

**Is syndromic management better than the current approach for  
treatment of STDs in China?**

**Evaluation of the cost-effectiveness of syndromic management**

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## **ABSTRACT**

**Objective:** To evaluate and compare the validity and costs of syndromic management with the approach currently used in management of male patients complaining of urethral discharge and genital ulcers in Hefei, China.

**Methods:** Diagnostic accuracy, appropriateness of treatment, costs and effectiveness were compared between current clinical management procedures and treatment based on clinical signs only (syndromic management) in 406 men attending four STD clinics. Physician's diagnosis and clinic laboratory test results were compared to the test results of the National Center for STD Control.

**Results:** Using a modified World Health Organization (WHO) syndromic algorithm for urethral discharge would have generated 100% sensitivity and a 69% positive predictive value (PPV). A syndromic algorithm for genital ulcers would have correctly treated all syphilis patients with a 25% PPV. Syndromic management would have over-treated 107 patients with urethral discharge and 40 patients with genital ulcers. The current approach incorrectly treated 119 patients with urethral discharge and 1 patient with genital ulcers, and over treated 107 patients with urethral discharge and 10 patients with genital ulcers. The average cost per correct treatment by the current approach was \$323.48 for urethritis, and \$85.65 for syphilis, whereas for the

syndromic approach, the average cost per correct treatment would be \$3.15 for urethritis, and \$13.54 for syphilis.

**Conclusions:** Syndromic management can provide better treatment at lower cost for treatment of STDs. It should, therefore, be considered for use in resource poor settings, such as China.

## **INTRODUCTION**

There is considerable evidence that the presence of a sexually transmitted disease (STD) increases the risk of HIV transmission by as much as twofold to 20-fold<sup>1</sup>. In developing countries where the incidence of STDs still remains very high, STDs have generated tremendous economic loss. Consequently, the prevention and control of STDs should be a top priority and would result in considerable health gains.

Unfortunately, although effective programmes that provide accurate diagnosis and effective treatment are essential, they are relatively rare in China. Thus, affordable, effective approaches to manage STD patients in developing countries, such as China, need to be developed. To address the need, the World Health Organization (WHO) developed and advocates syndromic management to manage STD patients<sup>2,3</sup>.

Syndromic management is based on classification by groups of symptoms (patient complaints) and signs (patient and provider observations) to determine the nature of infection. A combination of treatments is then prescribed that are effective against the most common organisms that cause the symptoms and signs<sup>4,5</sup>. This approach facilitates rapid diagnosis and treatment without requiring sophisticated and time-consuming laboratory tests or advanced medical skills. However, the decision to adopt syndromic management may need to be setting-specific considering the variations in STD epidemiology, operational issues, cost, local expertise, laboratory resource and acceptability<sup>6</sup>.

STDs, including AIDS, have increased rapidly in China in recent years<sup>7</sup>. Several studies have indicated that there are obstacles to effective STD management including the lack of laboratory facilities, qualified staff and financial resources<sup>8,9</sup>. Although studies in several countries have demonstrated that syndromic management is effective for STD management<sup>5,6</sup>, the approach has yet to be fully evaluated in STD clinics in local settings in China. Some studies have addressed the limitations of syndromic management, but very few have compared its cost-effectiveness with the current approach used in STD clinics. In this study, we first evaluated the validity of syndromic management to treat patients complaining of urethral discharge, dysuria, or genital ulcers, and then assessed its cost-effectiveness compared with the current approach being used in STD clinics. China's Action Plan for Reduction and Prevention of HIV/AIDS (2001 - 2005) calls for the reform of current health services and the implementation of new standardized STD management in STD clinics. Thus, information about the quality and cost effectiveness of syndromic management is essential to health policy makers in China in order to improve STD control and provide better health services to STD patients.

## **METHODS**

### *Study site*

Hefei is the capital city of Anhui province with a population of 1,302,800. About 78.5% of the population of Hefei live in urban areas<sup>10</sup>. The surveillance data for STDs indicates that the annual incidence increased from 7/100,000 in 1991 to 405/100,000 in 1999, a 58-fold increase<sup>11</sup>. The present study was conducted in four urban STD clinics in the city of Hefei. From a total of 16 STD clinics, four urban STD clinics

were selected to be studied. Two clinics were run by the local health department. The other two were private clinics. Selection criteria for the clinics included (1) at least one new patient sought medical service per day, (2) only one clinic per district, and (3) cooperation was obtained from the STD clinic staff. If more than one clinic met the selection criteria, the clinic to be included was selected randomly.

### *Study population*

Consecutive male patients complaining of urethral discharge, dysuria symptoms or genital ulcers presenting at the four STD clinics between May and July 2000 were included in the study. Only those who were attending the clinics for their first time for their current STD symptoms were invited to participate. After obtaining informed consent each participant was administered a two-part structured questionnaire. The questionnaire included demographic and behavioral data as well as a selective medical history regarding past STDs and current symptoms. The details of administration of the questionnaire have been previously reported<sup>12</sup>.

### *Current approach to treat patients at STD clinics*

STD physicians first made a presumptive diagnosis based on the physical examination, and then requested that the patient provide a specimen for testing for causative agents at the STD clinic laboratory. The physicians' final diagnosis was based on the results of both the local clinic laboratory tests and his experience. Drugs were proscribed based on the physicians' judgment.

### *Syndromic management*

Using the WHO syndromic algorithms, patients were classified initially as either urethral discharge or genital ulcers. For the final analysis, the WHO algorithm was modified to include all patients who complained of urethral discharge or dysuria.

### *Laboratory tests in local STD clinics*

Laboratories in the different STD clinics used various methods. Because we planned to evaluate the effectiveness of the current approach, the routine methods and their procedures in each laboratory were performed as usual. In STD clinics, urethral swabs were taken from each man complaining of urethral discharge or dysuria. Testing methods for *N. gonorrhoeae* included Gram stain or/and culture. The laboratory tests for *C. trachomatis* included culture, direct fluorescent antibody (DFA), enzyme immunoassay (EIA), or/and Chlamydia antigen detection. Blood samples were taken from patients who complained of genital ulcers. Serological tests for syphilis included the rapid plasma reagin (RPR) test and/or Treponema pallidum haemagglutination (TPHA) test. No other tests for diagnosis of genital ulcers were done at the local laboratories.

### *Gold standard tests in the National Center*

An aliquot of each specimen was transported to the Chinese National Center for STD Control and Prevention in Nanjing for testing. These tests were done without knowledge of the results of the tests performed in the local STD clinics or of the physicians' diagnosis.

1. Specimens from patients with urethral discharge

Fifty ml of first catch urine was collected from each patient at the clinic who had a urethral discharge. Specimens were stored in clean polypropylene containers without preservatives and kept at  $-30^{\circ}$  C. Specimens were tested for both *N. gonorrhoeae* and *C. trachomatis* by polymerase chain reaction (PCR test, Amplicor CT/NG, Roche, Branchburg, NJ, USA).

## 2. Specimens from patients with genital ulcers

After lesions in the genital area were thoroughly cleaned with a sterile swab, material from the base of the largest lesion was collected on a cotton-tipped swab. The swab was vigorously agitated for 15 seconds in the collection tube containing transport medium and was then frozen at  $-30^{\circ}$  C. Polymerase chain reaction tests were performed to detect herpes simplex virus (HSV) and *Haemophilus ducreyi*. In addition, 10 ml of venous blood was obtained and tested for syphilis serology by RPR (RPR test kit, Urumoqi, China). Positive tests were confirmed with the passive particle agglutination test for detection of antibodies to treponema pallidum (SERODIA<sup>®</sup>, Fujirebio Inc, Tokyo, Japan).

## *Cost and effectiveness analysis*

The costs of the current approach included direct costs, the amount of money paid by patients for their actual medical expenses. The direct costs covered laboratory tests, physical examination (check-up) by physicians and drugs. Costs were obtained directly from patients' payment records at each STD clinic. The costs of syndromic management included physical examination, drugs, materials for health education and condoms. The cost for drugs recommended by the WHO were estimated by STD physicians and pharmacists who were independent of the four selected STD clinics.

Correctly treated patients were defined as those who were correctly diagnosed and given appropriate drugs. Patients who were free of *N. gonorrhoeae*, *C. trachomatis*, or treponema pallidum infection, but were misdiagnosed and mistreated as having the infection were classified as over diagnosed and over treated. If patients with *N. gonorrhoeae*, *C. trachomatis*, or treponema pallidum infection, were not diagnosed and not treated for the infections, but were mistakenly treated for another infection, they were classified as incorrectly diagnosed and incorrectly treated. The cost of their diagnosis and treatment, however, was considered in cost analysis. No indirect cost was assigned to them although there would have been a cost to society since they would continue to be at risk for transmitting the STD to sexual partners.

#### *Statistical analysis*

All data were entered into a computerized database using Epi-Info 6.12 (Centers for Disease Control and Prevention, Atlanta, GA). Results from the STD clinics and the national center were compared using the testing results from the national center as the gold standard. The sensitivity, specificity, and positive predictive values (PPV) of syndromic management were calculated.

## **RESULTS**

#### *Study population*

Four hundred and seventeen eligible subjects were invited to participate, 11(3%) of whom refused. Thus, 406 (97%) men complaining of genitourinary symptoms were interviewed. Table 1 presents the distribution of demographic characteristics, and STD symptoms among the 406 STD patients. The majority of participants were married and had achieved middle school or higher education. Almost 1/3 (30%) were private

businessmen. Three hundred and fifty patients (86%) complained of urethral discharge or dysuria symptoms, and 55 patients (14%) had genital ulcers. One patient (0.3%) had both urethral discharge and a genital ulcers.

#### *Validity analysis for syndromic management*

Because urine samples could not be obtained from 3 patients, validity analysis was performed among 347 patients complaining of urethral discharge or dysuria. Among the 290 patients complaining of urethral discharge, 227 patients were positive for *N. gonorrhoeae* or/and *C. trachomatis*. Among 57 patients complaining of only dysuria, 13 were positive for each of the two causative agents (Figure1). According to WHO's syndromic algorithm, treatment is given only to patients with confirmed discharge. Therefore, 227 patients would have been correctly treated, generating 95% (227/240) sensitivity and 78% (227/290) PPV. Thirteen patients complaining of only dysuria would not have been treated. If treatment were given to all patients presenting either urethral discharge or dysuria, the sensitivity would have been increased to 100%, with 69% PPV (Table 2). One hundred and seven patients would be over treated by syndromic management. Thus, we modified the WHO algorithm for patients complaining of urethral discharge by treating dysuria as well. Further analysis was based the modified algorithm.

Among 55 patients complaining of genital sores or ulcers, 53 had confirmed genital ulcers. Among patients with confirmed genital ulcers, 13 were positive for syphilis, and none was positive among patients presenting no ulcers. No patients tested positively for chancroid. If syndromic management were used, all syphilis patients

would have been correctly treated, generating 100% of sensitivity, and 25% PPV, but 40 patients would have been over treated (Figure 2, Table 2).

*Effectiveness analysis of current approach and syndromic management*

Among 347 patients complaining of urethral discharge or dysuria, 121 (35%) were correctly treated for gonorrhoea or/and chlamydia by the current approach, 119 (34%) gonorrhoea or/and chlamydia patients were incorrectly treated, and 107 (31%) patients free of *N. gonorrhoeae* or *C. trachomatis* infection were over treated. If syndromic management had been used instead, all 240 patients with *N. gonorrhoeae* or/and *C. trachomatis* infections would have been correctly treated, and 107 (31%) patients would be over treated. The number of patients (107) over treated by syndromic management would have been the same as the number actually over treated by the current approach.

Among 53 patients presenting with ulcers, the current approach correctly treated 12 (23%) syphilis patients, over treated 10 (19%) non-syphilis patients for syphilis, and incorrectly treated 1 (2%) patient. If syndromic management had been used, all 13 syphilis patients would have been correctly treated, but 40 (75%) non-syphilis patients would have been over treated.

Using the current approach, 49% (77/158) of patients with *N. gonorrhoeae* infection, 25% (7/28) of patients with *C. trachomatis* infection and 65% (35/54) of patients with

both infections were not correctly treated. Using syndromic management, all patients would have been correctly treated.

*Cost analysis for the current approach and syndromic management*

As patients received a variety of drug regimens and laboratory tests, the cost for correct treatment, over treatment, and incorrect treatment differed. The median costs for per correctly-treated patient with gonorrhoea was \$84.27, \$158.30 for chlamydia, and \$177.42 for the mixed infections with gonorrhoea and chlamydia (Table 3).

According to the WHO syndromic management protocol for the management of patients complaining of urethral discharge, two drugs are to be used that are effective for both gonorrhoea and chlamydia<sup>13</sup>. Ciprofloxacin, 500mg in a single oral dose, is proscribed to treat gonococcal urethritis, and Doxycycline, 100 mg orally twice daily for seven days, is used to treat chlamydia urethritis. The cost of the two drugs for treating one patient is \$0.79. Fee for physical examination by a physician is \$0.60.

Syndromic management for STDs also requires health education and condom provision, therefore, \$0.79 per patient should be added to cover the health education materials (\$0.17) and the condoms (\$0.62). Thus, the total costs for syndromic management amounts to \$2.18 per correctly treated patient with gonorrhoea or/and chlamydia. The cost for syndromic management to manage STD patients (\$2.18) is much less than for the actual current approach that was employed. Because syndromic management uses the same drug regimen to treat all patients with the same syndrome, the cost of incorrect and over treatment is the same as correct treatment.

The median cost per correctly-treated patient presenting with a genital ulcer using the current approach was \$27.20, \$112.09 per incorrectly-treated patient, and \$58.94 per

over-treated patient. For the treatment of syphilis by syndromic management, WHO recommends Benzathine Penicillin G 2.4 million units given intramuscularly at a single session. The cost for the drug is \$1.93, plus \$0.60 for physical examination and \$0.79 for educational material and condoms. The total costs per patients with genital ulcers using the syndromic approach is \$3.32, regardless of whether the patient receives correct treatment or over treatment. Thus, the cost per correctly-treated patient by the syndromic approach (\$3.32) was also much less than the costs using the current approach (\$27.20).

The current approach cost a total of \$39,141.11 from the treatment of 347 patients complaining of urethral discharge or dysuria. Of the total cost, 30% was for correct treatment, 33% for incorrect treatment, and the other 37% for over treatment (Table 4). Thus, the average cost per correct treatment for urethritis was \$323.48 ( $\$39,141.11/121$ ). If modified syndromic management was used for the same patients, a total of \$756.46 would be charged for the 347 patients, 69% of the cost for correct treatment and 31% for over treatment. The average cost per correct treatment would be \$3.15 ( $\$756.46/240$ ). The proportion of costs for incorrect and over treatment using the current approach was greater than it would have been using syndromic management.

Twenty three patients with a genital ulcer paid \$1,027.89 for their treatments by the current approach. The cost of correct treatment was 32% of the total costs, 11% for incorrect treatment, and 57% for over treatment (Table 3-4). The average cost per correct treatment for syphilis, therefore, was \$85.65 ( $\$1027.89/12$ ). Were syndromic management used, a total of \$175.96 would be charged for 53 patients presenting

genital ulcers, 25% of the cost for correct treatment and 75% for over treatment. The average cost per correct treatment by syndromic management, thus, would be \$13.54 ( $\$175.96/13$ ). Obviously, the average cost per correct treatment for syphilis using syndromic management was much less than for the current approach. Therefore, syndromic management was more cost effective among patients with either urethral discharge or/and dysuria and genital ulcers.

## **DISCUSSIONS**

This study indicated that modified syndromic management would have high validity and cost effectiveness in the treatment of patients complaining of urethral discharge, dysuria or genital ulcers and could be easily implemented in China.

The urethral discharge algorithm proposed by WHO, however, would need to be reconsidered. The WHO algorithm treats only patients with confirmed urethral discharge, while patients with only dysuria are excluded. As a result, in the current study, 13 patients with only dysuria symptom and infected with *N. gonorrhoeae* or *C. trachomatis* would have been untreated. If the criteria are expanded to include both urethral discharge and dysuria, the sensitivity of the approach would increase to 100%, that is, all patients with *N. gonorrhoeae* or/and *C. trachomatis* infections would be correctly treated. The inclusion of dysuria was also suggested by another study<sup>14</sup>. Because the purpose of syndromic management is to treat correctly every possible patient and eliminate the source of infections from communities, we believe that the WHO algorithm should be expanded to also include men with a complaint of dysuria.

Successful diagnosis of the cause and selection of the appropriate therapy of genital ulceration requires considerable diagnostic accuracy by physicians. The WHO algorithm, which is simple to use, provided 100% sensitivity and 25% PPV. Thus, the algorithm would result in effective treating of all syphilis patients. A proportion of non-syphilis patients, however, would be over treated. As chancroid is rare in China<sup>15</sup>, the treatment for genital ulcers diseases at present may not include chancroid.

A significant advantage of the modified syndromic management to treat STD patients is its ability to effectively treat patients with the mixed infections of both *N. gonorrhoeae* and *C. trachomatis*. This study showed that all patients with the mixed infections would have been correctly treated by modified syndromic management, whereas, only 35% of the patients were actually correctly treated by the current approach. Because the diagnosis of mixed infections required both a diagnosis by the physicians and accurate laboratory tests, the inaccuracy in diagnosis may have resulted from the physicians' inability to make a correct diagnosis or an inaccurate laboratory test. Using syndromic management, two drugs for patients with urethral discharge that includes those with mixed infections would be given at their first visit. Therefore, syndromic management to treat patients with both urethral discharge and genital ulcer disease appears more effective.

One hundred and nineteen patients (34%) complaining of urethral discharge and 8% patients complaining of genital ulcers were treated incorrectly by the current approach. This incorrect treatment is a source of public health concern. First, incorrectly treated patients will continue to be infectious causing additional secondary sexually transmitted infections, resulting in additional costs for the communities. Our

previous report indicated that 164 (40.4%) men reported continuing to have sex after onset of STD symptoms<sup>16</sup>. Secondly, complications may result from the incorrect treatment, such as resistance to antibiotics. Further, patients will end up paying more for treatment because they will not be cured and will need additional treatment.

Over diagnosis and over treatment are considered the major disadvantages of syndromic management. This disadvantage has influenced health authorities against the approach. However, our study indicated that problems of over treatment and incorrect treatment using modified syndromic management were even less than for the current approach currently used in STD clinics because of the low level of accuracy using the current approach. For example, the current approach over and incorrectly treated 226 patients with urethral discharge or dysuria, whereas, syndromic management over treated only 107 patients. On the other hand, the number of over or incorrectly treated patients with genital ulcers was greater by syndromic management than the current approach. As the current approach also used RPR and TPHA to diagnosis syphilis, syndromic and current approaches have almost the same ability to diagnose syphilis. However, laboratory tests results usually can not be obtained immediately, as a result, patients have to return for treatment one or two days later. In that situation, some patients may not return.

Another major concern of syndromic management of STDs is the cost of drugs resulting from over treatment and the use of multiple antibiotic drugs. The high cost may cause under-utilization of services by patients, particularly for sexually transmitted diseases<sup>17</sup>. The question for determining the optimal medical policy is whether the cost of syndromic management is higher than the current approach

currently used in STD clinics in China. If syndromic management has the power to treat all STD cases at a lower extra cost than the current clinical management, it should be adopted. The study indicated that the cost per correct treatment by the current approach taking into consideration both mistreatment and over treatment was much higher than for syndromic management. Because the average cost per correct treatment for the same patients using syndromic management (\$3.15 for urethritis, and \$13.54 for syphilis) was much low than for the current approach (\$323.48 for urethritis, and \$85.65 for syphilis), syndromic management could significantly reduce the medical costs. In China where patients pay for their own treatment and few are covered by health insurance, the lower cost of syndromic management may reduce the delay in seeking treatment. For a given syndrome, syndromic management treats all patients the same way, the cost per over treatment is the same as the cost per correct treatment. It is quite different from the current approach. The cost per incorrect or over treatment was usually more than for the correct treatment, indicating that physicians used more drugs or larger doses than patients needed. If syndromic management were adopted, laboratory facilities and higher trained physicians would not be needed. As a result, more indirect costs, including laboratory personnel's salaries, would be saved. Thus, the costs we estimated for the modified syndromic approach here were probable higher than the actual costs would be. The incorrectly treated patients by the current approach may cause secondary cases as discussed above which also result in additional costs for the communities. Therefore, syndromic management is far more cost effective than the correct approach.

Obviously, syndromic management over treats patients when they have only one sexually transmitted infection. For example, a patient with *N. gonorrhoeae* infection

would be treated for both gonorrhoea and chlamydia. However, this study indicated that about 80% of patients were given 2 or more drugs for their treatment using the current approach. Therefore, the cost resulting from over treatment by syndromic management would be not higher than the current approach, because the current approach also used multiple drugs to treat patients and required laboratory testing as well which added to the cost for the patients.

Although the current approach used laboratory methods to make an etiological diagnosis, their results did not enhance effectiveness beyond that of syndromic management. A previous study indicated that laboratories in the STD clinics in China did not accurately test for sexually transmitted infections and the results did not enhance the physicians' ability to make a correct diagnosis<sup>9</sup>. The use of the laboratory, however, adds to the cost to the patients. As China is a developing country, reliable laboratory facilities usually are not available at health centers and dispensary levels, and quality control procedures to ensure valid laboratory results are often lacking even when laboratories do exist. Under these circumstances, syndromic management of STDs is far more cost effective. Because syndromic approach does not require laboratory staff and facilities, these would be saved using the modified syndromic approach.

Instructions about refraining from sexual activity during treatment, using condoms and partner notification are essential elements of effective STD management in a clinical setting. Health education plays an important role in awareness of disease, compliance to doctors' instructions, performance of safer sex and partner notification. As syndromic management provides quick diagnosis and treatment, physicians have

more time to conduct health education for patients and for providing patients with condoms. Although all STD patients should receive health counseling/education in STD clinics, more than half of the patients had not been given any health education by the current approach<sup>9</sup>.

Because STD patients seen in a few STD clinics in a single city probably do not represent all STD patients, the findings reported here may have limited generalizability. Another possible limitation of the study is that physicians might have changed their behavior in treating patients as a result of being observed. However, we reviewed the records of patients, who sought treatment for one month before the study started. The results suggest that the physicians and laboratories did not change their procedures in measurable ways<sup>9</sup>. Another limitation is that we assumed that all patients with proven etiology would respond to the appropriate treatment, and would take their medication as instructed. If this were not true, however, the bias would have been toward the null, suggesting that the validity of our observations would remain.

This study demonstrated that the modified WHO algorithm was able to detect and treat all gonorrhea or/and chlamydia infections among patients complaining of urethral discharge and dysuria. The WHO syndromic algorithm for genital ulcers also was able to identify all syphilis infections. Although the algorithm over treated a proportion of patients, the number of over treated patients and the resulting extra cost from the over treatment were less than what was actually spent using the current approach. The results have important public health implications. First, the results may allay fears of health policy makers that syndromic management results in more over treatment and higher cost in China. This fear is clearly incorrect at least in the setting

of our study. Second, many STD patients may go to pharmacies and buy drugs directly. Syndromic management does not require a physician's diagnosis and therefore, may be used by pharmacists, thereby further reducing costs. Last, owing to the scarcity of categorical resources and the predicated worldwide increase in the sexually active population at risk, using the modified syndromic management, health problems posed by STDs can more easily be addressed effectively within the framework of existing primary health care (PHC) resources. Thus, health authorities could set up clinics to implement the modified syndromic management at the PHC level, which does not require highly trained staff. The simplicity of the syndromic approach makes this intervention highly feasible at the PHC level where laboratory support is generally not available.

In conclusion, the modified syndromic management for medical care of male patients with urethral discharge and ulcers is a simple, cost effective approach for STD management in resource-poor countries. Although over treatment is an inherent problem, the advantages of the approach appear to outweigh its disadvantages. Health authorities should consider implementing the approach at STD clinics in China, especially at PHC level.

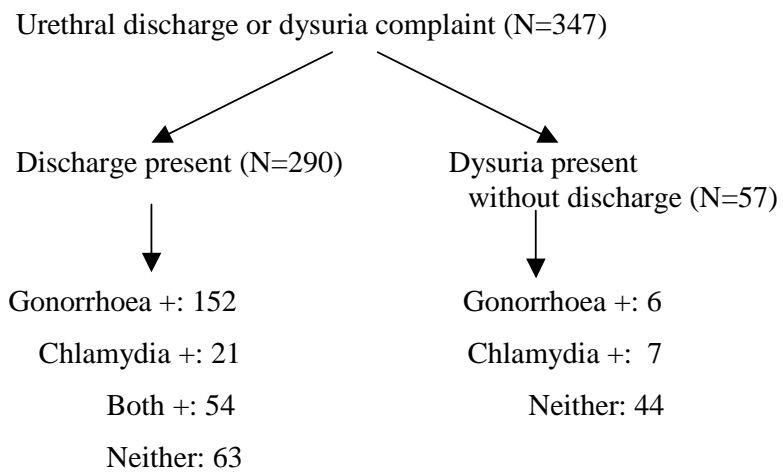


Figure 1. Outcome of urethral discharge algorithm

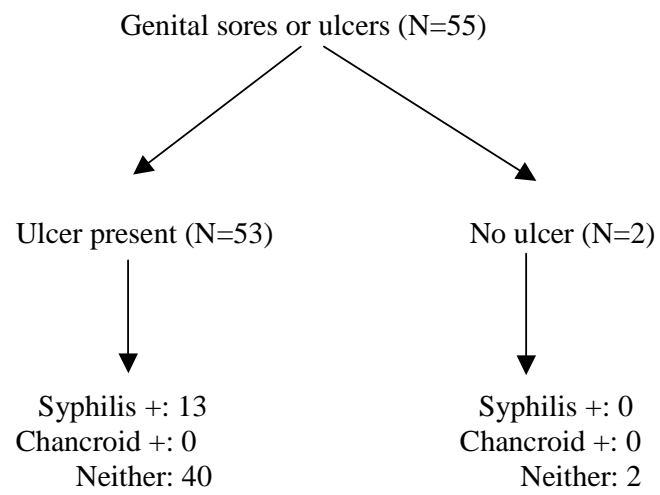


Figure 2. Outcome of genital sores or ulcers algorithm

Table 1. Selected Characteristics of symptomatic STD patients

	N	%
Age (years)		
18-25	91	22.4
26-30	113	27.8
31-35	66	16.3
36-40	82	20.2
41-83	54	13.3
Education		
0-5 years	32	7.9
6-8 years	133	32.8
9-10 years	141	34.7
Vocational school	33	8.1
University	67	16.5
Marital status		
Single	98	24.1
Married	276	68
Cohabiting or divorced	32	7.9
Occupation		
Worker	84	20.7
Private Business	122	30.1
Civil servant	79	19.5
Driver	50	12.3
Others	71	17.5
Symptoms		
Discharge or dysuria	350	86.2
Ulcer	55	13.5
Both discharge and Ulcer	1	0.3

Table 2. Validity analysis of STD syndromic managements

Algorithm	Syndromic classification	Causative agents		Sensitivity	Specificity	PPV
		+	-	%	%	%
Urethral discharge or dysuria						
WHO's algorithm	Discharge	227	63	95	41	78
	Dysuria only	13	44			
Modified algorithm	Both discharge & dysuria	240	107	100	0	69
Genital sore or ulcer						
WHO's algorithm	Ulcer	13	40	100	5	25
	no ulcer	0	2			

Table 3. Median cost per STD treatment by the current approach

	Correct treatment	Incorrect treatment	Over treatment
<b>Gonorrhoea</b>			
Lab cost	19.12	21.51	15.53
Check-up cost	0.60	0.60	0.60
Drug cost	64.55	120.67	54.36
<b>Cost in total</b>	<b>84.27</b>	<b>142.77</b>	<b>70.49</b>
<b>Chlamydia</b>			
Lab cost	14.34	21.51	15.53
Check-up cost	0.60	0.60	0.60
Drug cost	143.37	65.71	161.29
<b>Cost in total</b>	<b>158.30</b>	<b>87.81</b>	<b>177.42</b>
<b>Mixed infections with gonorrhoeae and chlamydia</b>			
Lab cost	21.51	21.51	28.67
Check-up cost	0.60	0.60	0.60
Drug cost	155.32	64.52	289.13
<b>Cost in total</b>	<b>177.42</b>	<b>86.62</b>	<b>318.40</b>
<b>Syphilis</b>			
Lab cost	8.46	19.35	8.46
Check-up cost	0.60	0.60	0.60
Drug cost	18.14	92.14	49.88
<b>Cost in total</b>	<b>27.20</b>	<b>112.09</b>	<b>58.94</b>

Table 4. Total cost for STD treatment by two approaches

	Current approach			Syndromic management		
	N	Total cost	%	N	Total cost	%
<b>Urethral discharge</b>						
Correct treatment	121	11485.49	30	240	523.20	69
Incorrect treatment	119	13022.37	33	0	0	0
Over treatment	107	14633.25	37	107	233.26	31
Total	347	39141.11	100	347	756.46	100
<b>Genital ulcer</b>						
Correct treatment	12	326.40	32	13	43.16	25
Incorrect treatment	1	112.09	11	0	0	
Over treatment	10	589.40	57	40	132.8	75
Total	23	1027.89	100	53	175.96	100

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