

Clinical Utility of Screening Laboratory Tests in Pediatric Psychiatric Patients Presenting to the Emergency Department for Medical Clearance

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Study objective: We assess whether screening laboratory tests obtained to medically clear pediatric psychiatric patients altered management or disposition.

Methods: This was a retrospective chart review of consecutive patients younger than 18 years and presenting to an academic pediatric emergency department for medical clearance of an acute psychiatric emergency potentially requiring an involuntary hold (danger to self, danger to others, grave disability) from July 2009 to December 2010. Patients were identified by discharge diagnosis codes. History and physical examination and screening laboratory tests were reviewed for changes in management or disposition. Further analysis compared length of stay according to type of laboratory test performed. To avoid missing patients presenting with or for evaluation of an involuntary hold for whom an organic cause was diagnosed, charts with psychiatric chief complaints were reviewed for the same period.

Results: One thousand eighty-two visits resulting in 13,725 individual laboratory tests were analyzed. Of 871 visits with laboratory tests performed, abnormal laboratory tests were associated with 7 disposition changes (0.8%) and 50 management changes (5.7%) not associated with a disposition change. Twenty-five patients with noncontributory history and physical examination results had management changes, all non-urgent. One patient with a noncontributory history and physical examination result had a disposition-changing laboratory result, a positive urine pregnancy test. Patients who had any screening test performed had a longer length of stay than patients without testing (117 minutes longer; 95% confidence interval 109.7 to 124.4 minutes). In charts reviewed according to chief complaint, no patient was found to have an organic cause of their symptoms according to only screening tests.

Conclusion: Screening laboratory tests resulted in few management and disposition changes in patients with noncontributory history and physical examination results but were associated with increased length of stay. [Ann Emerg Med. 2014;63:666-675.]

Please see page 667 for the Editor's Capsule Summary of this article.

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INTRODUCTION

Background

Psychiatric patients are frequently screened in the emergency department (ED) for “medical clearance” to differentiate patients with organic disorders from those with isolated psychiatric disease. The challenge in the ED is to medically screen patients with apparent psychiatric complaints in an accurate, timely, and cost-effective manner.^{1,2} Decline in mental health service availability and funding, shortages in pediatric mental health providers, increased demand for services, and the 24-hour accessibility of the ED have all contributed to increased ED utilization by patients

with psychiatric complaints.³ Psychiatric visits to the pediatric ED have increased from 0.3% to 0.6% of total pediatric ED visits in the 1970s⁴ to 1.6% to 5% of visits in the late 1990s.^{3,5} Admission rates of psychiatric patients are double that of pediatric patients without mental health complaints.^{3,5,6} Pediatric and adult studies have shown significantly longer ED lengths of stay for psychiatric visits compared with nonpsychiatric visits. In pediatric studies, length of stay averaged 4.7 to 5.4 hours for pediatric psychiatric cases,^{7,8} and the mean length of stay for psychiatric patients was 61 to 772 minutes longer than for patients without psychiatric complaints.^{9,10} Prolonged ED stays contribute to ED crowding, are costly, and involve the potential risk of having aggressive or suicidal patients in unlocked facilities.^{7,8,10}

Editor's Capsule Summary*What is already known on this topic*

There is a dearth of studies on what tests, if any, are indicated for "medical clearance" of pediatric patients with acute psychiatric complaints.

What question this study addressed

More than 1,000 records of pediatric patients being screened for psychiatric admission were retrospectively reviewed to determine which screening tests, if any, are indicated for medical clearance.

What this study adds to our knowledge

Abnormal laboratory test results caused almost no disposition changes and few management changes, none of them urgent. Routine screening laboratory tests are unnecessary and increase already long emergency department lengths of stay by almost 2 hours.

How this is relevant to clinical practice

Pediatric medical clearance for psychiatric patients equals a good history-taking and physical examination.

indicated.⁷ An ED study of screening urine toxicology tests in pediatric psychiatric patients with uncomplicated presentations demonstrated no effect on management or disposition but a cost of USD \$154 per test and a mean elapsed time of 92.8 minutes for results.²⁰

Goals of This Investigation

Our hypothesis was that in the pediatric population, as in adults, clinically relevant laboratory test result abnormalities would be rare if the history and physical examination result did not indicate the presence of underlying medical conditions. Our secondary hypothesis was that the performance of screening laboratory tests would increase ED length of stay.

MATERIALS AND METHODS**Study Design**

This was a retrospective chart review of consecutive pediatric patients brought to the ED for danger to self, danger to others, or grave disability. All included patients were brought to the ED for either an involuntary psychiatric hold or evaluation for potential danger to self, danger to others, or grave disability. The history, physical examination, and each screening laboratory test result were reviewed to determine whether they contributed to changes in the management or disposition of the patient. This study was approved by the institutional review board of the University of Southern California. Court approval was obtained to include charts of subjects in custody of juvenile hall.

Setting

Our facility is an academic, inner-city, Level I trauma center with a dedicated pediatric ED (annual patient volume of 22,000) and a pediatric psychiatric department that is available for consultation on weekdays from 9 AM to 5 PM, with evenings and weekends covered by general psychiatrists. There is no inpatient psychiatric unit in this facility, and there is a large juvenile hall facility within a mile of the hospital. Our pediatric ED policy is for patients presenting on an involuntary psychiatric hold to have a psychiatric consultation and be medically cleared before transfer to inpatient psychiatric units. The majority of the facilities to which psychiatric patients are routinely transferred require some or all of the following screening laboratory tests as part of the "medical clearance" process: WBC and platelet count; levels of hemoglobin, sodium, potassium, chloride, bicarbonate, blood urea nitrogen, creatinine, calcium, glucose, total bilirubin, alanine aminotransferase, aspartate aminotransferase, and thyroid stimulating hormone; urine pregnancy test; rapid plasma reagent test; and urinalysis. Therefore, whether each patient received these screening laboratory tests depended heavily on the anticipated accepting psychiatric facility. Ordering of additional laboratory tests was at the discretion of the emergency physician, with the consultation of the psychiatrist. Although these additional tests, such as acetaminophen levels, were often included in the evaluation, they were driven by physician concern and not

Importance

Many organic conditions can have psychiatric manifestations. Given the wide differential diagnosis in patients with psychiatric complaints, providers often screen patients for medical illness by using laboratory tests, with an average of 5.1 tests per ED visit (range 2 to 9.4) in adults.¹¹ Performance of ED laboratory tests increases length of stay and medical costs.^{9,10,12-14} Multiple adult studies have demonstrated low utility of laboratory testing in psychiatric patients. In these studies, only 0% to 1.1% of laboratory test results were abnormal.¹⁵⁻¹⁸ A 2004 literature review found screening laboratory tests to be of low yield except in the elderly, substance abusers, patients without psychiatric history, and patients with comorbid medical disorders.¹⁹ In 2006, the American College of Emergency Physicians published a clinical policy recommending not performing screening laboratory tests in patients with normal history and physical examination results who were not in one of the above categories.⁶ To our knowledge, no similar guidelines have been published for the pediatric population.

The literature on pediatric screening laboratory tests is limited. Of 153 patients admitted to an inpatient adolescent psychiatric hospital, only 4 tests led to a management change, and all changes were nonacute.¹⁴ A prospective study of 200 pediatric ED psychiatric visits found no management changes based on laboratory test results unless the test was medically

included as part of a screening laboratory panel and thus were not the subject of this article. Also, each of these studies was ordered independently, rather than as a predefined panel of laboratory tests, with the exception of CBC counts and comprehensive metabolic panels. Timing of screening laboratory tests was largely independent of the patient and thus was not included in the analysis because the tests being ordered were based on the accepting psychiatric institution, with some providers ordering studies in anticipation of placement and others waiting until the facility had been assigned.

Selection of Participants

Electronic medical records of a consecutive sample of patients younger than 18 years, treated in the pediatric ED between July 2009 and December 2010, and receiving a psychiatric diagnosis were identified by *International Classification of Diseases, Ninth Revision, Clinical Modification* discharge diagnosis codes (Appendix E1, available online at <http://www.annemergmed.com>). To avoid missing patients initially presenting with psychiatric complaints for whom an organic cause was diagnosed, charts were reviewed if presenting complaint included the terms psych#, 5150 (indicating an involuntary psychiatric hold), suicidality, homicid#, danger, or depress# for the same period. Exclusion criteria included patient older than 18 years, repeated visits in the same period, medical charts with missing data, or purpose of the visit not related to potential danger to self or others or grave disability. Many of the psychiatric facilities accepted previous normal laboratory test results. To minimize potential bias introduced by this and to reduce intraparticipant correlation, all repeated visits during the study period were excluded from data analysis. The repeated visits were reviewed for medical management and disposition changes to ensure that none for organic causes were missed.

Methods of Measurement

Data collected included age, discharge diagnoses, arrival and departure time from the ED, disposition, receiving facility if transferred, emergency physician's history and physical examination results, each of the screening laboratory test results, and psychiatric hold criteria. A pediatric laboratory reference range was used to determine whether a laboratory test result was abnormal.²¹

Four unblinded reviewers independently reviewed the history, physical examination results, and each of the medical clearance screening laboratory test results individually to determine whether any one of the components altered medical management or disposition. If any abnormality was found, the chart, including psychiatry consultation notes, medical hold documentation, inpatient notes, additional laboratory studies, and radiologic studies, was examined for any documented tests, consultations, or treatments that appeared to be associated with the abnormality. Reviewers were trained by in-person instruction and given written guidelines to follow (Appendix E2, available online at <http://www.annemergmed.com>). There was 1 reviewer per medical visit.

In equivocal cases, 2 pediatric emergency medicine faculty members reviewed the chart and came to a consensus (fewer than 10 cases).

The standard management for our study was considered to be a history, physical and the listed screening laboratory results only; any deviation from the above (further laboratory tests, radiologic studies, nonpsychiatric subspecialty consults, outpatient follow-up, medications, and extended observation) was considered to be a change in management. Standard disposition was considered to be transfer to psychiatric facility, discharge home, or juvenile hall or admission for boarding; medical admission was considered to be a change in disposition. Management changes were considered urgent if further evaluation or treatment would be required to rule out a condition potentially leading to morbidity or mortality in the ensuing 30 days (infection, ectopic pregnancy, etc). Management changes were considered nonurgent if related to an underlying abnormality that might be treated or followed in a primary care setting but would not require immediate care to prevent untoward consequence (eg, mild anemia, incidental pregnancy).

Our primary outcome was identification of abnormal laboratory test results in the setting of a normal history and physical examination result, which was one that did not require any additional evaluation, treatment, or other management or disposition changes. Secondary outcome was ED length of stay based on type of laboratory test performed: blood draw, urinalysis, urine toxicology, or point-of-care urine pregnancy test. Disposition of patient was categorized as home, juvenile hall, inpatient psychiatric unit, boarded on pediatric ward, medical admission to pediatric ward, or transfer to another nonpsychiatric hospital for insurance reasons. Juvenile hall was considered distinct from home because it is a monitored and locked setting. Patients were assumed to be boarded on the pediatric ward if the ED documentation stated that they were medically cleared for psychiatric transfer but were admitted to an inpatient medical bed instead. Records from psychiatric facilities were not reviewed.

Primary Data Analysis

Data were collected in an Excel database version 14.1.4 (Microsoft, Redmond, WA) and translated into a native SAS format with DBMS/Copy (Dataflux Corporation, Cary, NC). Analyses were conducted with SAS (version 9.3; SAS Institute, Inc., Cary, NC). Length of stay is presented as medians with interquartile ranges and age is presented as means with 95% confidence interval (CI). Differences in the groups with respect to continuous variables are described as difference in the means and medians with 95% CIs. To obtain a κ coefficient of interrater reliability, 1 rater randomly selected 10% of the total data set ($n=104$) and repeated the data collection. The rater's results were compared with those of the original data collection (4 raters). The unweighted interrater reliability and agreement rate were calculated for the scores. Event rates of laboratory test-associated changes in the visits with normal history and physical

examination results were compared with those with abnormal history and physical examination results. Because of small cell sizes, *P* values were calculated with Fischer’s exact test.

RESULTS

During the study period, 1,640 potential medical visits were identified, 558 were excluded, and 1,082 were included in the analysis (Figure). One hundred fourteen medical charts, including 3 repeated visits, were excluded for missing data. There was no significant difference in the ED length of stay or disposition in the excluded patients compared with that of the included patient population. Excluded patients were significantly older than included patients (Table 1).

A total of 13,725 individual laboratory tests were reviewed. The most common disposition was boarding on the pediatric medical ward (46.1% of patients), followed by transfer to an inpatient psychiatric hospital (36.9% of patients), and the most common hold criterion was danger to self (51.7%) (Table 1). Laboratory tests were performed in 871 visits (80.5%). The κ coefficient for type of change associated with laboratory tests results between raters was 0.78 to 0.89 for blood tests, 0.47 for urinalysis, 0.89 for urine toxicology, and 0.89 for urine pregnancy

test, with an agreement of 88% to 95%, 65%, 95%, and 95%, respectively.

Seven of 871 (0.8%) medical visits with screening laboratory tests performed had at least 1 laboratory test abnormality associated with a disposition change, and 50 of 871 (5.7%) had a management change not associated with a change in disposition. Contributory abnormalities in the history and physical examination result were present in 25 of 50 laboratory test–associated management changes (50%) and 6 of 7 disposition changes (85.7%). Of the remaining 26 of 56 (48.2%) visits in which the history and physical examination result was normal, all laboratory test abnormalities were nonemergency management changes, with the 1 disposition-changing laboratory test being a newly identified positive pregnancy test result (Table 2). The documented reason for admission was pregnancy, and no significant findings were obtained during the patient’s medical admission. Three hundred of 1,082 medical visits (27.7%) resulted in further treatment and evaluation based on the emergency physicians’ history and physical examination results (Table 2). Because pregnancy tests are fairly standard in the evaluation of a patient who might receive psychiatric medications, a comparison of the changes with and without pregnancy tests is included in Table 2. Dispositions of visits with normal history

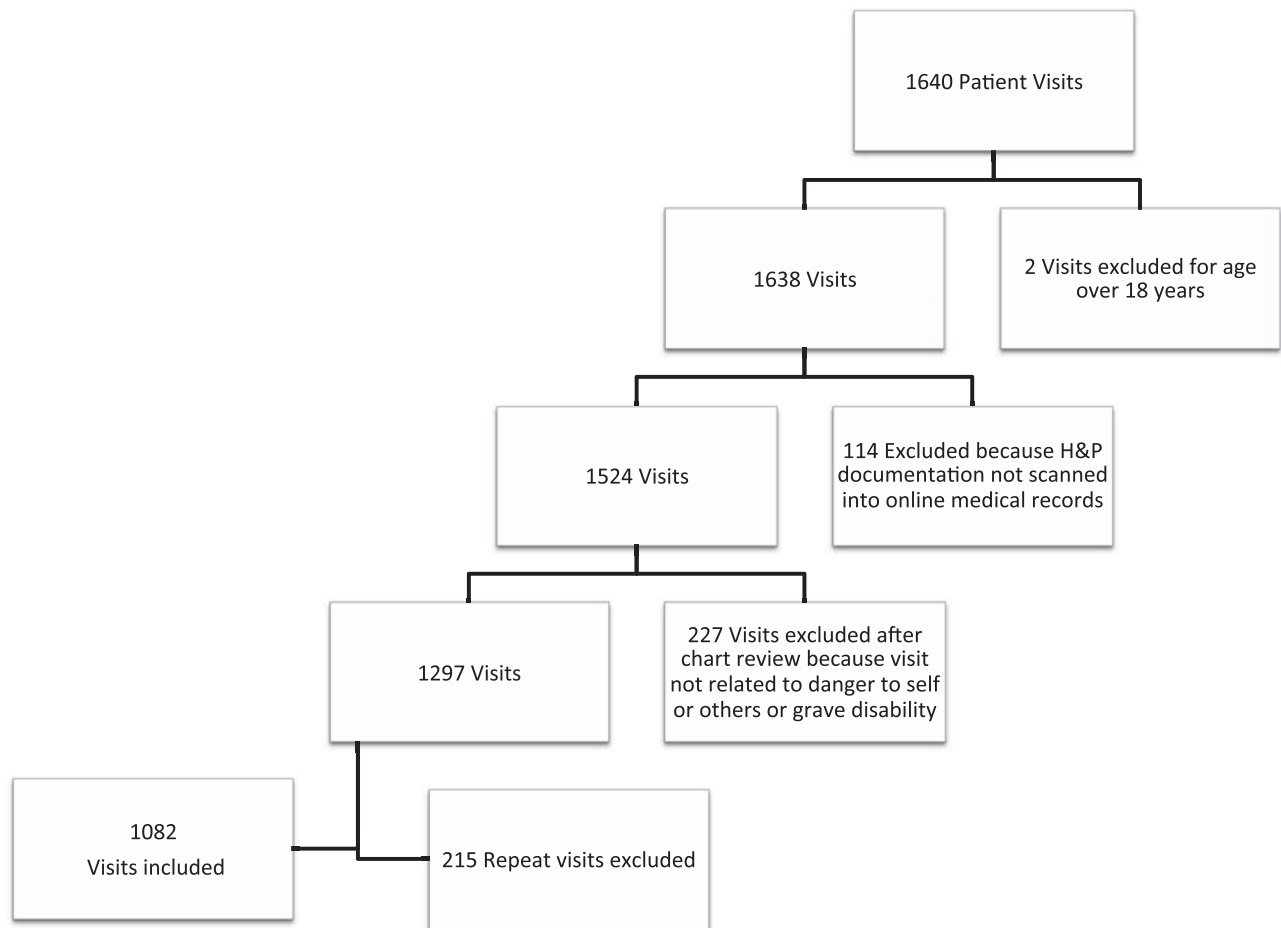


Figure. Patient selection.

Table 1. Patient demographics.*

Characteristics	Patients Included in Study	Patients Excluded for Missing Medical Record Components	Differences in 95% CI
Mean age (SD), y	14.3 (2.8)	15.1 (2.86)	-0.75 (-1.30 to -0.20)
Mean length of stay (SD), h	7.02 (3.92)	7.19 (3.74)	-0.17 (-0.94 to 0.59)
Number of patients	1,082	114	
Number of repeat visits excluded	214 (19.7)	3 (2.6)	
Disposition			
Home	88 (8.1)	6 (5.4)	
Juvenile hall	43 (4.0)	2 (1.8)	
Inpatient psychiatric hospital	399 (36.9)	36 (32.4)	
Admitted to pediatric ward	546 (50.5)	67 (60.4)	
Boarded on the pediatric ward	499 (46.1)		
Admission to pediatric hospital for medical reason	47 (4.3)		
Transferred to preferred provider (insurance reason)	6 (0.5)		
Hold type			
Danger to others	147 (13.6)		
Danger to self	559 (51.7)		
Gravely disabled	15 (1.4)		
Combination of hold criteria	261 (24.1)		
No hold placed/unknown hold type	97/3 (9.3)		

*Data are presented as No. (%) unless otherwise indicated.

and physical examination results or abnormalities not requiring any additional evaluation or treatment are included in Table 3.

Further analysis of specific laboratory tests revealed that the most commonly obtained tests were urine toxicology and serum electrolyte levels, with 788 (72.8%) and 776 (71.7%) performed, respectively (Table 4). The most frequent clinically important laboratory test abnormalities identified involved the urinalysis and hemoglobin level. Abnormalities in the urinalysis were associated with 28 (3.8%) management and 2 (0.2%) disposition changes in the 737 urinalyses performed (Table 5). The most common management changes were further evaluation of possible urinary tract infections and prescription of antibiotics (Appendix E3, available online at <http://www.annemergmed.com>), and the disposition changes were admission for intravenous antibiotics for pyelonephritis. Of the 28 patients with management changes based on urinalysis results, 17 (60.7%) had a normal history and physical examination result. Only 2 patients with abnormal urinalysis results had disposition changes (medical admission for intravenous antibiotics), and both had contributory abnormalities on history and physical examination. In 52 of 773 (6.7%) patients tested, the hemoglobin level result either changed management or was significantly abnormal, with no documentation of physician response in the medical chart, ie, those with microcytic anemia and an elevated RBC distribution width (Appendix E3, available online at <http://www.annemergmed.com>). One patient with an elevated hemoglobin level as a result of dehydration received intravenous fluids; the remainder of the hemoglobin-associated management changes were related to anemia. Of those 52 patients, 4 had abnormal history and physical examination results and 15 had management changes related to the anemia (further laboratory tests, outpatient follow-up, or prescription of iron) (Appendix E3, available online

at <http://www.annemergmed.com>). No hemoglobin level result changed disposition.

The urine toxicology test was positive in 54 of 788 (6.9%) patients tested, with no management or disposition changes. Thirty-five (64.8%) positive tests were due to amphetamines, 8 in patients receiving prescribed stimulants for attention deficit hyperactive disorder. Of the remaining positive results, there were 4 for cocaine, 2 for phencyclidine, and 13 for sedatives (2 barbiturate, 5 benzodiazepine, and 6 opiate, 3 of which were administered in ED). Our routine urine toxicology testing does not include marijuana, and gas chromatography mass spectroscopy for specific toxins (eg, synthetic cannabinoids) is not routinely performed.

Pregnancy was identified in 10 patients (0.9% of our population), with 5 receiving nonurgent further pregnancy evaluation and 3 being admitted for the following reasons: 1 to determine whether she had an early pregnancy or retained products of conception from a previous spontaneous abortion, although the consulting obstetrician thought the evaluation could be performed on an outpatient basis; 1 because psychiatric hospitals refused to admit as a result of her known pregnancy; and 1 with newly diagnosed pregnancy who was admitted to the ward with no other medical diagnoses documented (Appendix E3, available online at <http://www.annemergmed.com>). Eight of the 10 pregnant patients previously knew of their pregnancies.

An unexpected finding in our data analysis was the occurrence of abnormal thyroid stimulating hormone levels with normal free thyroxine levels. Of the 730 thyroid stimulating hormone level tests performed, 167 results (22.9%) were abnormal but associated with a normal thyroxine level. Two patients with abnormal thyroid stimulating hormone levels had abnormal thyroxine levels: 1 was followed as an outpatient and had normal repeated levels,

Table 2. Laboratory tests performed and management or disposition changes.

Testing and Changes	Including Pregnancy Tests		Excluding Pregnancy Tests	
	Number of Subjects	%	Number of Subjects	%
Visits with laboratory testing				
Visits with any laboratory test performed	871/1,082	80.5	871/1,082	80.5
Visits with blood testing performed	789/1,082	72.9	789/1,082	72.9
Visits with urinalysis performed	737/1,082	68.1	737/1,082	68.1
Visits with urine toxicology testing performed	788/1,082	72.8	788/1,082	72.8
Management changes				
Visits with management changes associated with an abnormal H&P result	265/1,082	24.5	264/1,082	24.1
Visits in which physical examination findings led to additional treatment	40/1,082	3.7	40/1,082	3.7
Visits in which H&P result led to further laboratory testing but no treatment	130/1,082	12	129/1,082	11.9
Visits in which H&P result and laboratory findings changed management	95/1,082	8.8	94/1,082	8.6
Visits with management changes associated with abnormal laboratory test results	50/871	5.7	48/871	5.5
Visits with abnormal laboratory test results and abnormal H&P result	25/871	2.9	23/871*	2.4
Visits with abnormal laboratory test results and normal H&P result	25/871	2.9	25/871	2.9
Disposition changes				
Visits in which the H&P result was associated with disposition change	46/1,082	4.3	43/1,082	4.1
Visits in which an abnormal laboratory test result was associated with a disposition change	7/871	0.8	4/871	0.5
Visits in which abnormal laboratory test results were related to abnormalities on H&P	6/871	0.7	4/871	0.5
Visits in which abnormal laboratory test results and normal H&P result	1/871	0.1	0/871	0
All management and disposition changes combined[†]				
Visits with any change	328/1,082	30.3	323/1,082	30
Visits in which any change was associated with an abnormal H&P result	300/1,082	27.7	296/1,082	27.1
Visits with changes made based on H&P result only with no laboratory tests performed	8/1,082 [‡]	0.7	8/1,082	0.7
Visits in which any change was associated with an abnormal laboratory test result	56/871 [§]	6.4	51/871	5.5
Visits with abnormal laboratory test results and abnormal H&P result	28/871	3.2	24/871	2.8
Visits with abnormal laboratory test results and normal H&P result	28/871	3.2	27/871	3.1

H&P, History and physical examination.
 *Three patients with management-changing urine pregnancy test results also had management-changing urinalysis test results.
[†]There are visits that had both management and disposition changes that were counted separately in the categories above but are combined for the category below.
[‡]Examples of changes include tetanus vaccination, laceration repair, and analgesics.
[§]One patient had a management-changing laboratory result and a disposition-changing laboratory result, both associated with an abnormal examination result (patient with alcoholic hepatitis).

and 1 (with an abnormal history and physical examination result) was admitted and received a diagnosis of Grave’s disease. Two patients with low thyroid stimulating hormone levels did not have a follow-up thyroxine-level test.

The median length of stay was 421.4 minutes (interquartile range 268 to 497 minutes). A comparison of length of stay between patients with different types of laboratory tests performed was calculated for patients with any test requiring venipuncture, urinalysis, urine toxicology testing, or urine pregnancy testing and any screening test. The majority of urinalyses in our ED are point-of-care testing, as is urine pregnancy testing. Length of stay was significantly shorter in 2 groups: individuals undergoing no blood testing compared with those undergoing it, with a median difference of 119 minutes (95% CI 114.4 to 123.6 minutes), and those with no screening tests compared with those with any testing, with a median difference of 117 minutes (95% CI 109.7 to 124.4 minutes) (Table 6).

Of the patients medically cleared but boarded on the pediatric ward, one patient with chronic catatonia who initially had no medical indication for admission developed a decubitus ulcer in the hospital, resulting in Gram-negative sepsis and disseminated

intravascular coagulation. No other patient admitted only for boarding had an urgent or emergency medical condition diagnosed or treated during the stay.

Eligible patients were identified according to discharge diagnosis. To ensure that no patient presenting with a psychiatric chief complaint but receiving a diagnosis of an organic illness was missed, the charts of all patients treated in the ED during the same period with a presenting complaint containing any of the words “suicide,” “5150,” “danger,” “psych#,” “depress#,” and “homic#” were reviewed. An additional 177 patients with a psychiatric chief complaint who were not identified according to discharge diagnosis were identified. Of these visits, 155 were isolated psychiatric visits. Eleven patients had primarily medical complaints with an unrelated psychiatric codiagnosis, 3 left without being seen, 4 had missing charts, and 3 had exclusively medical complaints with no psychiatric complaint. One patient presented with psychosis and suicidality that resolved after a glucose level of 48 mg/dL was treated. In this case, the mother’s chief complaint at triage was a need for psychiatric evaluation for concerns of homicidality; however, the patient had a history of diabetes mellitus and had been a direct referral from our hospital’s

Table 3. Dispositions of patients with a noncontributory history and physical examination.

	No.	%
No documented abnormality in history or physical examination result		
Total	519	48
Discharged home	54	5
Discharged to juvenile hall	24	2.2
Admitted to inpatient psychiatric ward	204	18.9
Boarded in pediatric ward	236	21.8
Transferred to preferred provider	1	0.1
No documented abnormality in history, but abnormal finding in physical examination, without further treatment or evaluation documented		
Total	262	24.2
Discharged home	23	2.1
Discharged to juvenile hall	16	1.5
Admitted to inpatient psychiatric ward	88	8.1
Boarded in pediatric ward	135	12.5
Transferred to preferred provider	0	0

endocrine clinic for hypoglycemia and resultant concern for adrenal or growth hormone deficiency. Many of these cases were not detected on the initial screen because they yielded final diagnosis such as “medication refill” in an asymptomatic psychiatric patient and not a diagnosis that would place the individual under consideration for an involuntary psychiatric hold.

Repeated visits from the same period were screened for missed medical diagnoses. One hundred twenty-eight patients had a total of 214 repeated visits; 35 had 3 or more visits. Fifteen (43%) of the

patients with 3 or more visits were in custody of juvenile hall. Of all repeated visits, there were 37 visits for 26 subjects with management and disposition changes. Thirteen (50%) of the subjects with management or disposition changes were in juvenile hall custody. Eleven repeated visits resulted in admission for a medical reason: 3 ingestions, 2 ingested foreign body, 4 with extreme violence and negative urine toxicology results, 1 self-induced blunt head trauma and chronic scaphoid fracture, and 1 with history of Hashimoto’s encephalopathy with normal thyroid studies. All of these admissions were the result of information obtained on the history or physical examination; none were based on results of screening laboratory tests or medical diagnoses missed on the first visit. The screening laboratory results associated with management changes in the repeated visits included 1 patient with a known pregnancy and hence a positive urine pregnancy test result, who was found to have fetal demise and received treatment with misoprostol; 2 patients with mild elevations in liver enzymes, who had fasting lipid and hepatitis panels performed, which were normal; 2 patients with microcytic anemia, who had iron prescribed; and 1 patient with elevated thyroid stimulating hormone, who had a normal repeated study result at a later visit.

LIMITATIONS

The study is limited by the biases of a retrospective chart review. These data were collected at a single center with a high proportion of underinsured patients and incarcerated youth and included a specific subset of the pediatric psychiatric population; thus, these findings may not be generalizable to the

Table 4. Laboratory test results.

Laboratory Test	Test Obtained		Test Not Obtained		Normal Results		Repeated Test Result Normal Without Interval Treatment		Mild Abnormal Result, No Change or Repeated Laboratory Testing	
	N	Percentage	N	Percentage	N	Percentage of Patients With the Laboratory Test Performed	N	Percentage of Patients With the Laboratory Test Performed	N	Percentage of Patients With the Laboratory Test Performed
		of All Patients		of All Patients		Test Performed		Test Performed		Test Performed
WBC count	773	71.4	309	28.6	635	82.1	5	0.6	128	16.6
Hemoglobin	773	71.4	309	28.6	667	85.5	3	0.4	51	6.6
Platelet count	771	71.3	311	28.7	750	97.3	0	0	19	2.5
Sodium	776	71.7	306	28.3	772	99.5	1	0.1	2	0.3
Potassium	775	71.6	307	28.4	750	96.8	7	0.9	17	2.2
Chloride	776	71.7	306	28.3	768	99	3	0.4	4	0.5
Bicarbonate	776	71.7	306	28.3	758	97.8	3	0.4	13	1.7
Blood urea nitrogen	775	71.6	307	28.4	759	97.9	0	0	13	1.7
Creatinine	775	71.6	307	28.4	772	99.6	0	0	1	0.1
Calcium	758	70.1	324	31.5	745	98.3	2	0.3	11	1.5
Glucose	776	71.7	306	28.3	770	99.2	1	0.1	1	0.1
Total bilirubin	626	57.9	456	42.1	601	96.0	1	0.2	18	2.9
Alanine aminotransferase	625	57.7	457	42.2	607	97.1	0	0	8	1.3
Aspartate aminotransferase	623	57.6	459	42.4	593	95.2	1	0.2	29	3.0
Urine pregnancy test	386	35.7	696	64.3	376	97.4	0	0	2	0.5
Rapid plasma reagent	706	65.2	376	34.8	703	99.6	3	0.4	0	0
Thyroid stimulating hormone	730	67.5	352	32.5	559	76.6	167	22.9	0	0
Urinalysis	737	68.1	345	31.9	399	54.1	13	1.8	291	39.5
Urine toxicology	788	72.8	294	27.2	734	93.1	0	0	54	6.9

Table 5. Laboratory test management and disposition changes.

Laboratory Test	Test Associated With Change in Management				Test Associated With Change in Disposition				Significantly Abnormal Test Result That Was Not Mentioned in ED Records	
	N	Percentage of Patients With the Laboratory Test Performed	Management or Disposition- Changing H&P (n)	Percentage With Management or Disposition- Changing H&P	N	Percentage of Patients With the Laboratory Test Performed	Disposition- Changing H&P (n)	Percentage With Disposition- Changing H&P	N	Percentage of Patients With the Laboratory Test Performed
WBC count	4	0.5	0	0	1	0.1	1	100	0	0
Hemoglobin	15	1.9	4	26.7	0	0	0	0	37	4.8
Platelet count	0	0	0	0	0	0	0	0	2	0.3
Sodium	1	0.1	1	100	0	0	0	0	0	0
Potassium	1	0.3	1	100	0	0	0	0	0	0
Chloride	1	0.1	1	100	0	0	0	0	0	0
Bicarbonate	1	0.1	1	100	0	0	0	0	0	0
Blood urea nitrogen	3	0.4	3	100	0	0	0	0	0	0
Creatinine	2	0.3	2	100	0	0	0	0	0	0
Calcium	0	0	0	0	0	0	0	0	0	0
Glucose	3	0.4	3	100	0	0	0	0	1	0.1
Total bilirubin	1	0.2	0	0	0	0	0	0	5	0.8
Alanine aminotransferase	3	0.5	1	33.3	1	0.2	1	100	6	1.0
Aspartate aminotransferase	3	0.5	1	33.3	1	0.2	1	100	6	1.0
Urine pregnancy test	5	1.3	4	80	3	0.8	2	66.7	0	0
Rapid plasma reagent	0	0	0	0	0	0	0	0	0	0
Thyroid stimulating hormone	1	0.1	1	0	1	0.1	1	1	2	0.3
Urinalysis	28	3.8	11	39.3	2	0.3	2	1	4	0.5
Urine toxicology	0	0	0	0	0	0	0	0	0	0

population of pediatric mental health patients treated at a private hospital and should be limited to patients on an involuntary hold.

Because our study sample was based on discharge diagnoses, some patients may have been unintentionally excluded if their discharge diagnosis was not included in the query. Furthermore, we reviewed only the charts for management changes documented in the medical record and written discharge instructions and would have missed any verbal, but unwritten, recommendations. These limitations may have led to missed diagnosed medical conditions or missed treatments. However, because prescriptions are written electronically and the electronic medical record prompts the physician to fill in follow-up recommendations before disposition, it is unlikely that follow-up recommendations or medication prescriptions were not documented.

Additionally, because this is a retrospective study, it is not clear to what extent findings on the history and physical examination may have been noted after realization of the laboratory abnormalities, although it is typical practice to document the history and physical findings before laboratory tests are ordered. We also erred on the side of assuming that management and disposition changes were due to any laboratory abnormalities present unless specifically documented otherwise in the medical chart, and as such, it is possible we overestimated the management and disposition changes because of screening laboratory results.

Our institution uses a standard urine toxicology screen that does not include marijuana. Additionally, the standard urine toxicology test does not report many drugs with increasing popularity and psychiatric symptoms, such as “bath salts” and synthetic cannabinoids. These limitations almost certainly led to

Table 6. Length of stay based on laboratory testing.

Laboratory Tests Performed	No Test Obtained			Test Obtained			Difference in Medians Between 2 Groups, Minutes (95% CI)	P Value
	N	Proportion of Visits, %	Length of Stay, Minutes (IQR)	N	Proportion of Visits, %	Length of Stay, Minutes (IQR)		
Blood testing included in laboratory tests	293	27.1	278 (212–368)	789	72.9	397 (298–542)	119 (114.4–123.6)	<.001
Any screening test performed	211	19.5	271 (200–352)	871	80.5	388 (289–533)	117 (109.7–124.4)	<.001

an underestimation of the number of patients with past exposure to illicit drugs. However, it is unclear that a positive toxicology screen would have changed management in patients who did not display clinical evidence of intoxication.

Last, length of stay is influenced by multiple factors such as time of day, ED crowding, and availability of psychiatric beds. Therefore, we can only report an association between length of stay and performance of laboratory tests but cannot determine causality.

DISCUSSION

Overall, in our sample of pediatric ED patients being evaluated for medical clearance for psychiatric holds, laboratory evaluation offered little information above careful history and physical examination and was associated with decreased ED throughput. Financial costs of laboratory tests were not assessed, but the patient discomfort from blood draws and, in some cases, potentially unnecessary follow-up of false-positive laboratory tests are real concerns. The study results are consistent with those of the adult literature and the few previous pediatric studies^{6,7,14-20} showing that no urine toxicology test, screening blood laboratory test, or urinalysis alone led to a medical admission for patients being medically cleared for psychiatric hospitalization. We did, however, find 1 admission for a newly diagnosed pregnancy in an asymptomatic patient. Because there was no documented reason for the admission besides pregnancy, this may have been an unnecessary admission. In this study, laboratory testing was associated with an increased ED length of stay. The abnormalities identified on laboratory testing alone were not urgent medical issues; the most common were microcytic anemia (6.7%), positive urine toxicology result (6.9%), and urinalyses suggestive of urinary tract infections (3.8%). It is likely that these represent abnormalities that would be identified in any population because the general pediatric ED population has a 14.8% to 20.7% incidence of occult anemia²² and a 0.9% to 2% incidence of asymptomatic bacteriuria.²³⁻²⁵

Unquestionably, there are certain laboratory results that may be of value to the treating psychiatrist, without altering ED management or disposition. Pregnancy may affect decisions related to psychiatric medications, and knowledge of a patient's concurrent substance use might affect the psychiatry care plan. Pregnancy was documented in 0.9% of our population, the majority of whom knew they were pregnant. The resultant disposition changes were primarily due to refusal of pregnant patients by psychiatric facilities, even in the absence of pregnancy-related complications. No urine toxicology result changed management or disposition, which is in concordance with results of previous adult and pediatric literature.^{6,20} Although a positive urine toxicology result may be helpful to direct drug rehabilitation, performing the test should not delay transfer of patient to a higher level of care.

Length of stay was significantly longer in patients undergoing blood testing (increase of 119 minutes) compared

with those without such testing and in patients with any laboratory tests performed compared with patients without any laboratory tests performed (increase of 117 minutes). This increase in length of stay is comparable to that associated with advanced imaging.¹² Clearly, this association does not establish causality, and other factors (eg, perceived illness of the patient, anticipated disposition) may have guided the decision to order laboratory tests and biased the length-of-stay data. Still, a national review of ED testing from 2006 to 2008 also found increased length of stay with testing,¹² and, given the consistency of our findings with those of previous literature, we believe that minimizing nonindicated tests may have the potential to decrease ED length of stay.

Screening tests may lead to further unnecessary evaluations. False-positive elevations of thyroid stimulating hormone resulted in the performance of free thyroxine testing in 22.9% of patients; only 1 asymptomatic patient had an elevated free thyroxine level. Three patients with positive pregnancy test results were admitted to the pediatric ward without any medical indication for inpatient admission. The second most common diagnosis in our study, urinary tract infection, resulted in antibiotic prescriptions for 1.8% of the study population. Previous literature has demonstrated a 0.9% to 2% incidence of asymptomatic bacteriuria, depending on age, and a Cochrane meta-analysis found no long-term benefit to treating asymptomatic bacteriuria in most patients.²³⁻²⁵ Current guidelines are to avoid screening asymptomatic, nonpregnant patients for urinary tract infections.^{24,25} In our sample, confirmatory cultures and treatments were at the discretion of the providers, and screening of asymptomatic patients likely led to overtreatment of asymptomatic pyuria and bacteriuria. All tests have some measurable false-positive rate, and routine screening of asymptomatic patients will inevitably result in unnecessary follow-up, further testing, medication prescription, and admission, with costs and potential for adverse events tied to these actions. When unsuspected abnormal results occur, ensuring follow-up places an additional burden on ED staff. The question of whether to capitalize on the opportunity to perform asymptomatic screening in the ED is well beyond the scope of this article; however, it is a question of relevance in an adolescent population with poor primary care follow-up.

In conclusion, our findings were consistent with the American College of Emergency Physicians clinical guidelines for adults. The only disposition change made according to a screening laboratory test was a non-medically indicated admission of a patient with an early asymptomatic pregnancy. Our results support the creation of guidelines to limit diagnostic testing in pediatric psychiatric patients to those indicated according to history and physical examination. Point-of-care urine pregnancy testing in all pubertal girls may be warranted because pregnancy may affect medication selection. Although anemia and bacteriuria were our top 2 diagnoses, we do not recommend routine screening for these conditions in asymptomatic ED patients.

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APPENDIX E1.

International Classification of Diseases, Ninth Revision, Clinical Modification screening discharge diagnosis codes.

V70.1 - V70.2	General psychiatric examination requested by the authority General psychiatric examination NOS
293.81 - 298.9	Other specified transient mental disorders due to conditions classified elsewhere Transient mental disorder NOS Persistent mental disorders due to conditions classified elsewhere: amnesia, dementia, mental disorders Schizophrenic disorders Episodic mood disorders Delusional disorders Other nonorganic psychoses
299.80 – 302.89	Other pervasive developmental disorders Unspecified pervasive developmental disorder Anxiety, dissociative and somatoform disorders Personality disorders Sexual and gender identity disorders
311-314.9	Depressive disorder, NOS Disturbance of conduct, NOS Disturbances of emotions specific to childhood and adolescence Hyperkinetic syndrome of childhood

APPENDIX E2.

Reviewer codes for clinical changes.

History	
0	No criteria for hospitalization (psychiatric or medical). Patient goes home.
1	History only psychiatric with no medical complaints and patient transferred to a psychiatric facility.
2	History only psychiatric, but no inpatient psychiatric beds available so admitted to ward for non-medical boarding.
3	Labs performed based off of abnormal history, but did not affect management. (normal acetaminophen/aspirin levels, etc.)
4	History associated with change in management but no medical admission required. (abuse consult, urinary tract infection, rash, ingestion work up, etc.)
5	History associated with medical admission for the patient. (acetaminophen overdose, trauma, rape, etc.)
6	History documentation suggestive that further management changes should have been pursued but were not. (Rape documented but not reported, etc.)
Physical Exam	
0	Normal Exam.
1	Abnormal exam but no labs or treatment needed. (cutting scars, self-inflicted bruises, etc.)
2	Abnormal exam requiring treatment but no diagnostic testing. (laceration repair, tetanus vaccination, etc.)
3	Abnormal exam indicated diagnostic test needed to be done, but did not affect management. (Repeat hemoglobin, bedside ultrasound, X-rays, etc.)
4	Abnormal exam indicated diagnostic test, which led to a change in management but no medically indicated admission. (Fracture getting casted, outpatient follow up, consults, etc.)
5	Abnormal exam resulting in a medically indicated admission. (Stab wound with a positive CT for internal injury leading to surgery or observation, persistent tachycardia, lethargy, delirium, etc.)
Screening Laboratory Tests	
0	No test obtained.
1	Test obtained and normal.
2	Initial test abnormal and repeat normal without intervention.
3	Test obtained and mildly abnormal but did not impact management. (Na 134, K 3.4, etc.)
4	Test obtained and abnormal associated with further testing or treatment but no medical admission. (Iron studies after low hemoglobin, hepatitis panel after elevated transaminases, etc.)
5	Test obtained, abnormal and associated with a medical admission. (Intravenous antibiotics in a patient with clinical pyelonephritis with leukocytosis, elevated transaminases in patient with overdose, etc.)
6	Test obtained and significantly abnormal with no intervention.

APPENDIX E3.
Descriptions of clinical changes based on laboratory test results.

Laboratory Test	Management Changes Made		Disposition Changes		Significant abnormal labs not addressed	
	n	Change Made	n	Reason for Disposition Change	n	Abnormality
White Blood Cell Count	4	Leukocytosis (11.4-14.1) with Urinalysis suggestive of urinary tract infection, treated with oral antibiotics	1	Leukocytosis with urine and clinical exam consistent with pyelonephritis, admitted for IV antibiotics	0	
Hemoglobin	13	Had additional labs or prescription for likely iron deficiency anemia	0		37	Microcytic anemia not addressed
Platelet Count	1	Sent hemoglobin electrophoresis which ended up resulting in beta-thal trait	0		2	Thrombocytopenia with elevated mean platelet volume
	0	Polycythemia secondary to dehydration, resolved with IVF	0		0	
Sodium	1	Hyponatremia secondary to dehydration from alcohol intoxication resolved with IVF	0		0	
Potassium	1	Hypokalemia with alcohol withdrawal, relieved with IVF and potassium chloride supplementation	0		0	
Chloride	1	Hyperchloremia secondary to dehydration from alcohol intoxication resolved with IVF	0		0	
Bicarbonate	1	Metabolic acidosis with alcohol withdrawal, relieved with IVF and potassium chloride supplementation	0		0	
Blood Urea Nitrogen	3	Elevated and resolved with IVF	0		0	
Creatinine	2	Elevated and resolved with IVF	0		0	
Glucose	2	Elevated glucose in known diabetic, resolved with insulin and IVF	0		0	Hypoglycemia with ketonuria not worked up
	1	Hypoglycemia in known anorexic patient, resolved with IV glucose and food	0		5	Elevated, but less than 2.5 with normal transaminases
Total Bilirubin	1	Level of 2.9, had ceruloplasm sent which was normal	0		6	Elevated with no work up
Alanine Aminotransferase	1	Rhabdomyolysis induced elevation, resolved with IVF	1	Alcoholic hepatitis patient with withdrawal	6	Elevated with no work up
Aspartate Aminotransferase	2	Hepatitis panels ordered and negative	1	Alcoholic hepatitis patient with withdrawal	6	Elevated with no work up
	1	Rhabdomyolysis induced elevation, resolved with IVF	1	Alcoholic hepatitis patient with withdrawal	6	Elevated with no work up
Urine Pregnancy Test	2	Hepatitis panels ordered and negative management)	1	Admitted for newly diagnosed pregnancy	0	
	2	Known pregnant patients, additional laboratory tests ordered (no change in management)	1	Admitted for vaginal bleeding in pregnant patient, determined to be normal intrauterine pregnancy	1	
	2	Known pregnant patient, additional laboratory tests, ultrasound and obstetrics consulted	1	Psychotic pregnant patient, admitted until baby delivered	1	
	1	Identified pregnancy and performed laboratory studies for new pregnancy diagnosis	1		1	
Thyroid Stimulating Hormone	1	Low level with low free thyroxine which on repeat was normal twice, told to follow up with endocrinology outpatient	1	Headache and photophobia. Graves disease diagnosed	2	Low thyroid stimulating hormone with no free thyroxine obtained
Urinalysis	18	UA suggestive of urinary tract infection (UTI) and treated with antibiotics	1	HIV positive per history with UTI, admitted for IV antibiotics. Later found to be HIV negative	2	Pyuria not worked up
	4	Urine cultures sent and negative but no antibiotics started	1	Leukocytosis with urine and clinical exam consistent with pyelonephritis, admitted for IV antibiotics	1	Positive urine culture with no treatment
	2	Treated for trichomonas	1		1	Ketonuria and hypoglycemia not worked up
	2	Dehydrated appearing urine, resolved with IVF				
	1	Microscopic hematuria work up (ultrasound, coagulation panel, culture) all negative				
	1	Ketonuria in diabetic resolved with insulin				