

Antimicrobial resistance carriage in Dutch long term care facilities

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Introduction

Although the resistance level in the Netherlands is low, little is known about the occurrence of resistant microorganisms in Dutch long term care facilities (LTCFs). We assessed the antimicrobial resistance of commensal micro-organisms, i.e. *Escherichia coli* and *Staphylococcus aureus*, and linked the observed antibiotic resistance to antibiotic usage and LTCF characteristics.

Methods

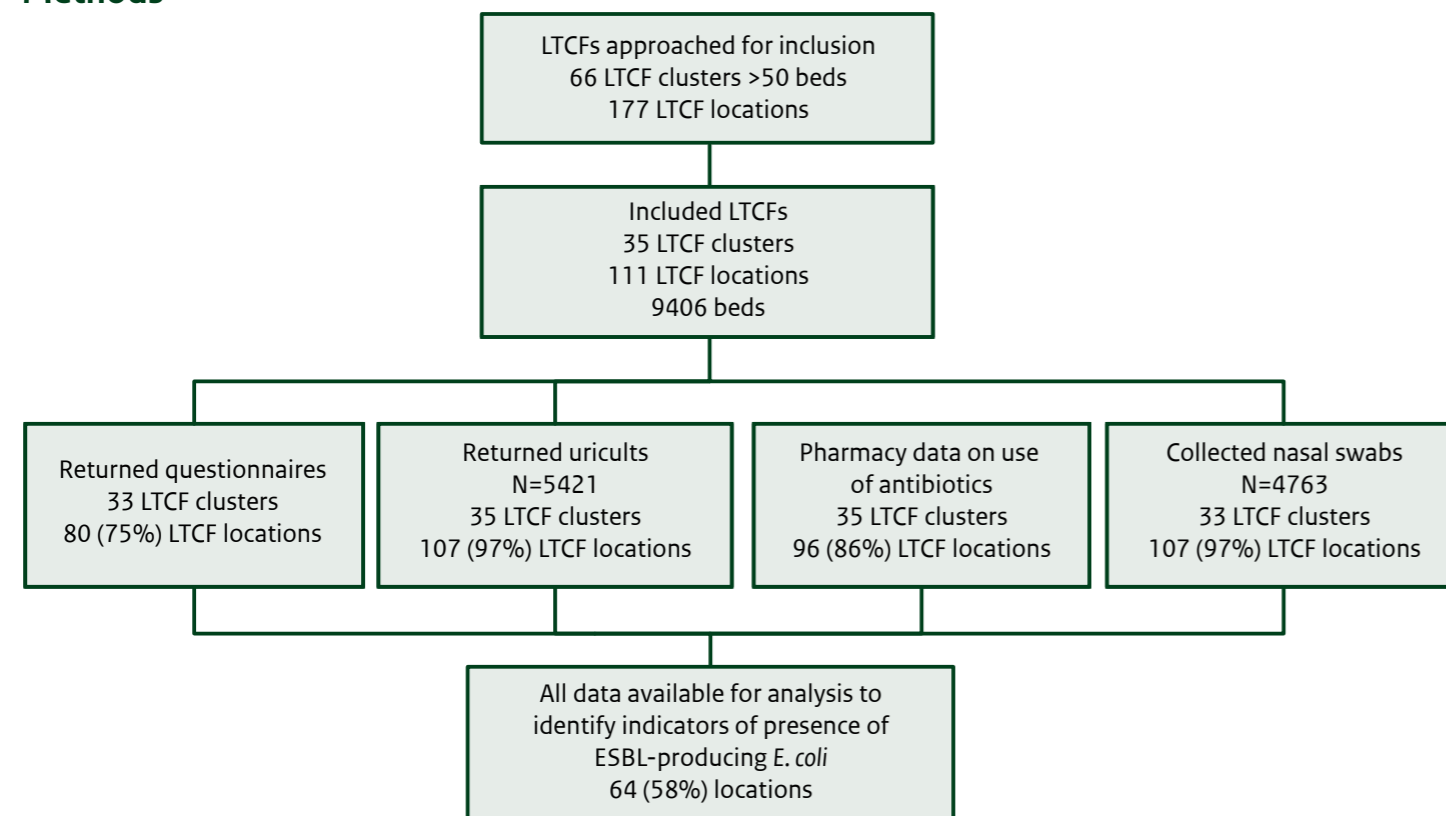


Figure 1. Selection and inclusion of LTCFs and collection of questionnaire, laboratory and pharmacy data.

Results

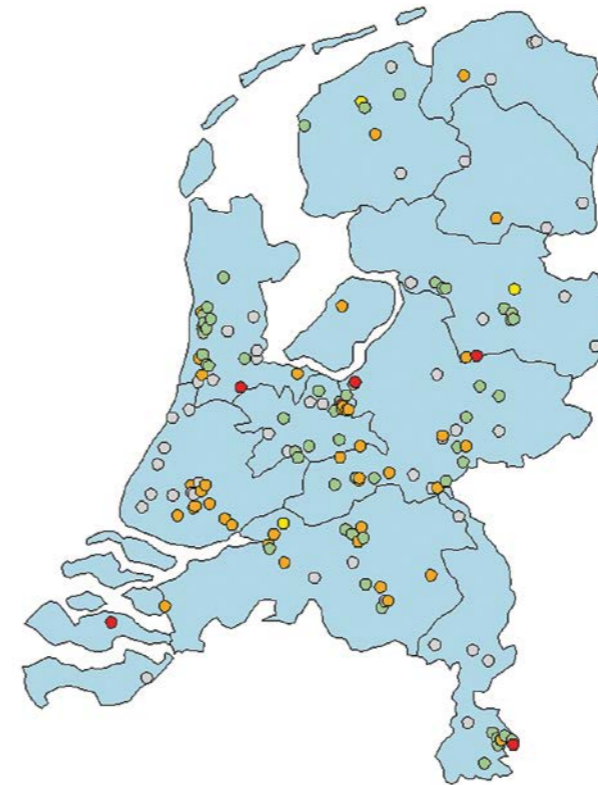


Figure 2. Geographical representation of long term care facilities (LTCFs) in the Netherlands approached for this study. The colored dots represent the LTCFs included in this study, with green dots for LTCFs negative for both ESBL-producing *E. coli* and MRSA; orange for LTCFs positive for ESBL-producing *E. coli* but negative for MRSA; yellow for LTCFs negative for ESBL but positive for MRSA; and red for LTCFs that were positive for both pathogens. The grey dots represent LTCFs that chose not to participate.

- Of 4763 nasal swabs, *S. aureus* was identified in 1269 (26.6%), including 13 MRSA carriers (0.3%).
- Of 5359 urine/incontinence samples, 2934 (55%) yielded *E. coli*, of which 123 (4.2%) produced ESBL.
- The percentage of ESBL-producing *E. coli* ranged from 1% to 33% between LTCFs. Seven tested antibiotics reached resistance percentages of at least 20%. A low resistance percentage (1%) was observed for the eighth antibiotic nitrofurantoin (Table 1).

Table 1. Resistance levels to eight antibiotics of *E. coli* from LTCF residents.

| Antibiotic | Mean usage* (95%CI) | %resistant <i>E. coli</i> |
|-------------------------|------------------------|------------------------------|
| Doxycycline | 6.4 (5.2-7.6) | 25 (22-27) |
| Amoxicillin | 4.2 (3.4-4.9) | 45 (42-47) |
| Amoxicillin-clavulanate | 21.8 (18.8-24.9) | 25 (23-28) |
| Trimethoprim | 1.7 (1.5-2.2) | 25 (23-27) |
| Co-trimoxazole | 2.7 (2.2-3.3) | 22 (20-24) |
| Ciprofloxacin | 8.8 (7.1-10.6) | 20 (18-23) |
| Norfloxacin | 1.8 (1.3-2.2) | 25 (22-27) |
| Nitrofurantoin | 9.6 (7.8-11.3) | 1 (0.6-1.6) |

*in DDD/1000 residents/day

In multilevel multivariate logistic regression, two indicators were associated with higher proportions of ESBL-producing *E. coli*:

- antibiotic usage (OR 1.8, 95%CI 1.1-3.0 for each extra 50 DDD/1000 residents/day);
- presence of MRSA carriers in the LTCFs (OR 2.4, 95%CI 1.0-5.6).

Conclusion

- Dutch LTCFs are not yet to be considered an important reservoir of multidrug resistant potential pathogens.
- The large variation between LTCFs of 1% to 33% warrants close monitoring of resistance in LTCFs to identify risk factors as well as success factors.
- Integrated surveillance, i.e. linking data on antibiotic usage, microbiological testing, epidemiology and clinical background on both individual and institutional level is needed.