цев [и др.] // Морская медицина. 2016;2(4):13-20. [Myznikov IL, Miloshevskiy AV, Burtsev NN, et al. Strategy–2020: the medical aspect Marine medicine. 2016;2(4):13-20 (In Russ).].

17. Brockmann PE, Gozal D, Villarroel L, Damiani F, Nuñez F, Cajochen C. Geographic latitude and sleep duration: A population-based survey from the Tropic of Capricorn to the Antarctic Circle Chronobiol Int. 2017;34(3):373-381. DOI: 10.1080/07420528.2016.1277735

18. Russ TC, Murianni L, Icaza G, et al. Geographical Variation in Dementia Mortality in Italy, New Zealand, and Chile: The Impact of Latitude, Vitamin D, and Air Pollution Dement Geriatr Cogn Disord. 2016;42:31–41. DOI:10.1159/000447449

19. Chong KC, Liang O, Jia KM, et al. Latitudes mediate the association between influenza activity and meteorological factors: A nationwide modelling analysis in 45 Japanese prefectures from 2000 to 2018. Science of The Total Environment. 2020;703:134727. DOI:10.1016/j.scitotenv.2019.134727

20. Lam T, VoPham T, Munger KL, et al. Long-term effects of latitude, ambient temperature, and ultraviolet radiation on the incidence of multiple sclerosis in two cohorts of US women Environmental Epidemiology. 2020;4(4):e0105. DOI: 10.1097/EE9.0000000000000105

21. Patten SB, Williams JVA, Lavorato DH, et al. Major Depression Prevalence Increases with Latitude in Canada. The Canadian Journal of Psychiatry. 2017;62(1):62-66. DOI:10.1177/0706743716673323

22. Maryanaji Z. The effect of climatic and geographical factors on breast cancer in Iran. BMC Research Notes. 2020;13:519. DOI:10.1186/s13104-020-05368-9.

23. Cabrera S, Benavente B, Alvo M, et al. Vitamin B12 Deficiency Is Associated with Geographical Latitude and Solar Radiation in the Older Population. J. Photochem. Photobiol. B. 2014;140:8–13.

24. Walrand S. Autumn COVID-19 surge dates in Europe correlated to latitudes, not to temperature-humidity, pointing to vitamin D as contributing factor. Sci Rep. 2021;11(1):1981. DOI:10.1038/s41598-021-81419-w

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ASSESSMENT OF THE IMPACT OF INVASIVE INTERVENTIONS ON THE RISK OF URINARY TRACT INFECTIONS ASSOCIATED WITH THE PROVISION OF MEDICAL CARE IN PATIENTS OF OLDER AGE GROUPS ON THE EXAMPLE OF THE LARGE MULTIDICSIPLINARY HOSPITAL IN ALTAI KRAI

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In order to assess the impact of invasive interventions on the prognosis of urinary tract infections (UTIs) associated with the provision of medical care among patients of older age groups 700 case histories of patients over 65 years of age were selected. Using the method of discriminant analysis the indicators of invasive interventions, surgical intervention were analyzed as well as the combination of these indicators with the most common somatic diseases that were identified among patients at risk of developing UTIs associated with medical care.

Keywords: urinary tract infections, infections associated with medical care, invasive interventions, epidemiology, morbidity, risk factors.

Introduction. Urinary tract infections occupy the second place among infectious diseases in the structure of infections associated with the provision of medical care (ISMP) of patients after respiratory tract diseases [1, 2]. Most hospital UTIs in patients of older age groups are complicated because they occur in patients with various somatic diseases (diabetes mellitus, immunodeficiency conditions), as well as in connection with the use of invasive methods of examination and treatment [3, 4, 5].

Endogenous infection of the urinary tract is associated with natural contamination of the external urethra and with various diagnostic transurethral manipulations, the introduction of microorganisms into the bladder is possible [6, 7]. Exogenous nosocomial infection occurs from patients with acute and chronic UTIs and from the hospital environment. The main places of infection with UTIs associated with the provision of medical care are dressing and cystoscopic rooms, wards (in the case of dressing patients in them and using open drainage systems) [8, 9, 10].

The aim of the study was to evaluate the impact of invasive interventions on the prognosis of UTI related to medical care among patients of older age groups.

Materials and methods

In the period from 2007-2019, 700 case histories of patients over 65 years of age were selected. In order to evaluate invasive interventions for the prognosis of the development of UTIS associated with the provision of medical care using the method of discriminant analysis (the IBM SPSS 23 statistical computer package was used), a prognostic function was built for patients of older age groups, in the calculation of which only the indica-

tors of surgical intervention in the kidney and bladder and catheterization of the bladder were analyzed. To assess the combination of indicators of invasive interventions with the most common somatic diseases that were identified during the study of patients' medical histories, an analysis by the method of variance analysis (ANOVA/ MANOVA) was carried out.

Results. In order to evaluate invasive interventions for the prognosis of UTI development related to medical care, a predictive function was constructed using the discriminant analysis method (the IBM SPSS 23 statistical computer package was used) (Table 1), when calculating which only the oper (kidney and bladder surgery) and catet (bladder catheterization) indicators were analyzed, the remaining indicators were excluded from the non-normalized prognostic function.

Thus, when assessing the impact of invasive factors (oper (kidney and bladder surgery) and catet (bladder catheterization) on the risk of developing UTIs associated with medical care in patients over 65 years of age, oper (kidney and bladder surgery) has a greater impact on the development of UTIs associated with medical care by 20.9% than catet (bladder catheterization).

Further, the most promising combinations of descriptors (signs) (chronic diseases + invasive interventions) were selected by the method of expert evaluation:

1. x1 sign: chronic pyelonephritis + surgical intervention, pieloneph * oper;
2. x2 sign: chronic pyelonephritis + catheterization of the bladder, pieloneph*catet;
3. x3 sign: chronic cystitis+ surgical intervention, chrcis*oper;
4. x4 sign: chronic cystitis + catheterization of the bladder, chrcis*catet;
5. x5 symptom: chronic pyelonephritis + surgery + hypertensive disease with predominant heart disease (congestive) heart failure, chrcis*oper**hypetho;
6. x6 sign: chronic pyelonephritis + catheterization of the bladder + hypertensive disease with predominant heart disease (congestive) heart failure, pieloneph*catet*hypetho;
7. x7 sign: chronic pyelonephritis + surgery + insulin-dependent diabetes mellitus with neurological complications, pieloneph*oper*insnerv;
8. x8 sign: chronic pyelonephritis + catheterization of the bladder + insulin-dependent diabetes mellitus with neurological complications, pieloneph*-catet*insnerv;
9. x9 sign: chronic cystitis + surgical intervention+ Insulin-dependent diabetes mellitus with neurological complications, chrcis*oper*insnerv;
10. x10 sign: chronic cystitis + catheterization of the bladder + insulin-dependent diabetes mellitus with neurological complications chrcis*catet*insnerv.

Table 1

Coefficients of the canonical discriminant function of the influence of invasive factors (oper (surgical intervention in the kidney and bladder)) and catet (catheterization of the bladder)) risk of developing UTI, as ISMP, for patients over 65 years of age

Signs	function 1	module	%
oper	1.953	1.953	60.484
catet	-1.276	1.276	39.516
(Constant)	-0.029		
Non-standardized coefficients	3.230		

Note. In Tables 1-2, UTIs are urinary tract infections, HAIs are health care-associated infections.

Table 2

Prognosis of the development of UTI, as ISMP with a combination of risk factors in patients over 65 years of age

Combination of features	Function 1	module	%
x2	-2.134	2.134	19.871
x3	-2.134	2.134	19.871
x4	6.343	6.343	59.055
(Constant)	10.741		

For patients, the influence of a combination of signs (chronic diseases + invasive interventions) on the prognosis of UTIS associated with the provision of medical care was assessed by the method of variance analysis (ANOVA / MANOVA). Most of these combinations did not show statistically significant predictive power. Combinations of features that turned out to be statistically significant are collected below in Table 2. Their predictive power was evaluated in the same way as it was done earlier for individual indicators (the method of variance analysis (ANOVA/ MANOVA, the IBM SPSS 23 package was used).

The greatest impact on the risk of developing UTIS associated with the provision of medical care with a combination of risk factors in patients older than 65 years has the following combination of signs:

- x2 sign: chronic pyelonephritis + catheterization of the bladder, pieloneph*catet (19.8%);
- x3 sign: chronic cystitis + surgical intervention, chrcis*oper (19.8%);
- x4 sign: chronic cystitis + catheterization of the bladder, chrcis*catet (59.05%);

Discussion. According to the literature, most urological pathologies are accompanied by a violation of the normal outflow of urine, which is a predisposing factor of infection of the urinary tract; the main contingent of patients are elderly people with reduced immunological reactivity, the use of various endoscopic equipment and instruments, the cleaning and sterilization of which is difficult, the use of transurethral manipulations and drainage systems, increasing the likelihood of penetration of microorganisms into the urinary tract [3, 4]. The activity of modern medical organizations is unthinkable without ensuring the quality of medical care and the safety of medical activities. The greatest potential for improving the quality of medical care is provided by quality management systems (QMS). SOPy is the basis of the QMS. In this regard, their implementation in medical organizations is a feasible and strategically correct solution.

Conclusions. The results of this study showed that when assessing the impact of invasive factors (oper (surgery in the kidney and bladder) and catet (catheterization of the bladder) on the risk of developing UTIs associated with medical care in patients over 65 years of age, oper (surgery in the kidney and bladder) has a greater impact on the development of UTI as an ISMP by 20.9% than catet (catheterization of the bladder).

In patients of older age groups, the

following combination of signs have the greatest impact on the risk of developing UTIs associated with medical care: chronic pyelonephritis + catheterization of the bladder (19.8%), chronic cystitis + surgery (19.8%), chronic cystitis + catheterization of the bladder (59.05%). Based on the results obtained, using the method of discriminant analysis, we can predict the development of UTIs associated with the provision of medical care in patients of older age groups when planning invasive interventions and to create computer programs and databases for urologists, epidemiologists and specialists of other related specialties.

In order to improve the information subsystem of epidemiological surveillance of UTIs related to the provision of medical care, it is necessary to use SOPs. Their implementation in medical organizations can be used to conduct an internal quality audit in order to identify critical points when performing various medical procedures and checking violations of the sanitary and anti-epidemic regime in medical organizations, as well as simplifies the commissioning of new employees.

Reference

1. Бузолева, Л.С. Характеристика штаммов бактерий, выделенных от больных с инфекциями мочевыводящих путей/ Бузолева Л.С. // Тихоокеанский медицинский журнал. -2011. -№1.- С. 51-53. [Buzoleva LS. Characteristics of bacterial strains isolated from patients with urinary tract infections. Tihookeanskij medicinskij zhurnal. 2011; 1: 51-53 (In Russ.).]

2. Каприн, А.Д. Катетер-ассоциированные инфекции мочевых путей / Каприн А.Д.// Справочник врача общей практики. -2016; -3: -34-38. [Kaprin AD. Catheter-associated urinary tract infections. Spravochnik vracha obshchej praktiki. 2016; 3: 34-38.

3. Перепанова, Т.С. Нозокомиальные инфекции мочевыводящих путей. Катетер-ассоциированные инфекции мочевыводящих путей /Перепанова Т.С. // Послеоперационные инфекционные осложнения. –М.: «Практическая медицина», 2013. - 251-270. [Perepanova TS. Nosocomial urinary tract infections. Catheter-associated urinary tract infections. Posleoperacionnye infekcionnye oslozhneniya. Moscow: "Practicheskaia Medicina". 2013, 251-270 (In Russ.).]

4. Сергевнин, В.И. Факторы риска и профилактика внутрибольничных катер-ассоциированных инфекций мочевыводящих путей / Сергевнин В.И. // Зам. главного врача. 2016; 4 (119): 82-85. [Sergevnin VI. Risk Factors and prevention of nosocomial boat-associated urinary tract infections. Deputy Chief Physician. 2016; 4 (119): 82-85 (In Russ.).]

5. Сушинский, В.Э. Инфекции мочевыводящих путей у пациентов старших возрастных групп: особенности микробного статуса / Сушинский В.Э. // Клиническая геронтология. 2010; 9-10: 83. [Sushinsky VE. urinary tract Infections in patients of younger age groups: peculiarities of microbial status. Klinicheskaia gerontologia. 2010; 9-10: 83 (In Russ.).]

6. Урология: клинические рекомендации. –3-е изд., переработанное. –М.: Практическая медицина, 2014. - 320-369. [Urology: clinical recommendations. - 3rd ed., revised. Moscow: Practicheskaia Medicina. 2014, 320-369 (In Russ.).]

7. Ярец. Ю.И. Хронические инфекции мочевыводящих путей: состояние проблемы/ Ярец Ю.И. // Медико-биологические проблемы жизнедеятельности. -2015; -2 (14): -18-23. [Yarets. Y.I. Chronic urinary tract infections: the state of the problem. Mediko-biologicheskie problemy zhiznedeyatel'nosti. 2015; 2 (14): 18-23 (In Russ.).]

8. Little, P. Effectiveness of five different approaches in management of urinary tract infection: randomised controlled trial. The BMJ. 2010. (340), 199.

9. Flores-MirelesA.L., Urinary tract infections: epidemiology, mechanisms of infection and treatment options. Nature Reviews Microbiology. 2015. (13), 5: 269-284.

10. Matty, L. Urinary Tract Infections: How New Findings Create New Research Questions Current Opinion in Infectious Diseases.2016. (29), 1:70-72.