

## Evaluation of Lower Urinary Tract Infection Management Among Non-Pregnant Women at a Primary Care Center

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### ABSTRACT

**Background:** Urinary tract infection (UTI) is one of the most common acute infections among women visiting outpatient clinics. Despite the availability of guidelines for its treatment, a wide range of inconsistency of acute UTI management has been reported.

**Objectives:** To compare the current practices of managing uncomplicated lower UTI (LUTI) among women in reproductive age treated at a primary care setting, where no specific guidelines for managing acute UTI are endorsed.

**Methods:** A retrospective chart review was done among non-pregnant women (15 to 45 years) who were presented with LUTI at Al-Wazarat Healthcare Center (WHC) located in Riyadh, Saudi Arabia between June and November 2013. The management practices were compared to the recommendations of the Scottish Intercollegiate Guidelines Network (SIGN).

**Results:** A total 147 women with an average age of  $31.1 \pm 7.9$  years were included. The most frequent urinary symptom was dysuria (72.1%). Only 10 (6.8%) women were assessed for the presence of vaginal discharge or irritation. Dipstick was done in 70 (47.6%) women, with only half (49.5%) were used appropriately to guide treatment in patient with  $\leq 2$  symptoms. Urine culture was done in 107 (72.8%) women, with the majority (87.9%) were inappropriately/unnecessarily requested.

While starting empirical treatment was high (134/147, 91.2%), only 14.2% (19/134) were appropriate (trimethoprim or nitrofurantoin). Additionally, 38.8% of the few appropriately prescribed antibiotics did not complete the recommended 3 day course.

**Conclusion:** We are reporting a substantial deviation from the SIGN recommendations for the management of LUTI in a primary care setting in Saudi Arabia.

**Keywords:** Urinary Tract Infection, Guidelines, Adherence, Primary Care, Saudi Arabia.

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### INTRODUCTION

Urinary tract infection (UTI) is one of the most common acute infections among patients visiting the outpatient clinics, with the risk is much higher among women than men.<sup>1,2</sup> It was estimated that more than 10% of adult women report at least one UTI episode every year.<sup>3</sup>

As the majority of these infections are caused by narrow spectrum of generally sensitive uropathogens, the current guidelines for the management of acute uncomplicated community-acquired UTI endorse empirical treatment without waiting for the urine culture or susceptibility testing to guide drug selection.<sup>4,5</sup>

Trimethoprim-sulfamethoxazole and nitrofurantoin remain the first-choice empiric therapy.<sup>6</sup> However, extensive empiric use of other antimicrobials may lead to overuse of antibiotics, which consequently may increase the healthcare cost and the risk of developing bacterial resistance.<sup>6,7</sup> Additionally, inappropriate management of UTI may result in recurrent infections.<sup>8</sup>

A number of guidelines for the treatment of acute UTI have been published with the aim to optimize the antimicrobial selection and duration of therapy as well as to minimize unnecessary use of diagnostic tests.<sup>9-11</sup> However, despite the availability of such guidelines, a wide range of inconsistency in the management of UTI have been reported worldwide.<sup>12-15</sup>

In Saudi Arabia, the variability in managing acute UTI among non-pregnant women at primary care setting has led to attempt to develop a local clinical practice guideline in 2000.<sup>16</sup> Since then there is lack of studies quantifying physicians' adherence to local or international guidelines. This is specially crucial in Saudi Arabia, where several hospitals have no specific managing guidelines and antibiotics are frequently sold with minimal restrictions.<sup>16,17</sup>

The objective of the current study was to compare the current practices of managing uncomplicated lower UTI (LUTI) among

non-pregnant women in reproductive age treated at a primary care setting, where no specific guidelines for managing acute UTI are endorsed.

## METHODS

**Setting:** The study will be conducted at the general clinics of Al-Wazarat Healthcare Center (WHC) located in Riyadh, Saudi Arabia. It is a big family medicine center that consists of thirty two general clinics, pharmacy, laboratory, treatment room and radiology room. The WHC is serving about 1000 visits daily.

**Study design:** A retrospective chart review study design was done as a part of an auditing process of the practices of family physicians. The study obtained all required ethical approvals from the research committee of Riyadh Military Hospital. The consent requirement was waived as the study was auditing routine care through retrospective chart review.

**Population:** The study was carried among women in the reproductive age (15 to 45 years) who were presented with symptoms of LUTI at WHC between June and November 2013. Patients were excluded if they have symptoms suggesting pyelonephritis (history of fever or loin pain), complicated cystitis (with underlying risk factors such as pregnancy, diabetes, urinary catheter, renal failure, renal stones, urinary cancers, obstructive uropathy, neurogenic bladder, and immunosuppression as in renal transplantation and chemotherapy), or recurrent uncomplicated LUTI (history of 2 attacks of UTI during last six months or 3 attacks during last one year).

**Standard Guideline:** The diagnosis and treatment practices among the examined women were compared to the recommendations of the Scottish Intercollegiate Guidelines Network (SIGN) for the management of suspected bacterial urinary tract infection in adults.<sup>9</sup>

The SIGN recommendations were published in 2006 and updated in 2012 and include the followings:

(1) Considering empirical treatment with antibiotic or otherwise healthy women aged less than 65 years of age presenting with severe or  $\geq 3$  symptoms of UTI,

(2) Using dipstick tests to guide treatment decisions in otherwise healthy women under 65 years of age presenting with mild or  $\leq 2$  symptoms,

(3) Exploring alternative diagnoses and consider pelvic examination for women with symptoms of vaginal itch or discharge,

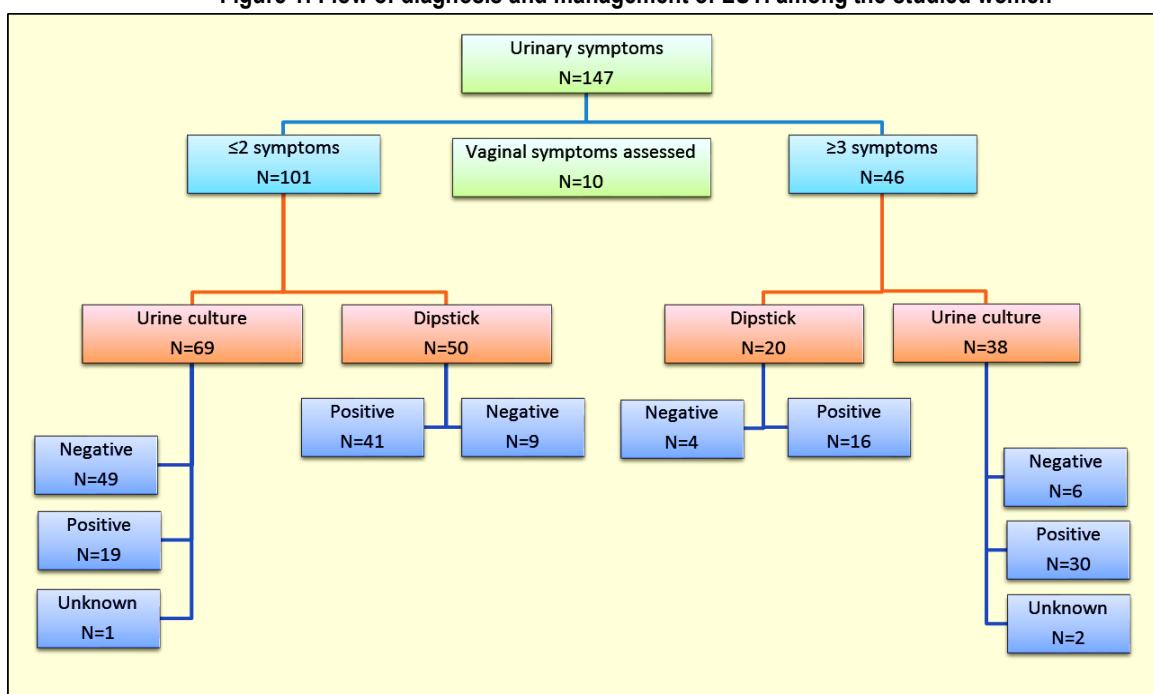
(4) Treating non-pregnant women of any age with symptoms or signs of acute LUTI with a three day course of trimethoprim or nitrofurantoin, and

(5) Taking urine for culture to guide change of antibiotic for patients who do not respond to trimethoprim or nitrofurantoin.<sup>18</sup>

**Data Collection:** Data were collected using a standard data extraction sheet which was filled after reviewing the medical records in WHC. The data extraction sheet was filled only after reviewing the inclusion and exclusion criteria including age and comorbidities. Clinical records (MedServe archive system), pharmacy prescriptions, and laboratory records (Main Frame system) were all used in collecting the data. The sheet had questions about the urinary symptoms, vaginal symptoms, laboratory diagnosis, treatment, and follow up. Urinary symptoms considered included dysuria, suprapubic discomfort, frequency of urination, hematuria, urgency of urination, and polyuria. The sheet was reviewed by two family medicine consultants for face and content validity and was piloted on 10 patient records to identify and fix unforeseen difficulties.

**Statistical Analysis:** Data were presented using frequencies and percentages for categorical data and mean and standard deviation (SD) for continuous data. Laboratory diagnosis and antibiotic treatment were stratified by the number of symptoms ( $\leq 2$  symptoms and  $\geq 3$  symptoms). Differences in laboratory diagnosis and treatment between the two groups were evaluated using Chi-square or Fisher's exact tests, as appropriate. For each recommendation, the adherence rate was calculated as those who had appropriate practice in relation to all applicable patients. SPSS software (release 20.0, SPSS Inc., Chicago, U.S.) was used for all statistical analyses.

Figure 1: Flow of diagnosis and management of LUTI among the studied women



AB. Antibiotics prescribed; TSX, trimethoprim/sulfamethoxazole; NFT, nitrofurantoin

**Table 1: Clinical presentations of the examined women**

	Number/mean	%/SD
<b>Age</b>		
Mean & SD	31.1	7.9
15-24	33	22.4%
25-34	66	44.9%
35-45	48	32.7%
<b>Assessment of urinary symptoms:</b>		
No	0	0.0%
Yes	147	100.0%
<b>Number of urinary symptoms</b>		
Mean & SD	2.0	0.9
1 symptom	57	38.8%
2 symptoms	44	29.9%
3 symptoms	44	29.9%
>3 symptoms	2	1.4%
<b>Urinary symptoms groups</b>		
≤2 symptoms	101	68.7%
≥3 symptoms	46	31.3%
<b>Type of urinary symptoms</b>		
Dysuria	106	72.1%
Suprapubic discomfort	67	45.6%
Frequency of urination	47	32.0%
Hematuria	37	25.2%
Urgency of urination	24	16.3%
Polyuria	5	3.4%
<b>Assessment of vaginal discharge or irritation</b>		
No	137	93.2%
Yes	10	6.8%
<b>Findings</b>		
Absent	7	70.0%
Present	3	30.0%

## RESULTS

A total 147 women were included in the study (Figure 1). As shown in Table 1, the average age of the women was  $31.1 \pm 7.9$  years. The majority were aged 25-34 years (44.9%), followed by age 35-45 years (32.7%) and age 15-24 years (22.4%). All women were assessed for urinary symptoms, with at least one urinary symptom. The average number of symptoms was 2 symptoms. Approximately 57 (38.8%) women had one urinary symptom, 44 (29.9%) had two symptoms, 44 (29.9%) had three symptoms, and finally 2 (1.4%) women had more than three symptoms. Therefore those who had ≤2 symptoms were 68.7% while those who had ≥3 symptoms were 31.3%. The most frequent urinary symptom encountered was dysuria (72.1%), followed by suprapubic discomfort (45.6%), frequency of urination (32.0%), hematuria (25.2%), urgency of urination (16.3%), and polyuria (3.4%). Out of the 147 women, the presence of vaginal discharge or irritation was assessed only in 10 (6.8%). Among these 10 women, 3 only had

actual complain of vaginal discharge or irritation, with no documentations indicating the search of alternative diagnosis. As shown in Table 2 and Figure 1, dipstick was appropriately done for 50 (49.5%) out of the 101 women who had ≤2 symptoms and was inappropriately done for 20 (43.5%) out of the 46 women who had ≥3 symptoms. In the 70 women who had dipstick done, approximately 81% had positive dipstick results, with similar rates among those who had ≤2 and ≥3 symptoms. Out of the 147 women examined, urine culture was done in 107 (72.8%) women, with the rate slightly higher among those who had ≥3 symptoms (82.6%) than those who had ≤2 symptoms (68.3%). The urine culture was positive in 27.9% of the women who had ≤2 symptoms and in 16.7% of the women who had ≥3 symptoms. The majority of urine cultures done were inappropriate in both women who had ≤2 symptoms (91.3%) and women who had ≥3 symptoms (81.6%).

Table 2: Laboratory diagnosis and treatment of LUTI in the examined women

	$\leq 2$ symptoms N=101		$\geq 3$ symptoms N=46		Total N=147	
<b>Dipstick</b>						
<b>Done</b>						
No	51	50.5%	26	56.5%	77	52.4%
Yes	50	49.5%	20	43.5%	70	47.6%
<b>Findings</b>						
Negative	9	18.0%	4	20.0%	13	18.6%
Positive	41	82.0%	16	80.0%	57	81.4%
<b>Appropriateness</b>						
No	0	0.0%	20	100.0%	20	28.6%
Yes	50	100.0%	0	0.0%	50	71.4%
<b>Urine culture</b>						
<b>Done</b>						
No	32	31.7%	8	17.4%	40	27.2%
Yes	69	68.3%	38	82.6%	107	72.8%
<b>Findings</b>						
Negative	49	72.1%	30	83.3%	79	76.0%
Positive	19	27.9%	6	16.7%	25	24.0%
<b>Appropriateness</b>						
No	63	91.3%	31	81.6%	94	87.9%
Yes	6	8.7%	7	18.4%	13	12.1%
<b>Antibiotic treatment</b>						
<b>Given</b>						
No	12	11.9%	1	2.2%	13	8.8%
Yes	89	88.1%	45	97.8%	134	91.2%
<b>Empirical treatment appropriateness*</b>						
No	6	6.7%	4	8.9%	10	7.5%
Yes	83	93.3%	41	91.1%	124	92.5%
<b>Antibiotic type</b>						
Cefuroxime	51	57.3%	29	64.4%	80	59.7%
Trimethoprim	9	10.1%	7	15.6%	16	11.9%
Amoxicillin	8	9.0%	5	11.1%	13	9.7%
Augmentin	11	12.4%	1	2.2%	12	9.0%
Ciprofloxacin	7	7.9%	1	2.2%	8	6.0%
Nitrofurantoin	2	2.2%	1	2.2%	3	2.2%
Azithromycin	1	1.1%	1	2.2%	2	1.5%
<b>Appropriateness of type</b>						
No	78	87.6%	37	82.2%	115	85.8%
Yes	11	12.4%	8	17.8%	19	14.2%
<b>Appropriateness of duration</b>						
No	5	45.5%	2	25.0%	7	36.8%
Yes	6	54.5%	6	75.0%	12	63.2%
<b>Overall appropriateness</b>						
No	83	93.3%	40	88.9%	123	91.8%
Yes	6	6.7%	5	11.1%	11	8.2%

\*Antibiotic prescription to non-negative dipstick

**Table 3: Evaluation of diagnosis and treatment of LUTI among the examined women against SIGN recommendations**

	Done (N)	Total (N)	Adherence %	Audit standard*
<b>SIGN recommendations</b>				
<b>Assessment of urinary symptoms</b>	147	147	100.0%	
<b>Assessment of vaginal discharge or irritation</b>	10	147	6.8%	80%
<b>Exploring or considering alternative diagnosis</b>	0	3	0.0%	80%
<b>Use of dipstick to guide treatment in patient with <math>\leq 2</math> symptoms</b>	50	101	49.5%	90%
<b>Starting empirical treatment in patient with <math>\geq 3</math> symptoms or <math>\leq 2</math> symptoms with positive dipstick</b>	124	134	91.2%	90%
<b>Appropriate antibiotic selection</b>	19	134	14.2%	90%
<b>Appropriate duration of appropriately prescribed antibiotics</b>	12	19	63.2%	90%
<b>Urine culture to guide treatment of appropriately prescribed antibiotics</b>	13	19	68.4%	90%
<b>Documentation of the response to treatment</b>	0	19	0.0%	
<b>Documentation of the use of urine culture to guide treatment of appropriately prescribed antibiotics</b>	0	19	0.0%	
<b>Unnecessary practices</b>				
<b>Use of dipstick to guide treatment in patient with <math>\geq 3</math> symptoms</b>	20	46	43.5%	
<b>Use of urine culture to guide treatment of inappropriately prescribed antibiotics</b>	94	107	87.9%	
<b>Having urine culture for those with positive dipstick</b>	33	57	57.9%	
<b>Starting empirical treatment in patient with <math>\leq 2</math> symptoms with negative dipstick</b>	10	13	76.9%	
<b>Doing follow up urine culture without justification</b>	22	24	91.7%	

SIGN, Scottish Intercollegiate Guidelines Network. The audit standard was set by Stewart (2012)

As shown in Table 2 and Figure 1, out of the 147 women examined, antibiotics were prescribed in 134 (91.2%). The prescription rate was slightly higher among those who had  $\geq 3$  symptoms (97.8%) than those who had  $\leq 2$  symptoms (88.1%). The most commonly prescribed antibiotic (N=134) was cefuroxime (59.7%), followed by trimethoprim (11.9%), amoxicillin (9.7%), Augmentin (9.0%), ciprofloxacin (6.0%), nitrofurantoin (2.2%), azithromycin (1.5%). Among those who were prescribed antibiotics (N=134), the recommended antibiotic course (trimethoprim/ trimethoprim sulfamethoxazole or nitrofurantoin) was prescribed in 11 (12.4%) of the 89 women who had  $\leq 2$  symptoms and in 8 (17.8%) of the 45 women who had  $\geq 3$  symptoms. Among those who were prescribed the recommended antibiotic course (N=19), the duration of antibiotic use was appropriate (3 days) in 6 (54.5%) of the 11 women who had  $\leq 2$  symptoms and in 6 (75.0%) of the 8 women who had  $\geq 3$  symptoms.

Table 3 evaluated the different practices of diagnosis and treatment of LUTI against SIGN recommendations. Clinically, all women were assessed for urinary symptoms but only 6.8% of them were assessed for the presence of vaginal discharge or irritation. For laboratory diagnosis, only half (49.5%) of the dipsticks done were used appropriately to guide treatment in patient with  $\leq 2$  symptoms. However, 11 (84.6%) of the 13 women with negative dipstick were prescribed antibiotics.

Moreover, the majority (87.9%) of urine cultures done were inappropriately/unecessarily used to guide treatment of inappropriately prescribed antibiotics while the recommended use of urine culture to guide treatment of appropriately prescribed antibiotics was 12.1% of all urine cultures done, which covered 68.4% of appropriately prescribed antibiotics. For treatment, while starting empirical treatment in patient with  $\geq 3$  symptoms or  $\leq 2$  symptoms with positive dipstick was high (91.2%), only 14.2% of these empirical treatments involved the recommended antibiotic course (trimethoprim/ trimethoprim sulfamethoxazole or nitrofurantoin). Additionally, 38.8% of the few appropriately prescribed antibiotics did not complete the recommended 3 day course. Finally, there were no documentations regarding the number of treatment failures or how urine culture was used to guide such failures.

## DISCUSSION

We are reporting the adherence of family physicians in a primary care center in Saudi Arabia to the SIGN recommendations for managing uncomplicated LUTI among non-pregnant women in reproductive age. The finding of the current study showed a substantial deviation from the SIGN recommendations. The inappropriate practices included both the selection of diagnostic laboratory tests and the prescription pattern of antibiotics. Actually out of the 5 SIGN recommendations set forth in the current

methods, "starting empirical treatment" was the only recommendation to meet the 90% audit standard.<sup>12</sup> On the other hand, all other recommendations were far away from achievement, with the exception of "using dipsticks to guide treatment" which was partially achieved. Likewise, several international studies showed suboptimal to low adherence to different UTI management guidelines, with wide variability in the interpretation of signs and symptoms, selection of different diagnostic tests, initiation of antibiotic therapy and follow up of patients.<sup>12-15,19,20</sup> For example, a similar audit study done in semi-rural health center in Scotland found suboptimal adherence to the SIGN recommendations, with only 2 of the 6 standards set forth were achieved.<sup>12</sup> In another study done at the Mayo Clinic family medicine center in the US, only 30% of the patients with uncomplicated UTI were appropriately managed as per the national guidelines, with less than 25% received appropriate empirical treatment.<sup>15</sup> Similar to the current finding, assessment of vaginal discharge or irritation to exclude other diagnoses (as sexually transmitted disease) as cause of urinary symptoms was very low in above Scotland and Mayo Clinic patients.<sup>12,15</sup>

Approximately three-quarters of the patients in the current study had their urine culture done with almost 90% of them were inappropriately/unnecessarily requested. Additionally, half of the current patients had unnecessary dipstick, with almost 60% of those with positive dipstick had also their urine culture done. This misuse of diagnostic testing was similar to some Western studies where 76% to 87% of their patients had urine culture, including 80% of patients with positive results on urine dipstick.<sup>5,15</sup> On the other hand, the current results was much worse than other similar study where 74% of urine cultures and 91% of dipsticks were appropriately requested.<sup>12</sup> It has been shown that urine culture is not needed for the confirmation of uncomplicated LUTI and dipstick should only be used in mild uncomplicated LUTI.<sup>9</sup> Requesting both of tests on the same time or requesting either one for the non-appropriate type of patient is just wasting of resources. It may also reflect easily accessible laboratory testing, inadequate patient counselling, and busy physician schedule.<sup>21</sup> The current finding showed a very low appropriate antibiotic selection (at 14%). This was similar to local studies<sup>17</sup> but considerably lower than similar rates in USA and Canada which ranged between 24% and 41% for trimethoprim/sulfamethoxazole and 19% and 30% for nitrofurantoin.<sup>5,13-15</sup> Surprisingly, the most commonly prescribed antibiotic in the current study was cefuroxime. This may partially reflect an increasing antibiotic resistance pattern among common uropathogens.<sup>22</sup> Nevertheless, cephalosporin use is against the SIGN<sup>9</sup> and other similar guidelines<sup>10</sup> and is not expected outside the hospital setting.<sup>23</sup> This inappropriate selection may unnecessarily increase the healthcare cost and the risk of developing bacterial resistance.<sup>6,7,24</sup> The inadequate adherence to SIGN recommendations in the current study may reflect local lack of uniform diagnostic criteria endorsed by the administration, lack of antimicrobial stewardship, and limited pharmaceutical auditing.<sup>16,17,25</sup>

Additionally, the physician may find it difficult to keep up with new recommendations for different conditions due to inadequate education and training programs.<sup>26</sup> Would be of greater concern, some physicians may be aware of the guidelines but choose to continue to prescribe independently of the published recommendations.<sup>27</sup> Such physicians may be influenced by

pharmaceutical marketing, own clinical experiences, concern for patient satisfaction and preference, misconceptions about antimicrobial resistance, and fear of infectious complications.<sup>20,27,28</sup> Finally, it has been shown that mere presence of guidelines is not sufficient and is not guarantee for appropriate change in the physician behavior, which emphasize the role of other concomitant intervention such as training and auditing.<sup>27,29</sup>

The study was done at primary care setting as a part of an auditing process. It represents an opportunity to understand current clinical practice, to quantify the practice gap, to identify additional efforts needed before implementing international guidelines, and to assist in future pharmaceutical decisions. Nevertheless, we acknowledge some limitations. As a single-center study, the finding can be generalized to all primary care centers in Saudi Arabia, specially that barriers to appropriate adherence of guidelines was shown to be different from one place to another.<sup>29</sup>

The poor documentation and the retrospective design probably limited our ability to study the impact of the current practices on patient outcome. However, poor documentation is almost unavoidable characteristic of similar studies.<sup>11,30</sup> Finally, other susceptible groups of UTI were not covered in the current study such as pregnant, older people and those with upper UTI symptoms. These groups should be the target of future similar studies.

In conclusion, we are reporting a substantial deviation from the SIGN recommendations for the management of LUTI in a primary care center in Saudi Arabia. The inappropriate practices included both the selection of diagnostic laboratory tests and the prescription pattern of antibiotics. Education of physicians about the guidelines and continuous monitoring of its application is of paramount importance. Additionally, initiating antimicrobial stewardship and enforcing pharmaceutical auditing may reduce inappropriate antibiotic prescriptions. The current design need to be repeated after implementing the above interventions to complete the audit cycle and to evaluate the proposed interventions. This will likely increase the physician adherence, improve quality of care and reduce the healthcare costs.

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