

# Diagnostic aspects of urinary tract infections among elderly residents of nursing homes

Akademisk avhandling

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av

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Avhandlingen baseras på följande delarbeten:

- I. Sundvall PD, Gunnarsson RK. Evaluation of dipstick analysis among elderly residents to detect bacteriuria: a cross-sectional study in 32 nursing homes. *BMC Geriatrics* 2009 Jul 27; 9:32.
- II. Sundvall PD, Ulleryd P, Gunnarsson RK. Urine culture doubtful in determining etiology of diffuse symptoms among elderly individuals: a cross-sectional study of 32 nursing homes. *BMC Family Practice* 2011 May 19; 12:36.
- III. Sundvall PD, Elm M, Ulleryd P, Mölsted S, Rodhe N, Jonsson L, Andersson B, Hahn-Zoric M, Gunnarsson RK. Interleukin-6 concentrations in the urine and dipstick analyses were related to bacteriuria but not symptoms in the elderly: a cross sectional study of 421 nursing home residents. Submitted.
- IV. Sundvall PD, Elm M, Gunnarsson RK, Mölsted S, Rodhe N, Jonsson L, Ulleryd P. Antimicrobial resistance in urinary pathogens among Swedish nursing home residents remains low: a cross-sectional study comparing antimicrobial resistance from 2003 to 2012. *BMC Geriatrics* 2014 Mar 13; 14(1):30.2.



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### ABSTRACT

**Background:** Up to half the residents of nursing homes for the elderly have asymptomatic bacteriuria (ABU), which should not be treated with antibiotics. Thus, it is difficult to know if new symptoms in residents with bacteriuria are caused by urinary tract infection (UTI), or if bacteriuria only represents an ABU. This is especially difficult in the presence of non-urinary tract specific symptoms. The diagnostic uncertainty is likely to generate significant over-treatment with UTI antibiotics.

**Aim:** The general aim was to clarify the association between symptoms, bacteriuria, dipstick urinalysis and urine Interleukin-6 (IL-6) among nursing home residents to improve the diagnostic procedure of a suspected lower UTI.

**Methods:** In 2003 a study protocol including newly onset symptoms was completed, and single voided urine specimens collected for dipstick urinalysis and cultures from 651 residents of 32 participating Swedish nursing homes for the elderly. This data was used for a study of dipstick urinalysis (Paper I) and for a study of nonspecific symptoms and bacteriuria (Paper II). In 2012, similar data was collected for 421 elderly residents of 22 nursing homes, which also included an analysis of IL-6 in urine and urine specimens from another 59 residents with urinary catheters. The association between bacteriuria, IL-6 in urine, dipstick urinalysis and newly onset symptoms was analysed (Paper III). Antimicrobial resistance rates were described among residents of nursing homes in 2012 and compared with those from 2003 (Paper IV).

**Results:** Paper I: The negative predictive value for predicting absence of bacteriuria was 88 (84-92)% when dipstick urinalysis for nitrite and leukocyte esterase were simultaneously negative. A positive dipstick or any combination thereof could not sufficiently predict bacteriuria. Papers II-III: New or increased nonspecific symptoms were common among elderly residents of nursing homes. Residents without nonspecific symptoms had positive urine cultures as often as those with nonspecific symptoms with a duration of up to one month. Paper III: Residents with positive urine cultures had higher concentrations of IL-6 in the urine. However, among residents with positive urine cultures there were no differences in IL-6 concentrations or dipstick findings between those with or without nonspecific symptoms. Paper IV: The average rates of antimicrobial resistance were low and did not increase between 2003 and 2012 in *Escherichia coli* (*E. coli*) urinary isolates among Swedish nursing home residents. Any antibiotic treatment during the last month and hospitalization during the last six months predicted higher resistance rates among *E. coli*.

**Conclusions:** Nonspecific symptoms among elderly residents of nursing homes are unlikely to be caused by bacteria in the urine. Therefore, dipstick urinalysis, IL-6 in the urine and urine cultures are of little or no value in clarifying the aetiology of nonspecific symptoms. If there is a reason for testing for bacteriuria, dipstick urinalysis for nitrite and leukocyte esterase can rule out but cannot reliably rule in bacteriuria. Antimicrobial resistance in urinary pathogens among Swedish nursing home residents remained low. It is important to use antibiotics rationally to preserve the effectiveness of antibiotics.

**Keywords:** Bacteriuria, Nursing Homes, Homes for the Aged, Urinary Tract Infections, Predictive Value of Tests, Dipstick Urinalysis, Interleukin-6, Drug Resistance; Bacterial.