

## Ready-to-use its potential?!

# National evaluation of standardized drug solutions in the intensive care medicine

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### Background

Ready-to-use drug-solutions for the application using syringe-pumps produced by industry or hospital pharmacists have advantages over manually prepared solutions on the ward in terms of accuracy of drug concentration and microbiological aspects. A key prerequisite for large-scale productions are standardized concentrations, which in Germany only exist on a local level.

### Methods

Two surveys were conducted among hospital pharmacies and intensive care units (ICU) for adults in German university hospitals. In-house standard drug concentrations were gathered from the ICUs on one hand and drugs being manufactured in different concentrations in the associated hospital pharmacies on the other.

### Results

2 Surveys among 32 German university hospitals and associated pharmacies

Locally standardized drug concentrations in ICUs.  
**17 responses** (53% response-rate)

**100** different drugs  
**262** different concentrations being listed.

**22** drugs listed by at least two-thirds of the responding hospitals.

Manufacturing of ready-to-use drug solutions.  
**19 responses** (59% response-rate)

**20** different drugs being manufactured in **36** different concentrations.

**3** different drugs are being manufactured by more than 30% of the responding pharmacies.

The consistency of the concentrations of the 22 most-listed drugs was studied. Dose-bands spanning +/- 10% from the first and second modal-value were used.

Fig. 1 Survey results

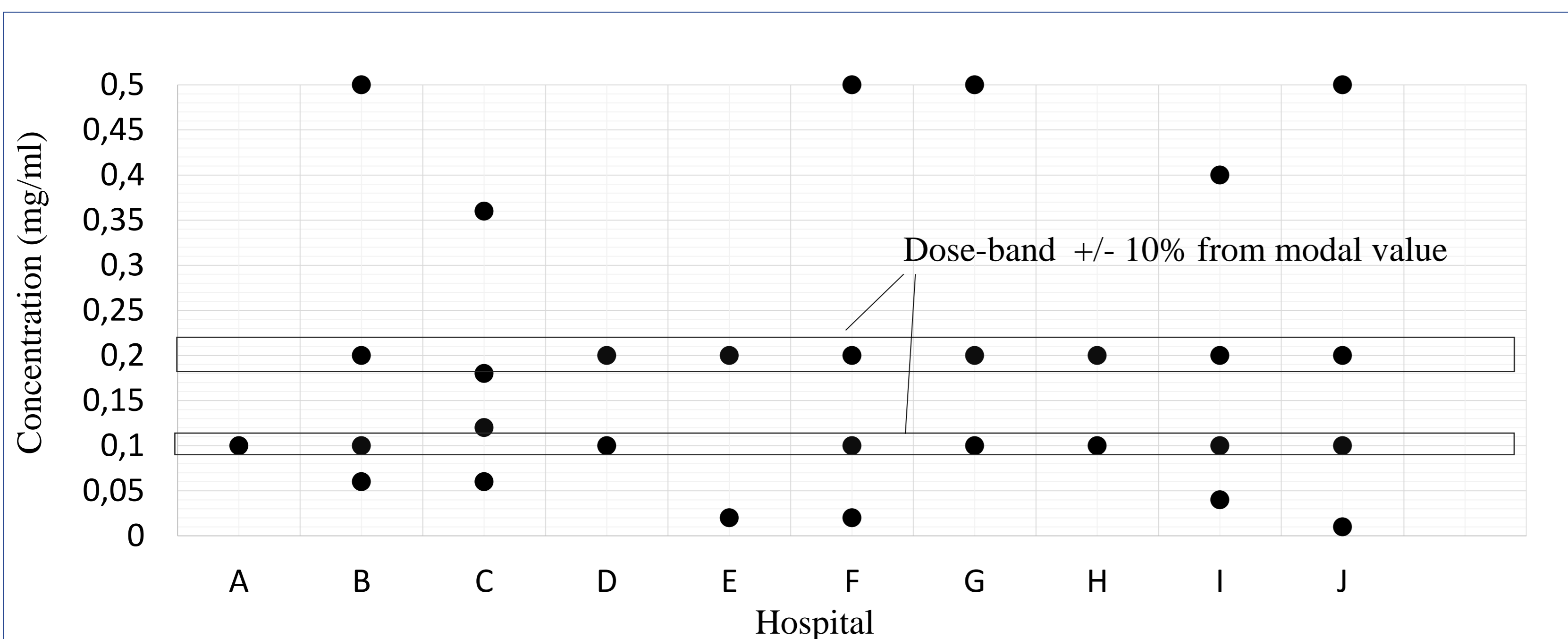


Fig. 2 Example for comparing the different in-house concentrations reported for norepinephrine

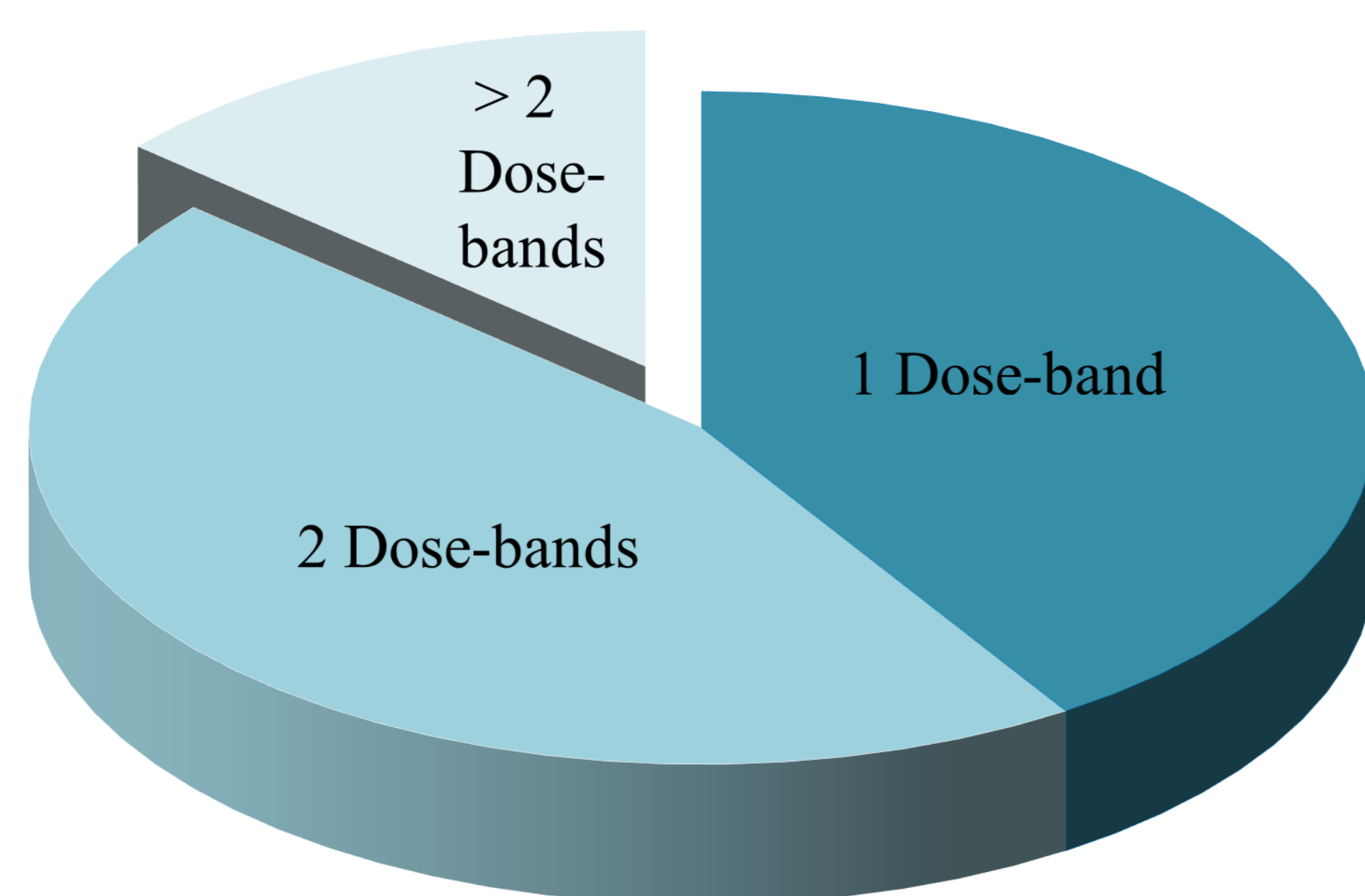


Fig. 3 Dose-bands necessary to cover more than 75% of concentrations of the 22 most-listed drugs

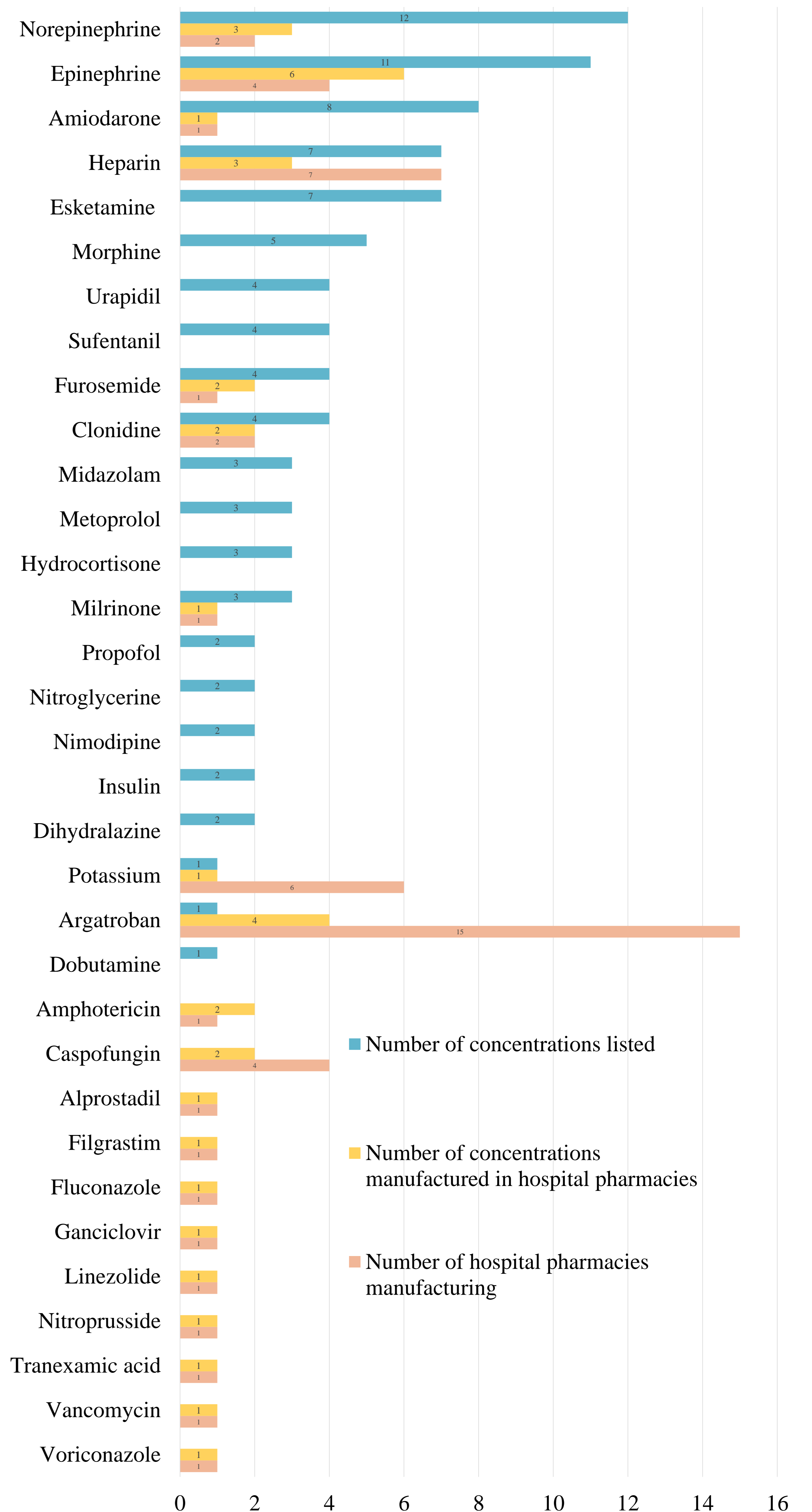


Fig. 4 Overview of drug solutions manufactured by hospital pharmacies and drug concentrations listed in German ICUs for adults

### Conclusion

The observed gap between in-house standard drug concentrations and drugs being manufactured might be due to limited manufacturing capacities of the pharmacies and/or limited stability data of the ready-to-use preparation (concentration, diluent and primary container). Standardizing the drug-concentrations on a national, or even European level might enable hospital pharmacies to cooperate in overcoming the lack of stability data.

The capacity deficit at the hospital pharmacies could be lessened by shifting high-turnover-drugs towards pharmaceutical companies. Only a small number of dose-bands would be necessary to cover most of the drugs already being used in in-house standardized concentrations. For nationwide recommendations of standardized concentrations of drugs used in intensive care an extensive survey among ICUs is being planned.