Unit-level antibiotic resistant bacterial colonisation pressure in 20 neonatal units across Europe

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Background

- Infants on neonatal units are at risk of severe bacterial infections, particularly those born at <32 weeks
- Infants colonised by resistant bacteria have an increased risk of sepsis
- Colonisation pressure, the proportion of infants colonised with resistant bacteria on a neonatal unit, is a major contributor to the spread of resistant bacteria in neonatal units
- We undertook a pre-trial colonisation feasibility study to characterise baseline colonisation pressure at the neonatal unit-level
- We aimed to understand feasibility of collecting these data using cross-sectional surveys to inform the frequency of sampling and sample analysis strategy for the NeoDeco trial

Methods

- Sites conducted 4 cross-sectional surveys in a one-month period
- At each survey clinical data, skin swabs and stool samples were collected from all infants present on the unit
- Stool samples were analysed by PCR for the presence of bacterial resistance genes
- Individual data were aggregated to present a unit-level picture
- Proportion of infants ARB colonised at the survey timepoint excludes infants with missing samples or indeterminate PCR results.

Gene targets of interest in stool samples

Carbapenem resistance: *bla*$_{KPC}$, *bla*$_{NDM}$, *bla*$_{VIM}$, *bla*$_{IMP}$, *bla*$_{OXA-48}$

Extended-spectrum beta-lactamase: *bla*$_{CTX-M}$ group1, *bla*$_{CTX-M}$ group9

Vancomycin resistance: *vanA*, *vanB*

Antibiotic resistant bacterial (ARB) colonisation was defined as the detection of at least one target gene in an infant's stool

Results

- 20 sites (8 countries) had complete sample data from 4 surveys (n=80 surveys)
- Median 21 infants per survey (IQR: 13-27 infants)
- 30 / 80 surveys did not identify any ARB colonisation → **varied by country**
- Median 45 % of infants (IQR: 35% - 60%) were born <32 weeks gestation (high risk)
- In surveys with <u>any</u> ARB colonisation
  - Median 25% (IQR: 14-42%) were colonised per survey (median n= 3, IQR: 2-7)
  - Median 1 high risk infants (<32 weeks) (IQR: 1-3) were colonised per survey
  - ARB colonisation prevalence was not associated with proportion of high-risk infants on the unit (logistic regression adjusted for country, OR: 0.49, p=0.71)

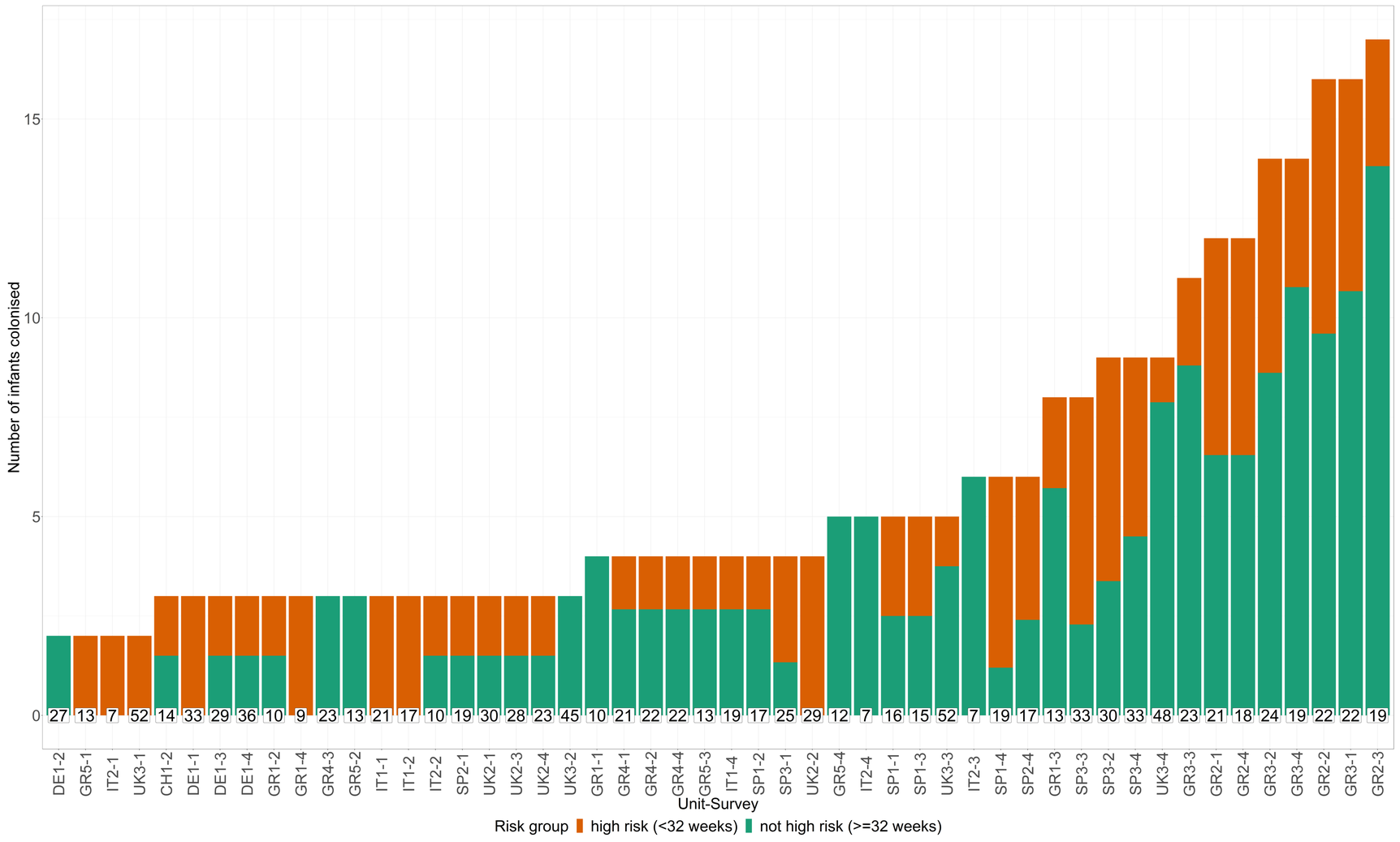
Number of surveys with any resistant bacterial colonisation by country

Greece	20/20 (100%)
Germany	4/4 (100%)
Italy	7/8 (88%)
Spain	10/12 (83%)
UK	8/12 (67%)
Switzerland	1/15 (6.3%)
Estonia	0/4 (0%)
Poland	0/4 (0%)

	Any resistant bacterial colonisation on unit at survey*	
	No (n = 30)	**Yes (n = 50)**
Total infants in survey	19 (7 - 26)	21 (14 - 28)
Number of infants present in previous survey	10 (5 - 14)	15 (9 - 17)
Gestational age (weeks)	32 (30 - 34)	32 (30 - 33)
Birthweight (grams)	1,715 (1,186 - 1,883)	1,658 (1,296 - 1,955)
Postnatal age (days) at survey	19 (11 - 30)	20 (14 - 24)
Length of stay on NICU at survey (days)	13 (9 - 21)	15 (11 - 20)
Number of infants received surgery prior to survey	2 (0 - 4)	4 (3 - 6)
Number of infants previously exposed to antibiotics	12 (6 - 20)	16 (12 - 22)

*Table presents median (IQR) for each characteristic

Figure: Number of infants colonised by antibiotic resistant bacteria per unit-survey split by high risk (born <32 weeks gestation) and not high risk (born ≥32 weeks gestation) and total number of infants present on the day of the survey.



Conclusion

- Resistant bacterial colonisation was generally low across European neonatal units
- Both low- and high-risk infants were colonised
- Findings to inform sampling frequency and sample analysis for NeoDeco trial
- Unit-level IPC interventions target both direct and indirect effects of colonisation regardless of risk status
- Interventions focusing only on infants at high risk of sepsis will miss significant resistant bacterial colonisation in low-risk infants

The NeoDeco trial is a cluster-randomised hybrid implementation-effectiveness trial looking at the impact of implementing optimal kangaroo care on neonatal sepsis and resistant bacterial colonisation prevalence.

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Learn more about the NeoIPC Project

The NeoIPC project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 965328