

Effect of an Antibiotic Stewardship Program in Non-University Children's Hospitals on Antibiotic Use: A Stepped-Wedge Cluster Randomized Trial

Sophie Diexer¹, Karen Holland¹, Christian Dohna-Schwake², Arne Simon³, Martina Stiefel¹, Rafael Mikolajczyk¹, Johannes Hübner⁴, Ulrich von Both⁴ on behalf of the TeleKasper consortium
¹University Medicine Halle, Halle (Saale), Germany, ²University Hospital Essen, Essen, Germany
³University Hospital of Saarland, Homburg, Germany, ⁴LMU University Hospital, Munich, Germany



Background

- Antimicrobial resistance is one of the leading health problems
- Overuse and misuse of antibiotics are drivers of antimicrobial resistance
- In pediatric patients infections make up a very high proportion of all treatment indications and antibiotic consumption is high
- Antibiotic stewardship programs (ASP) can reduce and optimize antibiotic use
- Implementation of ASP is limited in non-university children's hospitals in Germany
- Telemedicine approach: effective approach to implement ASP in this setting

Aim

- Supporting the implementation of an ASP in non-university children's hospitals
- Achieve 20% reduction in overall antibiotic consumption

Methods

Study Design

TeleKasper

- Stepped-wedge cluster randomized controlled trial
- Intervention: telemedical consultation service using an app as a communication tool
- Regional hubs (University hospital) coordinate non-university hospitals
- 33 non-university children's hospitals in 4 different German areas
 - Essen, Halle, Homburg, Munich (Figure 1)
- Study period: February 2022 – June 2024

Measures

- Antibiotic consumption: defined daily dose (DDD) per 100 patient days
- Monthly data provided by the hospital pharmacy
- Anonymized routine electronic health records

Statistical Analysis

- Poisson mixed-effects model
 - Fixed Effects:
 - Intervention
 - Seasonal Effects
 - Calendar time
 - Random Effect:
 - Hospitals
- Intention-to-treat analysis
- Data from the transition phase:
 - Excluded
- Stepped wedge phase: 02/2022 – 03/2024
- Extended phase: 01/2021 – 06/2024

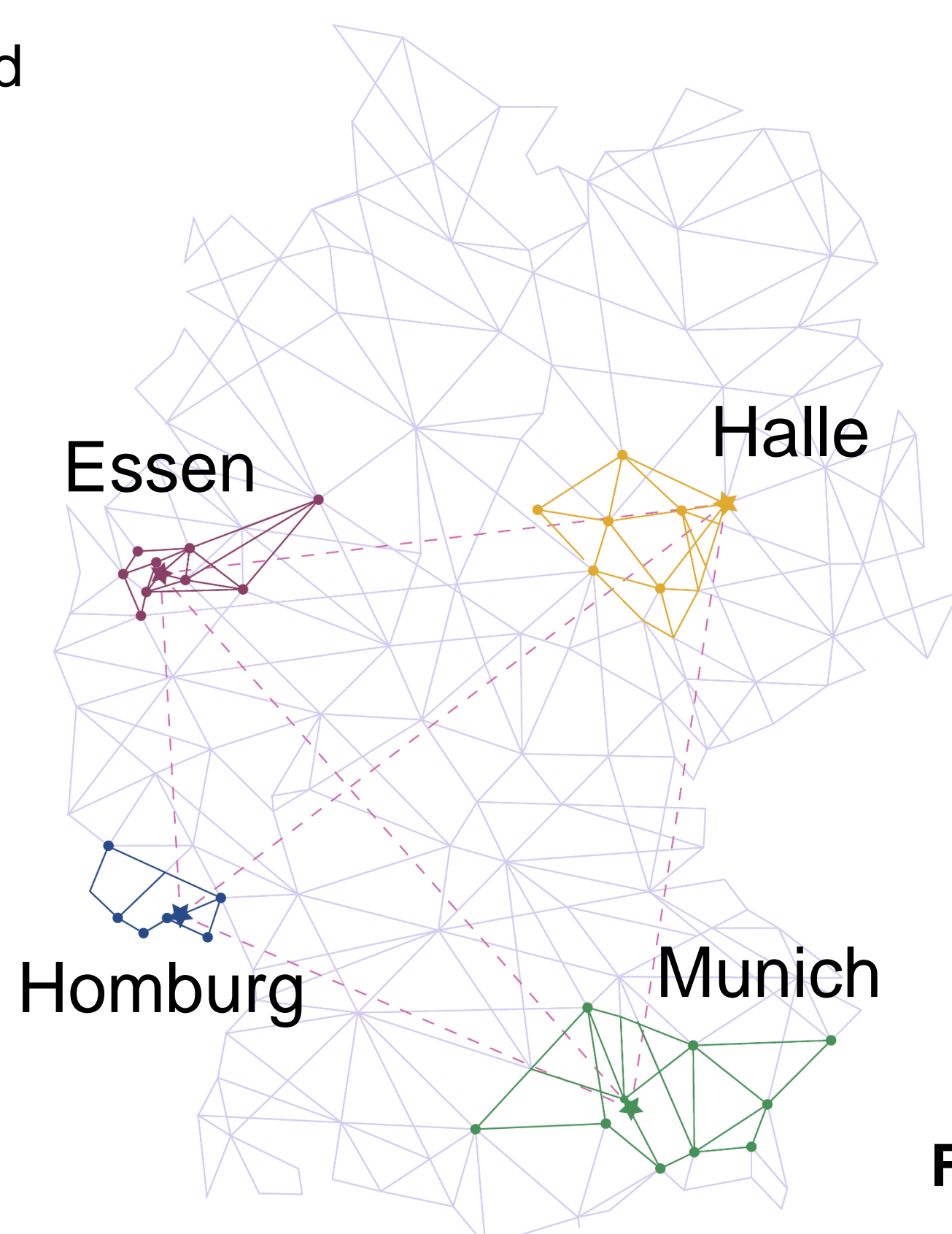


Figure 1. TeleKasper network

Results

- 52% of hospitals in urban region
- Median number of pediatric beds available: 52 (min=18, max=120)
- Median number of patients in pediatric hospitals annually: 2500 (min=1136, max=6500)
- 82% of hospitals used a paper based prescribing system
- Antibiotic consumption at baseline (2021): 23.34 DDD/100 patient days (Figure 2)

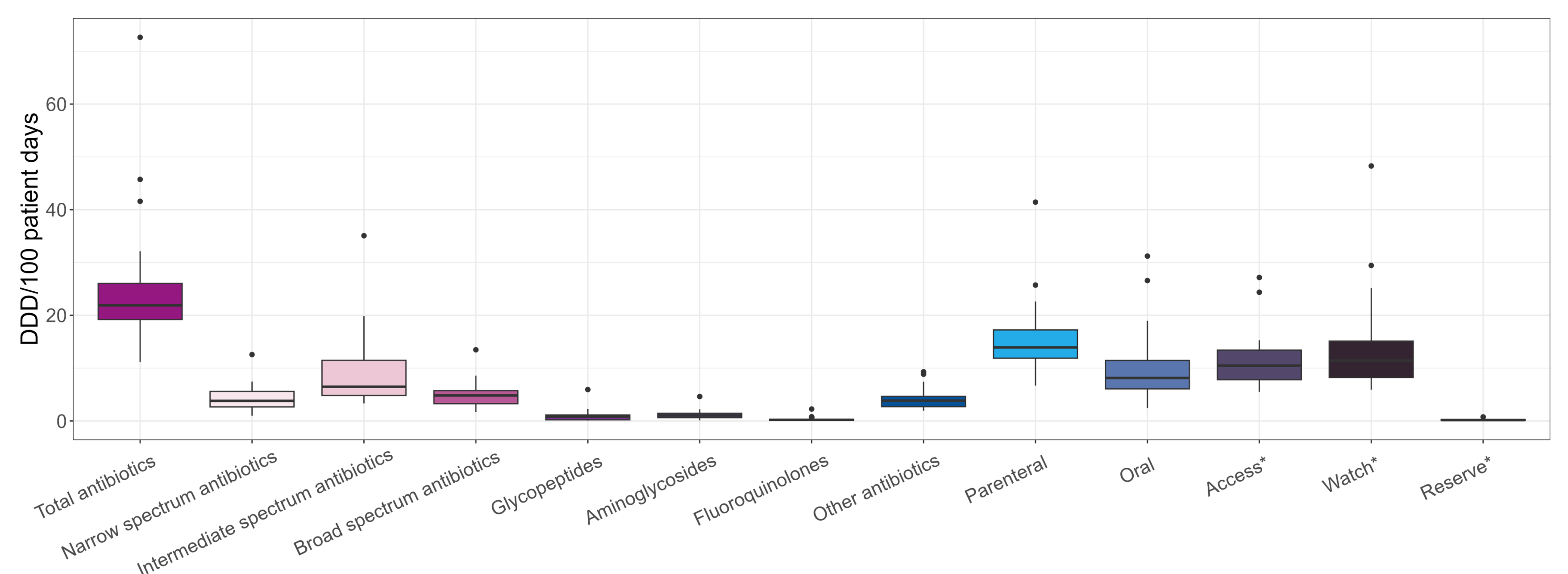


Figure 2. Baseline antibiotic use, *WHO AWaRe classification

- Effect of intervention: -8% (95% Confidence Interval: -12 to -3) (Figure 3)

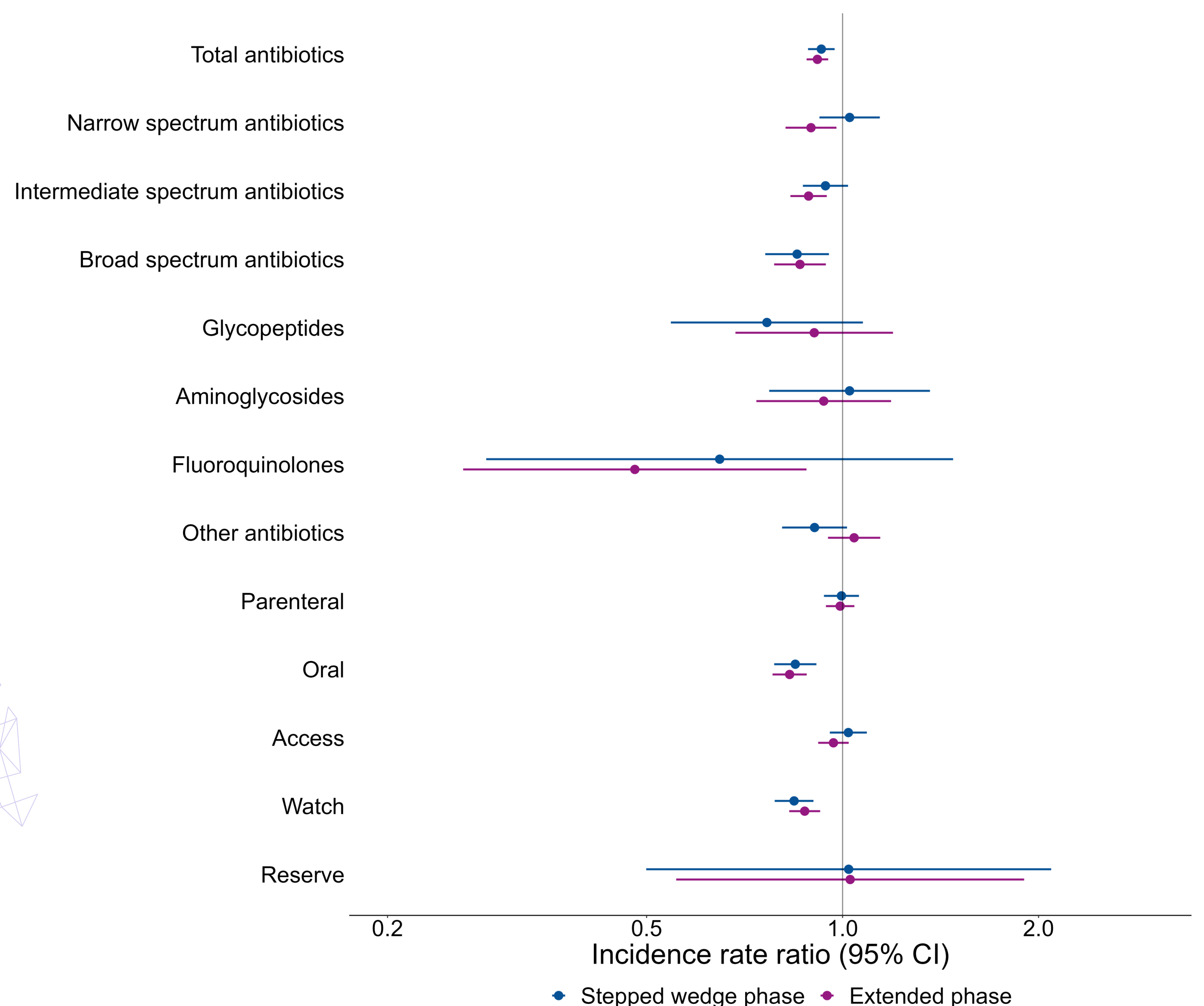


Figure 3. Intervention effect for stepped wedge phase and extended phase

Conclusion

- A telemedicine based ASP was successfully implemented in 33 non-university hospital
- The intervention resulted in an average reduction in total antibiotic consumption of 8%
- Consistent reductions in Watch, broad spectrum, and oral antibiotics

