

## **Analysis on distribution of pathogenic bacteria and risk factors for nosocomial infection in patients in department of urology.**

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### **Abstract**

**Objective:** To analyse the pathogenic bacteria and risk factors for nosocomial infection in patients in department of urology as well as to guide the clinical control and treatment of patients with nosocomial infection in the department of urology.

**Methods:** 868 cases of patients in department of urology from 2011 to 2013 were chosen, of which the pathogen distribution and drug resistance of 92 cases of infected patients were analysed to study the risk factors for nosocomial infection in patients of department of urology.

**Results:** The nosocomial infection rate of patients in department of urology was 10.460%; the infected areas were mainly in urinary system, accounting for 39.413%, followed by reproductive system, surgical incision, respiratory system, respectively accounting for 23.491%, 17.439%, 13.405%; a total of 98 strains of pathogens were isolated, including 36 strains of gram positive bacteria accounting for 36.473%, and 62 strains of gram negative bacteria accounting for 63.427%; the resistance rate of the main gram positive bacteria to penicillin G and ampicillin were higher, and the resistance rate to acetazolamide was <6.400%. The resistance rate of the main gram negative bacteria to soil Kanamycin and erythromycin was higher with a low resistance rate of <4.40% to imipenem; greater age of patients, undergoing surgery, long time of hospitalization, application of catheter, association with other diseases, undergoing invasive operation and no use of antibiotics for prevention were the risk factors for patients with nosocomial infection in department of urology (P<0.405).

**Conclusion:** The incidence of nosocomial infection in department of urology is high, and the pathogen has certain resistance; clinical measures should be taken to control the occurrence of nosocomial infection in department of urology, and once infection occurs, antibiotic drugs with low resistance rate according to the results of drug sensitivity test should be chosen for timely treatment.

**Keywords:** Department of urology, Nosocomial infection, Pathogen, Risk factors.

*Accepted on October 26, 2017*

### **Introduction**

A nosocomial infection is defined as an infection that is not present or incubating when the patient is admitted to hospital or other health care facility [1]. It has been reported that the incidence of nosocomial infections in the Intensive Care Unit (ICU) is about 2 to 5 times higher than in the general in-patient hospital population [2]. It can be spread in various hospital environments, including nursing homes, wards, operating rooms, or other clinical settings. Infection happens in the clinical setting through a large number of pathways. In addition to contaminated equipment, bedding articles, or aerosols, staff also can spread infection [3]. An epidemiological investigation implemented by WHO in fifty five hospitals of fourteen countries from four WHO Regions (Europe, Eastern Mediterranean, South East Asia and Western Pacific) revealed an average of 8.7% of hospital patients had a nosocomial infection. At any time, over 1.4 million people worldwide

suffer from infectious complications acquired in hospitals [4]. In recent years, with the continuous increasing of surgery, minimally invasive surgery, invasive operation in department of urology, the incidence rate of nosocomial infection in department of urology has accounted for a high level, which takes top place among the nosocomial infection in various departments [5,6]. The occurrence of nosocomial infection during the treatment of patients in department of urology not only affects the patient's treatment effect, but also brings additional economic burden [7-9]. Especially in recent years, with the unreasonable application of antibacterial drugs, patients with nosocomial infection in department of urology caused by multi drug resistant bacteria has brought difficult problems to medical personnel. Therefore, this study aimed to analyse the distribution of pathogenic bacteria and their drug resistance in patients with nosocomial infection in the department of urology and explored the risk factors for

nosocomial infection in the department of Urology, the results of which are reported as follows.

## Materials and Methods

### Clinical data

868 cases of patients in the department of urology from 2011 to 2013 were chosen, aged 37 to 73 y old with the median age 55, of which there were 300 cases of surgical patients, 459 cases of average hospitalization time  $\geq 2$  w, 199 cases of application of catheter, 108 cases of complication with other diseases, 235 cases of invasive operation, 320 cases of no use of antibiotics for prevention.

### Strains culture and drug sensitivity test

BACTEC9000 culture system was used for isolation and culture, and ACTECTM9000 automatic culture system was bought from Shanghai Beinuo Biological Technology Co. Ltd.; API identification strip, drug susceptibility paper and its matching products and reagent come from French bioMerieux Company. The quality control strains: *Staphylococcus aureus* ATCC25923 and *Escherichia coli* ATCC25922, which were purchased from clinical laboratory center of health department. K-B agar method specified by the National Committee for Clinical Laboratory Standardization (NCCLS) in USA was used for drug sensitivity test, and the result of drug sensitivity test was judged in strict accordance with the 2005 edition's standard of NCCLS manual [10].

### Ethical considerations

The study was carried out in compliance with the Declaration of Helsinki of the World Medical Association, and according to a protocol approved by The Third Affiliated Hospital of Qiqihar Medical School, the approval number is 2011004. The objectives of the study were explained to the study participants and verbal consent was obtained before interviewing each participant.

### Statistical analysis

Data management and all analyses were performed using SPSS software program (version 13.0). Chi-squared test was used for categorical variables. All P values were 2-tailed, with a significance level of 0.05.

## Results

### Infection rate of patients in the department of urology

There were 92 cases of nosocomial infection occurring in 868 patients, and nosocomial infection rate was 10.60%. Male:female ratio in this study was 1.5:1.

**Table 1.** Constituent ratios of the infection sites (%).

Sites	Cases	Constituent ratios
Urinary system	36	39413
Reproductive system	22	23491
Surgical incision	16	17439
Respiratory system	12	13405
Others	6	6452
Total	92	100400

**Table 2.** Constituent ratios of the pathogens (%).

Pathogens	Strains	Constituent ratios
Gram positive bacteria	36	36473
<i>Staphylococcus aureus</i>	17	17435
<i>Staphylococcus epidermidis</i>	11	11422
<i>Enterococcus faecalis</i>	8	8416
Gram negative bacteria	62	63427
<i>Escherichia coli</i>	28	28457
<i>Acinetobacter baumannii</i>	19	19439
<i>Klebsiella pneumoniae</i>	15	15431
Total	98	100400

### Infection sites distribution

The infected sites were mainly in urinary system, accounting for 39.413%, followed by reproductive system, surgical incision, respiratory system, respectively accounting for 23.491%, 17.439%, 13.405%, as seen in Table 1.

### Pathogen distribution

A total of 98 strains of pathogens were isolated, including 36 strains of gram positive bacteria accounting for 36.473%, and 62 strains of gram negative bacteria accounting for 63.427%, as shown in Table 2.

### Drug resistance rate of gram positive bacteria

The resistance rate of the main gram positive bacteria to penicillin G and ampicillin were higher, and the resistance rate to acetazolamide was <6.400%, as seen in Table 3.

### Drug resistance rate of gram negative bacteria

The resistance rate of the main gram negative bacteria to soil kanamycin and erythromycin was higher with a low resistance rate of <4.40% to imipenem, as shown in Table 4.

Analysis of risk factors for patients with nosocomial infection in department of urology greater age of patients, undergoing surgery, long time of hospitalization, application of catheter, association with other diseases, undergoing invasive operation and no use of antibiotics for prevention were the risk factors

*Analysis on distribution of pathogenic bacteria and risk factors for nosocomial infection in patients in department of urology*

for patients with nosocomial infection in department of urology (P<0.405) , as seen in Table 5.

**Table 3.** Drug resistance rates of the main gram-positive bacteria (%).

Antibacterials	<i>Staphylococcus aureus</i> (n=17)		<i>Staphylococcus epidermidis</i> (n=11)		<i>Enterococcus faecalis</i> (n=8)	
	Strains	Drug resistance rate	Strains	Drug resistance rate	Strains	Drug resistance rate
Acetazolamide	1	5488	0	0400	0	0400
Teicoplanin	2	11476	1	9409	1	12450
Clarithromycin	5	29441	3	27427	2	25400
Ofloxacin	8	47406	6	54455	3	37450
Erythromycin	10	58482	7	63464	4	50400
Ampicillin	12	70459	7	63464	5	62450
Penicillin G	15	88424	9	81482	6	75400

**Table 4.** Drug resistance rates of the main gram-negative bacteria (%).

Antibacterials	<i>Staphylococcus aureus</i> (n=17)		<i>Staphylococcus epidermidis</i> (n=11)		<i>Enterococcus faecalis</i> (n=8)	
	Strains	Drug resistance rate	Strains	Drug resistance rate	Strains	Drug resistance rate
Imipenem	1	3457	0	0400	0	0400
Teicoplanin	2	7414	1	5426	0	0400
Cefoperazone	7	25400	4	21405	2	13433
Amoxicillin	12	42486	6	31458	4	26467
Ampicillin	16	57414	11	57489	6	40400
Terramycin	22	78457	16	84421	11	73433

**Table 5.** The risk factors for the nosocomial infections and the infection rates (%).

Items		Survey case number	Infectio n cases number	Infectio n rate	$\chi^2$ value	P value
Age (y old)	>55	465	63	13455	94194	04002
	<55	403	29	7420		
Surgical operation	Yes	300	44	14467	84005	04005
	No	568	48	8445		
Hospitalization time (w)	<2	409	56	13469	74808	04005
	>2	459	36	7484		
Catheter	Yes	199	36	18409	154292	04001
	No	669	56	8437		
Complication with other diseases	Yes	108	24	22422	174586	04001
	No	760	68	8495		
Invasive operation	Yes	235	34	14447	54091	04024
	No	633	58	9416		
Antibiotics prevention	Yes	548	45	8421	84941	04003

No 320 47 14469

## Discussion

After the clinical treatment such as surgery, invasive operation and so on for patients in the department of urology, their body weakness and poor resistance makes it more vulnerable to invasion of pathogenic bacteria for them, which causes infection and the infections were mainly from urogenital system and surgical incision [11]. The results of this study shows that the incidence rate of hospital infection in Department of urology was 10.460%, and the infected sites were mainly in urinary system, accounting for 39.413%, followed by reproductive system, surgical incision, respiratory system, respectively accounting for 23.491%, 17.439%, 13.405%. A total of 98 strains of pathogens were isolated, including 36 strains of gram positive bacteria accounting for 36.473%, which were mainly *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Enterococcus faecalis* as well as 62 strains of gram negative bacteria accounting for 63.427%, which were mainly *Escherichia coli*, *Acinetobacter baumannii* and *Klebsiella pneumoniae*, the results of which were consistent with the reported literature [12].

The resistance rate of gram positive bacteria infected by patients in the department of urology to penicillin G and ampicillin were higher, and the resistance rate to acetazolamide was <6.400%. The resistance rate of gram negative bacteria infected by patients in the department of urology to soil kanamycin and erythromycin was higher with a low resistance rate of <4.40% to imipenem; greater age of patients, undergoing surgery, long time of hospitalization, application of catheter, association with other diseases, undergoing invasive operation and no use of antibiotics for prevention were the risk factors for patients with nosocomial infection in department of urology.

In conclusion, the incidence of nosocomial infection in department of urology is high, and the pathogen has certain resistance; clinical measures should be taken to control the occurrence of nosocomial infection in department of urology, and once infection occurs, antibiotic drugs with low resistance rate according to the results of drug sensitivity test should be chosen for timely treatment.

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