



# Evaluation of Compliance with the 2017 Canadian Pediatric Society (CPS) Statement Recommendations for the Management of Newborns at Risk for Early-Onset Sepsis (EOS)

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## Study Objective

To evaluate the compliance of Victoria General Hospital (VGH) to the 2017 Canadian Pediatric Society (CPS) recommendations for the management of newborns at risk of early-onset sepsis (EOS)

## Introduction

- EOS is a rare, but serious systemic infection that manifests  $\leq 72$  h of birth
- Clinicians often treat newborns before confirmation of EOS, due to the high-mortality rate and non-specific presentation
- Aggressive management with investigations (INV) and antibiotics (ABX) may lead to prolonged hospitalizations and downstream consequences
- In 2017, CPS updated the recommendations of newborns at risk of EOS, which incorporates signs and symptoms (S&S) and maternal risk factors (RFs)
- The compliance of these recommendations at VGH has not been examined

Table 1. Summary of 2017 CPS Recommendations (Adapted from Jefferies, 2017)

Group	# S&S suggesting Sepsis <sup>a</sup>	# Maternal RFs <sup>b</sup>	(INV) <sup>c</sup>	(ABX) <sup>c</sup>
1	$\geq 1$	0-3	CBC $\pm$ CRP Blood culture (BC)	Empiric IV ABX
2	Early respiratory signs only	1-3		
3	Early respiratory signs only	0		
4	None	1	No INV	No ABX
5		$\geq 2$ and/or chorioamnionitis	Individualized approach	Individualized approach

<sup>a</sup> Respiratory distress requiring NCPAP or O<sub>2</sub>, hemodynamic instability, newborn encephalopathy or temperature instability

<sup>b</sup> GBS risk factors; Prolonged rupture of membranes; Fever

<sup>c</sup> For group 3 only, CPS recommends an observational period before INV or ABX are ordered

## Outcome Measures

### Primary Outcome

- % Newborns (Groups 1-4) with non-compliant management

### Secondary Outcomes

- Prevalence of each newborn group 1-5
- % Newborns in each group (1-4) with non-compliant management, and reasons for deviations
- % Group 5 newborns with INV or ABX therapy within  $\leq 72$  h of birth
- Average duration of ABX therapy
- % Newborns (Groups 1-5) with culture-confirmed EOS, and readmission for sepsis  $\leq 7$  d of discharge

## Methods

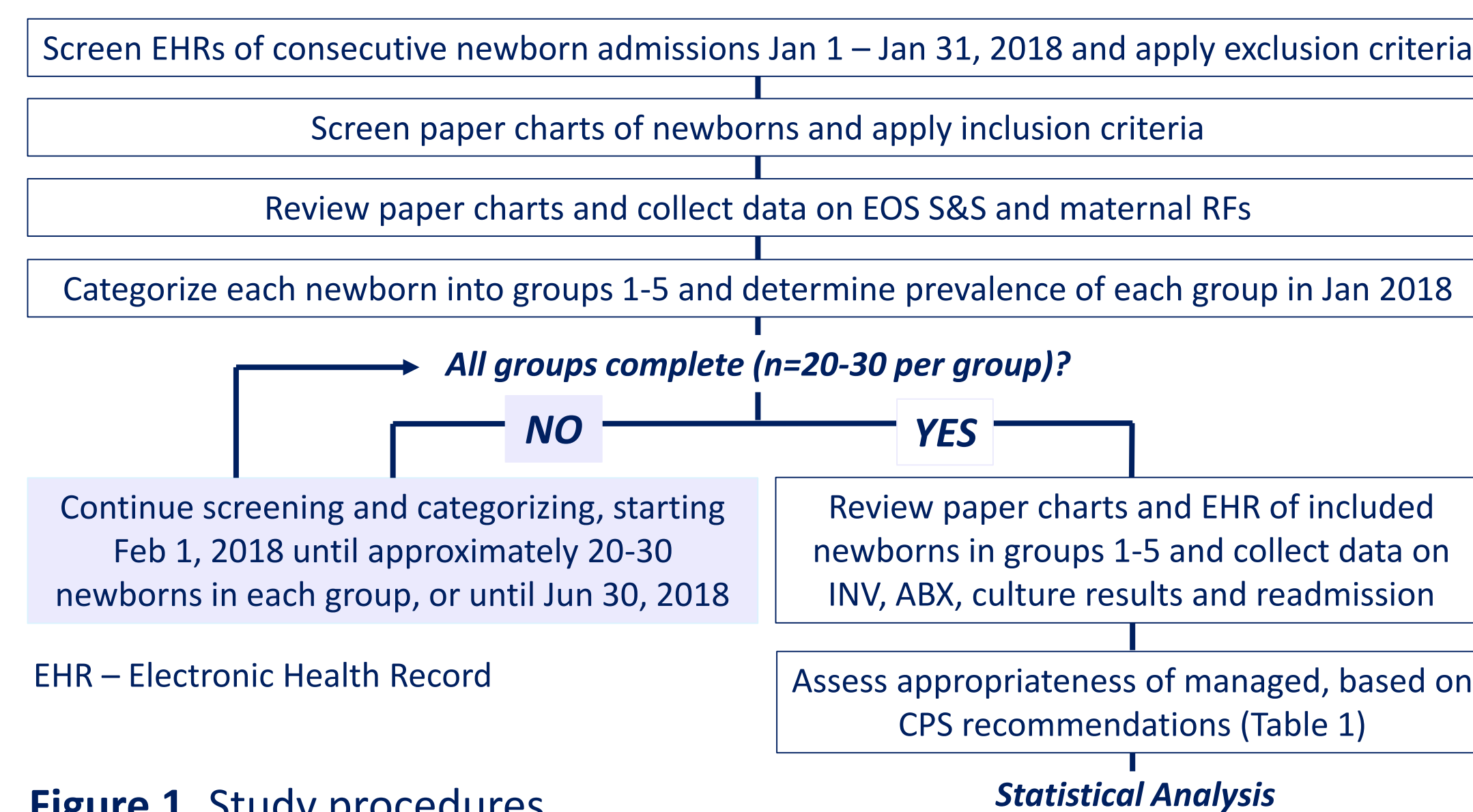


Figure 1. Study procedures

Table 2. Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
$\geq 35$ weeks admitted to VGH, with an increased risk of EOS defined as either: <ul style="list-style-type: none"><li>• <math>\geq 1</math> clinical S&amp;S suggestive of sepsis</li><li>• Born to mothers with RFs for newborn sepsis</li></ul>	<ul style="list-style-type: none"><li>• Admitted &lt; Jan 1, 2018 or &gt; Jun 30, 2018</li><li>• Postnatal day <math>\geq 3</math></li><li>• ABX for indications other than sepsis</li><li>• Conditions that may predispose seizures</li><li>• Known major congenital abnormalities</li></ul>

## Results

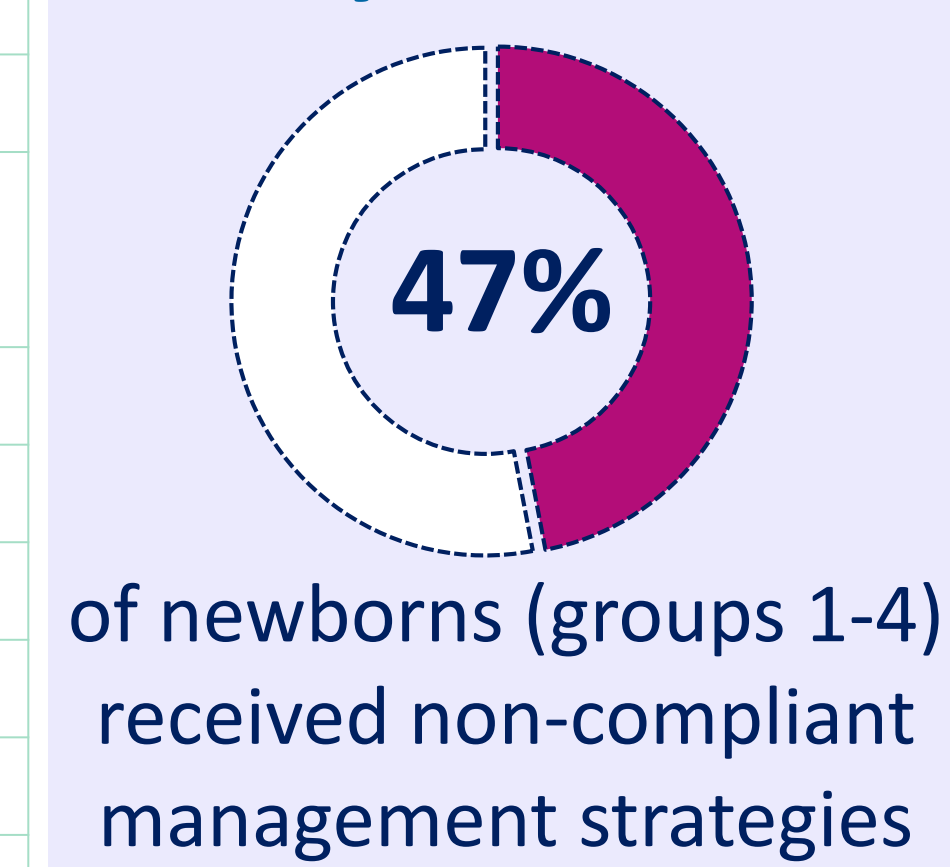
Table 3. Baseline Characteristics of Included newborns

Group	1	2	3	4	5	Total
Total N (%)	20 (16)	20 (16)	30 (24)	30 (24)	25 (20)	125 (100)
Location (Unit)						
Neonatal	19 (95)	20 (100)	30 (100)	6 (20)	9 (36)	85 (68)
Intensive Care	1 (5)	-	-	24 (80)	16 (64)	40 (32)
Postpartum						
Gestational Age (weeks)						
35-37	0 (0)	3 (15)	9 (30)	6 (20)	3 (12)	21 (17)
37-40	9 (45)	11 (55)	14 (47)	16 (53)	9 (36)	59 (47)
>40	11 (55)	6 (30)	7 (23)	8 (27)	13 (52)	45 (36)
Birth Weight (g)						
1500-2500	-	-	2 (7)	3 (10)	-	5 (4)
>2500	20 (100)	20 (100)	28 (93)	27 (90)	25 (100)	120 (96)
Gender						
Male	11 (55)	13 (65)	19 (63)	15 (50)	15 (60)	73 (58)
Female	9 (45)	7 (35)	11 (37)	15 (50)	10 (40)	52 (42)
Mode of Delivery						
Vaginal	13 (65)	15 (75)	13 (43)	24 (80)	17 (68)	82 (66)
Caesarean	7 (35)	5 (25)	17 (57)	6 (20)	8 (32)	43 (34)

### Screening Results

- 655 EHRs and 357 paper charts were screened
- 125 newborns were included in the study
- 228 Jan 2018 births were screened

### Primary Outcome



### Secondary Outcomes

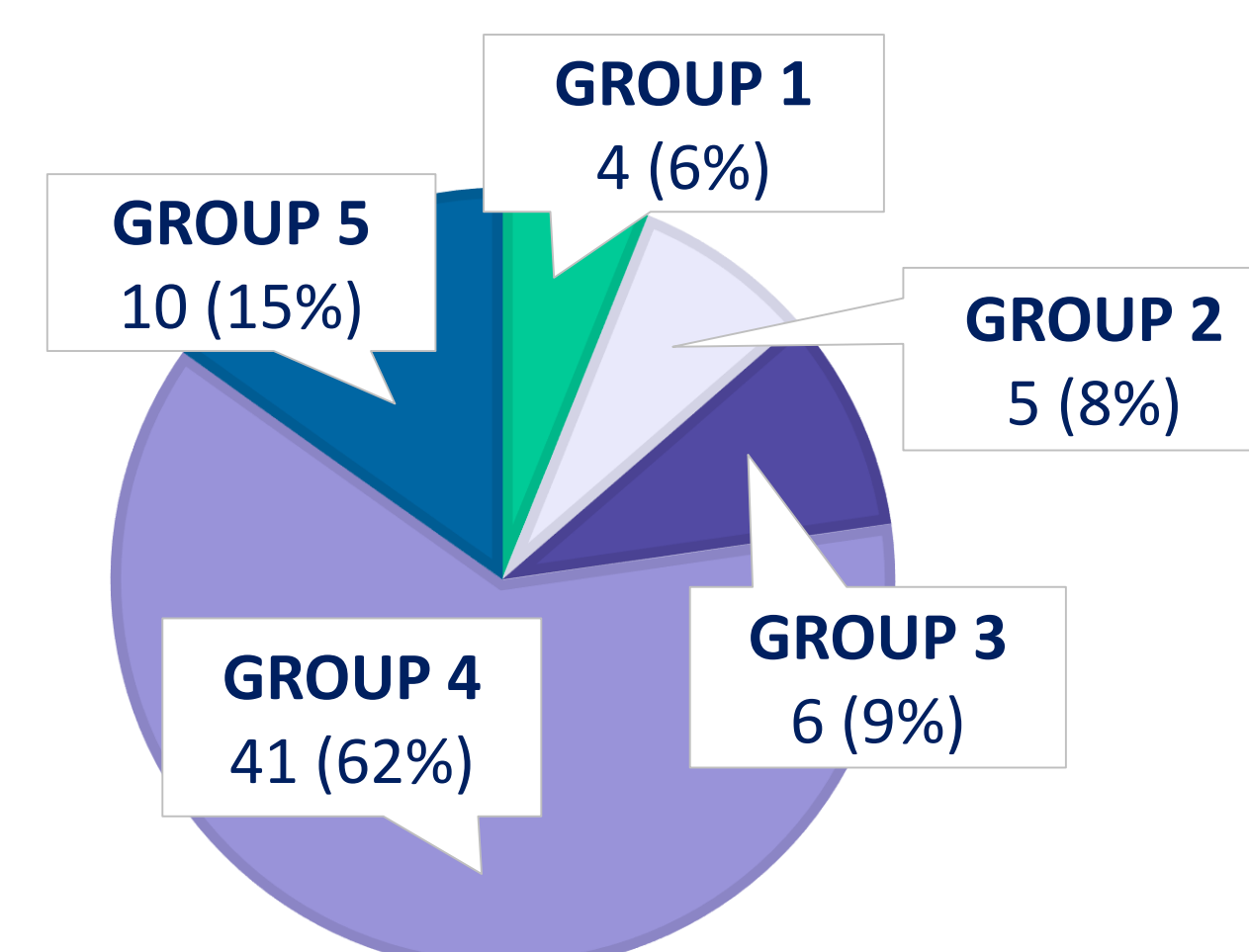


Figure 2. Group prevalence Jan 1-Jan 31, 2018

### ABX Management Groups 1-5

- 40/125 (32%) received ABX
  - Ampicillin PLUS Aminoglycoside
  - Mean ABX duration = 2.85 d

### INV Management Groups 1-5

- 91/125 (73%) received  $\geq 1$  INV
  - 53/125 (42%) BC
  - 23/125 (18%) CRP

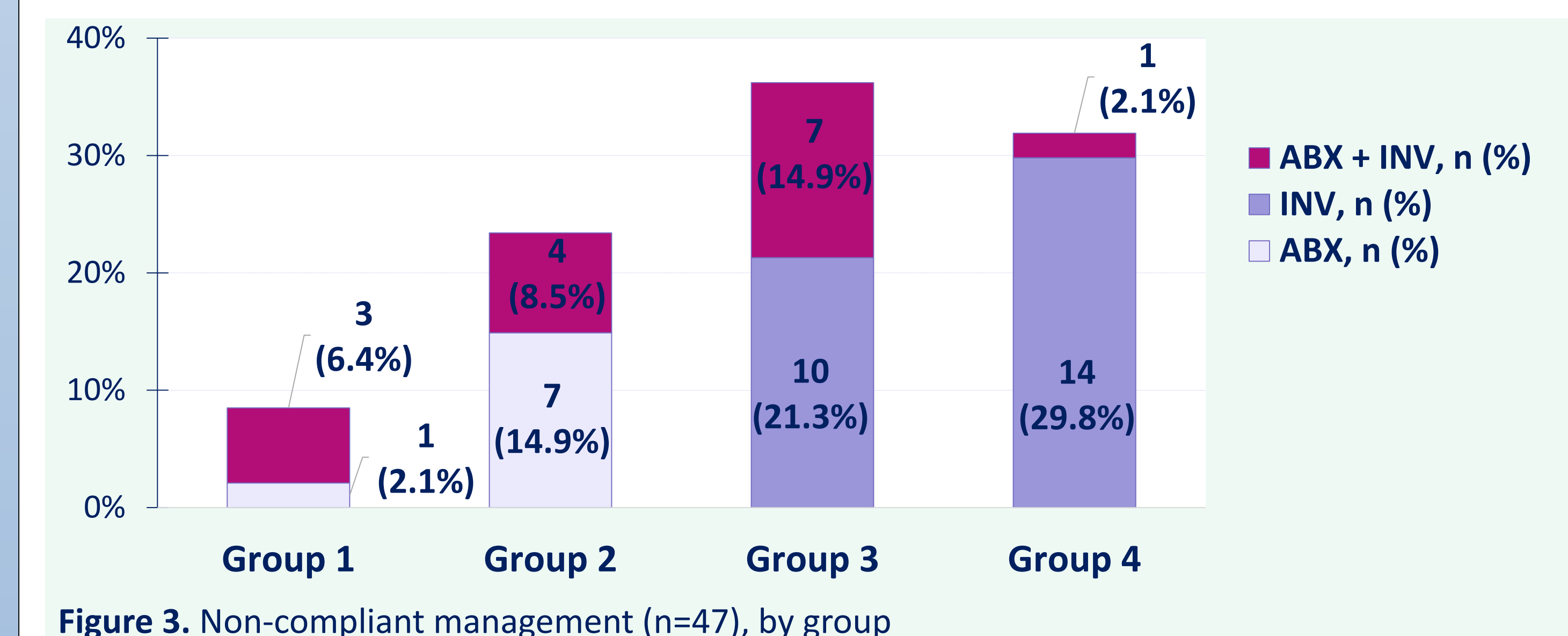


Figure 3. Non-compliant management (n=47), by group

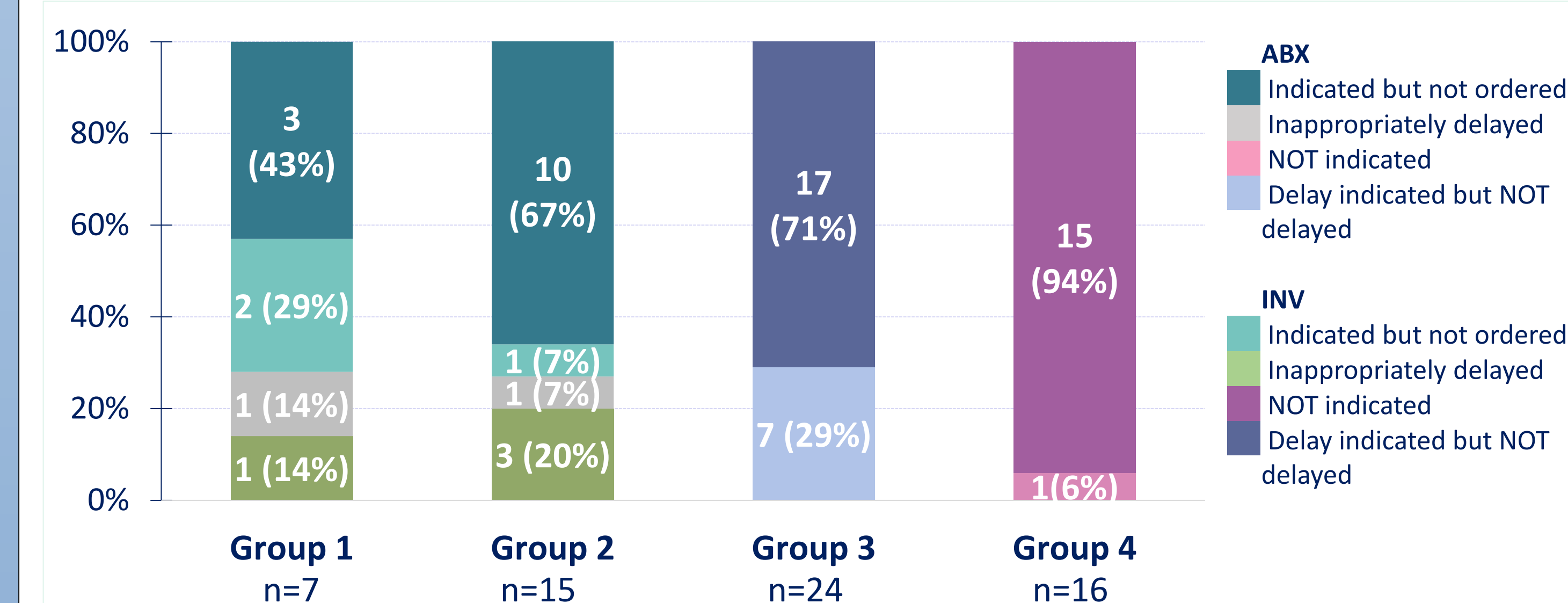


Figure 4. Classification of noncompliance, by group. Newborns may be represented in >1 category

## Results (continued)

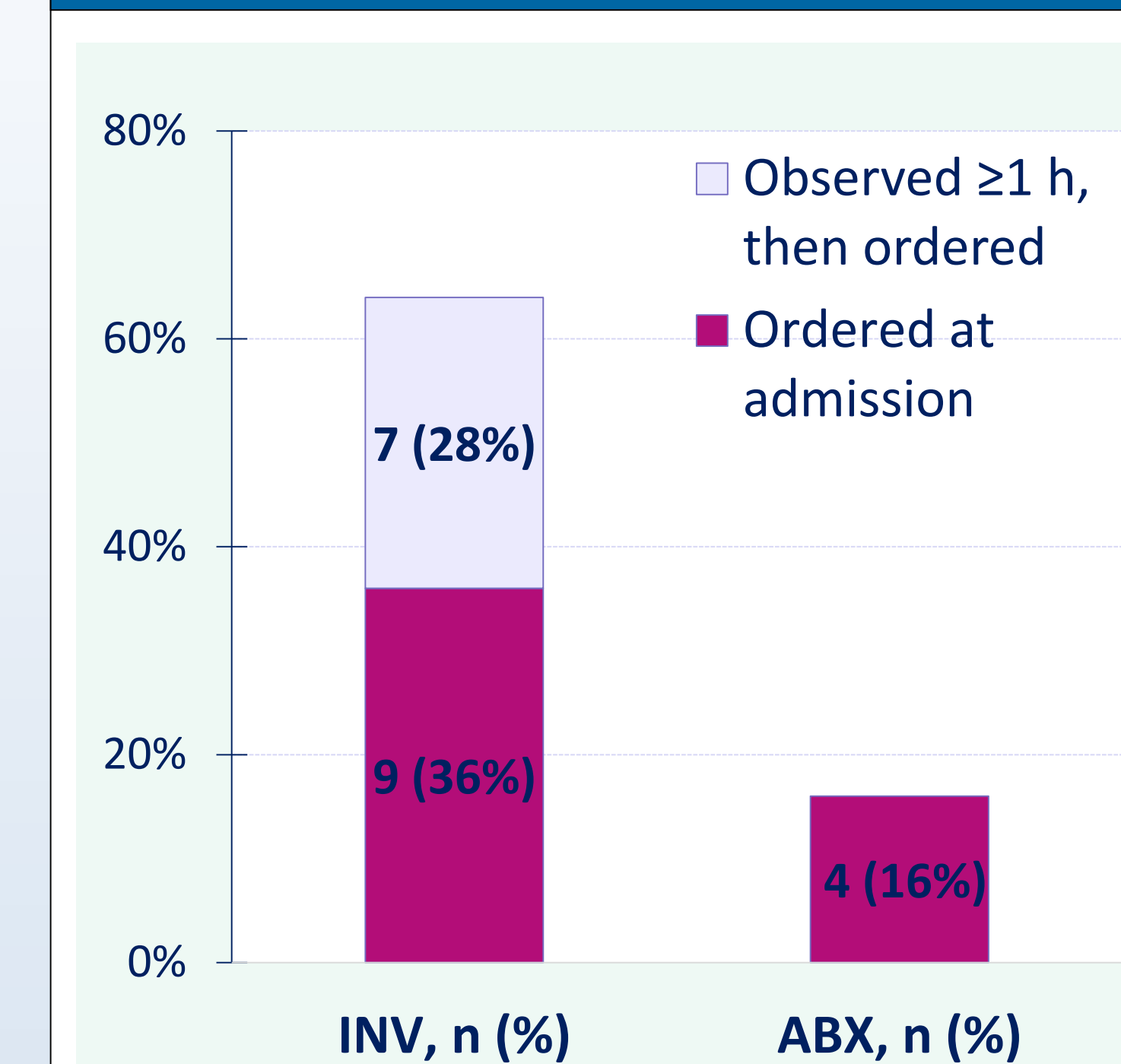


Figure 5. Management of group 5 newborns, n=25. Newborns may be represented in >1 category

### Readmission Rate Groups 1-5

- 2/125 (1.6%) readmitted for a septic work-up  $\leq 7$  d of discharge
- Both newborns received non-compliant initial management
  - Group 1: INV & ABX delayed
  - Group 3: INV delay indicated but not delayed
- Non-significant association of readmission with initial management ( $\chi^2$ ;  $p=0.13$ )

### Culture-Positive EOS Groups 1-5

- No culture-positive EOS

## Discussion

### INV and ABX use do not correlate with rate of culture-positive EOS

- The rate of culture-positive EOS was 0%, yet 32% received ABX and 73% underwent INV, suggesting aggressive management strategies

### Management of Group 1 is mostly compliant

- <10% of total non-compliant management occurred in group 1

### Management of Group 2 is likely sufficient

The omission of ABX lead to non-compliance but no newborns were readmitted

### Management of Group 3 may require improvement

The omission of an observation period lead to the highest proportion of non-compliance

### Management of Group 4 may require improvement

All non-compliance was due to unnecessary INV or ABX

### Management of Group 5 is likely judicious

Most newborns received INV or were solely observed

### Study Strengths

- Large and comprehensive study population
- Practice changing results

### Limitations

- EOS S&S extrapolated from literature
- Management and categorization was adjusted to reflect VGH practice
- Data from maternal EHRs and charts not triangulated
- Newborns not followed-up into infancy

## Conclusion

Noncompliance in our study was mostly due to Group 3 and 4 newborns. Implementing targeted interventions to improve management in these groups may be worth considering.