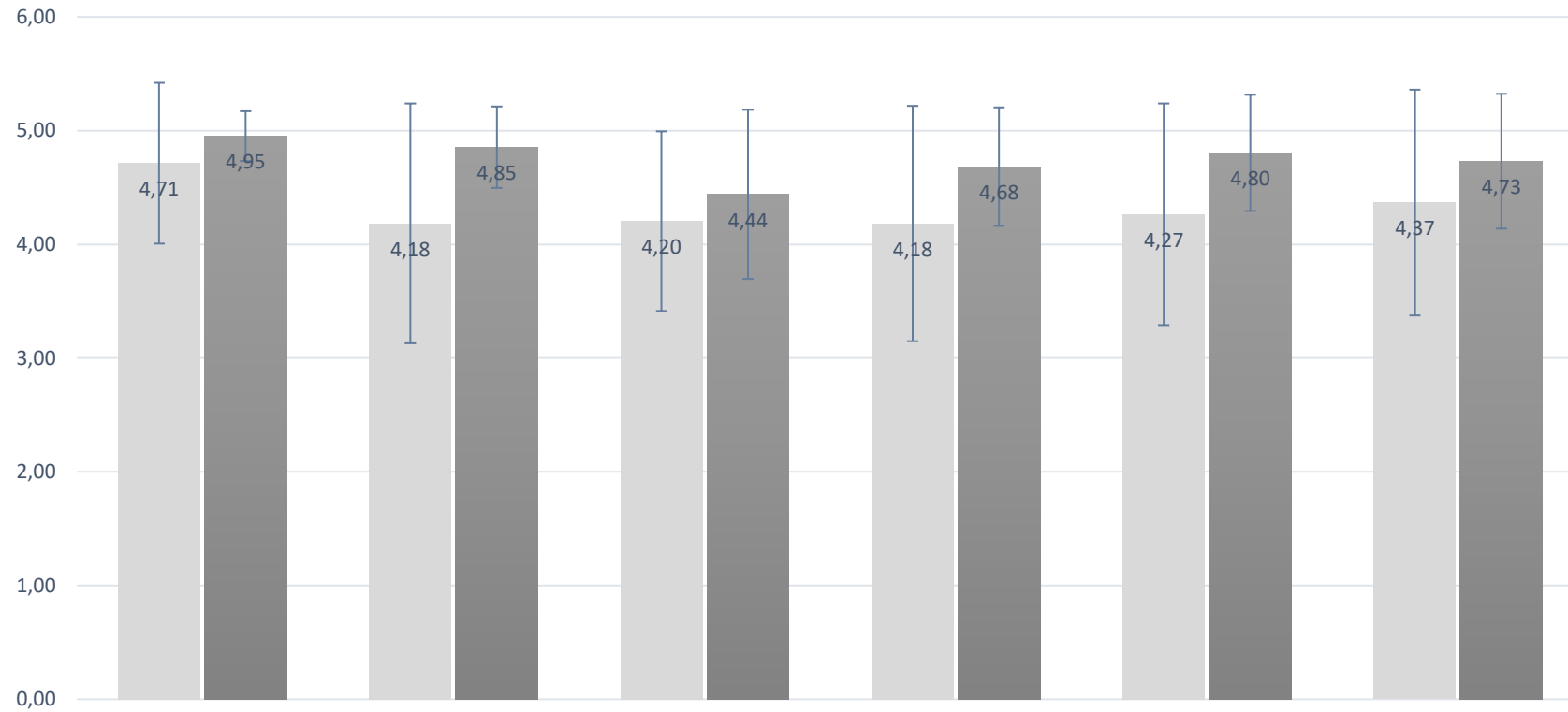




## EPIDEMIOLOGY



1. Escherichia coli is the most common pathogen in pediatric UTIs accounting for more than 70% of all cases, followed by Klebsiella spp, Enterobacter spp, and Proteus spp.

2. Pseudomonas aeruginosa is uncommon in community acquired pediatric UTIs but it is associated with more severe infections.

3. Up to 30% of pediatric patients experience a recurrence after the first episode of UTI.

4. Prevalence of pathogens resistant to antibiotic therapy varies widely in different geographical areas.

5. The main risk factors for UTIs caused by resistant pathogens include urinary tract anatomical or functional abnormalities

6. The main risk factors for UTIs caused by resistant pathogens include long-term antibiotic prophylaxis

First survey (%)

95.9

83.7

85.7

81.6

77.6

83.7

Second survey (%)

100.0

100.0

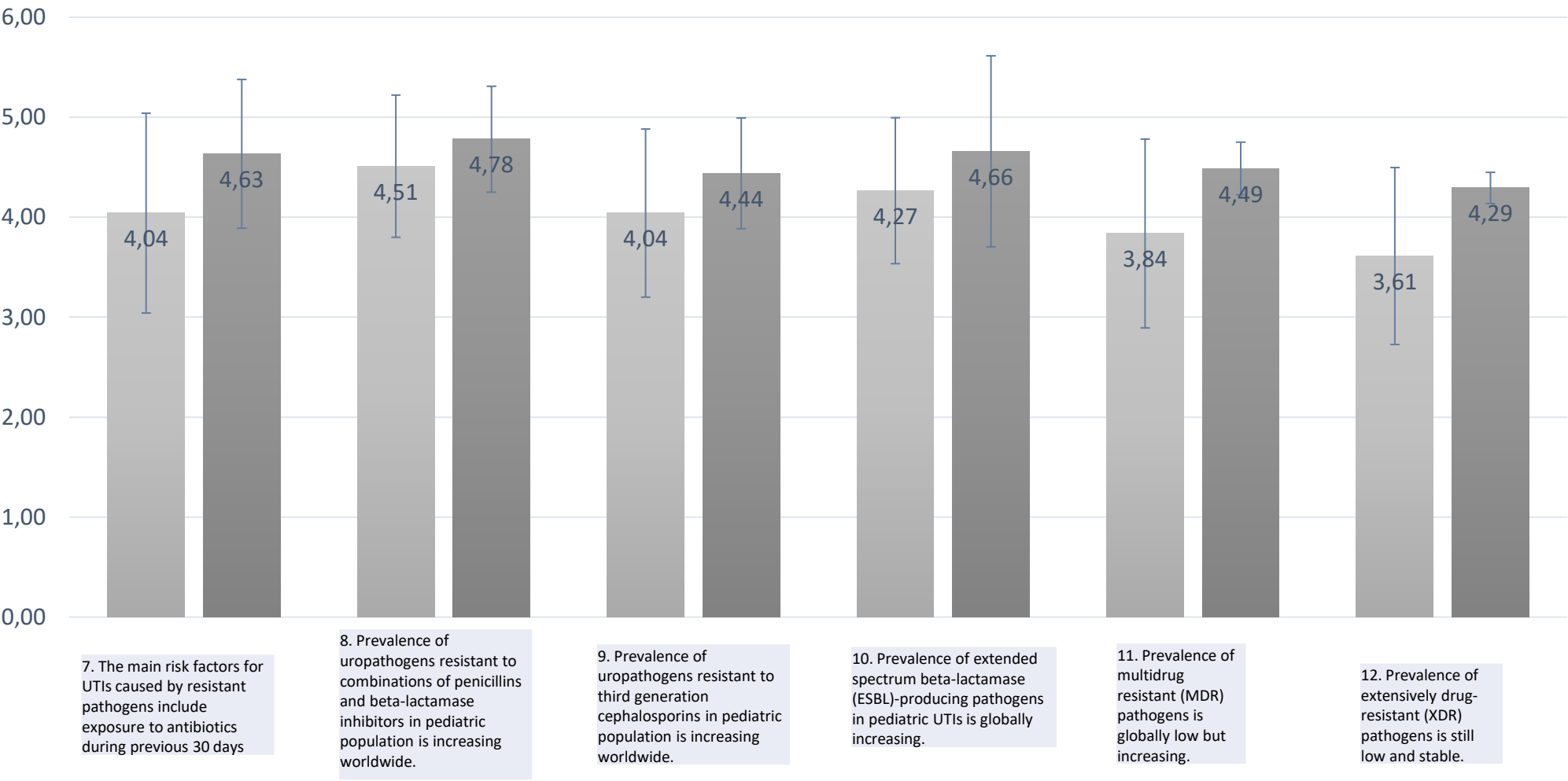
95.1

97.6

95.1

97.6

EPIDEMIOLOGY

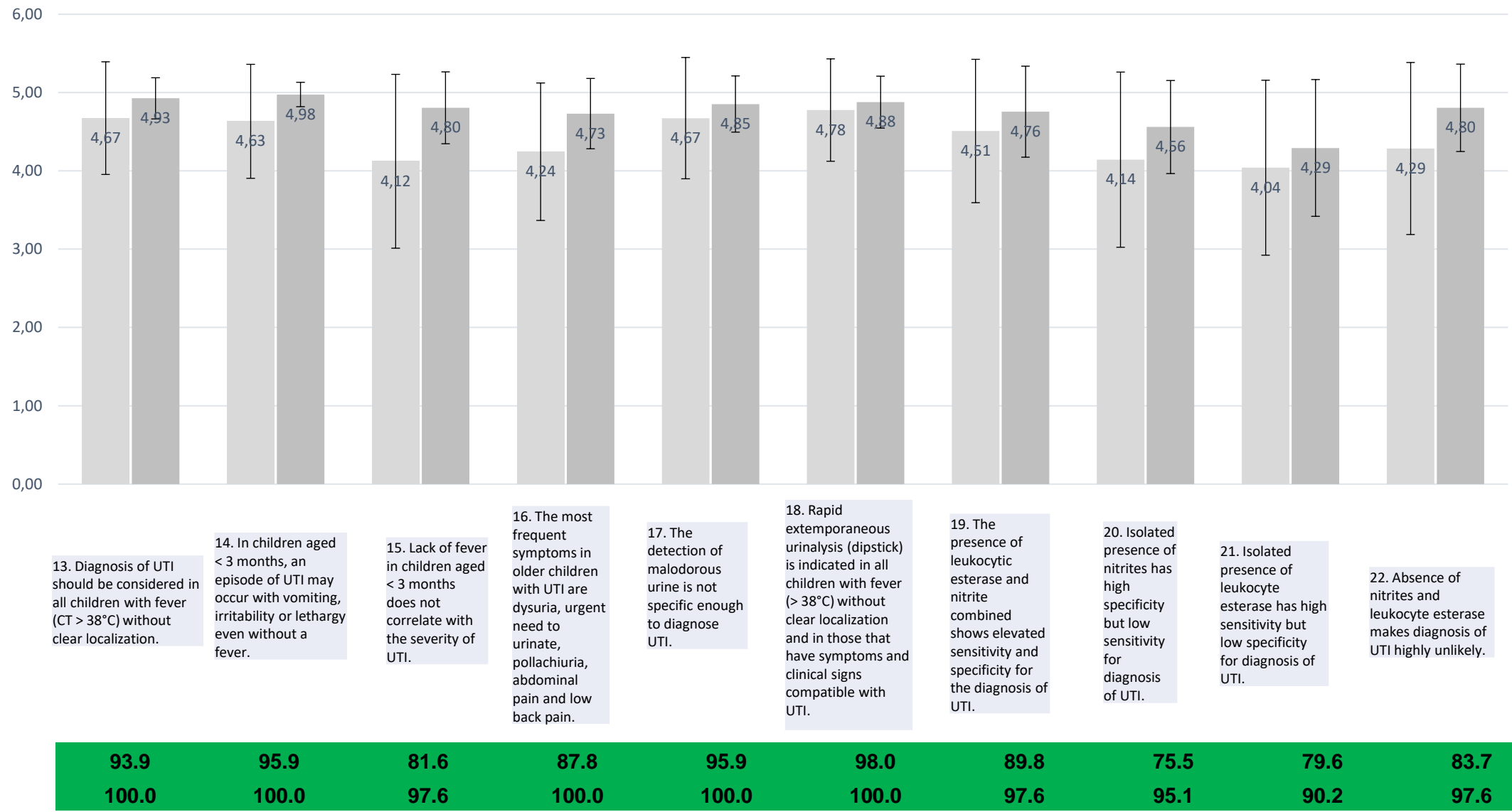


First survey (%)

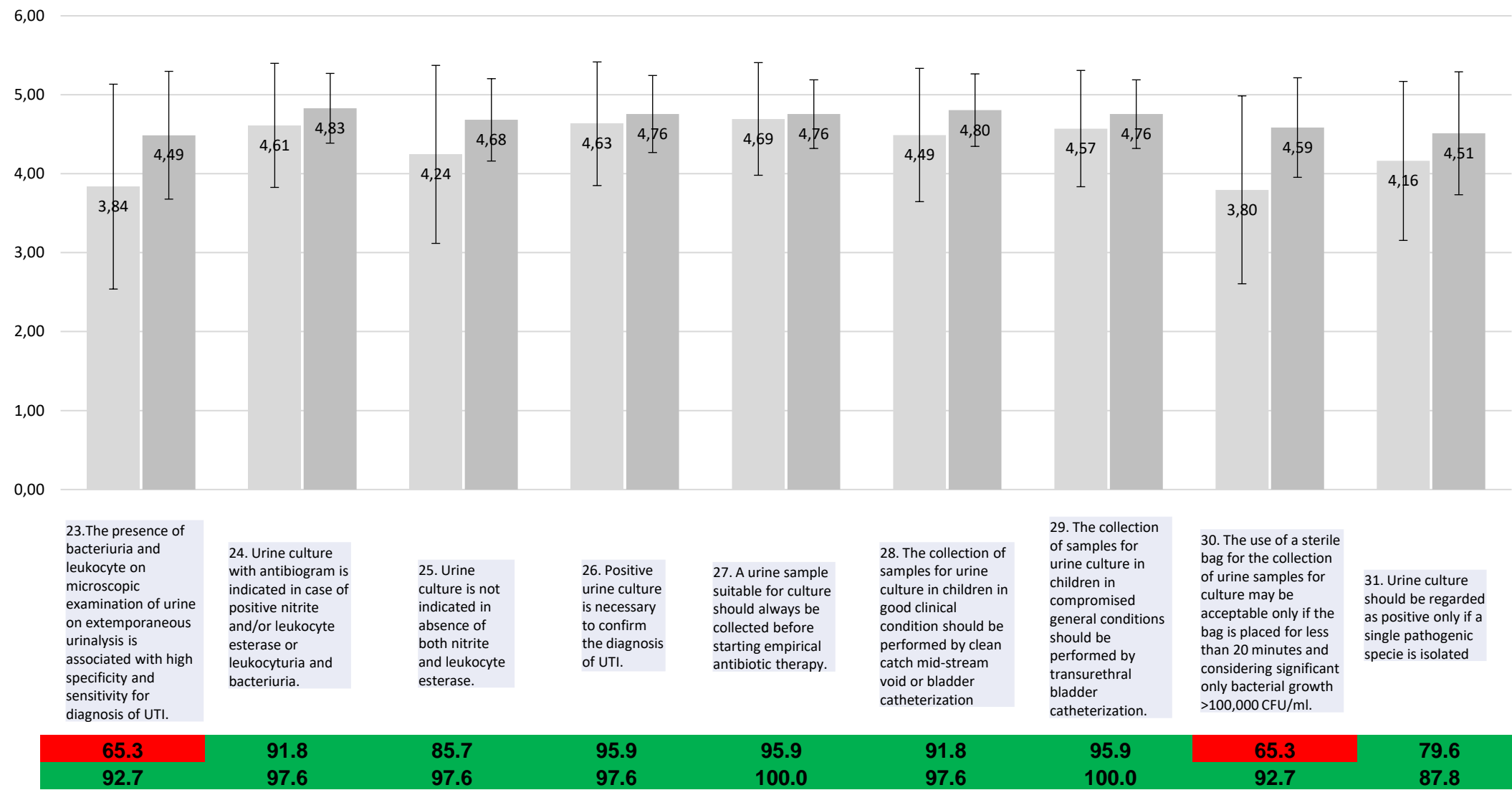
Second survey (%)

79.6	98.0	79.6	93.9	81.6	61.2
95.1	100.0	97.6	97.6	97.6	90.2

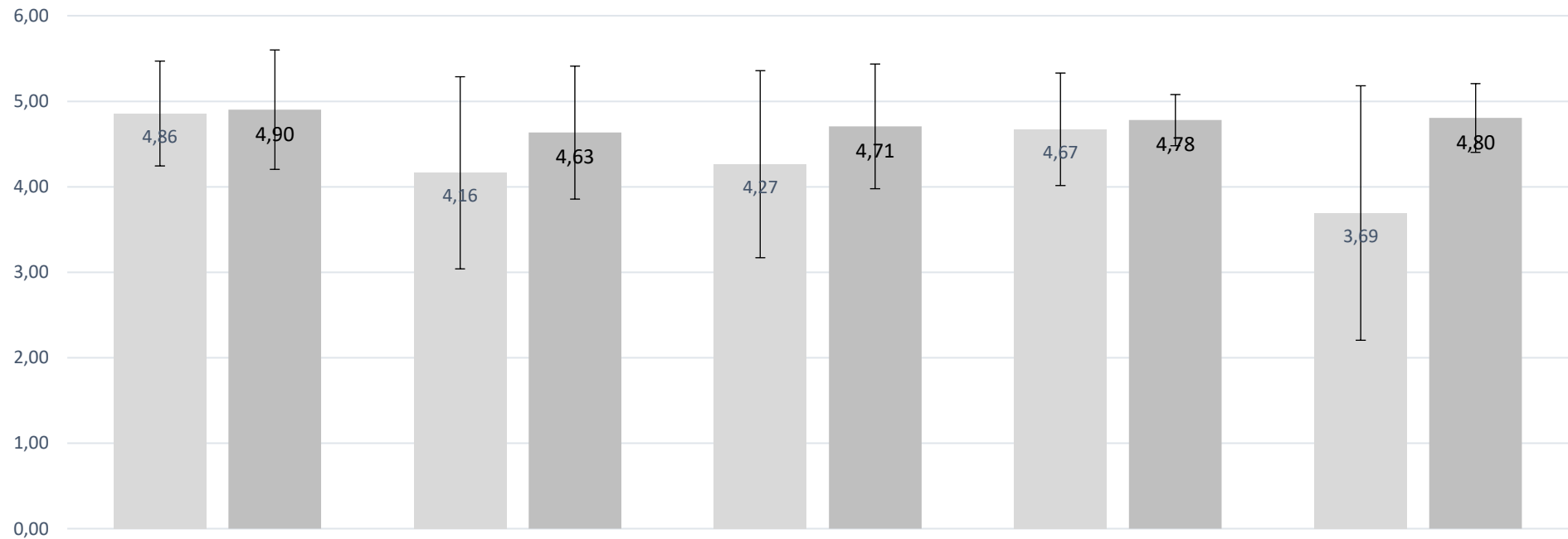
DIAGNOSIS



DIAGNOSIS



MANAGEMENT



32. Hospitalization is suggested for critically ill children requiring intravenous therapy (e.g. vomiting, dehydration, sepsis), failure of oral therapy (persistence of fever after 72 hours of adequate antibiotics), or poor compliance to oral therapy.

33. Hospitalization is recommended for children with UTIs aged under 3 months

34. Blood tests are not routinely needed in children affected by febrile UTI.

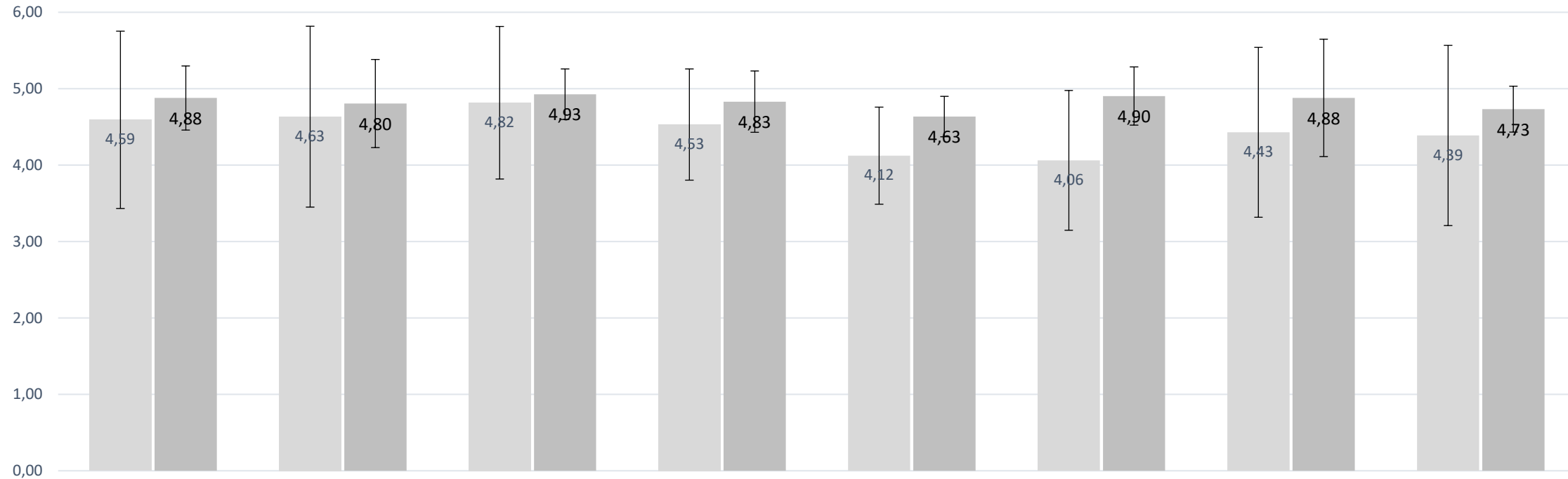
35. Complete and differential blood count, C-reactive protein (CRP), procalcitonin, and kidney function tests are recommended in children aged under 3 months.

36. Complete and differential blood count, C-reactive protein (CRP), procalcitonin, and kidney function tests are recommended in children over 3 months old in all cases requiring hospitalization.

First survey (%)  
Second survey (%)

98.0	79.6	83.7	93.9	69.4
100.0	95.1	95.1	95.1	100.0

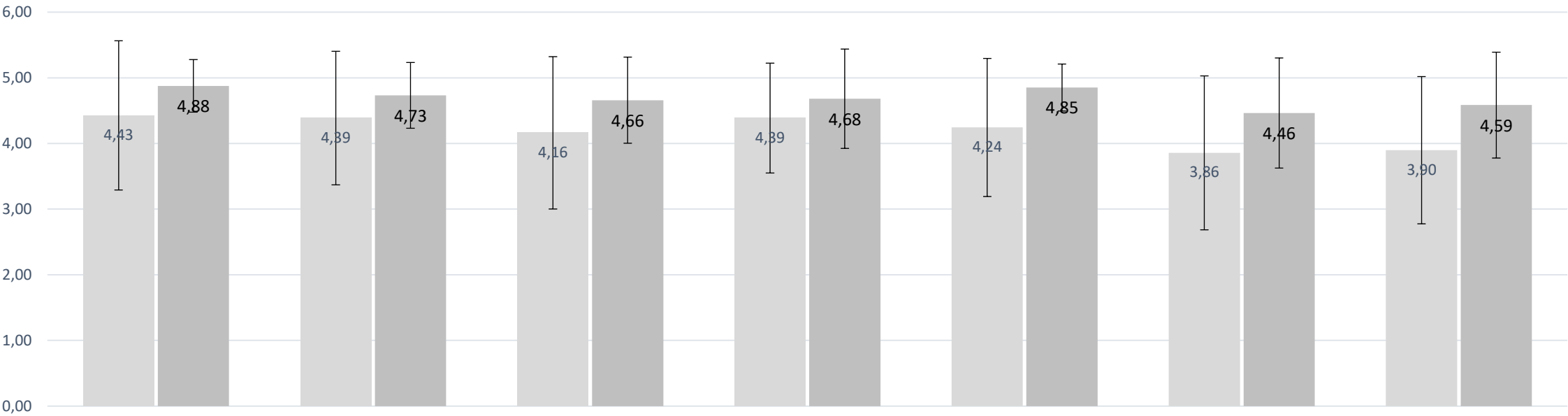
# TREATMENT



37. Empirical antibiotic therapy is indicated in all patients presenting with fever ( $\geq 38^{\circ}\text{C}$ ) and urine dipstick positive for leucocyte esterase (LE) and/or nitritis	79.6	69.4	93.9	95.9	98.0	91.8	77.6	69.4
38. Empirical antibiotic therapy is indicated in all patients presenting with fever ( $\geq 38^{\circ}\text{C}$ ) and presence of leucocyturia and bacteriuria in a fresh urine specimen.	100.0	95.1	100.0	100.0	100.0	100.0	95.1	100.0
39. Empirical antibiotic therapy is not indicated for asymptomatic bacteriuria (i.e., bacteriuria without fever or symptoms and without leucocyturia).								
40. When indicated, empirical therapy should be started as soon as possible within 3-4 days from fever onset.								
41. Intravenous regimens are recommended in case of sepsis, dehydration, inability to take or poor compliance to oral therapy, and should be considered for patients younger than 3 months.								
42. Intravenous therapy should be switched to oral route 24-48 hours after defervescence, according to clinical conditions.								
43. Empirical antibiotic therapy should be adjusted only when clinical failure occurs, defined by persistence of fever or lack of clinical improvement								
44. Empirical antibiotic therapy should be adjusted only when clinical failure occurs, on the basis of susceptibility testing.								

First survey (%)  
Second survey (%)

TREATMENT



45. The empirical use of amoxicillin should be avoided because of high resistance rates among uropathogens.

46. Suggested empirical treatments are combinations of penicillins and beta-lactamase inhibitors for patients older than 3 months affected by uncomplicated UTI

47. Suggested empirical treatments are third generation cephalosporins for patients older than 3 months affected by complicated UTI

48. Suggested empirical treatments are third generation cephalosporins for patients older than 3 months affected by complicated UTI or presenting with risk factors for infections caused by resistant uropathogens (e.g., history of recurrent UTIs and antibiotic therapy in the previous 30 days)

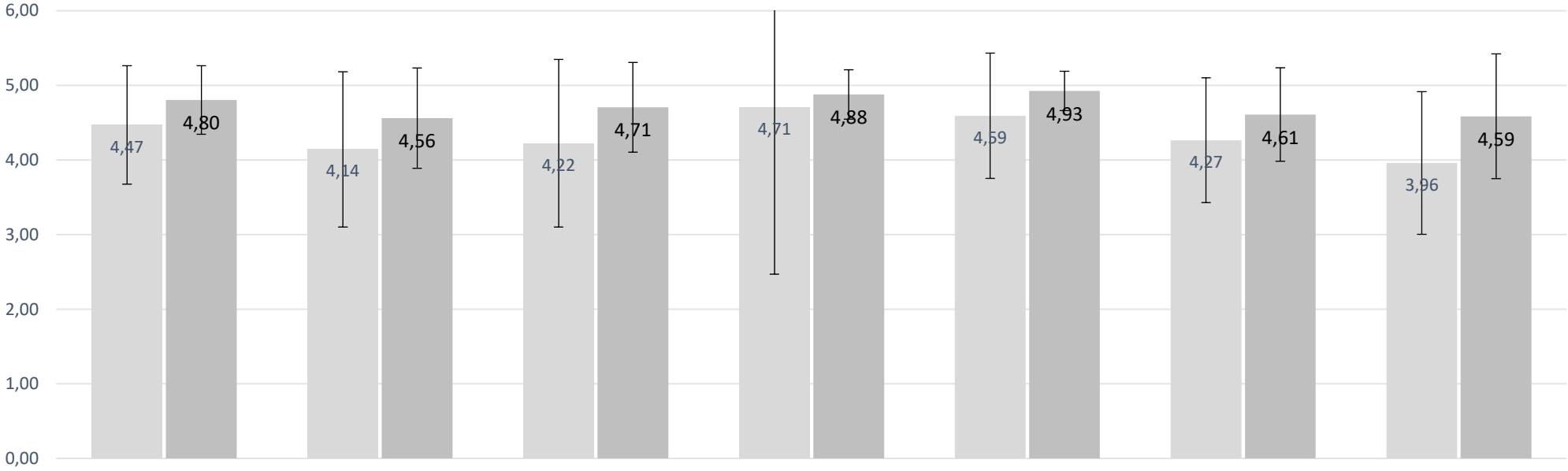
49. Suggested empirical treatments are combinations of penicillins with aminoglycosides or cephalosporins for patients younger than 3 months affected by complicated UTI.

50. Patients allergic to beta-lactams should be treated with aminoglycosides.

51. The empirical use of trimetoprim/sulfamethoxazole should be avoided because of high resistance rates among uropathogens.

First survey (%)	83.7	85.7	77.6	85.7	81.6	75.5	69.4
Second survey (%)	97.6	97.6	95.1	95.1	100.0	90.2	92.7

TREATMENT



52. Fluoroquinolones should be reserved only for severe or non-responsive cases.

53. Treatments of recurrent UTIs should be based on previous urine cultures and susceptibility tests.

54. Combinations of penicillins and beta-lactamase inhibitors should be prescribed at high dosages.

55. Antibiotic therapy should be continued for at least 7-10 days in patients with febrile uncomplicated UTI

56. Antibiotic therapy should be continued for at least 10-14 days in patients with complicated UTI (es. urosepsis).

57. Duration of antibiotic therapy may be reduced to 5 days in case of infection limited to lower urinary tract in patients aged > 3 months.

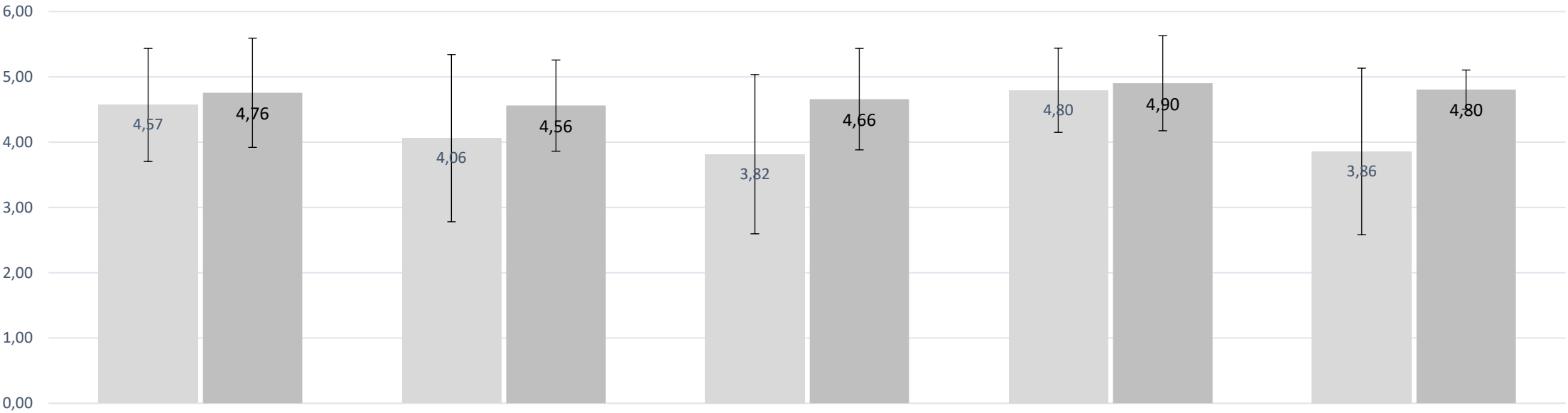
58. In patients affected by complicated UTI and concomitant obstructive uropathy, temporary urinary diversion may be considered after failure of both empirical and second-line antibiotic therapies, defined as lack of clinical improvement after 72 hours of adjusted second therapy.

First survey (%)  
CSecond survey (%)

91.8	79.6	81.6	97.1	91.8	85.7	69.4
97.6	95.1	92.7	100.0	100.0	92.7	90.2



IMAGING



59. Renal and bladder ultrasound (RBUS) during the acute phase of infection is indicated only in case of complicated or atypical UTI, defined as sepsis, fever persisting after 72 hours of adequate antibiotic therapy, oliguria, elevated plasma creatinine, or pathogens other than E. coli.

60. Renal and bladder ultrasound (RBUS) is indicated in all children, at least 2-4 weeks after a first febrile UTI in order to exclude urological anomalies.

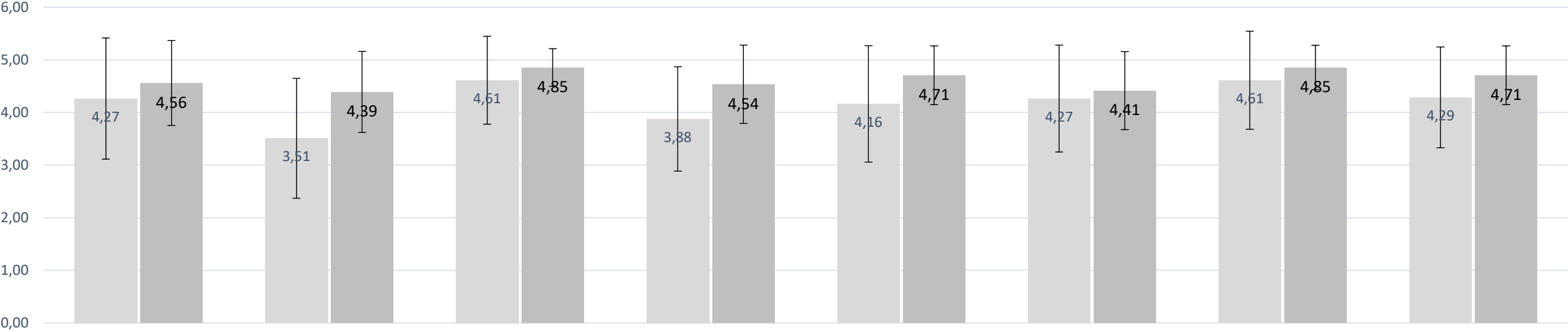
61. Isolated dilatation of renal pelvis < 10 mm is not an indication to further imaging exams.

62. Fluoroscopic contrast voiding cistourethorography (VCUG) is the gold-standard method for the diagnosis of vesicoureteral reflux (VUR) and provides information on the anatomy of lower urinary tract.

63. VCUG is indicated after the first episode of febrile UTI if it is caused by pathogens other than E. coli or when RBUS reveals renal hypoplasia, severe dilatation of renal pelvis, ureteral dilatation, uroepithelial thickening, or bladder abnormalities. VCUG is indicated in all second febrile UTIs.

Prima survey (%)	93.9	79.6	67.3	98.0	67.3
Seconda survey (%)	97.6	92.7	97.6	100.0	100.0

IMAGING



64. VCUG is indicated after the first episode of febrile UTI if it is caused by pathogens other than E. coli or when RBUS reveals renal hypoplasia, severe dilatation of renal pelvis, ureteral dilatation, uroepithelial thickening, or bladder abnormalities. VCUG is indicated in all second febrile UTIs.

65. Contrast-enhanced voiding ultrasonography and direct radionuclide cystography, when available, represent valid alternatives to VCUG for the diagnosis of VUR.

66. VCUG is always required before planning operative treatment of VUR.

67. Indirect radioisotopic cystography, obtained during the last phases of a MAG3 scintigraphy, has low sensitivity and specificity for diagnosis of VUR, thus is not routinely recommended.

68. When performing diagnostic procedures involving urinary catheterization, antibiotic prophylaxis is recommended for children with strongly suspected or already proven urinary abnormalities.

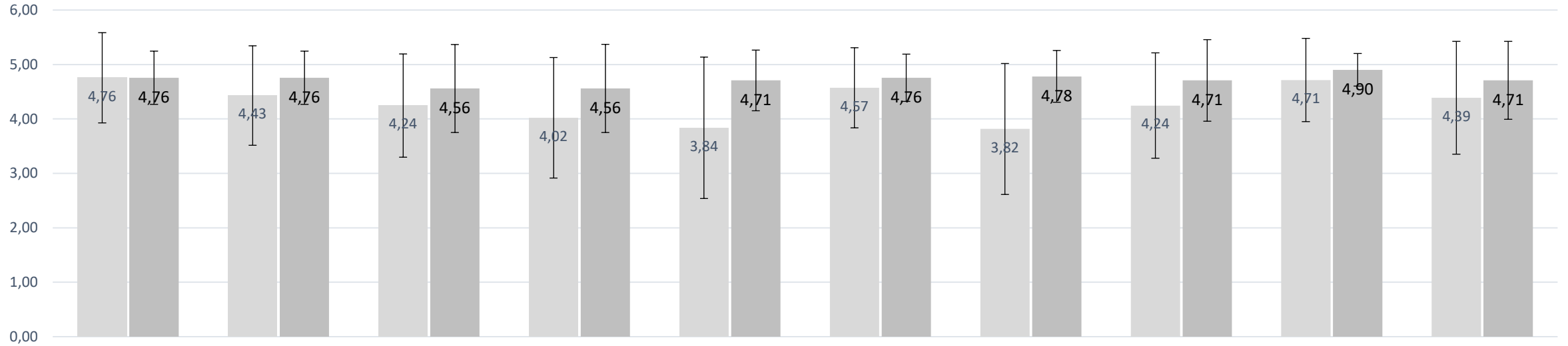
69. When performing diagnostic procedures involving urinary catheterization, antibiotic prophylaxis with trimethoprim/sulfamethoxazole (2 mg/kg of trimethoprim p.o. in patients >6 weeks of age) or amoxicillin/clavulanic acid (50 mg/kg of amoxicillin) or gentamicin (2.5 mg/kg i.v./i.m.) immediately before the procedure is recommended.

70. Scintigraphy is not routinely recommended after the first UTI.

71. Renal cortical scintigraphy with technetium-99m labeled dimercaptosuccinic acid (DMSA) is recommended in all children with VUR grades IV and V, at least 6 months after the febrile UTI in order to detect renal scarring.

83.7	51.0	91.8	73.5	79.6	81.6	93.9	83.7
90.2	95.1	100.0	97.6	95.1	85.4	97.6	95.1

# PROPHYLAXIS



72. The role of long-term antibiotic prophylaxis has been questioned by several clinical studies, it seems to have no effect on the risk of recurrence, and it is not routinely indicated.

73. Antibiotic prophylaxis may be considered until performing VCUG, when it is indicated, in children with history of recurrent UTIs ( $\geq 3$  episodes/year) or with VUR grade IV-V.

74. When prophylaxis is indicated, amoxicillin/clavulanic acid or third generation oral cephalosporins represent valid options for long-term prophylaxis.

74. When prophylaxis is indicated, amoxicillin/clavulanic acid or third generation oral cephalosporins represent valid options for long-term prophylaxis.

75. There is not enough evidence to define which are the most proper molecules, dosages and duration for long-term antibiotic prophylaxis.

76. Doses from one third to one half of those administered during the acute infection are generally considered suitable for long-term prophylaxis.

77. There is insufficient evidence on the effectiveness of cranberry preparations in preventing relapses of UTI.

78. There is insufficient evidence on the effectiveness of probiotics in preventing relapses of UTI.

79. Modifiable risk factors for the occurrence of UTI are phimosis, constipation, bladder-bowel disfunctions and low daily water intake.

80. In children with recurrent UTIs or urinary tract malformations, urine culture is indicated only when fever and/or symptoms or clinical signs of UTI occur.

95.9	81.6	81.6	65.3	67.3	95.9	75.5	87.8	95.9	85.7
97.6	97.6	92.7	92.7	95.1	100.0	97.6	95.1	100.0	97.6