Eur J Clin Microbiol Infect Dis (2017) 36:1559–1563
DOI 10.1007/s10096-017-2968-x

ORIGINAL ARTICLE

Tracking unnecessary negative urinalyses to reduce healthcare costs: a transversal study

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Received: 6 December 2016 / Accepted: 12 March 2017 / Published online: 29 March 2017

Abstract About 7 million urinalyses are reimbursed yearly by the French public healthcare system, but the results of most of these tests are normal. The aim of this study was to estimate the prevalence of negative urinalyses in ambulatory care, identify the associated factors and assess the relevance of prescriptions by general practitioners (GPs) according to French guidelines. A cross-sectional study was conducted in patients over 18 coming for urinalyses in two French ambulatory laboratories. Patients received a questionnaire on their symptoms, the reason for performing urinalysis and the use of urinary dipsticks. GP who prescribed urinalyses received a questionnaire assessing their practice. A total of 510 patients were included, and 71% of urinalyses were negative. Urinalyses were prescribed to 283 patients by GPs. Compared to those of specialists, GP prescriptions were associated with fewer negative urinalyses (59 vs 86%; $p < 0.01$). Among the negative urinalyses prescribed by GPs, the reasons of prescription were as follows: suspected urinary tract infection (UTI) (42.7%), control of bacteriological cure after UTI (24%), fever or abdominal pain (13%) and routine test (7%). About 35% of urinalyses were not indicated according to guidelines. Only 12% of patients used dipsticks before performing urinalysis although 87% of GPs were favourable to their use if they were provided by healthcare services. The annual cost of non-indicated urinalyses is estimated at 13 million euro. A systematic use of dipsticks provided by healthcare services could help to reduce health costs and the unnecessary use of antibiotics.

Introduction

About 7 million urinalyses are reimbursed yearly by the French public healthcare services for a total cost of 116 million euro [1]. The French health authorities would like to reduce by 10% the number of bacteriological examinations to save 300 million euro [2]. In France, 58–76% of urine cultures are sterile [3, 4] and 80% in the UK [5]. We assumed that these rates could be explained by an overprescription due to the underuse of urinary dipsticks, inappropriate prescriptions for controlling routine examinations or a prior use of antibiotics. In 2014, the French Society of Infectious Disease (SPILF) has stressed that urinary dipsticks should be used for any suspected urinary tract infection (UTI), and that urinalyses are not recommended in cystitis diagnosed based on a positive dipstick [6].

The aim of this study was to estimate the prevalence of negative urinalyses in ambulatory laboratories and identify the factors associated with negative results. The secondary aim was to assess the relevance of prescriptions based on the reason of the prescription, the patient symptoms and the prior use of urinary dipsticks.

Methods

Design

A cross-sectional study was conducted in two French ambulatory laboratories in the Parisian area. All patients over 18 who came for urinalyses were consecutively included between

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May and June 2014. They received an information letter, a consent form and had to fill out a questionnaire. Patients could complete their questionnaires in the laboratories or return them when they came back for the urinalysis result. Patients with cognitive disorders or unable to complete the questionnaire were excluded.

Procedure

Urinalyses were considered negative if they did not meet the following criteria for UTI: pyuria $>10^4$ white cells/mL with bacteria, $>10^3$ CFU/mL for infections with *Enterobacter* spp. and *Staphylococcus saprophyticus*, $>10^4$ CFU/mL for infections with other bacteria in women and $>10^3$ CFU/mL in men, according to French guidelines [6] and in line with European guidelines [7].

Urine samples were collected at home or in the laboratory after genital cleaning. Mid-stream urines were collected and returned to the laboratories for analyses within 2 h according to the laboratory protocol. The results of the sensitivity test and culture were provided by an automated urinalysis device (Vitek II).

The patient questionnaire focused on their sex, age, reason for prescribing urinalysis, patient symptoms, any prior antibiotic prescription and use of a urinary dipstick by the physician.

The questionnaire was used to assess whether or not the urinalysis was indicated according to guidelines or non-contributing if the collected information was not sufficient to determine whether or not it was indicated.

General practitioners (GPs) who prescribed urinalyses with negative results received a physician questionnaire on the reason for prescribing urinalysis and the use of a dipstick test.

Sample size and statistical analyses

To estimate the prevalence of negative urinalyses with an accuracy of 5% and a predicted prevalence of 50% [3], 400 urinalyses had to be included. Statistical tests were two-sided, and results were considered significant for $p < 0.05$. Complete case analyses were performed using chi square tests and Fisher's exact tests for univariate analyses. Data were analysed with "R" software (http://www.R-project.org, release 3.1.1).

Results

The results of the urinalysis of 510 patients were collected, and 362 (71%) were negative (Fig. 1). When urinalyses, in particular with negative results, were prescribed by a GP, a female predominance was observed and patients were younger compared to urinalyses prescribed by a specialist (respectively, 54.7 vs 56.5 years in all urinalyses and 53.0 vs 58.5 years in negative urinalyses) (Table 1).

Factors associated with negative urinalyses

Urinalyses were prescribed by a GP to 283 patients (55.5%) and were negative in 166 patients (59%) (Fig. 1). GP

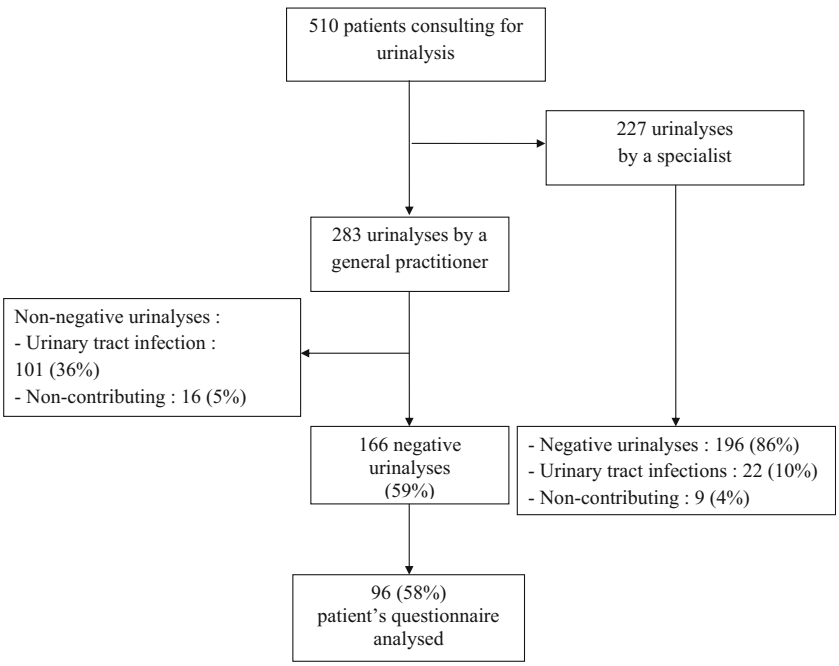

Fig. 1 Flow chart

Table 1 Characteristics of patients

	All urinalyses *n* (%)			Negative urinalyses *n* (%)		
	GPs *N* = 283	Specialists *N* = 227	*p*	GPs *N* = 166	Specialists *N* = 196	*p*
Male	83 (29.3)	113 (49.8)	<0.01	66 (39.7)	106 (54.1)	<0.01
Age			0.06			<0.01
18–50 years	115 (40.6)	70 (30.8)		78 (47.0)	61 (31.1)	
51–75 years	106 (37.5)	105 (46.3)		45 (27.1)	89 (45.4)	
>75 years	62 (21.9)	52 (22.9)		43 (25.9)	48 (24.5)	

prescriptions were associated with fewer negative urinalyses (59% by GP vs 86% by specialists; $p < 0.01$).

Among urinalyses prescribed by both GPs and specialists, the male gender was associated with an increased number of negative urinalyses (respectively, 79.5% in men vs 50% in women; $p < 0.01$, and 93.8% in men and 79% in women; $p < 0.01$). However, those prescribed by GPs were also associated with the age in women (by GPs $p = 0.01$ and by specialists $p = 0.96$) but not in men ($p = 0.13$ and $p = 0.2$, respectively).

Reasons of prescriptions

Among the 166 negative urinalyses, the reason of prescription was known for 96 (58%) patients. It was mainly performed for suspected UTI (42.7%), controlling bacteriological cure after UTI (24%), fever or abdominal pain (13%) and a routine test (after excluding routine preoperative urinalyses) (7%). (Table 2).

The analyses of patient questionnaires allowed classifying urinalyses: 33 urinalyses were not indicated (34.4%), 55 were indicated (57.3%) and 8 were non-contributing (8.3%).

Use of urinary dipsticks by general practitioners

Information on the use of urinary dipsticks was known for 66 patients with negative urinalysis (response rate 40%). They were only used in 8 patients (12%), and 3 had negative results.

Among the 69 GPs who prescribed urinalyses with negative results, 27 (39%) completed the "physician questionnaire". They justified that they did not use urinary dipsticks for the following reasons:

- Technical constraints: the lack of reliability of dipsticks, their short shelf-life;
- Organisational constraints: the easier access to the laboratory, the difficulty to collect urine samples at the GP practice and the lack of time;
- Professional constraints: difficulty of interpretation, not being accustomed to using them;
- Patient-related constraints: patient not comfortable or unable to urinate during the consultation or not present.

Among GPs, 72% reported that they would have used dipsticks if they were provided for free to physicians by public healthcare services, like rapid diagnostic tests for group A streptococcus in pharyngitis.

Table 2 Reasons of prescription of urinalyses according to sex

	Men *n* (%) *N* = 42	Women *n* (%) *N* = 54
Acute prostatitis	16 (38)	–
Chronic prostatitis	1 (2)	–
Epididymitis	1 (2)	–
Uncomplicated cystitis	–	5 (9)
Complicated cystitis	–	11 (20)
Acute pyelonephritis	–	8 (15)
Isolated fever	1 (2)	1 (2)
Unexplained abdominal pain	5 (12)	5 (9)
Nephrolithiasis	2 (5)	4 (7)
Hematuria	3 (7)	2 (4)
Control after infection	7 (17)	16 (30)
Preoperative urinalyses	1 (2)	0
Routine test	5 (12)	2 (4)

Discussion

Summary

In this study, we found that more than 70% of urinalyses were negative and more than onethird were not indicated according to guidelines. Nevertheless, these findings could be improved by providing dipsticks for free to physicians.

Strengths and limitations

This study was one of the rare prospective studies conducted in ambulatory care using negative urinalysis results to analyse whether they were indicated according to guidelines for economic purposes. The number of urinalyses needed was exceeded so that the power and accuracy of our analysis were sufficient. The participation rate of patients whose urinalysis was prescribed by a GP was good (60%).

Urinalyses prescribed by specialists were not studied because their practice as specialists is probably different from global guidelines. Only 30 GPs reported their practice and this number was sufficient since qualitative questions do not depend on the number of answers but on their diversity.

Comparison with the existing literature

As expected, most urinalyses were negative. Our results are between those of the French observatory Labville (58.8% of sterile urinalyses of 59,748 urinalyses performed) [3] and those of a British study assessing 150,000 urinalyses, including twothirds of ambulatory urinalyses (80% of sterile urinalyses) [5]. The French DRUTI study [8] has found 73% of positive urinalyses in women with urinary symptoms. But, in our study, this reason of prescription corresponded to less than 50% of urinalyses.

A study has assessed the use of dipsticks by 1500 French GPs and shown that they were only used in 25% of women for urinary symptoms while 40% were prescribed urinalyses [9]. Another study has included 229 GPs and found that only onethird used dipsticks weekly [10]. We confirmed that only a few GPs used urinary dipsticks. However, most GPs reported that they would use them more often if they were provided for free.

Implications for the practice

The cost of a urinary dipstick is between 0.13 and 0.86 euro depending on the number of parameters assessed [11–13]. Dipsticks with 8 or 10 parameters cost about 0.65 euro and provide information on leukocyte esterase and nitrites for UTI and on albuminuria, hematuria and glycosuria for other indications. As 7 million urinalyses are performed yearly, the systematic use of urinary dipsticks by GPs (55% of urinalyses in our study) would cost 2.5 million euro. Nevertheless, 59% of urinalyses prescribed by GPs are negative, and 34% of which (750,000 urinalyses) are not indicated, corresponding to 13 million euro.

Thus, rationalising urinalysis use could reduce by 10% their prescription as supported by the French healthcare services for 2017 [2]. Since a urinalysis costs 17.55 euro [1] (about 25 dollars in the USA [14]), providing urinary dipsticks to GPs could allow saving more than 10 million euro yearly. Moreover, health costs could be reduced because in patients with 3 or more urinary symptoms, neither dipsticks nor urinalyses are needed [15, 16].

Using urinary dipsticks could also prevent the use of non-indicated antibiotics between the consultation and the negative result of the urinalysis [17]. It could reduce at the same time unnecessary expenses and the risk of bacterial resistances due to the inappropriate use of antibiotics [6]. Procedures are needed to reduce health costs and prevent antibiotic use to limit bacterial resistances.

Conclusion

The annual cost of non-indicated urinalyses may be estimated at 13 million euro in France. The systematic use of dipsticks provided by healthcare services could help to reduce health costs and unnecessary antibiotics. Studies assessing urinalysis prescription by GPs using dipsticks provided for free could confirm our findings and investigate the feasibility of this process in a larger population.

Acknowledgements We thank Dr. Duffier for the coordination of the study in the laboratories and Stéphanie Sidorkiewicz for her advices.

Compliance with ethical standards

Funding None.

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval The protocol was approved by an ethics committee (CPP Ile de France II).

Informed consent Patients received an information letter and had to sign a consent form before their inclusion.

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