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Improvement of Urinary Tract Infection Care in Swedish Nursing Homes from 2006 to 2010

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Abstract

Urinary tract infections (UTIs) are the most prevalent infectious disease requiring antibiotic treatment in nursing homes in Sweden. Diagnosis was primarily based on diffuse symptoms without microbiology tests for identifying bacteria. Excess treatment was obvious in that patients with asymptomatic bacterial urine (ABU) were included for treatment for infections. New guidelines were given by the local Strama group and the Department of Communicable Disease Control and Prevention to increase accuracy of diagnosis and education in care of UTI.

Aim: The aim of this study was to evaluate local guidelines to improve diagnostic accuracy by microbiologic confirmation of urinary bacteria before treatment, less use of rapid diagnostic tools, contact with physician before prescribing medication and more education.

Method: The prevalence of UTI was assessed together with infectious disease pattern and antibiotic prescribing during three periods in 2006, 2007 and 2010 in nursing homes. Nurses answered UTI surveys on knowledge about and opinions of UTI treatment.

Results: The UTI survey was conducted in 4 to 6 nursing different homes in each study period with in all 208, 325 and 505 inhabitants, respectively. The prevalence of infectious disease requiring antibiotic treatment decreased from 1.2 to 0.73 infections per inhabitant and year. For UTIs the decrease was 50%. The most prevalent urinary pathogen was *E.coli* (41%). Remarkably, 23% of the urine samples did not show any significant bacterial growth.

Discussion: Less antibiotic-requiring UTIs and use of antibiotics with lower potential for antibiotic resistance accompanied increased frequency of microbiology samples to confirm diagnosis, less test sticks, increased physician presence for diagnosis and prescription, improved hygiene routines and education was noted during the three study periods.

Conclusions: The prevalence of antibiotic treated UTI decreased dramatically without any obvious change in the prevalence of infectious disease. Microbiologic confirmation, expectation and greater physician involvement may have contributed for the change.

Keywords: Diagnosis accuracy; Nurses view; Prevalence; Urinary tract infection care

Introduction

Urinary tract infections (UTIs) are the most common antibiotic-requiring infectious disease in nursing homes in Sweden with incidence over 50% of antibiotic prescriptions [1-3]. Signs of UTI are diffuse symptoms such as confusion, tiredness and general feelings of sickness. In addition, urine odour and frequent urination may occur. These symptoms are not indicative of an UTI. Expectation for a couple of days may resolve symptoms and therefore antibiotic therapy is not necessary. Present guidelines require a positive urine culture. Good collaboration among the nurses in the nursing homes and the responsible physician may limit unnecessary antibiotic treatment for the benefit of less risk for the development of antibiotic resistance [4,5]. Diagnosis of UTI from urinary samples for analysis of bacteria is not generally done at the first outbreak but is more commonly performed when a second UTI occurs. Expectation on microbiology result has been shown important since 30-50% of the cultures are bacteria negative. Instead, diagnostic test like nitrite and leukocyte sticks, C-reactive protein (CRP) are used to confirm diagnosis. The selectivity and sensitivity of these diagnostic aids are low and may therefore result in a false diagnosis [6-8]. Asymptomatic bacteriuria (ABU) is also frequent. In summary, many factors may contribute to false positive UTI diagnoses which may create a large unnecessary prescribing of antibiotic drugs [9-10]. The emerging risk of side effects as well as environmental bacterial flora by resistance to antibiotic prompted a revision of the UTI care in nursing homes in the County of Uppsala, Sweden.

The aim of the present study was to stepwise introduce guidelines for UTI management in a step-wise manner, together with education, in order to improve diagnostic accuracy, prescription and care for patients living in nursing homes. The results were evaluated by surveys of the care of UTIs in the nursing homes by registration of all cases of infectious disease in the period from 2006 to 2010.

Methods

Setting and infectious disease registration

The study was performed on three separate occasions between 2006

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and 2010 in four to six nursing homes but not the same, in each study period in Uppsala County, Sweden. The study was performed as a part of the quality assessment in nursing homes in the County of Uppsala that was initiated by the Department of Communicable Disease Control and Prevention and the local Strama group, Uppsala County, Sweden. All nurses in the study homes were well informed about the background and aim of the research project before giving informed consent to participate in the study.

The nursing staff members at the nursing homes were asked to register each infectious disease episode during the three study periods by completing out a pre-designed formula. The study periods in the nursing homes were 12 weeks each. A formula was used that included the patient's age, sex, symptom and symptom duration, diagnostic tools, medical examination, diagnosis and treatment in relation to prescribed antibiotic, dose and length of treatment was used Patient weight and serum creatinine were applied to determine whether antimicrobial agent dosing regimens were adequate.

In 2007 national guidelines were implemented for the treatment of UTIs [13], which were the basis for new local guidelines. The guidelines that were carried out during the study period was supported by several occasions of education pertaining to UTI diagnosis and treatment for all general physicians and nurses in the county on UTI diagnosis and treatment. Telephone prescription was substituted to physician consultation diagnosis and treatment; i.e. prescribing of antibiotics. In addition, demands of urine microbiology assay before antibiotic prescription; restricted use of diagnostic tests as nitrite sticks and more intense hygiene education and surveillance were implemented.

In the survey 2007 and also in an identical one 2008, urine cultures were sampled at each occasion before antibiotic prescription. The study in 2008 focused only on UTIs. In this study, 324 residents were included in four nursing homes, not the same as in 2007.

Nurse interviews

Nurses at the nursing homes were interviewed regarding detection and diagnosis of UTI, prescription of antibiotics, co-operation with the responsible physician, hygiene routines and education on care of infectious disease in the elderly.

Results

The nursing homes provided care facilities for 208, 325 and 505 residents respectively during the different survey studies (2006, 2007 and 2010) (Table 1). The mean age of the residents was 87 years. The nursing homes were mainly designed for long-term living. The prevalence of antibiotic requiring infectious disease declined from 1.2 to 0.73 episodes per year/resident from 2006 to 2010. A decreased prevalence was observed for patients treated for UTI from 0.70 to 0.34 infections/year and resident. The fraction of patients with skin infections and respiratory airway fluctuated over the three study occasions (Table 1).

The number of UTI patients not treated with antibiotic drugs increased and the antibiotic choice changed from a predominance of trimetoprim (47%) and quinolones (37%) in 2006 to pivmecillinam (50%) and nitrofurantoin (17%) in the survey, 2010 (Table 2).

From 2006 to 2008 92 urine samples from patients with UTI symptoms were collected. The most prominent pathogen was *Echerisia coli* (41%). Single patients also were diagnosed with *Klebsiella pneumonia, Enterobacter cloacae, Enterobacter faecalis, Citrobacter* and *Proteus mirabilis*. Twelve percent of the cultures showed growth of several types of bacteria in low abundance and 11% showed no growth.

Time	200602-05	200709-12	201009 – 12
Nursing homes	6	4	5
Residents	208	325	505
Mean age	89	87	87
Number of infections	71	60	47
Infection/year and resident	1.3	0.80	0.73
UTI (%) #	54	78	47
Prevalence of UTI	0.70	0.62	0.34
(UTI/year and resident)			
RTI* (%)	24	8	19
Prevalence of RTI	0.31	0.06	0.14
(RTI/year and resident)			
Skin infections (%)	13	7	32
Prevalence of skin infections	0.17	0.06	0.23
Infection/year and resident			
Other infections (%)	9	7	6
Prevalence of other infections	0.12	0.06	0.04
(Infection/year and resident)			

#UTI: Urinary tract infection
*RTI: Respiratory tract infection

Table 1: Patient charactersistics and diagnoses.

Time	200602-05	200709-12	201009 – 12
Diagnoses			
Urine microbiology	53%	72%	43%
Nitrit or leukocyte dipsticks	79	n.d	19 %
Time of treatment	7 days	7 days	7 days
Treatment			
Trimetoprim	47%	17%	10%
Pivmecillinam	11	40	50
Quinolones	36	-	10
Nitrofurantoin	3	-	15
No antibiotic	3	28	13

N.d = not determined

Table 2: Diagnostic aids, treatment duration and antibiotic prescription.

Antibiotic resistance in *E.Coli* was 32% for ampicillin in *E.coli,* 11% for trimethoprim, 8% for quinolones and 3% for mecillinam. No antibiotic resistance to cephalosporin- or nitrofurantoin isolates was detected.

Discussion

Differences in UTI prevalence and antibiotic prescription occurred during the study period simultaneously with the introduction of the new guidelines were introduced for the care of UTI. Before the introduction of the guidelines, UTI was most often diagnosed on diffuse symptoms and with diagnostic aids such as dipsticks for nitrite and leucocytes. The low selectivity and sensitivity of these aids resulted in a general recommendation to avoid their use [6]. This decision divided nurse´ opinions into two groups while some physicians still supported their use. Before the new guidelines, the nurses at the nursing homes prescribed antibiotics after telephone contact with the responsible physician. The prescription pattern at that time also revealed a high consumption of antibiotics that have a high resistance risk antibiotics as e.g. quinolones and trimetoprim.

Good hygiene standards and routines are the foundation for low incidence of infectious disease prevalence in nursing homes [11,12]. Special actions in the county nursing homes with intense both verbal and practical education have resulted in a high hygiene standard. The hygiene recommendations became even more restrict when resistant extended spectrum beta-lactamase (ESBL) bacteria were detected in the community and in a few nursing homes.

Education for physicians and particularly for nurses in the primary care and in nursing homes started just after completion of the first survey in 2006. Nurses were invited to information meetings on the new national guidelines for UTI treatment [13]. The primary aim of the guidelines was to make diagnosis accurate, not to include patients with only general disease symptoms and to encourage urine sampling for microbiology screening. The use of drugs that had a low risk to cause the emergence of bacterial antibiotic resistance was encouraged, as well as to change antibiotics to avoid treating all patients with the same drug. Group education and visits to the nursing homes from the community hygiene section were carried out routinely. In addition, visits by nurses from the Infectious Control department to avoid the use of the low sensitivity and selectivity of dipsticks. Generally the attendance at the education and the information meetings was low but it was obvious that the messages were forwarded from the nurses present to those not being able to participate. After some time, the changes were well adopted by the nursing personnel, although there were complaints in the 2010 survey that the hygiene routines were in excess and took away time needed to take care of the patients. There was an obvious shift in the prescribed antibiotics to those preparations with a lower risk of creating bacterial resistance to antibiotic drugs. Many nurses expressed an interest for additional education on infections in the elderly and particularly for UTI.

The prevalence of drug resistant *E.coli* in nursing homes in the County of Uppsala was not higher than in the general population. However, the number of samples was low and therefore a comparison to figures from the population might be misleading. It was remarkable that as many as 23% of the urinary specimens did not show any significant bacterial growth which may have resulted in unnecessary antibiotic treatment. Similar figures for non-significant growth in urine specimen have been reported previously.

A major change in the new guidelines was that before prescription of antibiotics for UTIs the diagnosis and treatment should be decided after consultation with a physician. As a whole this approach resulted in a marked decrease in the prevalence of antibiotic treatment of UTI in nursing homes. One limitation of the study was that there were no control nursing homes. The reason for not having a control was that the educational programme was arranged for nursing staff working in nursing homes in the County of Uppsala. Furthermore, good communication between the nurses prevented a realistic control design.

Conclusions

New guidelines on UTI care were distributed to the nursing staff at education sessions and recommendations were made in nursing homes to improve of hygiene standard, the diagnostic process and the care of the patients. The prevalence of UTI that required antibiotic treatment decreased dramatically and the choice of antibiotic used shifted to less risk-prone antibiotics that cause bacterial resistance causing drugs. Bacterial resistance was not high and the nurses generally supported the activities and the change of UTI care routines.

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