be evaluated. Nevertheless there is neither a certain opinion nor a consensus about performing coagulation tests and urine analysis on these occasions (7).

Routine preoperative tests performed in our clinic were found to cost 200-250 TL per patient in 2004. This significant amount should be taken into consideration when ordering preoperative tests in a country in which ~~Department of Health~~ health budget is low like ours. In United States of America, in the patients with normal history and physical examination, with the precise order of laboratory tests \$100 per patient could be saved. In our country the cost of history and physical examination is 14.5 TL and it seems 185.5-235.5 TL per patient could be gained if not examined with unnecessary preoperative tests.

**Preoperative evaluation of pediatric patients who would undergo surgery is essential. However the methods that are used for this evaluation should be in reasonable order that consists of thorough medical history and detailed physical examination before performing laboratory tests. Besides the laboratory tests should be well planned and limited according to the risk during surgery.** When children are to be monitored for elective surgery it must be the pediatrician's mission to emphasize the importance and convince the surgeon of the value of precise history taking and physical examination. As most of the abnormalities in laboratory are usually independent of planning surgery, laboratory tests should be performed if clinically necessary and the cost of preoperative evaluation is to be reduced in minor surgeries. We believe that larger studies are warranted to assess the routine preoperative tests in the setting of our country's conditions.

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