

***OPALS Pediatric Studies:
Impact of Advanced Life Support
on Survival and Morbidity***



Annual Meeting 2006

**Department of Emergency Medicine
Ottawa Health Research Institute
University of Ottawa**

**11 Base Hospital Programs:
Cambridge Halton Region Kingston
London Niagara Region Ottawa
Peterborough Sarnia Sudbury
Thunder Bay Windsor**

Canadian Institutes of Health Research

The Clinical Problem

- Children < 16 years represent 20-25% of all EMS transports
- Little evidence on effectiveness of prehospital interventions



The Clinical Problem

- **Most common pediatric conditions seen:**
 - ▶ **Minor trauma (51%)**
 - ▶ **Seizure (14%)**
 - ▶ **Respiratory Distress (10%)**
 - ▶ **Major Trauma (8%)**

EMS Outcomes Project 1999

Objectives

To determine the impact of an ALS program on mortality, other clinical outcomes, morbidity (quality of life), EMS response intervals and cost effectiveness for pediatric patients with:

- ▶ **Seizure**
- ▶ **Respiratory distress and obstruction**
- ▶ **Major trauma**
- ▶ **Cardiac arrest**

Methods: Pediatrics

- **Multicenter before - after controlled clinical trial**
- **17 Ontario cities pop. 16,000 - 750,000**
- **All eligible out-of-hospital pediatric cases (age < 16)**
 - ▶ **Seizure**
 - ▶ **Respiratory Distress**
 - ▶ **Major Trauma**
 - ▶ **Cardiac Arrest**

OPALS Pediatric Study Design

- **BLS Phase (1992-1998 36 mo.):**
 - ▶ BLS-D EMS with first responding fire
- **ALS Phase (1998-2002 36 mo.):**
 - ▶ Full advanced life support with intubation & IV drugs

OPALS Pediatric Seizure Study Update



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OPALS Peds Seizure Study

- **Seizure Inclusion: Generalized convulsion, not due to acute trauma; seizing on arrival of EMS or second seizure enroute; febrile seizures included**
- **Main outcome: Survival to hospital discharge**
- **Data sources: ACR, ARIS, Hospital Health Records**

Peds Seizure Study Status

**Prehosp
cases**

**Outcome
data**

Total ACRs Reviewed ~ 10,000

Seizure (N=417)

BLS

183

95%

ALS

234

89%

Peds Seizure Study Status (N=417)

Months

**BLS
(N=183)**

**ALS
(N=234)**

Cambridge	36	5	6
Kitchener	36	15	35
Burlington	32	9	13
Mississauga	18	22	11
Oakville	15	4	0
Kingston	32	0	15
London	8	0	17
Niagara Falls	--	--	--

Peds Seizure Study Status (N=417)

Months

**BLS
(N=183)**

**ALS
(N=234)**

Ottawa	36	73	100
Peterborough	24	7	9
Port Hope	27	0	2
Sarnia	27	12	7
Sudbury	9	5	2
Thunder Bay	26	12	7
Windsor	36	19	10

Patient Characteristics (N=417)

	BLS (N=183)	ALS (N=234)
Age in years	4.2	5.7
Range	0-16	0-15
Males	53%	53%
Community size		
30,000-100,000	10%	8%
100,000-200,000	19%	18%
200,000-500,000	18%	27%
>500,000	52%	47%

Nature of Seizure (N=417)

**BLS
(N=183)** **ALS
(N=234)**

Nature of Seizure

Febrile	36%	22%
New onset, non-febrile	20%	22%
Previous non-febrile	39%	50%
Unable to determine	5%	6%

Airway Interventions by EMS (N=417)

	BLS (N=183)	ALS (N=234)
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ALS on Scene	--	83%
Intubation		
Attempts (N=5)	--	2%
Successful (N=2)	--	40%
Bag Ventilation	7%	19%
Oral/Nasal Airway	13%	12%

Drug Therapy by EMS (N=417)

	BLS (N=183)	ALS (N=234)
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IV Line Attempt	--	53%
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Successful	--	65%
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Diazepam/Valium		
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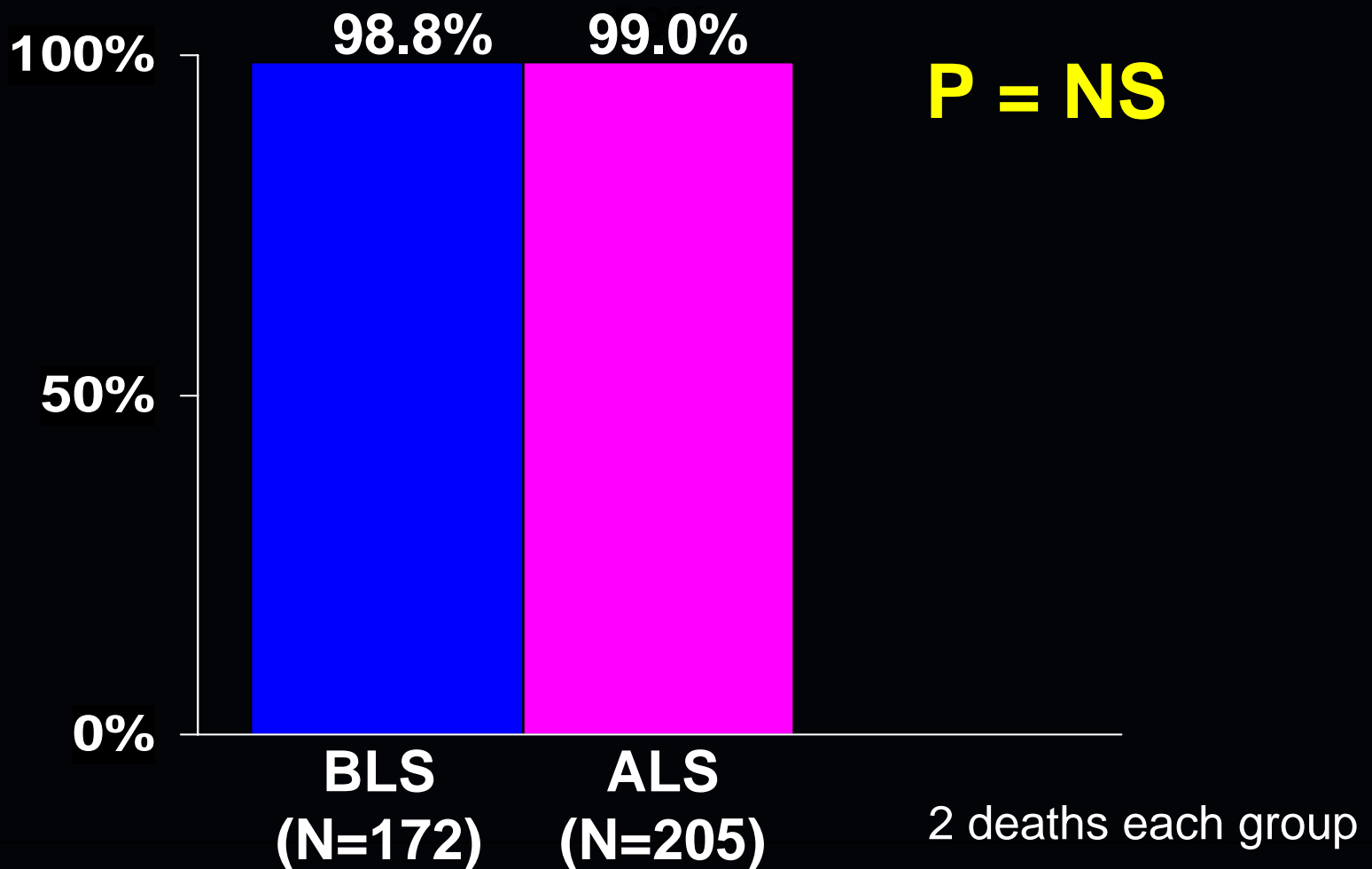
IV	--	9%
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PR	--	34%
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Median Response Intervals (Minutes)

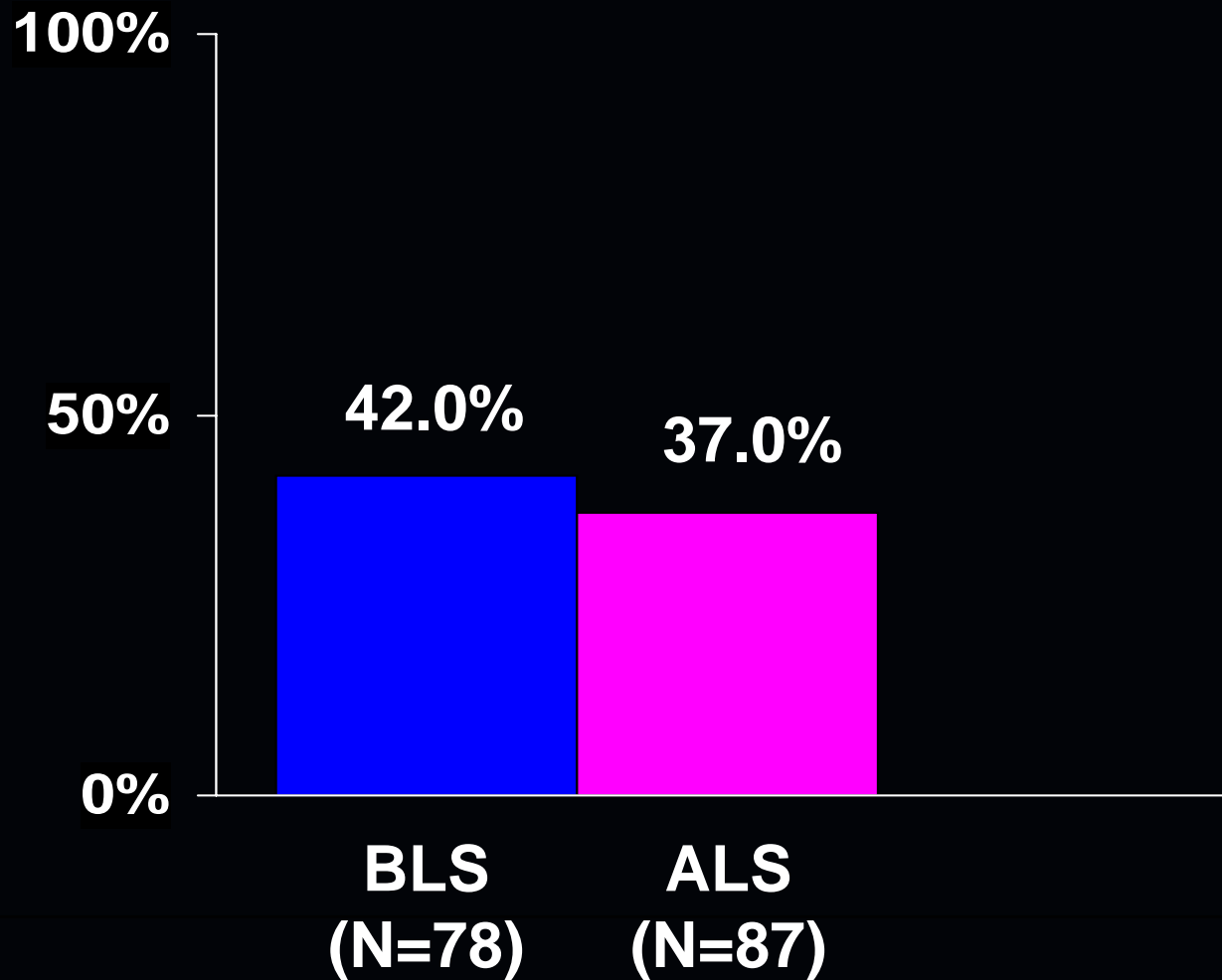
	BLS (N=183)	ALS (N=234)
Call received - notified	0.8	0.7
Notified - vehicle stops	5.7	6.5
Vehicle stops - pt side	2.0	2.0
Pt side - depart scene	5.7	12.1
Depart scene - hospital	6.7	8.2
Total: notified - hospital	20.6	31.1

Primary Outcome: Hospital Discharge



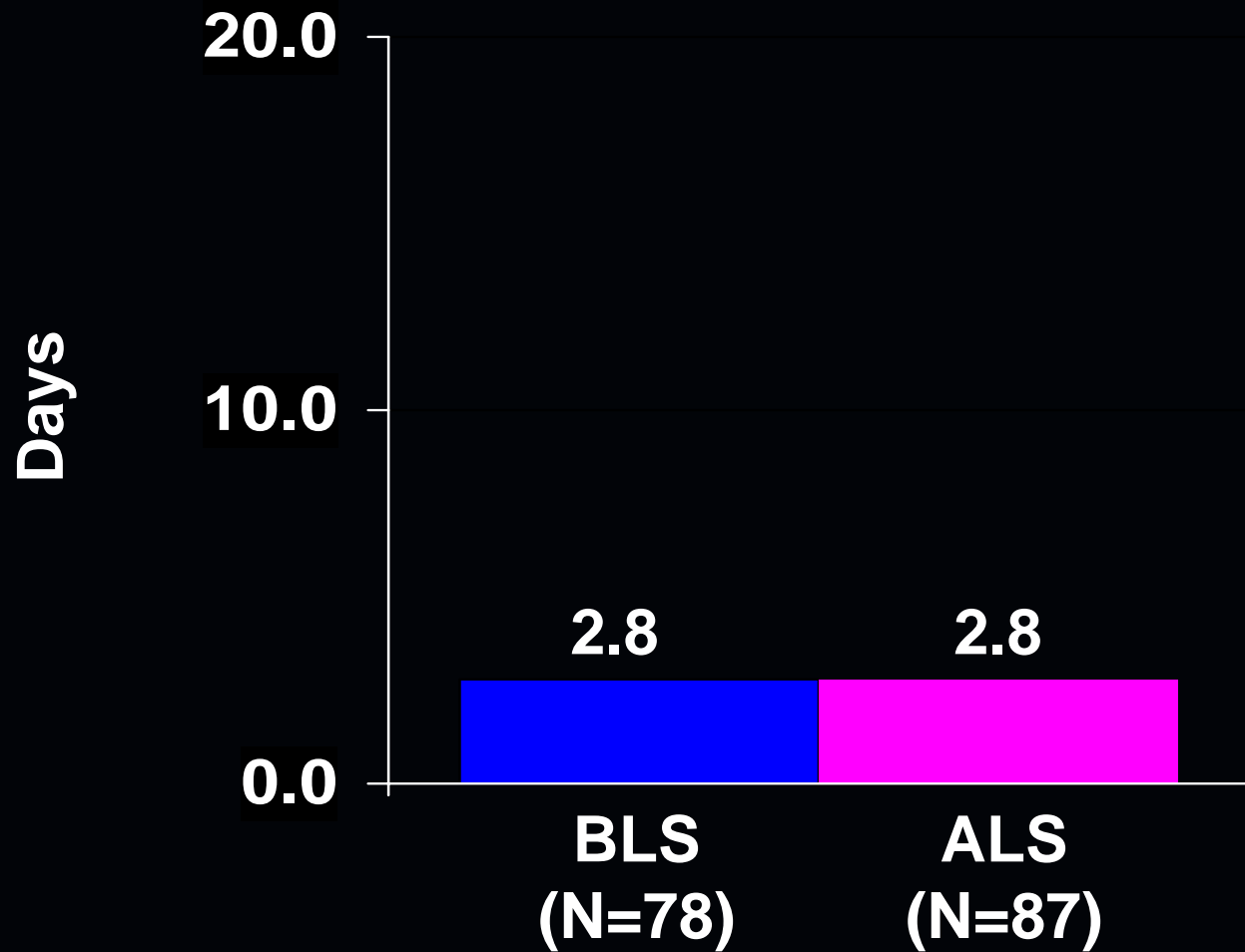
Admission to Hospital

P = NS



Length of Stay in Days

P = NS



***OPALS Pediatric
Respiratory Distress Study Update***



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OPALS Peds

Respiratory Distress Study

- **Respiratory Distress Inclusion: Difficulty breathing; airway obstruction; shortness of breath**
- **Main outcome: Survival to hospital discharge**
- **Data sources: ACR, ARIS, Hospital Health Records**

Respiratory Study Status

**Prehosp
cases**

**Outcome
data**

Respiratory Distress (N=1,257)

BLS

615

93%

ALS

642

92%

Peds Respiratory Study Status ***(N=1,257)***

	Months	BLS (N=615)	ALS (N=642)
Burlington	32	29	30
Mississauga	5	18	23
Cambridge	28	15	31
Kitchener	26	29	43
Kingston	32	91	55
London	8	39	31
Niagara Falls	--	--	--

Peds Respiratory Study Status ***(N=1,257)***

	Months	BLS (N=615)	ALS (N=642)
Ottawa	24	238	250
Peterborough	24	17	26
Sarnia	27	22	35
Sudbury	9	9	14
Thunder Bay	25	19	29
Windsor	24	90	75

Patient Characteristics (N=1,257)

	BLS (N=615)	ALS (N=642)
Age in years	4.9	5.0
Range	0-16	0-15
Males	54%	58%
Community size		
30,000-100,000	6%	10%
100,000-200,000	27%	25%
200,000-500,000	25%	23%
>500,000	42%	42%

Airway Interventions by EMS

(N=1,257)

	BLS (N=615)	ALS (N=642)
ALS on Scene	--	78%
Intubation (N=1)		0.2%
Successful		100%
Bag Ventilation	1.6%	1.4%
Oral/Nasal Airway	0.7%	0.8%
Ventolin	6.3%	40.0%

IV Therapy by EMS (N=1,257)

**BLS
(N=615) ALS
(N=642)**

IV Line Start (N=33)	--	5%
 Successful (N=24)	--	73%
IV Epinephrine (N=6)	--	0.9%

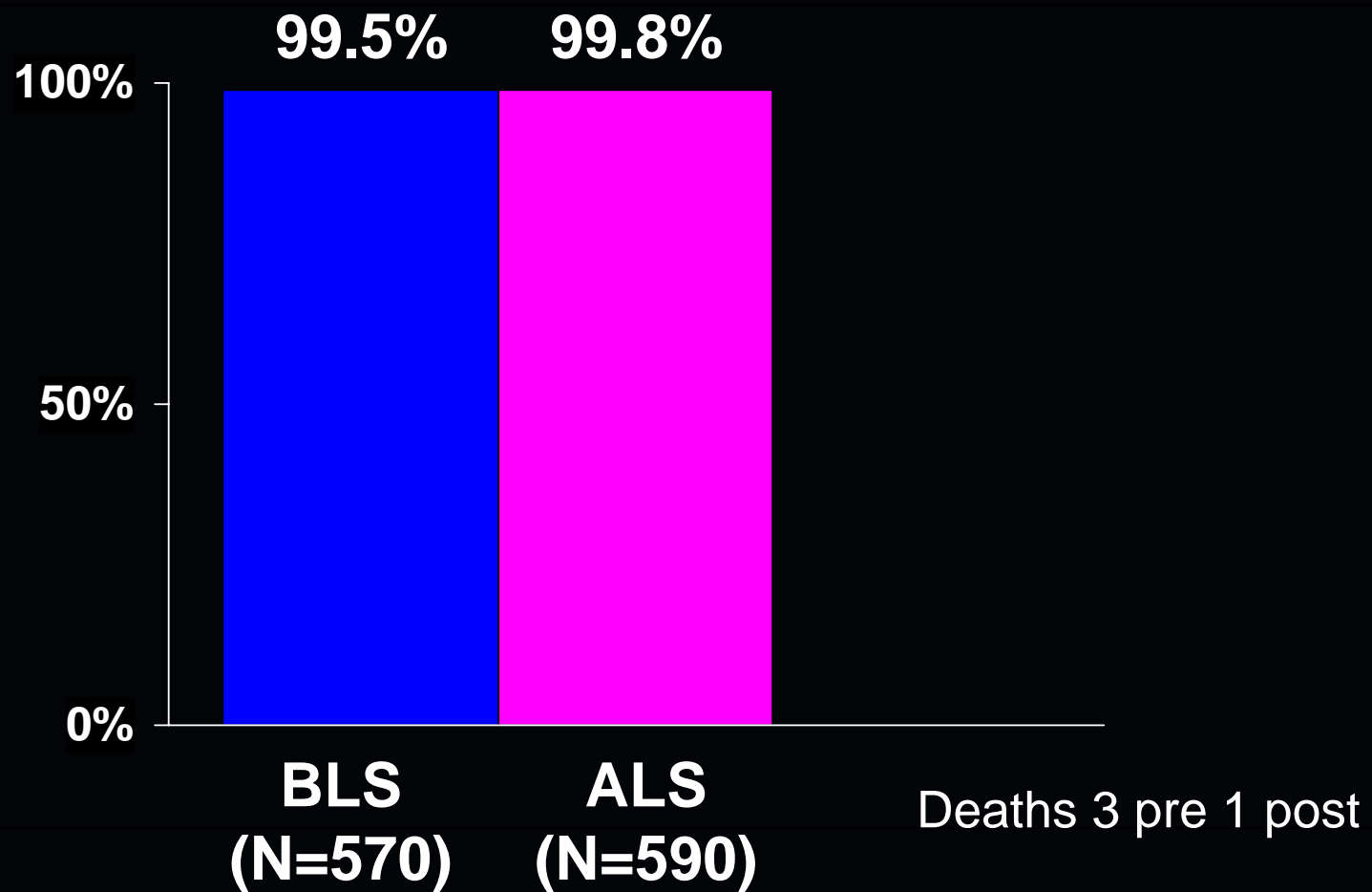
Median Response Intervals (Minutes)

**BLS
(N=615) ALS
(N=645)**

Call received - notified	0.8	0.6
Notified - vehicle stops	5.9	6.6
Vehicle stops - pt side	2.0	2.0
Pt side - depart scene	7.3	9.7
Depart scene - hospital	9.0	9.8
Total: notified - hospital	25.6	29.6

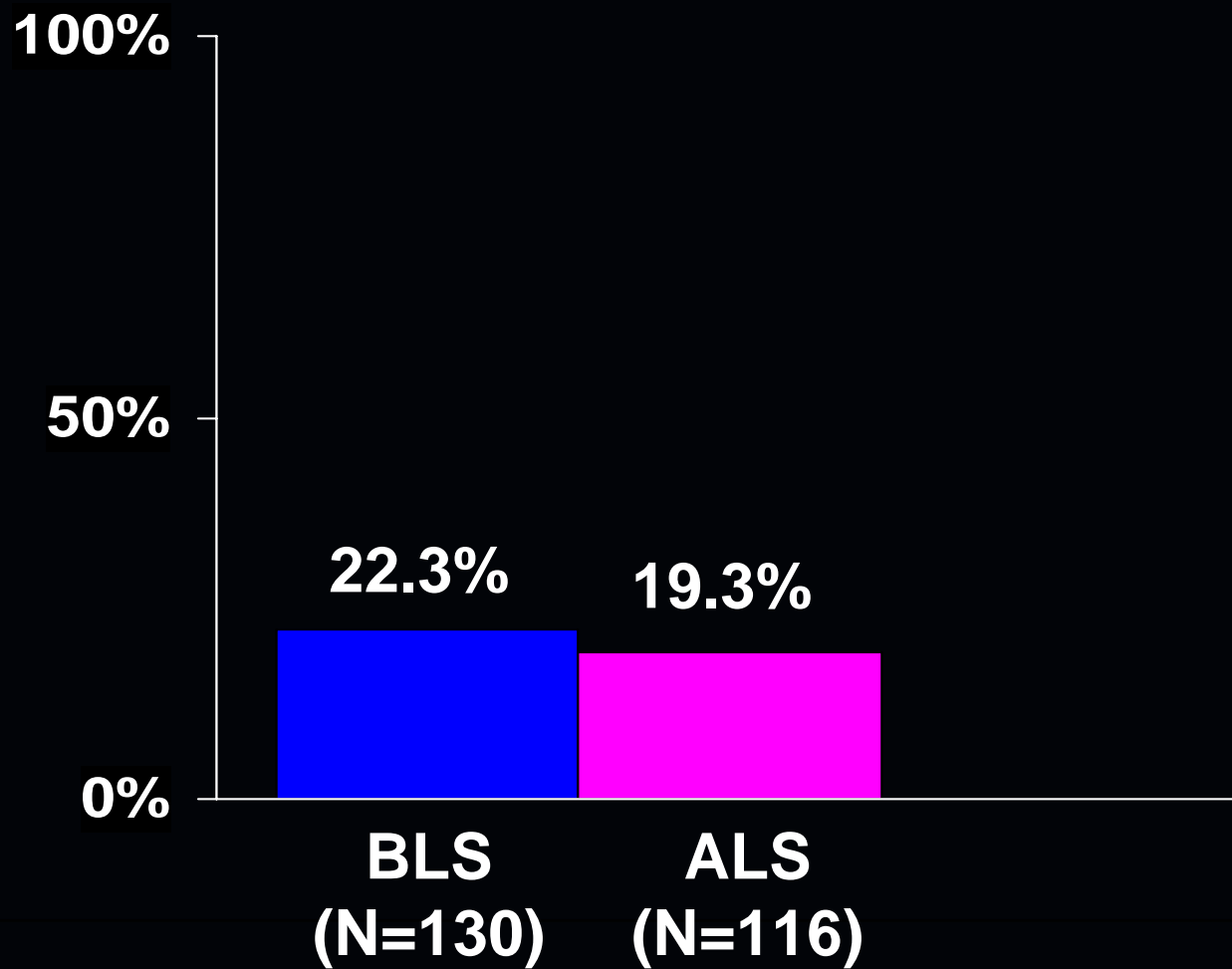
Primary Outcome: Hospital Discharge

P = NS



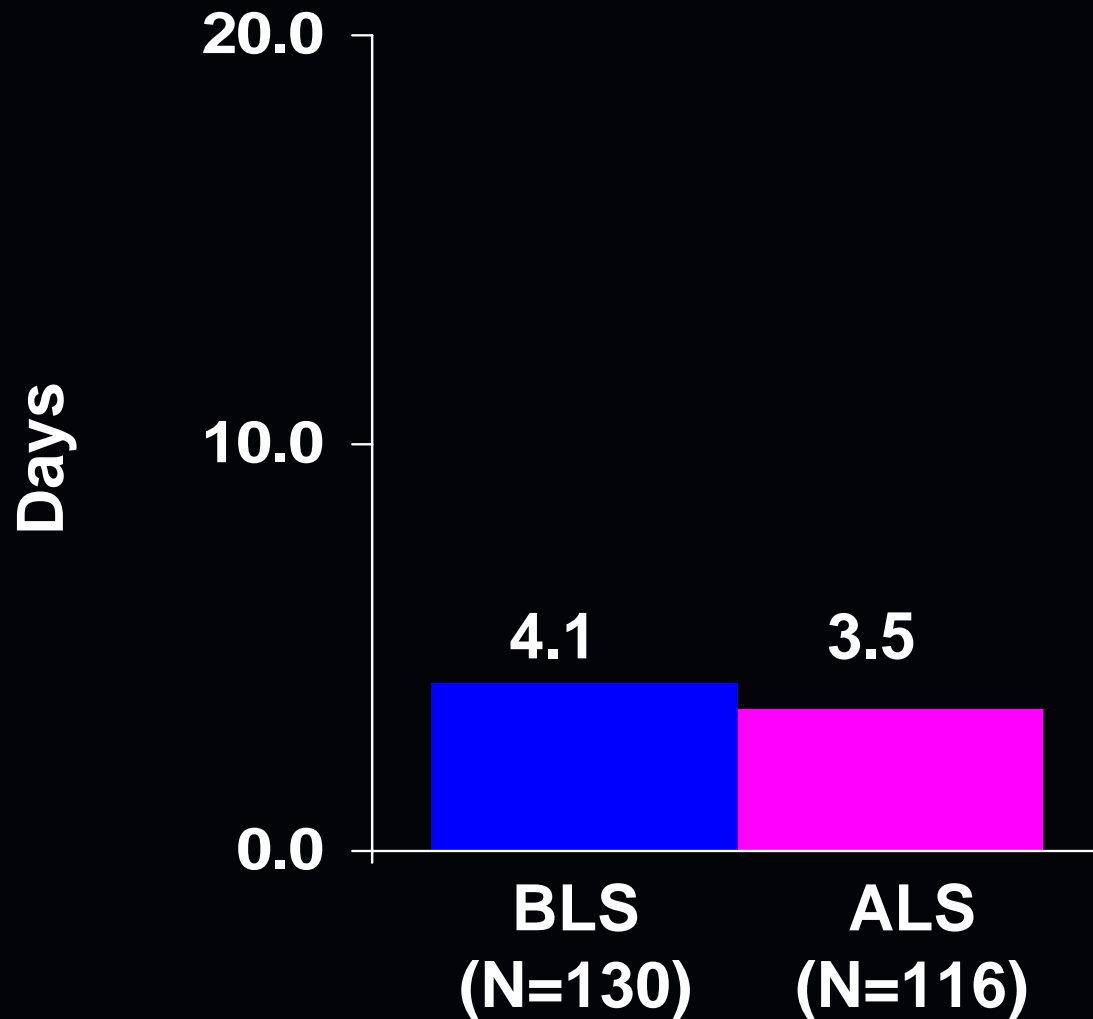
Admission to Hospital

P = NS



Length of Stay in Days

P = NS



***OPALS Pediatric Trauma Study
Update and Preliminary Results:
Impact of Advanced Life Support
on Survival and Morbidity***



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Study Population

Inclusion criteria:

- **Age <16 years**
- **Injury, any mechanism**
- **Injury Severity Score >12**
- **Transported by land ambulance**
- **Treated in 1/12 lead trauma hospitals**

Two study phases (N=526):

- **Pre-ALS (N=244)**
- **Post-ALS (N=282)**

Trauma Study Status

**Prehosp
cases**

**Outcome
data**

Trauma (N=526)

BLS

244

91%

ALS

282

89%

Pediatric Trauma Study Status ***(N=526)***

Months

BLS
(N=244)

ALS
(N=282)

Cambridge	36	19	14
Kitchener	36	21	34
Burlington	32	7	26
Mississauga	18	31	12
Oakville	15	9	1
Kingston	32	23	10
London	8	17	13
Niagara Falls	--	--	--

Pediatric Trauma Study Status ***(N=526)***

	Months	BLS (N=244)	ALS (N=282)
Ottawa	36	59	86
Peterborough	24	9	4
Port Hope	27	0	4
Sarnia	27	4	5
Sudbury	9	6	4
Thunder Bay	26	4	2
Windsor	36	35	67

Patient Characteristics (N=526)

	BLS (N=244)	ALS (N=282)
Age in years	8.5	9.3
Range	0-16	0-16
Males	60%	68%
Community size		
30,000 – 100,000	5%	5%
100,000 – 200,000	28%	20%
200,000 – 500,000	30%	40%
>500,000	37%	35%

Trauma Causes (N=526)

**BLS
(N=244)** **ALS
(N=282)**

Type of Injury

Blunt	87%	94%
Penetrating	1%	0%
Drowning	0%	1%
Strangulation/Hanging	5%	2%
Fire	3%	1%
Burns, Not Fire Related	2%	1%
Non-Specific/Unknown	2%	1%

Pre-Hospital GCS Scores (N=526)

**BLS
(N=244)** **ALS
(N=282)**

Glasgow Coma Scale

Severe (<9)	31%	18%
Moderate (9 to 12)	16%	11%
Minor (13 to 15)	53%	71%

Airway Interventions by EMS ***(N=526)***

	BLS (N=244)	ALS (N=282)
ALS on Scene	--	72%
Intubation (N=14)		5%
Successful (N=11)		79%
Oral (N=10)	--	4%
Nasal (N=1)	--	0.4%
Bag Ventilation	13%	7%
Oral/Nasal Airway	14%	4%

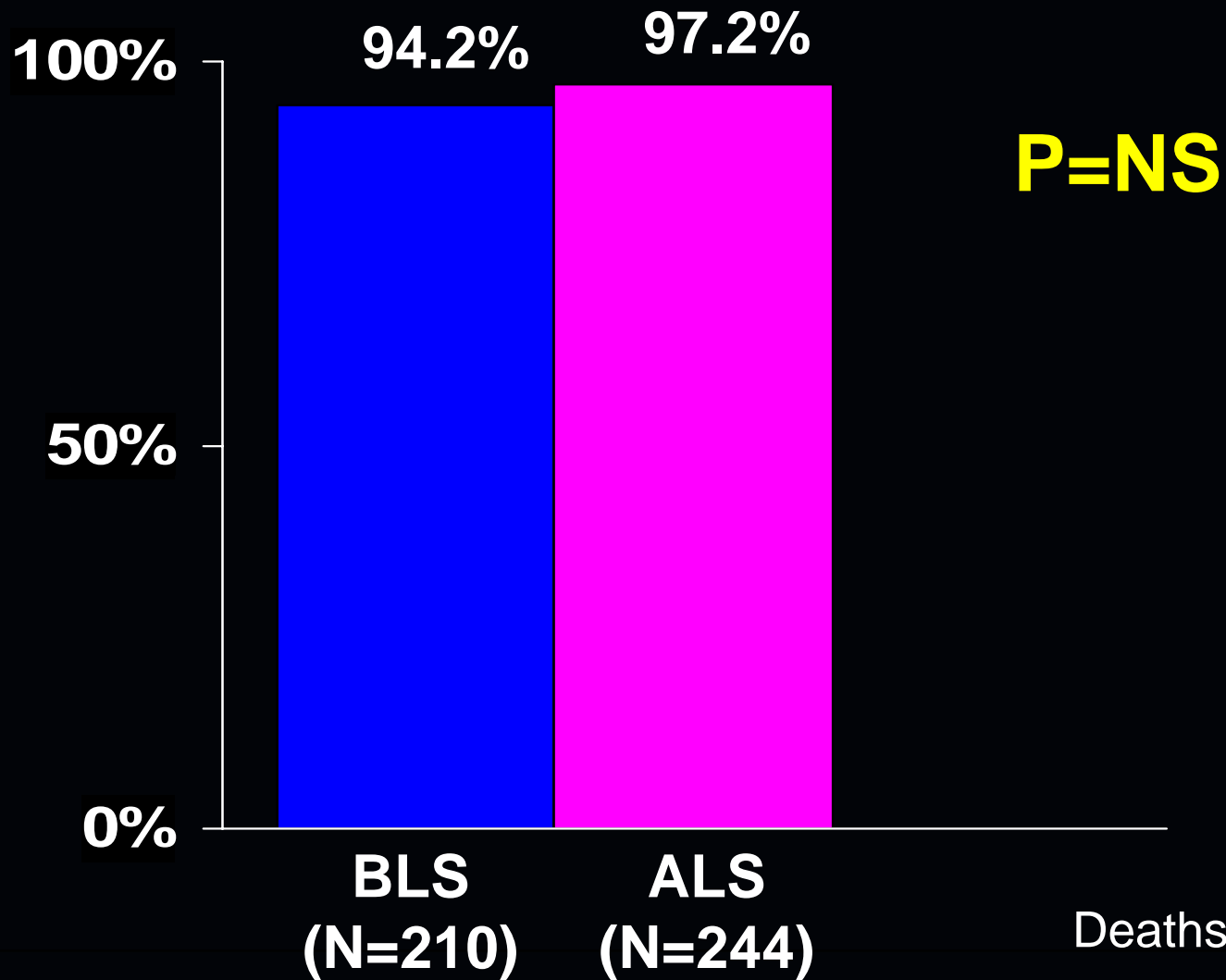
IV Therapy by EMS (N=526)

	BLS (N=244)	ALS (N=282)
IV Line Start (N=116)	--	41%
Successful (N=93)	--	80%
IO Line Start (N=5)	--	2%
Successful (N=4)	--	80%
IV Epinephrine (N=3)	--	1%
IV Morphine (N=6)	--	2%

Median Response Intervals (Minutes)

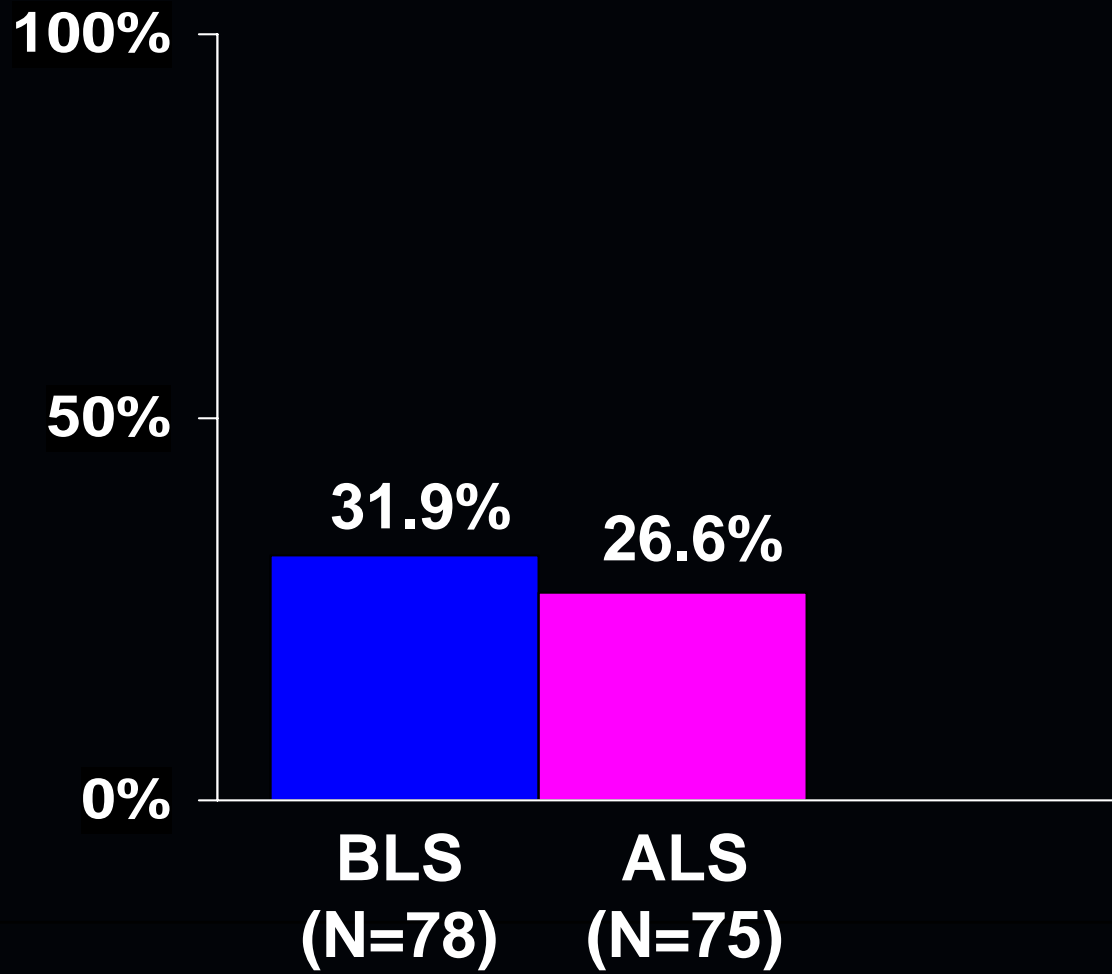
	BLS (N=244)	ALS (N=282)
Call received - notified	0.9	0.7
Notified - vehicle stops	5.3	6.0
Vehicle stops - pt side	2.0	2.0
Pt side - depart scene	11.0	13.4
Depart scene - hospital	7.6	9.1
Total: notified - hospital	28.2	32.1

Primary Outcome: Hospital Discharge



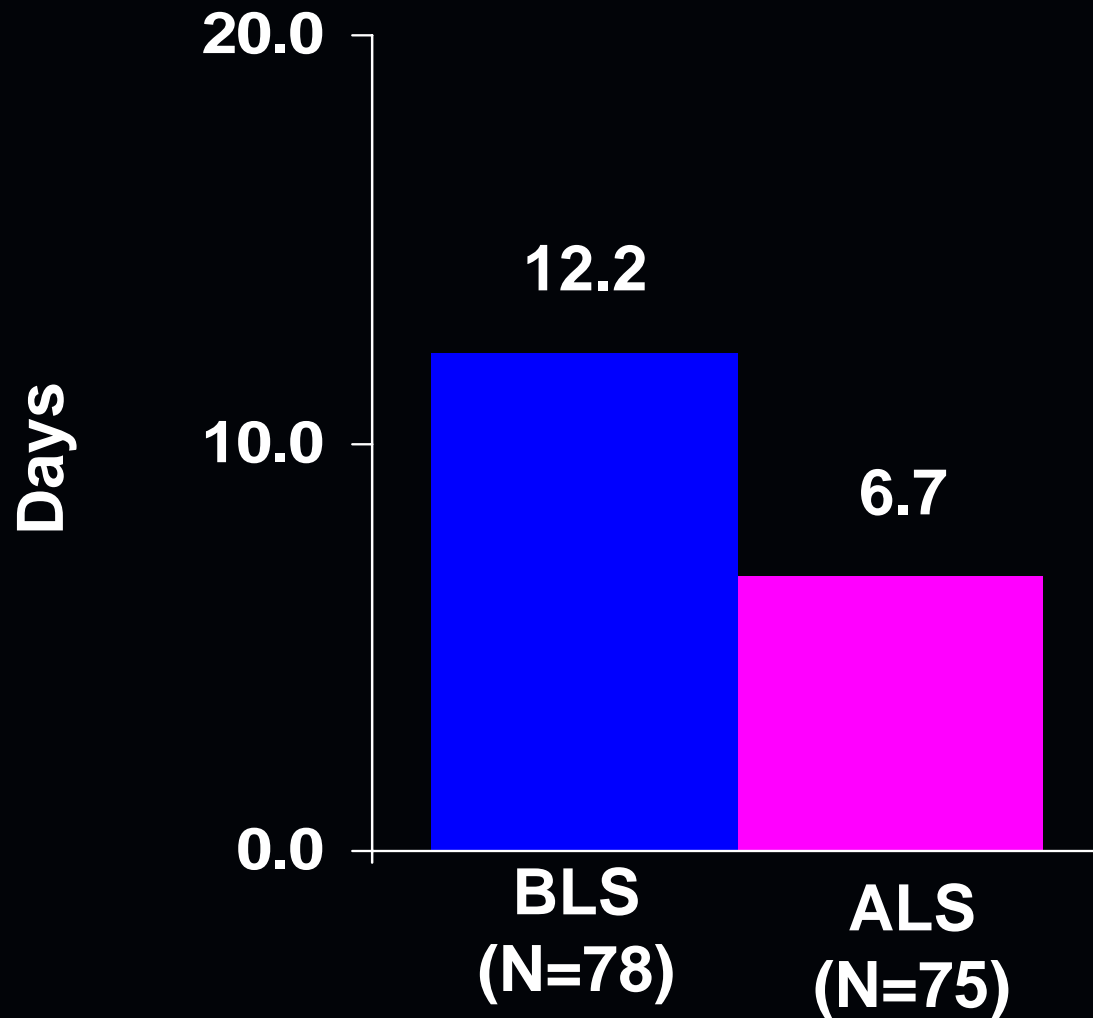
Admission to Hospital

P=NS



Length of Stay in Days

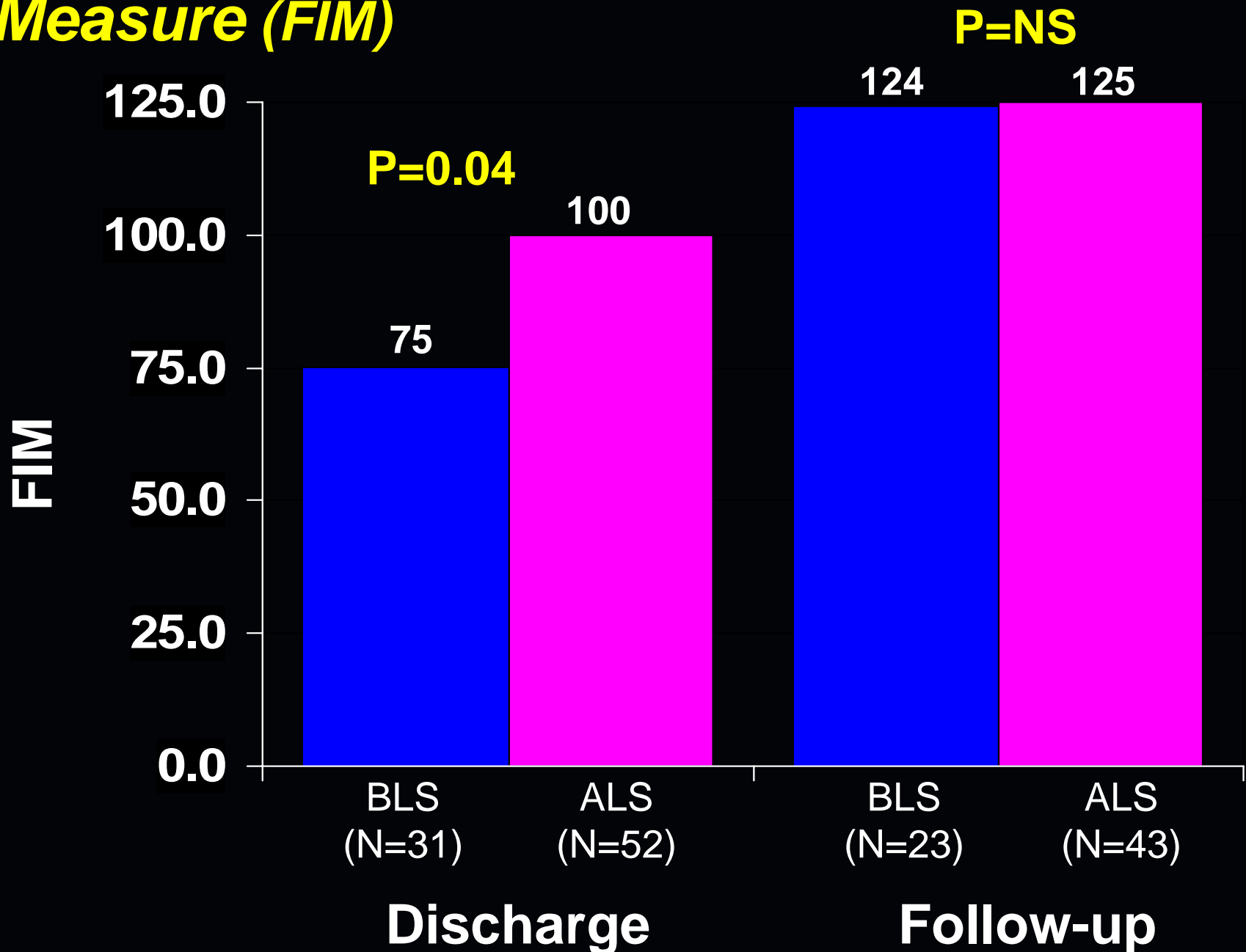
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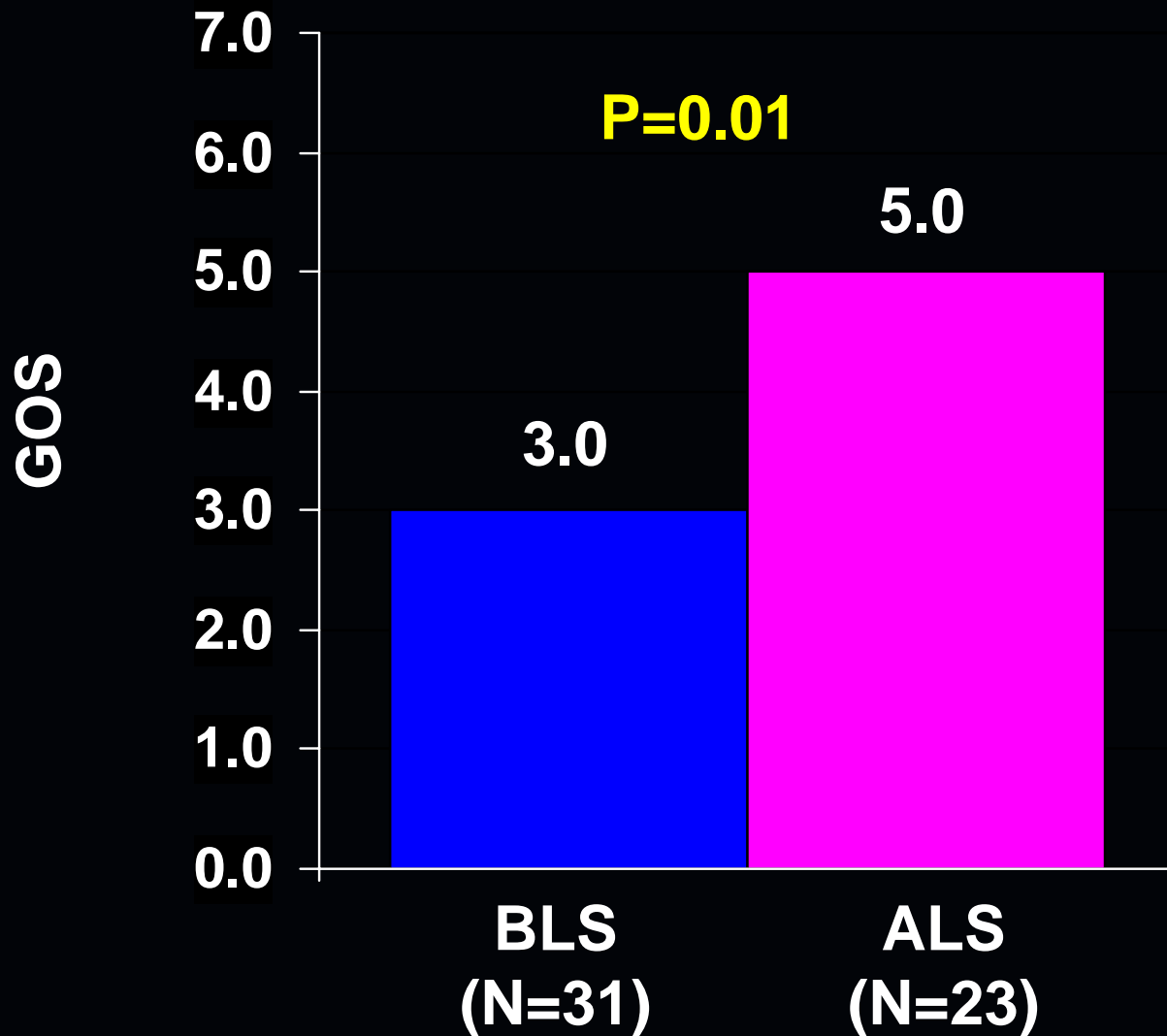
Final Injury Severity Scores

	BLS (N=58) % (N)	ALS (N=82) %(N)
ISS (1 – 75)		
12 to 15	7% (4)	16% (13)
16 to 24	41% (24)	49% (40)
25 to 40	41% (24)	29% (24)
41 to 70	7% (4)	4% (3)
71 to 75	4% (2)	2% (2)

Median Functional Independence Measure (FIM)



Median Glasgow Outcome Score



Issues for Discussion & Next Steps

- **There are a number of sites that show an unbalanced number of cases in the BLS vs. the ALS phase**
- **We are in final stages of obtaining outcomes from various Health Record Departments**
- **Death Registry Reconciliation will be done for cases where outcome has been unobtainable**

