Insurance Testing

DIAGNOSTIC TESTING FOR ACUTE DYSURIA IN ADULT WOMEN: THE CURRENT STATE

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Introduction

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The Medical Information Sciences program is a National Library of Medicine-sponsored training and research program dedicated to the finding of new uses for computers in medical research, education and patient care. Research fellows and faculty members pursue computer-related research projects in a variety of areas. For example, in clinical decision analysis, they will extensively research a particular medical decision, including all possible strategies and the consequences of those strategies. The typical decision is between observing a patient suspected of having a particular clinical entity, treating the patient empirically, or testing the patient first to decide whether to treat or not. They then draw a “decision tree” listing all the possible consequences of all possible strategies, including the probabilities associated with those consequences and their utilities, or costs, both economic and otherwise. By using an ordinary desktop computer, they can calculate the maximum utility that one can realize from the situation and determine the best strategy for achieving that end. And since the computer relieves them of the onerous task of hand-calculation of these utilities, they can make these calculations multiple times, with multiple values for probabilities or outcome states about which they are uncertain. In this manner, they can calculate the best decision in nearly every conceivable medical setting.

Cost-benefit analysis and cost-effectiveness analysis are subsets of clinical decision analysis in which economic costs are explicitly taken into account, and often balanced against a recognizable clinical measure of utility, such as quality-adjusted life expectancy.

Other projects of interest include interactive multimedia presentations, computer-based instruction and examination of medical students, patient data management, and expert system design and implementation. I believe graduates of this program will be implementing broad-based changes in how we practice medicine in the future. The combination of computer skills plus medicine will allow them to design efficient, cost-effective techniques in diagnosis and management of patient care.

Acute dysuria in adult women is a serious problem in clinical medicine. Cost-effective early diagnosis is important for therapy. In those instances when this is not done, many of these women can have chronic recurring dysuria which has both morbidity and mortality implications. This of course is important for the insurance industry for health care insurance and possibly life insurance. Drs. Hurlbut and Littenberg are evaluating the most cost effective methods of diagnosis and management of this disorder. They are also evaluating the significance of various different positive urine tests in the differential diagnosis of acute dysuria versus acute vaginal infection. I felt this column would be of interest as a hallmark of things to come in directions of new research in computer applications in clinical medicine and laboratory testing.

Acute Dysuria, Incidence and Importance

Acute dysuria in women is one of the most common health problems in the United States today. Estimates of its incidence range from 10% to 20% of women at least once in their lifetime to as high as 25 per 100 woman-years. At least three million U.S. doctors’ office visits are made by women complaining of dysuria.

For nearly twenty years, the management of acute dysuria in women was dominated by several traditional assumptions about what disease these women usually have (bacterial urinary tract infection), the best test for that disease (bacterial culture of mid-stream, clean-catch urine), the criterion for a positive culture, and the optimal therapy for bacterial UTI. Several events in more recent years have cast doubt upon most or all of these assumptions. This discussion is intended to summarize the current medical consensus regarding acute dysuria in women, and to clarify the newer thinking that now pertains to this common clinical problem.

What does acute dysuria actually mean?

Acute dysuria literally means pain on urination. Usually, it refers to a burning sensation in the urethra that occurs whenever a patient passes urine.
When evaluating a man, this definition almost never produces any confusion. But when evaluating a woman’s complaint of dysuria, this definition can be confusing, and this confusion is definitely not trivial. The confusion is this: Does the woman feel this burning sensation “inside” her pelvis, or “outside”? That is, does she feel the pain from the passage of the stream itself, or does she feel the pain in her vagina, when the stream strikes the vaginal wall? This distinction may be, but is not always, helpful in determining whether the woman’s problem is really a bladder or urethral infection at all, or whether her actual problem is a vaginal infection, which requires a totally different course of treatment. Bacterial or chlamydial infections of the urinary tract may both respond to the same antibiotics, i.e., trimethoprim-sulfamethoxazole, but most infections of the vagina are due to fungi and yeast, and these will not respond to trimethoprim-sulfamethoxazole.

What is the differential diagnosis of acute dysuria?

The differential diagnosis of acute dysuria includes acute and subacute pyelonephritis (upper urinary tract infection) and bacterial lower urinary tract infection. It also includes urethritis caused by Chlamydia trachomatis and occasionally by Neisseria gonorrhoeae, Trichomonas vaginalis, Candida albicans, and herpes simplex virus. Dysuria may also be due to vaginitis. Finally, a syndrome of dysuria with no known pathogen has been described; this is usually due to noninfectious causes such as trauma or post-menopausal desiccation.

Stamm and colleagues in 1982 found Chlamydia trachomatis in 15 out of 63 women with bacteriologically sterile urine. Komaroff and colleagues in 1978 found a 77% prevalence of pure bacterial UTI and a 2% prevalence of vaginitis among women who complained of dysuria but not of vaginal discharge. Among women who complained of dysuria with a vaginal discharge, the prevalence of bacterial UTI was found to be 9%, and of vaginitis, 61%.

How good are bacterial urine cultures?

Traditionally, the bacterial culture of mid-stream, clean-catch urine has been considered the reference test for bacterial lower urinary-tract infections. Kass, in 1962, first proposed 100,000 colony-forming units per milliliter (CFU/ml) as a criterion of a positive culture, and this is currently the most common criterion in use in modern microbiology laboratories. Kass was attempting to promulgate a reference standard for the prevention or early detection of pyelonephritis, not lower-tract infection. Also, Kass set this criterion in an era when most catheters were made of glass, not today’s flexible plastic, and thus catheterized urine specimens were more difficult to obtain safely than they are today. More recently, Stamm and colleagues have cast serious doubt on whether 100,000 CFU/ml is a sensitive enough criterion for the detection of bacterial urinary tract infection; Stamm now recommends 100 CFU/ml in a catheter specimen or suprapubic aspirate as the new bacterial culture criterion.

Another, more serious limitation of the bacterial culture is that it cannot detect infections by Chlamydia trachomatis. Chlamydiosis has become more prevalent in recent years in men and women presenting to sexually-transmitted disease clinics. Cell culture for chlamydiae is expensive and may not be cost-effective.

What is the potential value of urinalysis in the management of acute dysuria?

Urinalysis traditionally has comprised testing of the urine with chemical reagents, and examination of urine under a microscope. Usually, the practitioner or laboratory technologist will centrifugate the urine, resuspend the sediment in a small amount of supernatant, and examine this concentrate under the microscope. Sometimes, uncentrifugated urine is examined directly. Chemical tests, for the past twenty years or longer, have been carried out with “dipsticks,” which are plastic strips with chemically-treated pads mounted on them. Dipsticks are, in general, easy to use and store; a dipstick examination of urine can usually be completed within five minutes or less.

In the diagnosis of acute dysuria, attention has focussed on two recent additions to the multiple-reagent dipstick in common use today. One of these is based on the Greiss test for nitrite in urine; nitrite is a metabolic by-product of Gram-negative bacteria, still the most common (but not the sole) agents of bacterial urinary tract infection. The other is designed to detect leukocyte esterase, which is found only in neutrophils. The leukocyte esterase test pad has been shown to detect white blood cells in urine with equal reliability whether the white cells have been lysed or not.

Based on multiple reported comparisons of the nitrite and leukocyte esterase dipstick tests to the traditional bacterial culture, a conjunctive combination of the two tests (calling the dipstick positive if one or both tests are positive) is about 75% sensitive and 80% specific, on average, in detecting bacteriuria defined as 100,000 CFU/ml on culture. No data currently exist on the ability of the dipstick to detect bacteriuria defined as 100 CFU/ml, and it is entirely possible that the dipstick could be less sensitive (but more specific) in detecting bacteriuria defined by this criterion.

What do the Experts Currently Recommend?

A thorough clinical history remains the cornerstone of effective diagnosis of acute dysuria in women. If a patient’s symptoms are unambiguous for urinary tract infection (no vaginal discharge, dysuria described as strictly “internal”), then a pelvic examination may not be required, and indeed the patient may best be treated empirically with trimethoprim-sulfamethoxazole, which is equally effective against coliform bacteria and chlamydiae. If her symptoms are unambiguous for vaginitis (vaginal discharge present; dysuria described as strictly “external”), then a urinalysis need not be done, but a pelvic examination may be required. Women with ambiguous symptoms and signs should probably have a pelvic examination and a urinalysis, and probably a urine culture. If a culture is obtained, the best criterion for a positive bacterial culture is probably 100 CFU/ml as recommended by Stamm, rather than Kass’s 100,000 criterion. Whether dipstick tests can replace the more expensive and time-consuming urinalysis, or the urine culture, is open to question.
REFERENCES


