

OPALS Pediatrics Study:

***What is the Impact of Advanced Life Support
on Children with Out-of-Hospital Respiratory
Distress?***



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The OPALS Study

- The largest prospective pre-hospital study yet conducted
- Evaluates the impact of rapid defibrillation and ALS programs on survival and morbidity
- Over 9 years (1994-2003) involved adult and pediatric patients:
 - ▶ Cardiac arrest (193)
 - ▶ Seizure (415)
 - ▶ **Respiratory distress (1,256)**
 - ▶ Major trauma (526)

The Clinical Problem

- Pediatric patients constitute **15 – 25%** of all ambulance transports by emergency medical services (EMS)
- The most common conditions transported are:
 - **Trauma 60%**
 - **Seizures 15%**
 - **Respiratory distress 10%**



EMS Outcomes Project

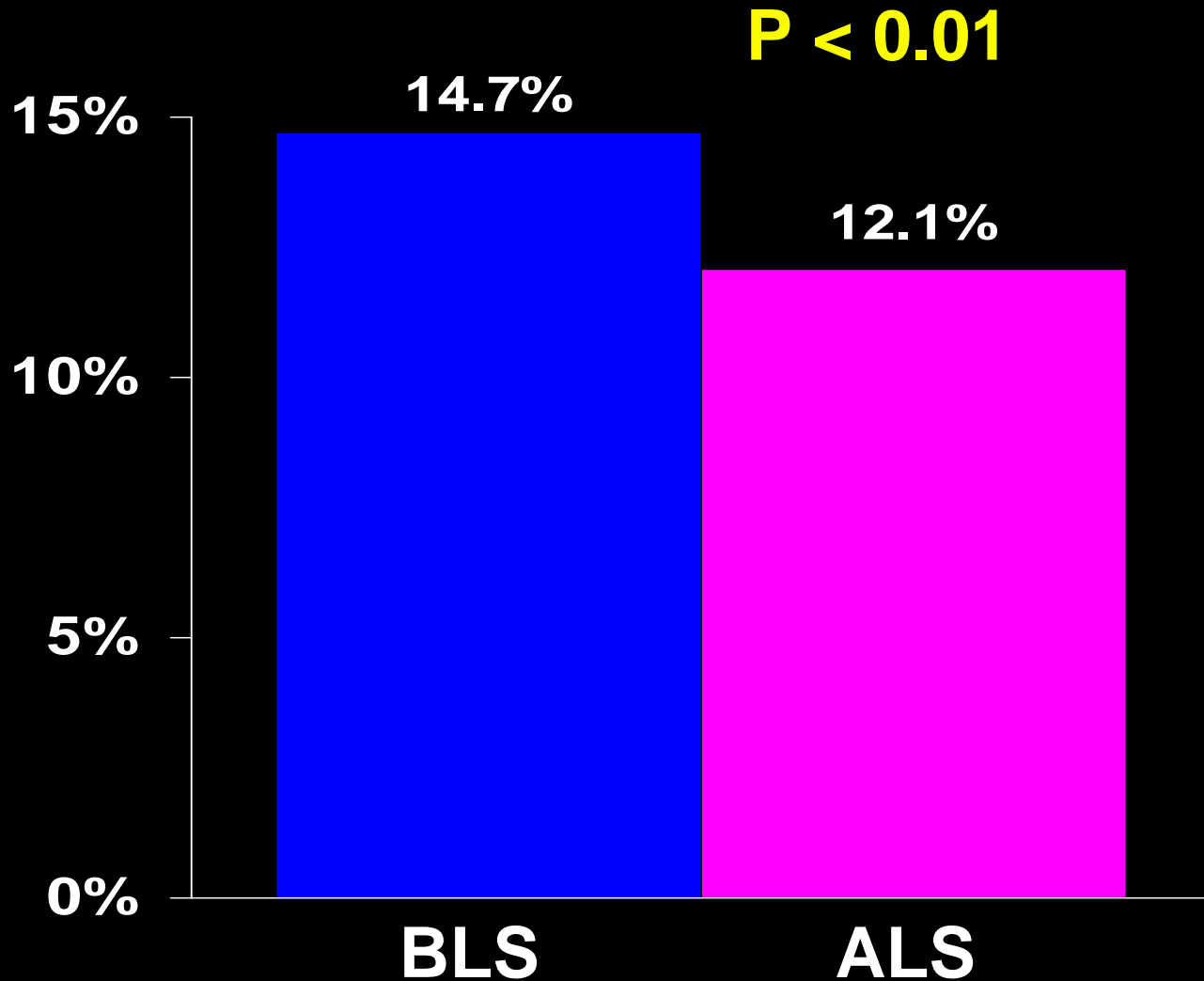
- A panel of 37 US and Canadian EMS experts rated the importance and potential impact of EMS for **27 pediatric conditions**
- The conditions with the highest rankings to improve survival were:
 - **airway obstruction (1st)**
 - **respiratory arrest (2nd)**
 - **cardiac arrest (3rd)**
 - **major trauma (4th)**
 - **respiratory distress (5th)**

EMS Outcomes Project

- The conditions with the highest rankings to alleviate discomfort were:
 - respiratory distress (1st)
 - airway obstruction (2nd)
 - trauma (3rd)
 - respiratory arrest (4th)
 - seizure (5th)

OPALS: Respiratory Distress Mortality

N= 6,936



The Clinical Problem

- **Little evidence of effectiveness of prehospital interventions on outcomes in children**

Objectives of OPALS Pediatric Respiratory Distress Study

- **To evaluate the incremental benefit of a full advanced life support EMS program on the outcomes of out-of-hospital pediatric respiratory distress patients**
 - ▶ **Mortality**
 - ▶ **Morbidity**
 - ▶ **Processes of care**

Methods: Pediatrics

- **Multicenter before - after controlled clinical trial**
- **17 Ontario cities pop. 16,000 - 750,000**
- **Eligibility: All out-of-hospital pediatric respiratory distress patients (age < 16)**
 - ▶ ***chief complaint of difficulty breathing, respiratory failure, respiratory arrest, or airway obstruction***

Methods: Pediatrics

- *BLS Phase (1992-1998 24 mo.):*
 - BLS-D EMS with first responding fire
- *Run-in Phase (1995-1999 12-24 mo.)*
- *ALS Phase (1998-2002 24 mo.):*
 - Full advanced life support

ALS Phase Intervention

Advanced Life Support

Full advanced life support program

- ◆ Endotracheal intubation
- ◆ Intravenous lines
- ◆ Intravenous drugs

Additional training for EMT Level III

- ◆ Didactic (6 weeks)
- ◆ Clinical (6 weeks)
- ◆ Preceptorship (6-12 weeks)

Four ALS target criteria

**400 paramedics ALS trained*

Data Sources

- **Ambulance Call Report (ACR)**
- **Ambulance Response Information System (ARIS)**
- **Hospital Record (if admitted)**

Patient Characteristics (N=1,256)

	BLS	ALS
	(N=614)	(N=642)

Age in years

4.8

5.0

Range

0-15

0-15

Male gender

54%

58%

Community size

<30,000

0%

0%

30,000 - 100,000

6%

10%

100,000-200,000

27%

25%

200,000-500,000

26%

23%

>500,000

41%

43%

Patient Characteristics (N=1,256)

	BLS (N=614)	ALS (N=642)
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Initial mean heart rate

122

126

Initial mean resp. rate

32

31

Asthma

188 (31%)

234 (36%)

Patient Characteristics (N=1,256)

	BLS	ALS
	(N=614)	(N=642)

EMS Return Code

Urgent

23%

16%

Prompt

60%

66%

EMS Case Severity

Severe/Life Threat.

37%

27%

Moderate

45%

50%

Minor

18%

22%

EMS Median Response Intervals in Minutes

Interval	BLS (N=614)	ALS (N=642)
Call received - notified	0.8	0.7
Notified – vehicle stops	5.9	6.6
Vehicle stops – Pt side	2.0	2.0
Pt side – departs scene	7.2	9.6
Departs scene - hospital	9.0	9.9
Total: notified – hospital	24.1	28.1

Final Diagnosis if Admitted

	BLS (N=130)	ALS (N=114)
Asthma	25%	22%
Croup	11%	11%
Pneumonia	10%	11%
Bronchiolitis	9%	11%
Other Resp Diagnoses	21%	18%
Other Diagnoses	23%	25%

Performance for BLS Procedures ***(N=1,256)***

BLS
(N=614)

ALS
(N=642)

Oral Airway

4 (0.7%)

5 (0.8%)

Bag Valve Mask

10 (1.6%)

9 (1.4%)

Performance for ALS Procedures ***(N=1,256)***

	BLS (N=614)	ALS (N=642)
ALS paramedic at scene	--	81%
Intubation		
Attempt	--	1 (0.2%)
Success if attempted	--	1 (100%)
IV insertion		
Attempt	--	33 (5.1%)
Success if attempted	--	24 (73%)

Symptom Relief Medication (N=1,256)

	BLS (N=614)	ALS (N=642)
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Salbutamol (Neb)

6%

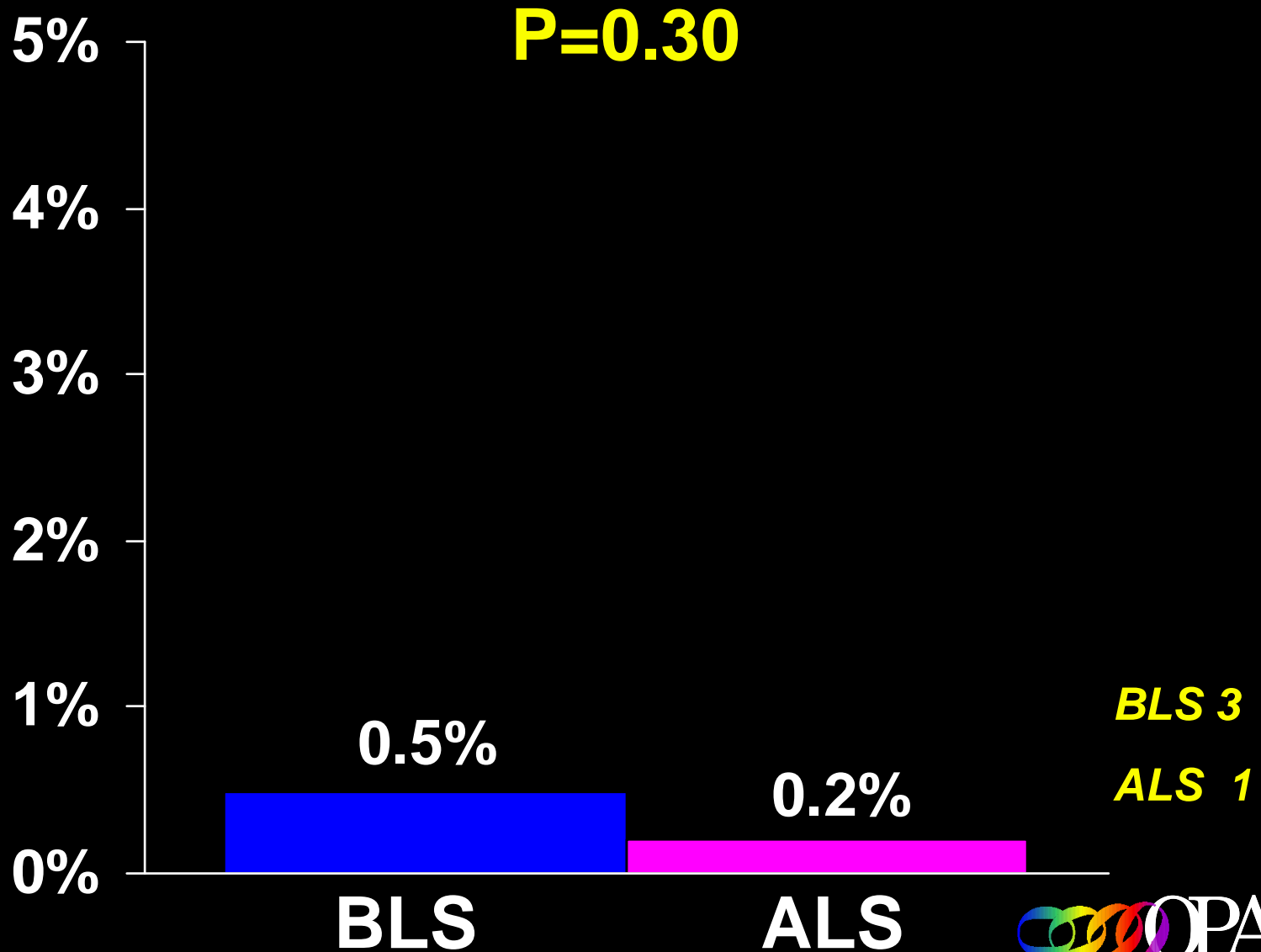
40%

Epinephrine (SC)

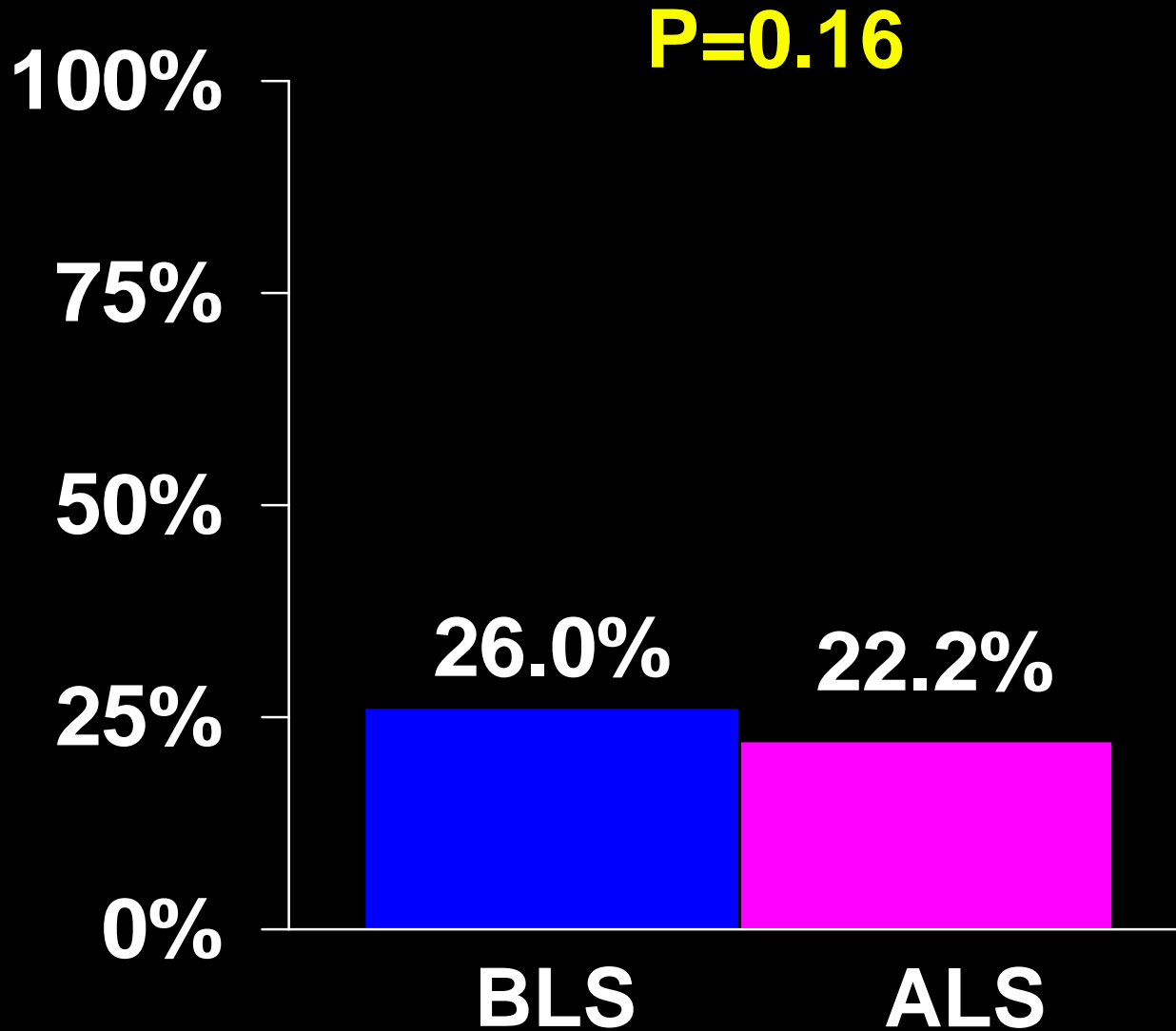
1%

0.9%

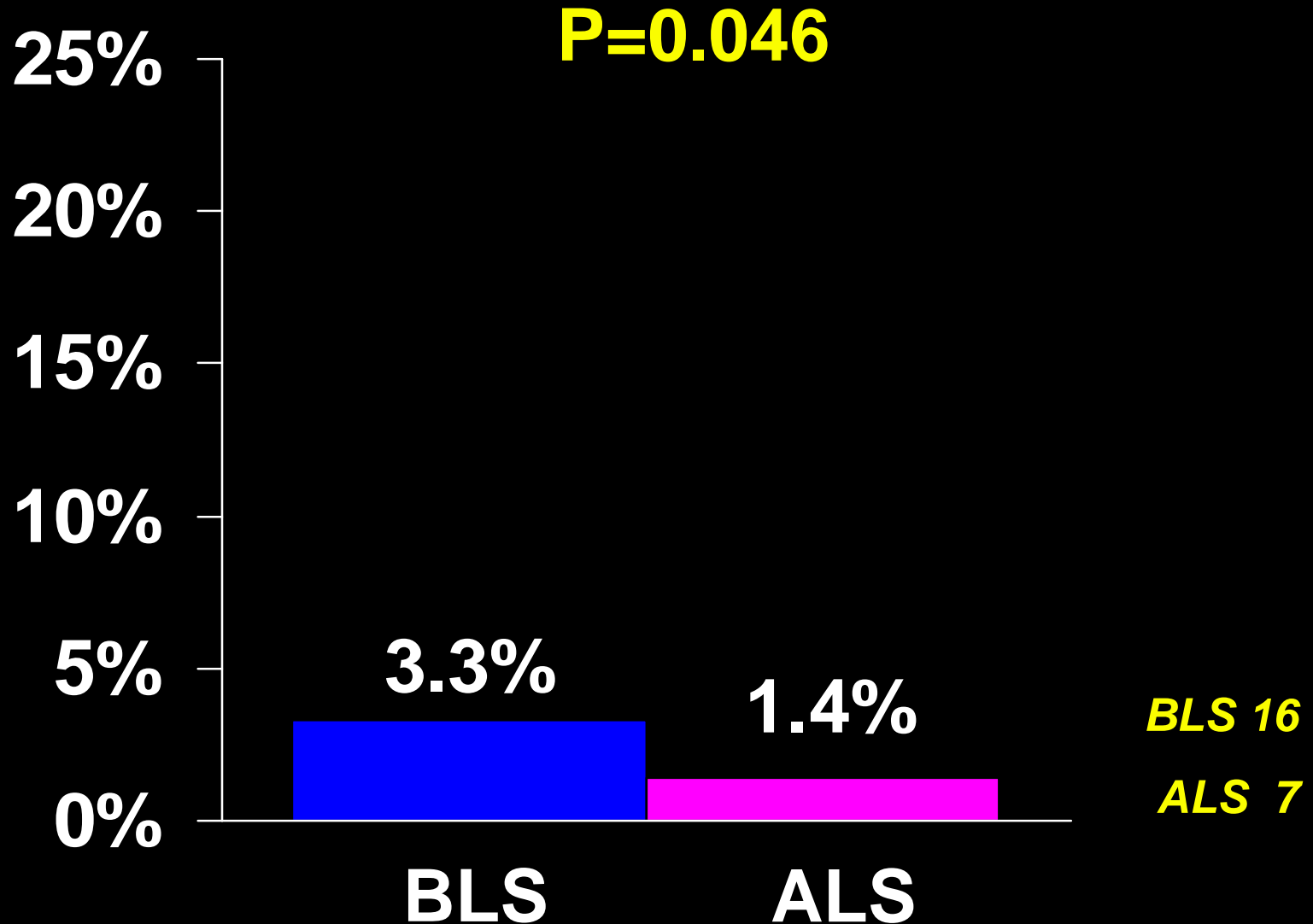
Overall Mortality



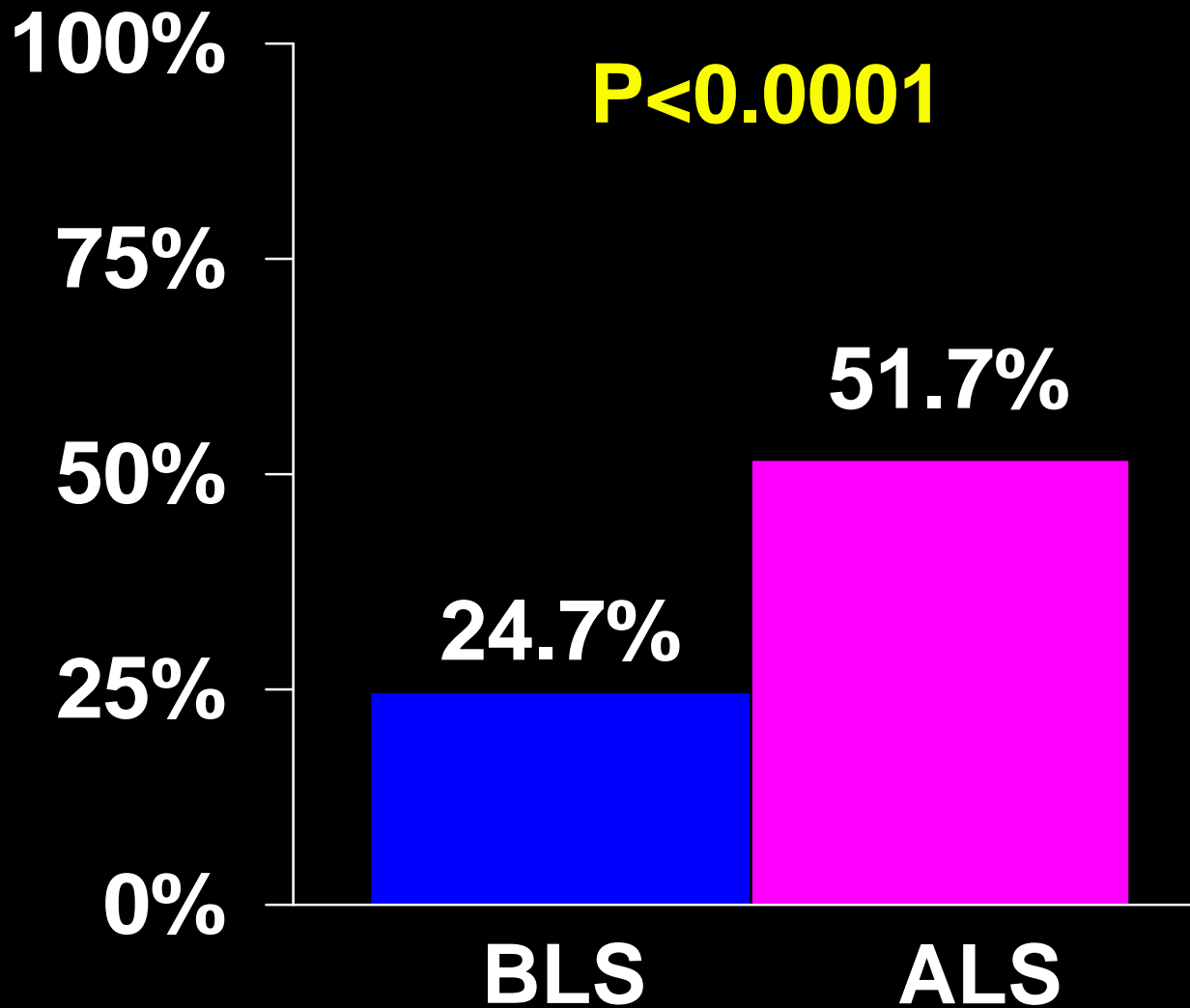
Admission to Hospital



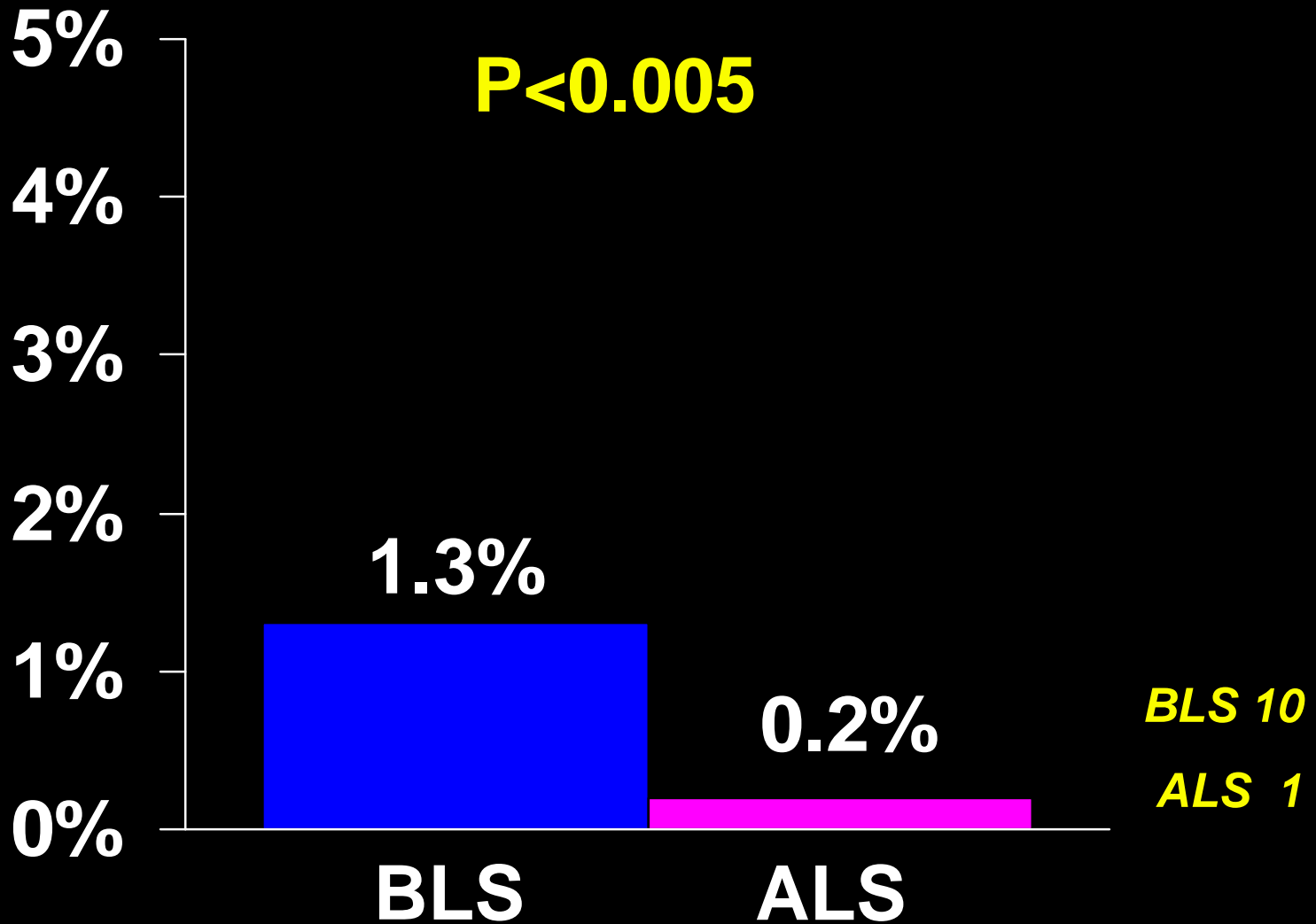
Admission to ICU



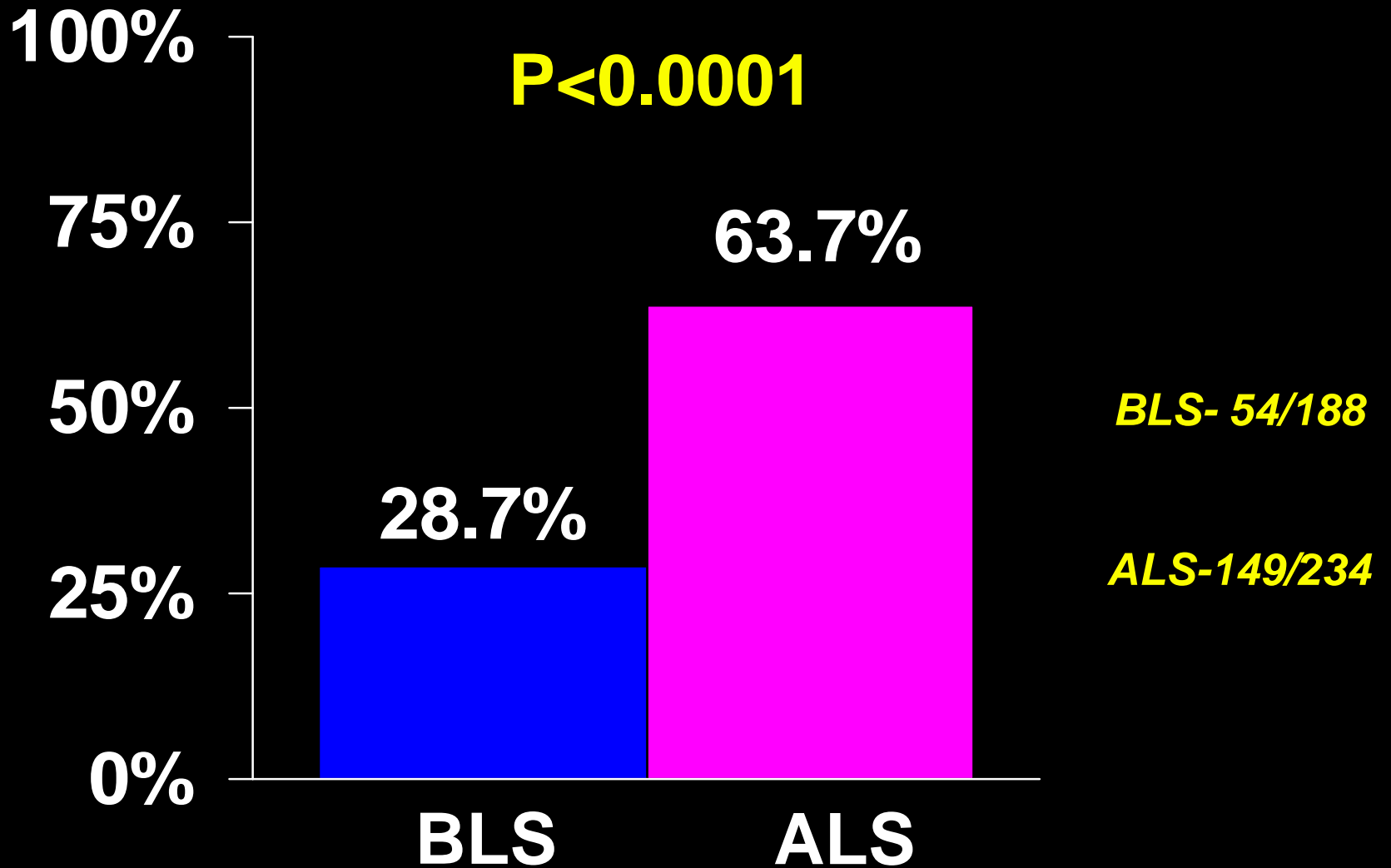
Percent of Patients “Improved” on ED Arrival



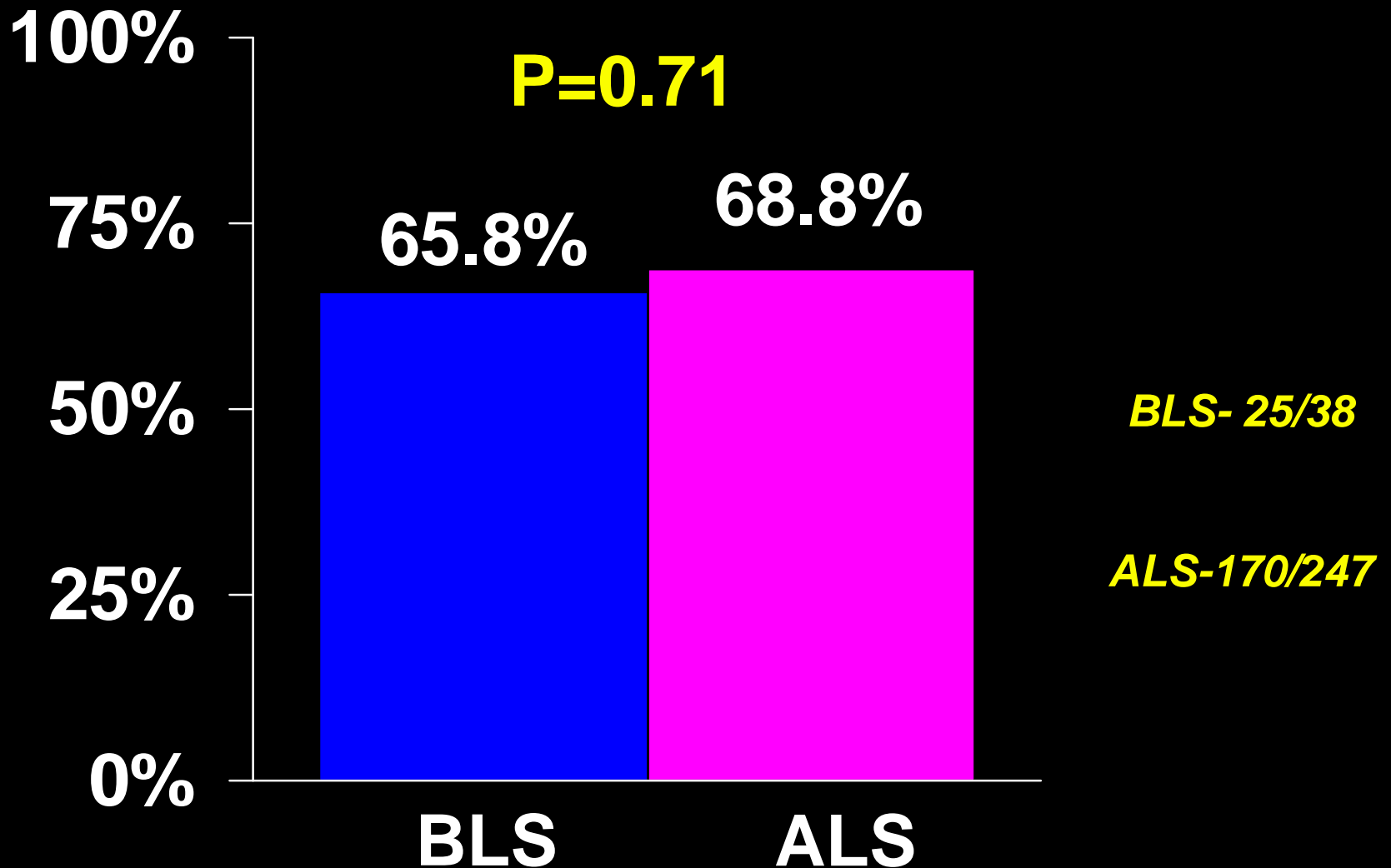
Percent of Patients “Worsened” on ED Arrival



Percent of Asthma Patients “Improved” on ED Arrival by phase



Percent of Salbutamol Treated Patients “Improved” on ED Arrival by phase



Issues for Discussion

- **Before-after controlled trial** rather than randomized
- **Complete ALS program** rather than individual interventions
- Decrease ICU admission might be explained by:
 - **Secular trends**
 - **Increased severity** in the BLS phase
- Status of patient on ED arrival coded by EMS is subjective and may be subject to **reporting bias**
- **No data on ED diagnosis and interventions in the ED**

Conclusions

- We failed to show benefit from ALS programs on survival or hospital admission in pediatric respiratory distress
- There may be a benefit to decreasing ICU admissions
- Prehospital treatment for symptom relief is commonly used and appears to result in **improvement on ED arrival** (particularly for children with asthma)

Conclusions

- **Assisted ventilation and advanced airway maneuvers are rarely used**
- **Future randomized controlled trials to clarify the most helped populations and the most effective interventions**

