



ORIGINAL ARTICLE

Use of urine drug screening in the emergency department of a paediatric hospital^{☆,☆☆}



Núria Ferrer Bosch^{a,*}, Lidia Martínez Sánchez^a,
Victoria Trenchs Sainz de la Maza^a, Jesús Velasco Rodríguez^b,
Elsa García González^a, Carles Luaces Cubells^a

^a Servicio de Urgencias, Hospital Sant Joan de Déu, Barcelona, Spain

^b Servicio de Laboratorio, Hospital Sant Joan de Déu, Barcelona, Spain

Received 16 November 2016; accepted 30 January 2017

Available online 21 November 2017

KEYWORDS

Toxicology screening;
Emergency
department;
Drugs of abuse;
Paediatrics

Abstract

Objective: To describe the situations in which urine drug screening is used in a Paediatric Emergency Department (ED). An analysis is also made on its potential usefulness on whether it changes the patient management, and if the results are confirmed by using specific techniques. **Methodology:** A retrospective study was conducted on patients under the age of 18 attended in the ED during 2014 and in whom urine drug screening was requested. Depending on the potential capacity of the screening result to change patient management, two groups were defined (potentially useful and not potentially useful).

Results: Urine drug screening was performed on a total of 161 patients. The screening was considered not to be potentially useful in 87 (54.0%). This was because the clinical history already explained the symptoms the patient had in 55 (34.1%) patients, in 29 (18.0%) because the patient was asymptomatic, and in 3 (1.9%) because the suspected drug was not detectable in the screening. The drug screening results changed the patient management in 5 (3.1%) cases. A toxic substance was detected in 44 (27.3%). Two out of the 44 that were positive (2.1%) were re-tested by specific techniques, and presence of the toxic substance was ruled out in both of them (false positives).

Conclusions: Most of the drug screening tests are not justified, and it is very infrequent that they change patient management. It is very rare that the results are confirmed using more

[☆] Please cite this article as: Ferrer Bosch N, Martínez Sánchez L, Trenchs Sainz de la Maza V, Velasco Rodríguez J, García González E, Luaces Cubells C. Utilidad de las técnicas de cribado de tóxicos en orina solicitadas desde el servicio de urgencias de un hospital pediátrico. An Pediatr (Barc). 2018;88:19–23.

^{☆☆} Previous presentation: this study has been presented at the 20th Meeting of the Sociedad Española de Urgencias en Pediatría; April 2015; Bilbao, Spain.

* Corresponding author.

E-mail address: nferrer@sjdhospitalbarcelona.org (N. Ferrer Bosch).

PALABRAS CLAVE

Cribado toxicológico;
Urgencias;
Drogas de abuso;
Pediatria

specific methods. Urine drug screening tests should be restricted to particular cases and if the result has legal implications, or if the patient denies using the drug, it should be followed by a specific toxicological study to provide a conclusive result.

© 2016 Asociación Española de Pediatría. Published by Elsevier España, S.L.U. All rights reserved.

Utilidad de las técnicas de cribado de tóxicos en orina solicitadas desde el servicio de urgencias de un hospital pediátrico

Resumen

Objetivo: Describir las situaciones en las que se solicita cribado toxicológico en orina desde un servicio de urgencias pediátricas. Determinar si la prueba es potencialmente útil, si conlleva un cambio en el manejo del paciente y si los resultados se comprueban mediante técnicas específicas.

Metodología: Estudio retrospectivo de los pacientes menores de 18 años atendidos en urgencias durante el año 2014 a los que se solicitó cribado de tóxicos en orina. Se definieron 2 grupos en función de la potencial capacidad de modificar el manejo del paciente (potencial utilidad y ausencia de utilidad).

Resultados: Se recogieron 161 pacientes. En 87 casos (54,0%) el cribado de tóxicos se consideró sin potencial utilidad. En 55 pacientes (34,1%) la falta de utilidad fue debida a que la anamnesis ya explicaba la sintomatología presente, en 29 (18,0%) a que el paciente se encontraba asintomático y en 3 (1,9%) a la sospecha de intoxicación por una sustancia no detectable mediante esta técnica. El resultado ocasionó un cambio de manejo en 5 casos (3,1%). Se detectó algún tóxico en 44 pacientes (27,3%). Se solicitó confirmación con técnicas específicas en 2 (1,2%). Ambos fueron falsos positivos.

Conclusiones: La mayor parte de los cribados de tóxicos solicitados no están justificados y es infrecuente que condicionen un cambio en el manejo del paciente. La confirmación mediante técnicas específicas es inusual. Su uso debe restringirse a casos concretos y, siempre que pueda tener repercusiones legales o el paciente niegue el consumo, debe seguirse de un estudio toxicológico específico que aporte un resultado concluyente.

© 2016 Asociación Española de Pediatría. Publicado por Elsevier España, S.L.U. Todos los derechos reservados.

Introduction

Urine drug screening is often requested in Paediatric Emergency Departments (PEDs) for patients with symptoms suggestive of poisoning. This type of screening is quick and easy to perform, but has significant limitations. Chief among them are the potential cross-reactivity with structurally similar compounds (false positive), the potential for false-negative results, and the influence of detection times for the involved substance in urine, with positive results not always corresponding to recent consumption.¹⁻⁶ Another factor that needs to be considered is that the concentration of urine may affect test results.^{2,4} Therefore, it is important to ensure that results are interpreted correctly, considering them tentative until they are confirmed by means of a technique with a higher specificity, such as mass spectrometry.²⁻⁸

The aims of this study were:

1. To describe the situations in which urine drug screening is requested in the PED, determining those where it may be useful and its performance is justified.

2. To assess whether performance of toxicology tests affects how patients are managed.
3. To assess whether confirmation of results is requested by the PED and analyse the occurrence of false positives and/or negatives.

Methods

We conducted a retrospective study in the PED of a tertiary women's and children's hospital that receives approximately 100,000 paediatric visits a year.

We included all patients aged less than 18 years seen in the PED in 2014 that underwent urine drug screening. We selected the sample by reviewing the Laboratory records for rapid test orders.

This laboratory uses 2 types of methods to detect drugs in urine:

1. Automated/semiquantitative methods: they produce a quantitative result, but results are reported as positive or negative based on whether the detected level exceeds a specific threshold for a

substance. They are used to detect the presence of amphetamines/methamphetamines, benzodiazepines, cannabinoids, cocaine and opiates.

2. Non-automated/qualitative: performed on lateral flow immunochromatography assay strips, they produce qualitative results (positive or negative) for various substances simultaneously: amphetamines, tricyclic antidepressants, barbiturates, benzodiazepines, cocaine, phencyclidine, marijuana, methadone, methamphetamine, methylenedioxymethamphetamine, morphine and opiates.

We collected data by reviewing the electronic health records of the patients.

We defined 2 groups based on the potential of the drug screen to lead to changes in the management of the patient, and therefore, whether performing the screen was or was not justified. To determine the situations in which a drug screen was potentially useful, we reviewed the indications described in the literature^{1,6–10} and adapted them to the paediatric population through a consensus process involving all authors. We considered that a drug screen was potentially useful and therefore was justified in the following situations:

1. Presence of cardiovascular, neurologic or psychiatric symptoms in patients in who the findings of the history does not justify the manifestations or exposure to an unknown substance is suspected. In these cases, detection of a substance may guide the differential diagnosis, always within the constraints of the method employed for detection.
2. Patients who are in a coma in the context of alcohol poisoning. In these cases, history taking cannot be used to rule out consumption of other substances that may require specific treatment.
3. Patients aged less than 12 years with suspected exposure to an illicit drug (as this may result from a situation of abuse or neglect) or older patients in which administration of a drug with criminal intent is suspected (chemical submission). In these cases, the detection of substances may have legal ramifications and the results of screening must be confirmed.

We considered that screening was not useful and therefore the order not justified in cases in which:

1. The findings of history taking (usually involving the use of substances) explain the presenting symptoms of the patient.
2. The patient is asymptomatic.
3. Intoxication by or exposure to a substance that cannot be detected by rapid laboratory tests is suspected.

We analysed the results of ordered tests and whether they led to changes in the management of the patient. Applying criteria used in previous studies,⁷ we considered that screen results led to a change of management in cases in which receipt of results led to a specific therapeutic or diagnostic intervention, a specific non-medical intervention, or the discontinuation of an ongoing treatment.

We also analysed whether the results were confirmed by means of specific techniques and the occurrence of false

positive results. In our hospital, the decision to submit a sample to a specialised laboratory to confirm screen results is made by the clinician in charge of the patient.

We analysed the data with the software SPSS version 21.0 (IBM; Chicago, IL, USA). We have described quantitative variables by means of the median and interquartile range (IQR), and categorical variables by means of absolute frequencies and percentages.

The study was approved by the Research Ethics Committee of the hospital.

Results

In the period under study, the emergency department received 99,941 visits, and a urine drug screen was requested in 161 (0.2%). In 85 of these cases (52.8%), the reason for visiting the PED was suspected poisoning. The median age of these patients was 15.1 years (IQR, 13.3–16.2); 99 (61.5%) were female. Eighty patients (49.7%) arrived to the PED through emergency medical services.

In 87 cases (54.0%), we considered that urine drug screening did not have the potential to be useful, so that ordering it was not justified. Table 1 shows the distribution of patients in the 6 clinical situations previously described.

We concluded that drug screening results had led to a change in management in 5 cases (3.1%). These involved, on one hand, 4 adolescent patients that presented to the PED with symptoms associated with substance use but who did not report such use. The positive results (for cannabis in 3 and opiates in 1) led to the filing of a legal report and, in the opiates case, to referral to social services. The other case corresponded to a girl aged 9 years that presented with disorientation and who tested positive for benzodiazepines and cannabis. These results led to, on one hand,

Table 1 Distribution of patients based on the potential usefulness of urine drug screening ($n = 161$).

Clinical situation	<i>n</i> (%)
<i>Not useful (unjustified)</i>	87 (54.0)
Patients in whom the findings of the anamnesis explain current symptoms	55 (34.1)
Asymptomatic patients	29 (18.0)
Patients suspected to have consumed or be intoxicated by a substance that cannot be detected by rapid laboratory tests	3 (1.9)
<i>Potentially useful (justified)</i>	74 (46.0)
Presence of cardiovascular, neurologic or psychiatric symptoms in patients, where history findings do not justify the presenting symptoms or exposure to an unidentified substance is suspected	61 (37.9)
Patients who are in a coma in the context of alcohol poisoning	13 (8.1)
Patients aged less than 12 years with suspected exposure to an illicit drug, or older patients in whom administration of a drug with criminal intent is suspected (chemical submission)	0 (0)

admission to hospital to better assess her condition and, on the other, submission of the sample to a specialised laboratory for confirmation of results. These 5 patients were part of the group in which the test was considered potentially useful, specifically in the clinical situation with "presence of cardiovascular, neurologic or psychiatric symptoms in patients in who the findings of the history does not justify the manifestations or exposure to an unknown substance is suspected." We did not identify any cases in which a specific treatment was initiated on account of the toxicology results.

The results of urine drug screening were positive in 44 patients (27.3%). Of these, 23 (52.2%) were positive for cannabis, 22 (50.0%) for benzodiazepines, 2 (4.5%) for amphetamines and 1 (2.3%) for opiates. Three samples (6.8%) tested positive for more than 1 substance. All patients with positive results were adolescents (aged 13–17 years), except a girl aged 9 years.

In 2 cases, the sample was submitted to the reference toxicology laboratory for confirmation. In both cases, the results turned out to be false positives. They involved an adolescent patient whose emergency laboratory screen detected amphetamine, the presence of which was not confirmed by mass chromatography, and the girl aged 9 years presenting with disorientation, in who the urine screen detected benzodiazepines and cannabis, and only the presence of benzodiazepines was subsequently confirmed.

A different department was consulted in 68 cases (42.2%), and more than one other department was consulted in 3 cases (1.9%). The most frequently consulted departments, in decreasing order, were: psychiatry, in 47 patients (29.2%), social work in 7 (4.3%), traumatology in 5 (3.1%), neurology in 5 (3.1%), surgery in 4 (2.5%) and gynaecology in 3 (1.9%).

Ninety-two patients (57.1%) were discharged home from the PED, 57 (35.4%) were admitted to an inpatient ward, and 5 (3.1%) were admitted to the paediatric intensive care unit with severe neurologic manifestations. Four patients (2.5%) were referred to the outpatient social work clinic or to the regional mental health centre for children and youth, and 2 (1.2%) were referred to other hospitals. The outcome was favourable in 160 patients and unknown in 1 patient that left the PED without the approval of the physician in charge.

Discussion

The results presented above demonstrate that most toxicology screens ordered by the PED of the hospital under study did not contribute information that was useful for the management of the patient, and therefore seemed unjustified. These findings confirm that the usefulness of urine drug screens in the management of poisoned patients is very limited and overestimated.

Previous studies in the paediatric population have reached similar conclusions. Thus, in a retrospective study of 338 cases, Sugarman et al. found that toxicology testing had only resulted in changes to management in 3 cases (0.9%).⁷ Another retrospective study by Belson and Simon that reviewed 463 screens found only 7 (1.5%) whose results were clinically relevant, and none that led to initiation or withdrawal of a treatment.⁸ Belson et al. performed a prospective study in which they asked physicians whether

the toxicology tests they had ordered had ultimately been useful, and found that qualitative tests did not lead to changes in patient management.¹¹ Similarly, Wang et al. performed a retrospective analysis of 62 urine drug tests in 2013, and found that the results of 3 (4.8%) had led to changes in the clinical approach, with referral of patients for a social work consultation.¹²

In our sample, only 3.1% of screens resulted in changes in the approach to management, consistent with the percentages previously reported in the literature. Furthermore, we analysed the potential usefulness of the testing method based on the clinical situation and independently of the actual results, and consider that the screen had the potential to be useful in half of the cases.

In one third of the patients that underwent urine drug screening at the PED, the findings of the anamnesis were consistent with the presenting symptoms. This suggests that in many cases the sole purpose of the urine screen is to corroborate what has already been found in the anamnesis, even though it seems illogical to question self-reported substance use in adolescents. Fortu et al. demonstrated that self-reporting of illicit substance use in 385 patients who received care for behavioural changes at a PED was strongly correlated with the results of urine toxicology tests and that the results of the latter did not affect their management.¹³ On the other hand, if the aim of the clinician is to obtain laboratory evidence of substance use due to potential legal ramifications, specific drug tests should be used.^{2,4}

Eighteen percent of the patients that underwent urine drug screening were asymptomatic. It is important to take into account that a positive result in an asymptomatic patient may correspond to non-recent use or be a false positive, and therefore testing is not recommended in these patients.^{10,14} When a substance use habit is suspected, patients should be managed in a more suitable health care setting, and their care should not be based on the results of tests with such limited sensitivity and specificity.

Lastly, in 1.9% of tested patients, the substance suspected to have been ingested or have caused intoxication could not be detected by the methods used. This suggests that in some instances clinicians order urine toxicology tests without knowing which substances can actually be detected in the affiliated laboratory. This issue was already described a few years ago by Durback et al.,¹⁵ who demonstrated that a high percentage of the surveyed clinicians were unable to correctly identify the drugs that could be detected by the urine toxicology tests performed in their own hospitals. These results highlight the need to improve the multidisciplinary approach to these patients, and that the latter requires effective communication between emergency physicians and laboratory personnel.

In our case series, further testing was performed to confirm screening results in only 2 cases. These were cases in which the screen results were positive and the clinical manifestations were compatible with the presence of the detected drug. However, both turned out to be false positives.

The confirmation of screen results by specific drug tests is always advisable, but entails a significant use of resources. For this reason, we recommend ordering toxicology screening only in select cases, with cautious interpretation of its results and confirmation of any positive

results that are not confirmed by the anamnesis (the patient denies consumption of the substance) or that may have legal ramifications.^{2,10,16} Other authors recommend confirmatory testing in any case where screen results may lead to changes in management.⁴ In our opinion, a patient's self-report of substance use is of great diagnostic value, making confirmation unnecessary in such cases.

Our findings reveal aspects that can be improved in the use of urine drug screening in the PED under study. In addition to improving knowledge of the currently existing protocol, other possible improvements could include face-to-face training sessions and performance of surveys followed by a discussion of their results.

There are limitations to this study. First of all, its retrospective design may have resulted in data losses. This limitation is particularly relevant in the assessment of whether performance of the tests resulted in changes in patient management, as it is possible that changes in approach occurred that were not documented in the emergency department records. In any case, the electronic health records of the PED document every medical prescription, every ordered diagnostic test and its results, the referral to other services and the filing of legal reports, so that most interventions are actually documented. The retrospective design did not allow us to assess whether patients denied consuming the detected substance (and therefore whether confirmatory testing was indicated), as this information is not routinely recorded in emergency department records.

Furthermore, our study is based on a single hospital, whose results cannot be generalised. Nevertheless, it allowed the identification of opportunities for improvement in the use of toxicology testing in the PED under study, and the design of strategies to that end.

Lastly, we established the situations in which the results of toxicology testing could be useful based on the existing literature and by consensus, and therefore they may not be applicable to other contexts. Nevertheless, there is evidence that the application of specific indications for drug screening is associated with a higher rate of positive results and associated changes in management,⁹ so it would be advisable for every PED to have a protocol for the use of these methods.

Based on our findings, it could be inferred that most of the urine drug tests ordered by a PED do not result in changes to patient management, and lack the potential to do so, and are therefore unnecessary. Furthermore, the occurrence of false positives and the infrequent confirmation of results may give rise to management errors.

Specific indications for ordering these tests are needed, as well as the collaboration of the emergency and laboratory services so that paediatricians have updated information on the available rapid toxicology tests and their limitations. This would prevent the ordering of tests in cases in which it is not indicated, reducing health care costs and the

consequences that result from the incorrect interpretation of results.

Conflicts of interest

The authors have no conflicts of interest to declare.

References

1. Hammett-Stabler C, Pesce AJ, Cannon DJ. Urine drug screening in the medical setting. *Clin Chim Acta*. 2002;315:125–35.
2. Martínez L, Velasco J. Valor del cribado toxicológico en orina en las sospechas de intoxicación en urgencias. *An Pediatr Contin*. 2010;8:139–43.
3. Saitman A, Park HD, Fitzgerald RL. False-positive interferences of common urine drug screen immunoassays: a review. *J Anal Toxicol*. 2014;38:387–96.
4. Moeller KE, Lee KC, Kissack JC. Urine drug screening: practical guide for clinicians. *Mayo Clin Proc*. 2008;83:66–76.
5. Vincent EC, Zebelman A, Goodwin C. What common substances can cause false positives on urine screens for drugs of abuse. *J Fam Pract*. 2006;55:893–7.
6. Hoffman RJ, Nelson L. Rational use of toxicology testing in children. *Curr Opin Pediatr*. 2001;13:183–8.
7. Sugarman JM, Rodgers GC, Paul RI. Utility of toxicology screening in a pediatric emergency department. *Pediatr Emerg Care*. 1997;13:194–7.
8. Belson MG, Simon HK. Utility of comprehensive toxicologic screens in children. *Am J Emerg Med*. 1999;17:221–4.
9. Erdmann A, Werner D, Hugli O, Yersin B. Focused use of drug screening in overdose patients increases impact on management. *Swiss Med Wkly*. 2015;145:w14242.
10. Wu AH, Mc Kay C, Broussard LA, Hoffman RS, Kwong TC, Moyer TP, et al. National academy of clinical biochemistry laboratory medicine practice guidelines: recommendations for the use of laboratory tests to support poisoned patients who present to the emergency department. *Clin Chem*. 2003;49:357–79.
11. Belson MG, Simon HK, Sullivan K. The utility of toxicologic analysis in children with suspected ingestions. *Pediatr Emerg Care*. 1999;15:383–7.
12. Wang GS, Deakine S, Bajaj L, Yin S, Heard K, Roosevelt G. The limited utility of screening laboratory tests and electrocardiograms in the management of unintentional asymptomatic pediatric ingestions. *J Emerg Med*. 2013;45:34–8.
13. Fortu JM, Kim K, Cooper A, Condra C, Lorenz DJ, Pierce MC. Psychiatric patients in the pediatric emergency department undergoing routine urine toxicology screens for medical clearance: results and use. *Pediatr Emerg Care*. 2009;25:387–92.
14. Bhalla A. Bedside point of care toxicology screens in the ED: utility and pitfalls. *Int J Crit Illn Inj Sci*. 2014;4:257–60.
15. Durback LF, Scharman EJ, Brown BS. Emergency physicians perceptions of drug screens at their own hospitals. *Vet Hum Toxicol*. 1998;40:234–7.
16. Gourlay D, Caplan Y, Heit H. Urine drug testing in clinical practice; 2006. Available from: <http://www.mc.uky.edu/equip-4-pcps/documents/section8/urine%20drug%20testing%20in%20clinical%20practice.pdf> [accessed December 2016].