

Background

- Pyelonephritis is a common disease of the elderly, and as the population ages, the number of elderlies hospitalized for pyelonephritis will increase.
- We examined differences between Barthel index (BI), an activities of daily living score (ADLs), at admission and discharge, and medical costs of pyelonephritis in the older population in Japan.

Methods

- We retrospectively collected hospitalized pyelonephritis cases in National Center for Global Health and Medicine in Tokyo between January 1, 2013 and March 31, 2019.
- Inclusion criteria was following: (1) Urine culture within 48 hours of admission detected *Escherichia coli* (*E. coli*), over 10⁴ Colony Forming Unit/ml, (2) Patient with at least one of the following: fever $\geq 38^{\circ}\text{C}$, costovertebral angle tenderness, suprapubic tenderness, urinary frequency, urinary urgency, dysuria at the time of admission, (3) Patient with independent in ADLs.
- We divided the enrolled patients into four groups according to age: young adults (20-64 years), pre-old (65-74 years), old (75-84 years), and super-old (≥ 85 years).
- Patient information retrieved from medical records were used to compare each group using Fisher's exact test, and Kruskal-Wallis test. The Bonferroni corrected P-value < 0.05 was deemed to be statistically significant.

Table 1. Patients' characteristics, n (%)

	Young adults	Pre-old	Old	Super-old	P-value*
	n=112	n=72	n=130	n=79	
Female	89 (79.5)	48 (66.7)	90 (69.2)	60 (75.9)	0.20
Charlson Comorbidity Index					<0.001
0	72 (64.3)	22 (30.6)	19 (14.6)	0 (0)	
1	2 (1.79)	0 (0)	0 (0)	0 (0)	
2	17 (15.2)	13 (18.1)	10 (7.69)	0 (0)	
3	10 (8.82)	17 (23.6)	18 (13.8)	0 (0)	
≥ 4	11 (9.82)	20 (27.8)	83 (63.8)	79 (100)	
<i>E. coli</i> bacteremia	42 (37.5)	44 (61.1)	78 (60.0)	33 (41.8)	<0.001
ESBL producing <i>E. coli</i>	13 (11.6)	11 (15.3)	22 (16.9)	4 (5.1)	0.060

Table 2. Outcomes

BI at admission (IQR)	91.8 (100, 100)	70.2 (37.5, 100)	50.3 (5.0, 100)	32.2 (0.0, 57.5)	<0.001
BI at discharge (IQR)	98.0 (100, 100)	91.2 (100, 100)	76.7 (60, 100)	59.5 (30, 100)	<0.001
Difference in BI between admission and discharge (IQR)	5.36 (0, 0)	24.1 (0, 45)	31.4 (0, 50)	29.3 (5, 48.8)	<0.001
Medical costs, USD [†] (IQR)	\$6054 (2639, 5216)	\$8310 (3675, 8094)	\$10129 (4183, 9362)	\$12577 (4726, 11279)	<0.001
Length of hospital stay, days (IQR)	10.8 (6.0, 12.0)	17.9 (9.75, 18.3)	17.2 (10.0, 18.0)	21.6 (12.0, 21.0)	<0.001
Medical costs per day of hospitalization, USD [†] (IQR)	\$487 (321, 503)	\$459 (301, 524)	\$567 (320, 655)	\$576 (324, 625)	0.16
Mortality during hospitalization, n (%)	1 (0.89)	2 (2.78)	4 (3.08)	1 (1.27)	0.60

*P-value is calculated for the differences among four groups, [†] 1USD = 128 yen**Results**

- 393 cases were included, and 112 (28.4%) young adults, 72 (18.3%) pre-old, 130 (33.2%) old, and 79 (20.1%) super-old patients.
- Difference in BI was 5.36, 24.1, 31.4, and 29.3 in young adults, pre-old, old, and super-old, respectively (P < 0.001). However, there were no significant differences among pre-old, old, and super-old.
- Medical costs were \$6054, \$8310, \$10129, and \$12577 (1USD = 128 yen) in young adults, pre-old, old, and super-old, respectively (P < 0.001).
- Nevertheless, a comparison of medical costs per day showed no significant differences between the groups.
- The number of deaths during hospitalization was 1 in young adults, 2 in pre-old, 4 in old, 1 in super-old patients, respectively.

Discussion

- The elderly are hospitalized for longer periods of time, resulting in higher medical costs.
- The high severity of illness, the time required for discharge coordination, and the difficulty in switching from intravenous to oral antibiotics were the reasons for the longer hospital stay.
- The degree of recovery of patients' ADLs, expressed as the difference in BI between admission and discharge, was comparable between the three groups of patients aged 65 years and over. This is due to the fact that our hospital provides rehabilitation to prevent loss of strength, the disease burden of pyelonephritis may be not so high, and our study included patients who were independent in ADLs.

Conclusion

- The cost of hospitalization increases with age, which is due to the longer length of stay. Even if ADLs are reduced due to acute pyelonephritis, super-old patients over 85 years old, who have high ADLs to begin with, will regain ADLs as much as those over 65 years old.