

***The OPALS
Prehospital Research
Group***



ONTARIO PREHOSPITAL ADVANCED LIFE SUPPORT STUDY

Annual Meeting Ottawa 2008

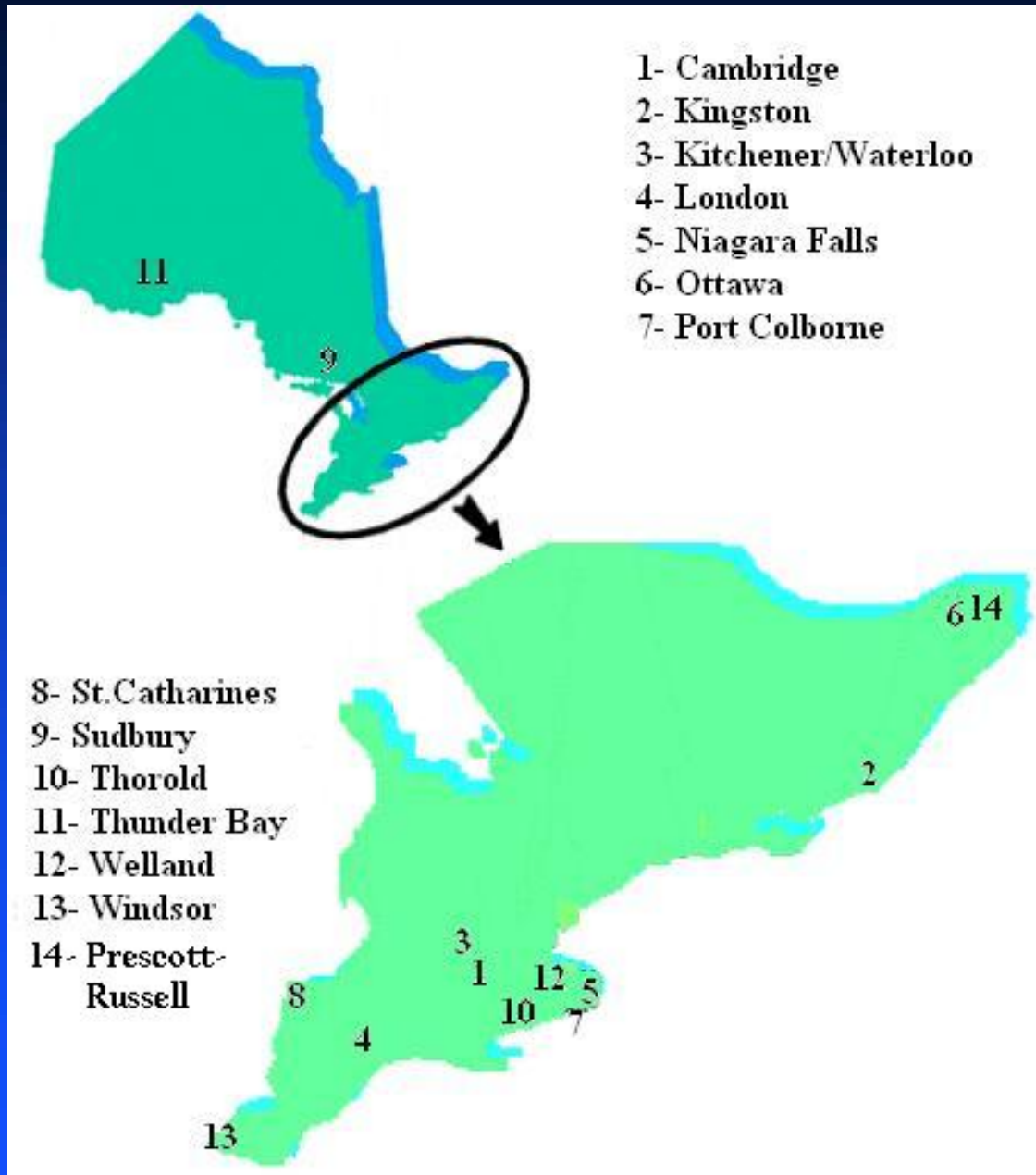
OPALS PRG

Thank you to all our members!

OPALS PRG Members

- **Ottawa Health Research Institute**
- **MOHLTC and 6 Base Hospital Programs**
- **14 cities in 8 municipal regions**
- **Population of 2 million**
- **12 EMS Services**
- **13 Fire Departments**
- **Resuscitation Outcomes Consortium**

OPALS Study Cities



OPALS Prehospital Research Group

- **Kingston Region:** Andy Reed, Mark Halladay, Rosie Hawkins, Susan Duncan, Sandra Brennan
- **London Region:** Jon Dreyer, Severo Rodriguez, Shelley McLeod, Shireen Fard, Nancy Densmore, Ken Boyle, Gord Kinney, Joanne Kehoe
- **Niagara Region:** Doug Munkley, Lorie Luinstra-Toohey, Greg Soto, Carol DeGiuli, Lori Ann Parker, Dee Crozier, Jill Banbury
- **Ottawa Region:** Justin Maloney, Richard Dionne, John Trickett, Jeanny Verdon, Susan Bartlett-Arsenian, Suzanne Vokey, Jason Rouleau, Kristy Smaggus, James Marki

OPALS Prehospital Research Group

- **Sudbury**: Paul Colella, Sylvie Michaud, Nicole Sykes, Pam Labelle
- **Thunder Bay**: Andrew Affleck, Elaine Graham, Kristine Perrier, Chrissy Klaas, Irene Hietikko, Dana Kolodziejczak
- **Waterloo Region**: Dave Waldbillig, Kieran Ballah, Renee MacPhee, Lori Smith, Nilla Dutrisac, Jane Seifried
- **Windsor Region**: Paul Bradford, Cathie Hedges, Sandra Slogan, Mike Gobet, Chris Fader, Suzanne McKenzie, Linda Purcell, Peter Morasutti

Thank You EMS Service Staff

- **Region of Waterloo:** Roger Mayo, John Prno
- **Prescott-Russell:** Louis Rathier, Gilles Lacroix, Yves Lariviere, Mario Periard, Marc-Andre Periard, Natalie Nadeau
- **Frontenac Paramedic Service:** Paul Charbonneau, Susan Brown
- **Thames EMS:** Bob Hopper, Dave Goddard
- **Niagara Region EMS:** Hal Klassen, Rick Ferron

Thank You EMS Service Staff

- **Ottawa Paramedic Services:**
Anthony Di Monte, Pierre Poirier, Kevin Newell,
Peter Kelly, Andrew Orchard, Mike Dupuis, Saleh
Hashem, Stan Morrow
- **Greater Sudbury EMS:** Tom Isaia, Jennifer
Amyotte, Tim Beadman
- **Superior North Emergency and Rescue:** Norm
Gale, Wayne Gates
- **Essex Windsor EMS:** ??

Thank You Fire Service Staff

- Cambridge: David Greenhough
- Kingston: Neville Murphy, Clint Long, Harold Tulk
- London: Brian Arnold, Gwen Frances
- Niagara: Jim Boutillier
- Ottawa: Ian Thomson, Dave Cranidge
- Sudbury: Gordon Stauffer
- Thunder Bay: Rod Hurdon
- Waterloo: Ryan Schubert
- Windsor: Mike Mio, Curtis Fedoruk

OPALS PRG Steering Committee

Dr. Ian Stiell	Chair and Scientific Director
Dr. George Wells	Scientific Advisor
Ms. Cathy Clement	Research Manager
Dr. Justin Maloney	OPALS Med Director Rep
Mr. John Trickett	OPALS Prog Director Rep
Dr. Jon Dreyer	OBHG Med Director Rep
Mr. Tony Campeau	MOHLTC Rep

OPALS PRG Steering Committee

Mr. Anthony Di Monte At Large Member

Ms. Lorie Luinstra-Toohey At Large Member

Dr. Doug Munkley At Large Member

Dr. Christian Vaillancourt At Large Member

Thank You Ottawa D.C.C. Staff

- ◆ **Cathy Clement**
- ◆ **Elizabeth Anderson**
- ◆ **Vanessa Baillie**
- ◆ **Jane Banek**
- ◆ **Tammy Beaudoin**
- ◆ **Jennifer Brinkhurst**
- ◆ **Julie Cummins**
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- ◆ **Sheryl Domingo**
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- ◆ **Wayne Lowe**
- ◆ **Mary-Jo Lewis**
- ◆ **Angela Marcantonio**
- ◆ **Tracy McArdle**
- ◆ **Julie O'Brien**
- ◆ **Connor Sheehan**
- ◆ **My-Linh Tran**
- ◆ **Christine Tym**
- ◆ **Irene Watpool**

Thank You to Our Invited Speakers

Judy Powell

Seattle DCC

Sheldon Cheskes

Peel Region

Fred Chapman

Seattle - PhysioControl

Dave Grant

Philips

David Birnie

Ottawa Heart Institute

Thank you to our Sponsors !



PHILIPS



***What Has the OPALS Study Taught us
about the
Prehospital Care of Critically Ill and
Injured Patients?***



OPALS Annual Meeting Ottawa 2008

***The Ontario Prehospital Advanced Life
Support Study***



ONTARIO PREHOSPITAL ADVANCED LIFE SUPPORT STUDY

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 36,000 patients:
 - ▶ Cardiac arrest (10,000)
 - ▶ Major trauma (3,000)
 - ▶ Respiratory distress (8,000)
 - ▶ Chest pain (13,000)
 - ▶ Pediatrics (2,000)

Primary Objectives

- 1. Cardiac Arrest:** The incremental benefit for survival of adding rapid defibrillation program
Phase II - JAMA 1999
- 2. Cardiac Arrest:** The incremental benefit of adding ALS program
Phase III – New Engl J Med 2004
- 3. Respiratory:** The incremental benefit of ALS
Phase III – New Engl J Med 2007
- 4. Trauma, Chest Pain, Pediatrics:** The incremental benefit for survival/morbidity of adding ALS
Phase III – Can Med Assoc J 2008

Secondary Objectives: Cardiac Arrest

1. Modifiable factors affecting survival
Ann Emerg Med 1999
2. EMS-witnessed cases
Ann Emerg Med 2000
3. Survival with only CPR?
Ann Emerg Med 2001
4. Quality of life of survivors
Circulation 2003
5. Optimal Defib Response Interval
Ann Emerg Med 2003
6. Locations of arrest and PAD
Can J Card 2004
7. Coroner's Diagnosis Pediatric CA
Resusc 2007
8. Comparison of HUI3 and CPC in CA
Ann Emerg Med 2008

OPALS: Setting and Design

- Multicenter before-after controlled clinical trial
- 21 Canadian cities
- Multiphase design:
 - *Phase I Baseline (36 mo.)*
 - *Phase II Rapid Defibrillation (12 mo.)*
 - *Phase III Full ALS (36 mo.)*
- Interventions:
 - Rapid defibrillation (II)
 - Endotracheal intubation
 - IV lines
 - IV fluids & drugs

Improved Out-of-Hospital Cardiac Arrest Survival Through the Inexpensive Optimization of an Existing Defibrillation Program

OPALS Study Phase II

Ian G. Stiell, MD, MSc, FRCPC

George A. Wells, PhD

Brian J. Field, EMA III

Daniel W. Spaite, MD

Valerie J. De Maio, MSc

Roxanne Ward, RN

Douglas P. Munkley, MD, MCFP(EM)

Marion B. Lyver, MD, FRCPC, MCFP(EM)

Lorraine G. Luinstra, BScN, MHA

Tony Campeau, BSc

Justin Maloney, MD, FRCPC

Eugene Dagnone, MD, FRCPC

for the OPALS Study Group

Context Survival rates for out-of-hospital cardiac arrest are low; published survival rates in Ontario are only 2.5%. This study represents phase II of the Ontario Prehospital Advanced Life Support (OPALS) study, which is designed to systematically evaluate the effectiveness and efficiency of various prehospital interventions for patients with cardiac arrest, trauma, and critical illnesses.

Objective To assess the impact on out-of-hospital cardiac arrest survival of the implementation of a rapid defibrillation program in a large multicenter emergency medical services (EMS) system with existing basic life support and defibrillation (BLS-D) level of care.

Design Controlled clinical trial comparing survival for 36 months before (phase I) and 12 months after (phase II) system optimization.

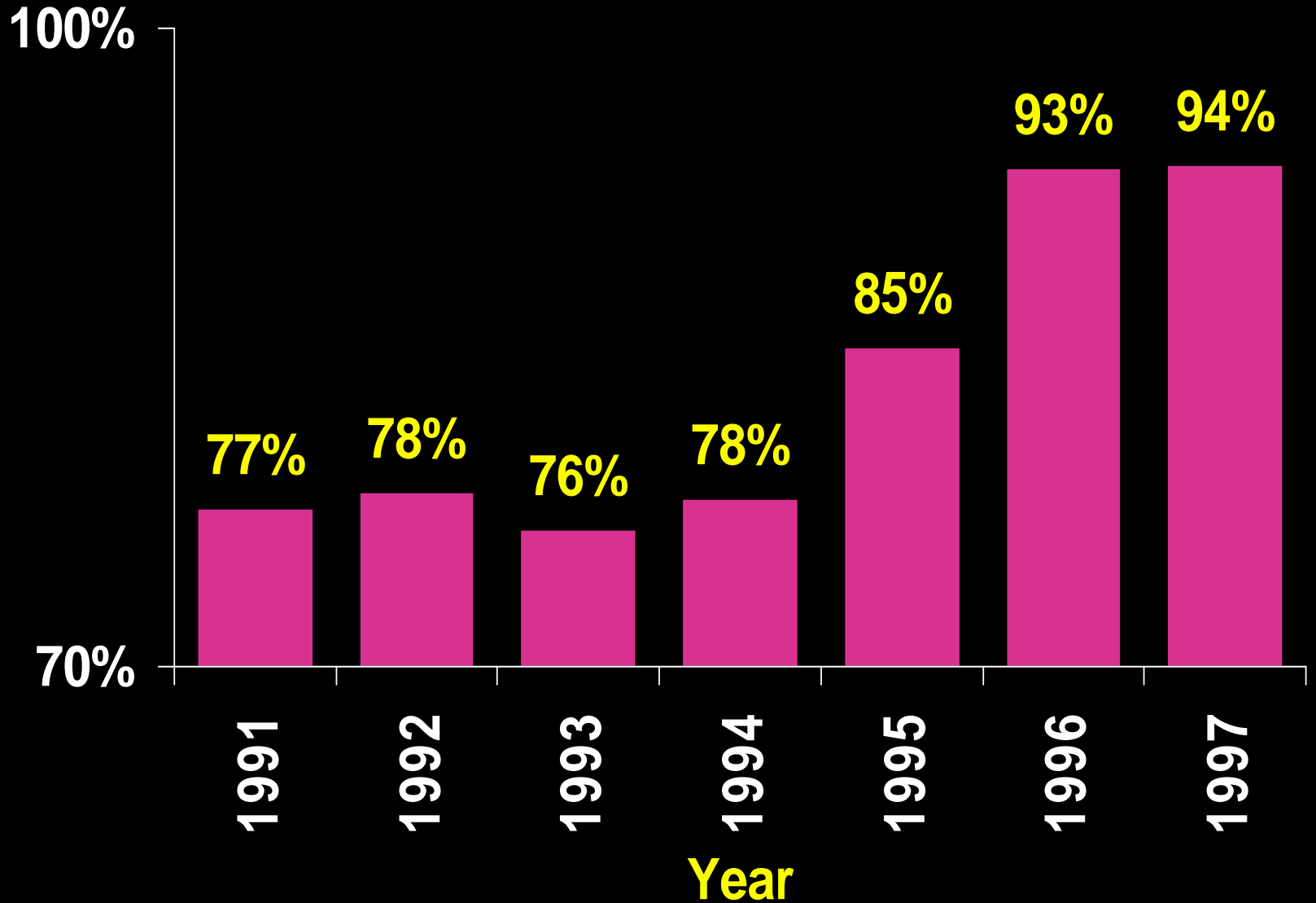
Setting Nineteen urban and suburban Ontario communities (populations ranging from 16 000 to 750 000 [total, 2.7 million]).

Patients All patients who had out-of-hospital cardiac arrest in the study communities for whom resuscitation was attempted by emergency responders.

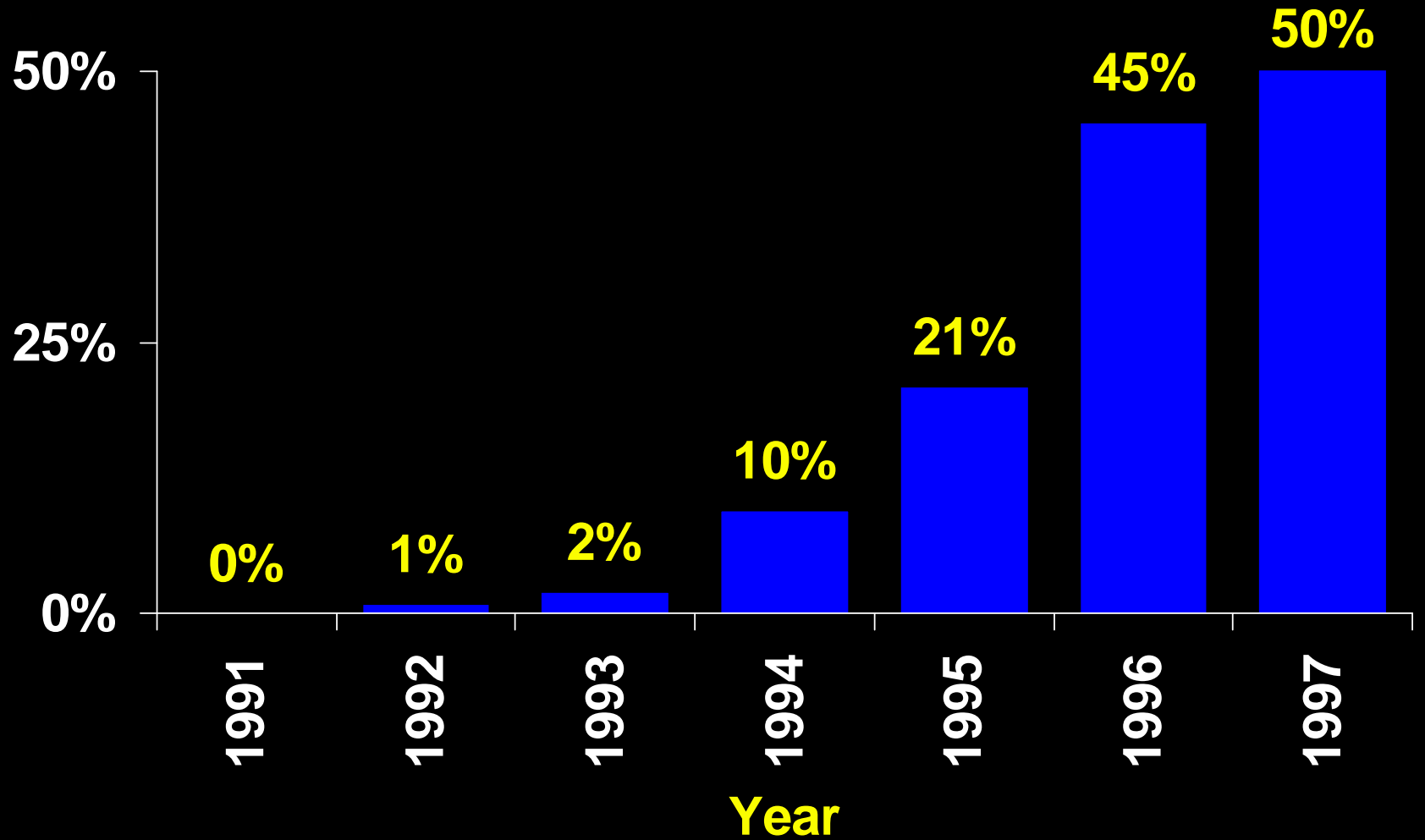
Interventions Study communities optimized their EMS systems to achieve the target response interval from when a call was received until a vehicle stopped with a defibrillator of 8 minutes or less for 90% of cardiac arrest cases. Working both locally

JAMA 1999;281:1175-1181

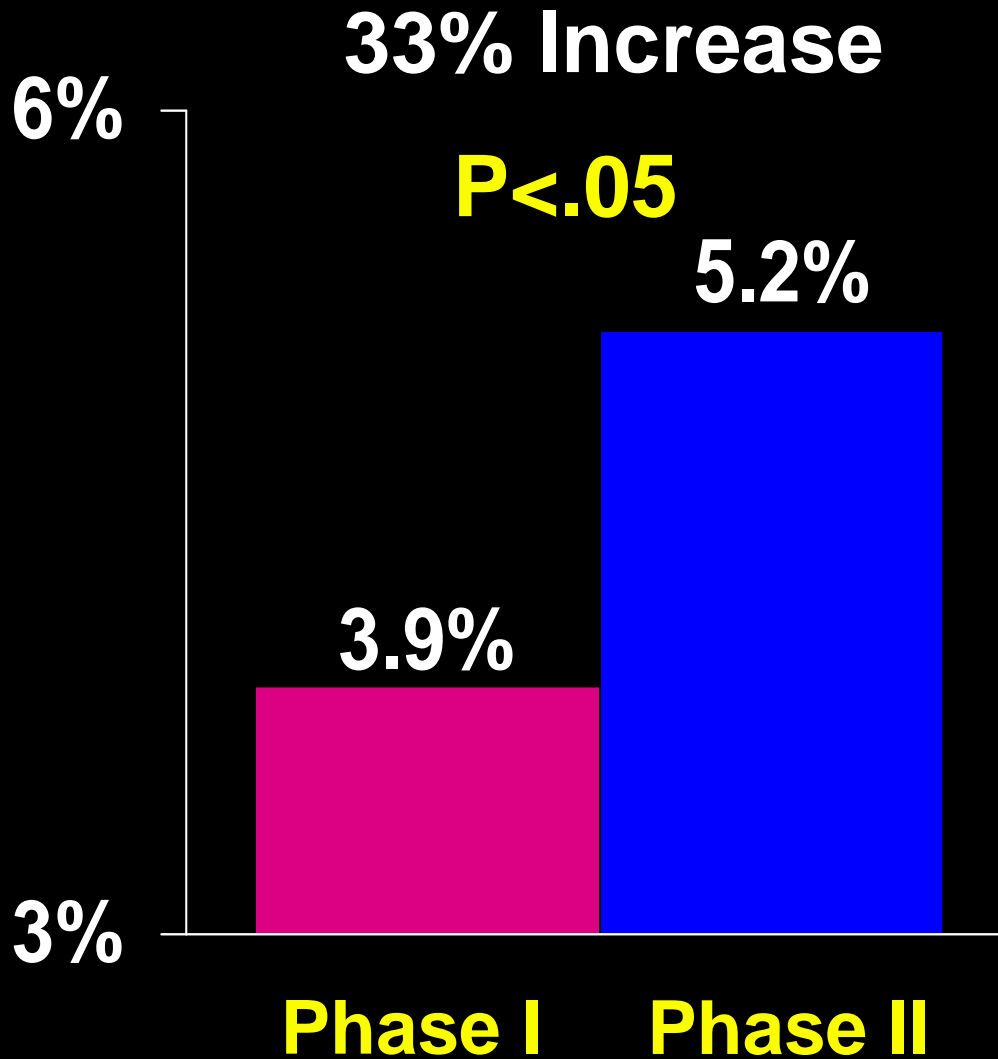
% of Cases Reached with Defibrillator in 8 Minutes or Less



Firefighters Arrived First with Defibrillator



Patient Survival



ORIGINAL ARTICLE

Advanced Cardiac Life Support in Out-of-Hospital Cardiac Arrest

Ian G. Stiell, M.D., George A. Wells, Ph.D., Brian Field, A.C.P., M.B.A.,
Daniel W. Spaite, M.D., Lisa P. Nesbitt, M.H.A., Valerie J. De Maio, M.D.,
Graham Nichol, M.D., M.P.H., Donna Cousineau, B.Sc.N., Josée Blackburn, B.Sc.,
Doug Munkley, M.D., Lorraine Luinstra-Toohey, B.Sc.N., M.H.A.,
Tony Campeau, M.Ed., Eugene Dagnone, M.D., and Marion Lyver, M.D.,
for the Ontario Prehospital Advanced Life Support Study Group

N Engl J Med 2004;351:647-56

Table 2. Survival and Functional Outcomes of Patients from the Two Study Phases.*

Outcome	Rapid-Defibrillation Phase (N=1391)	Advanced-Life-Support Phase (N=4247)	Absolute Increase (95% CI)	P Value
	<i>no. (%)</i>		<i>percentage points</i>	
Return of spontaneous circulation	180 (12.9)	766 (18.0)	5.1 (3.0 to 7.2)	<0.001
Admission to hospital	152 (10.9)	621 (14.6)	3.7 (1.7 to 5.7)	<0.001
Survival to hospital discharge	69 (5.0)	217 (5.1)	0.1 (-1.2 to 1.5)	0.83
Survivors' cerebral performance category, level 1†	54 (78.3)	145 (66.8)	—	0.73
	<i>score</i>			
Survivors' Health Utility Index, Mark III, at one year			—	0.67
Median	0.84	0.79		
Interquartile range	0.49–0.97	0.43–0.91		

* CI denotes confidence interval, and dashes denote not applicable.

† There were 69 survivors in the rapid-defibrillation phase, and 217 in the advanced-life-support phase.

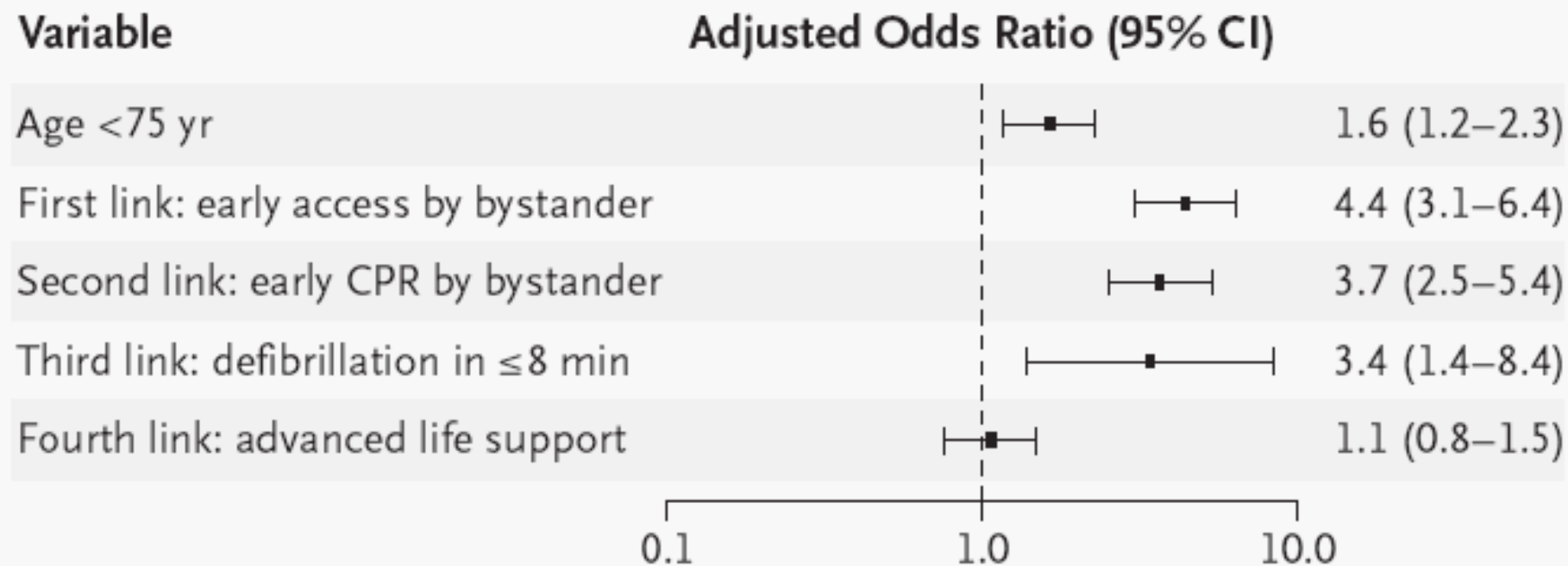


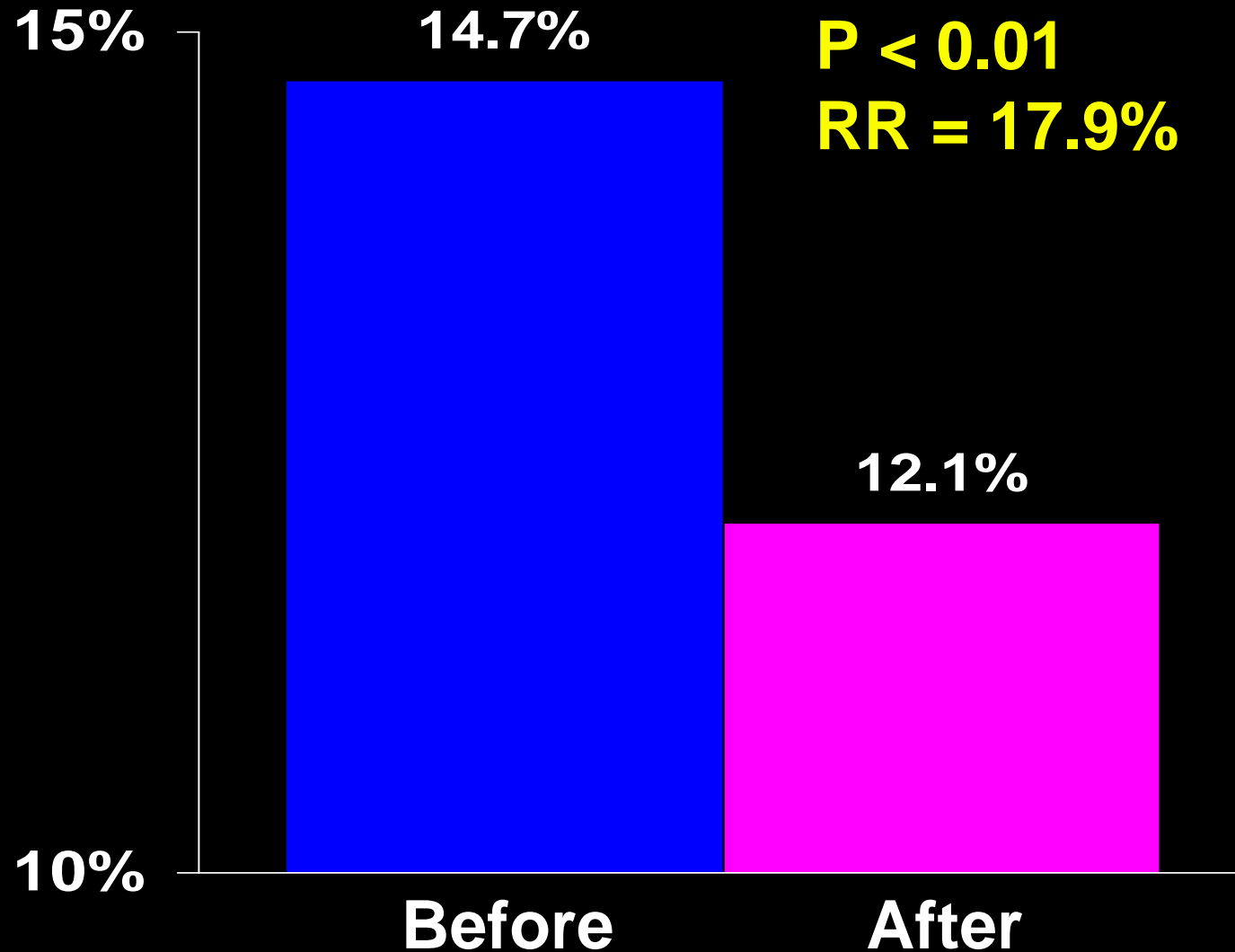
Figure 1. Odds Ratios for Survival to Hospital Discharge Associated with Selected Factors.

ORIGINAL ARTICLE

Advanced Life Support for Out-of-Hospital Respiratory Distress

Ian G. Stiell, M.D., M.Sc., F.R.C.P.C., Daniel W. Spaite, M.D.,
Brian Field, M.B.A., E.M.C.A., Lisa P. Nesbitt, M.H.A., Doug Munkley, M.D.,
Justin Maloney, M.D., F.R.C.P.C., Jon Dreyer, M.D., F.R.C.P.C.,
Lorraine Luinstra Toohey, B.Sc.N., M.H.A., Tony Campeau, M.A.Ed.,
Eugene Dagnone, M.D., F.R.C.P.C., Marion Lyver, M.D.,
and George A. Wells, Ph.D., for the OPALS Study Group*

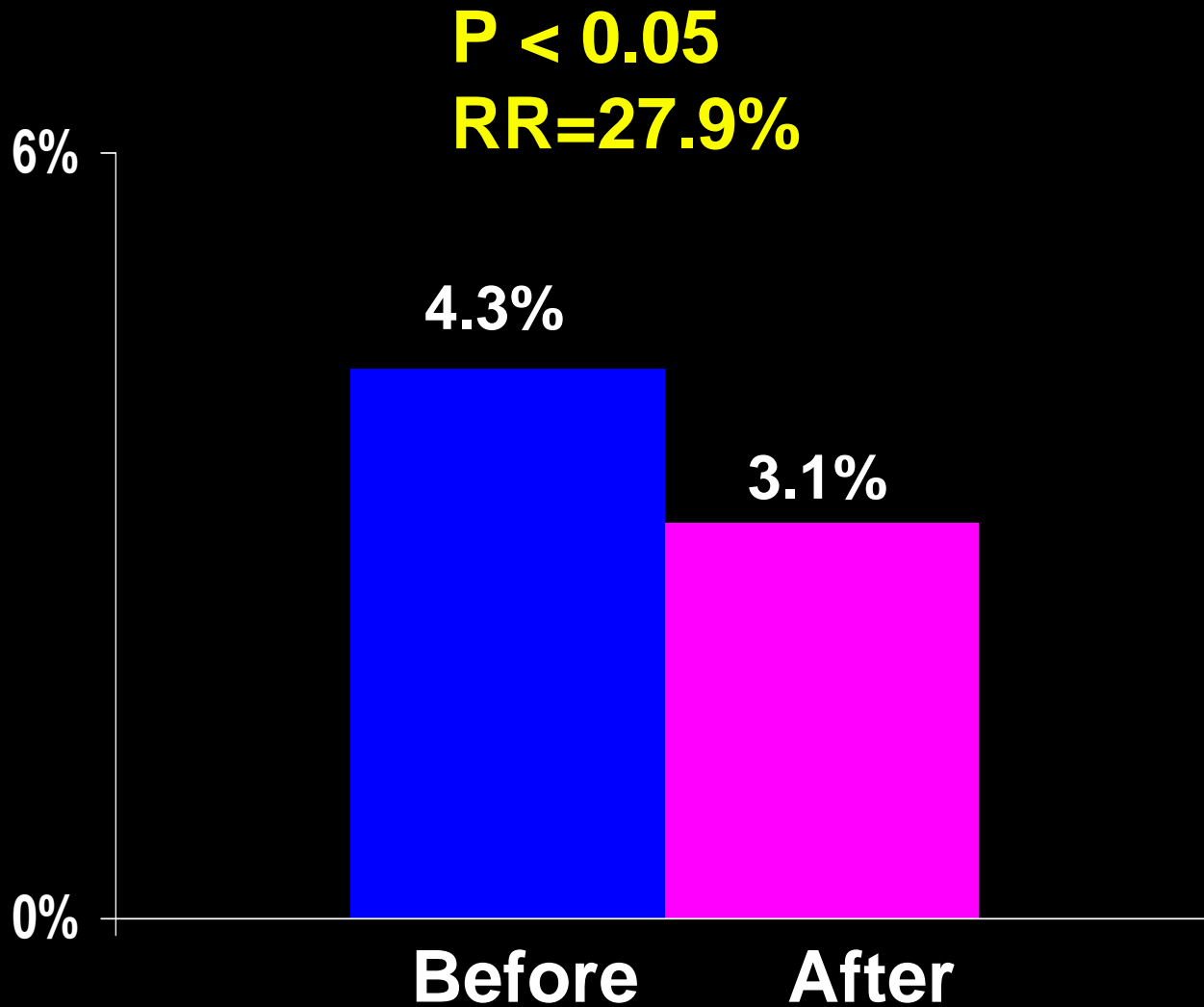
Primary Outcome: Overall Mortality



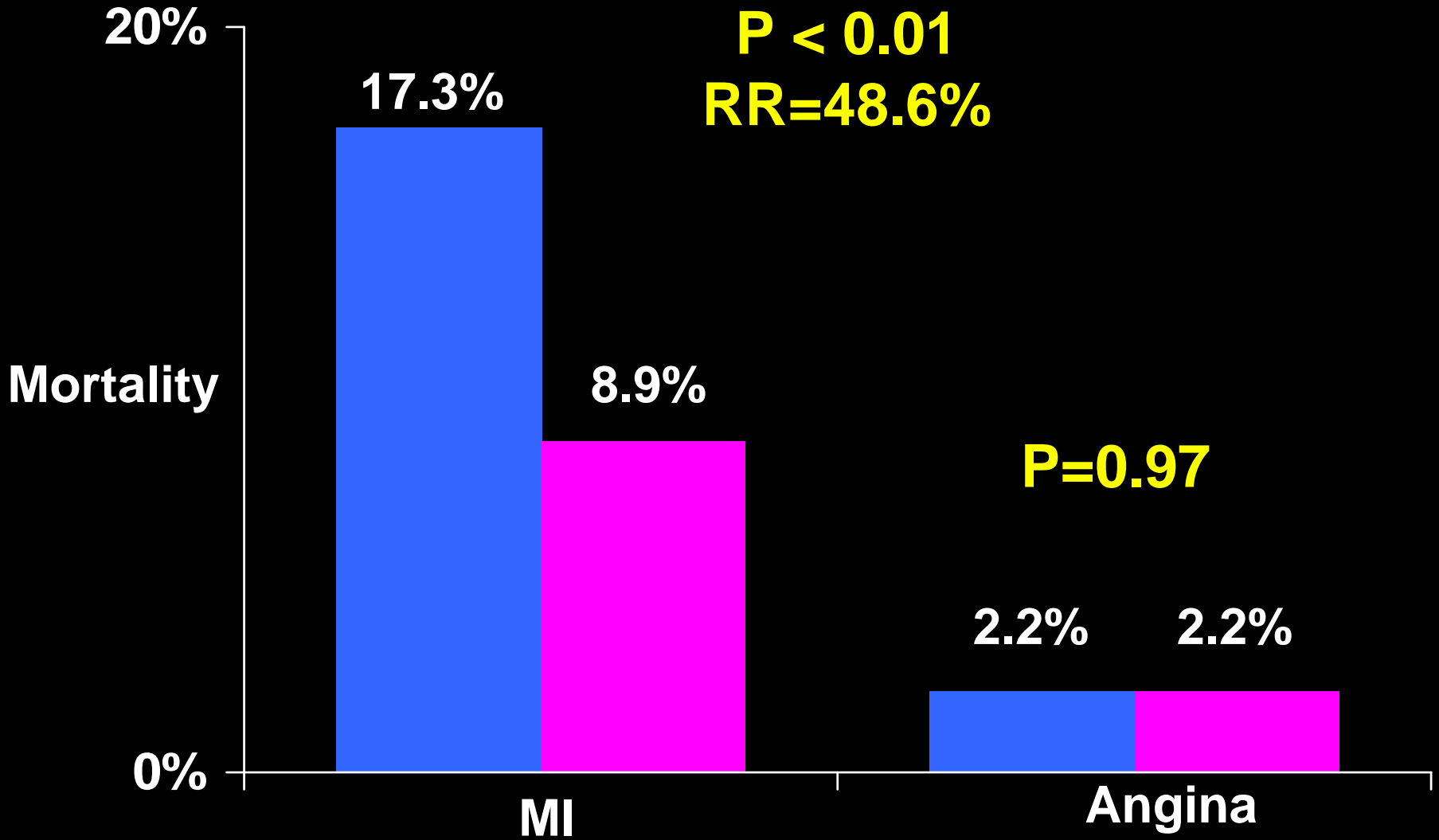
Overall Impact of ALS in Study Communities (N = 2 Million)

Additional lives saved / year	173
Number needed to treat to save a life	38

Chest Pain: Overall Mortality (N=10,371)



Mortality by Diagnosis Subgroups



RESEARCH

The OPALS Major Trauma Study: impact of advanced life-support on survival and morbidity

Ian G. Stiell MD MSc, Lisa P. Nesbitt MHA, William Pickett PhD, Douglas Munkley MD, Daniel W. Spaite MD, Jane Banek CHIM, Brian Field MBA EMCA, Lorraine Luinstra-Toohey BScN MHA, Justin Maloney MD, Jon Dreyer MD, Marion Lyver MD, Tony Campeau MAEd PhD, George A. Wells PhD, for the OPALS Study Group

∞ See related article page 1171

ABSTRACT

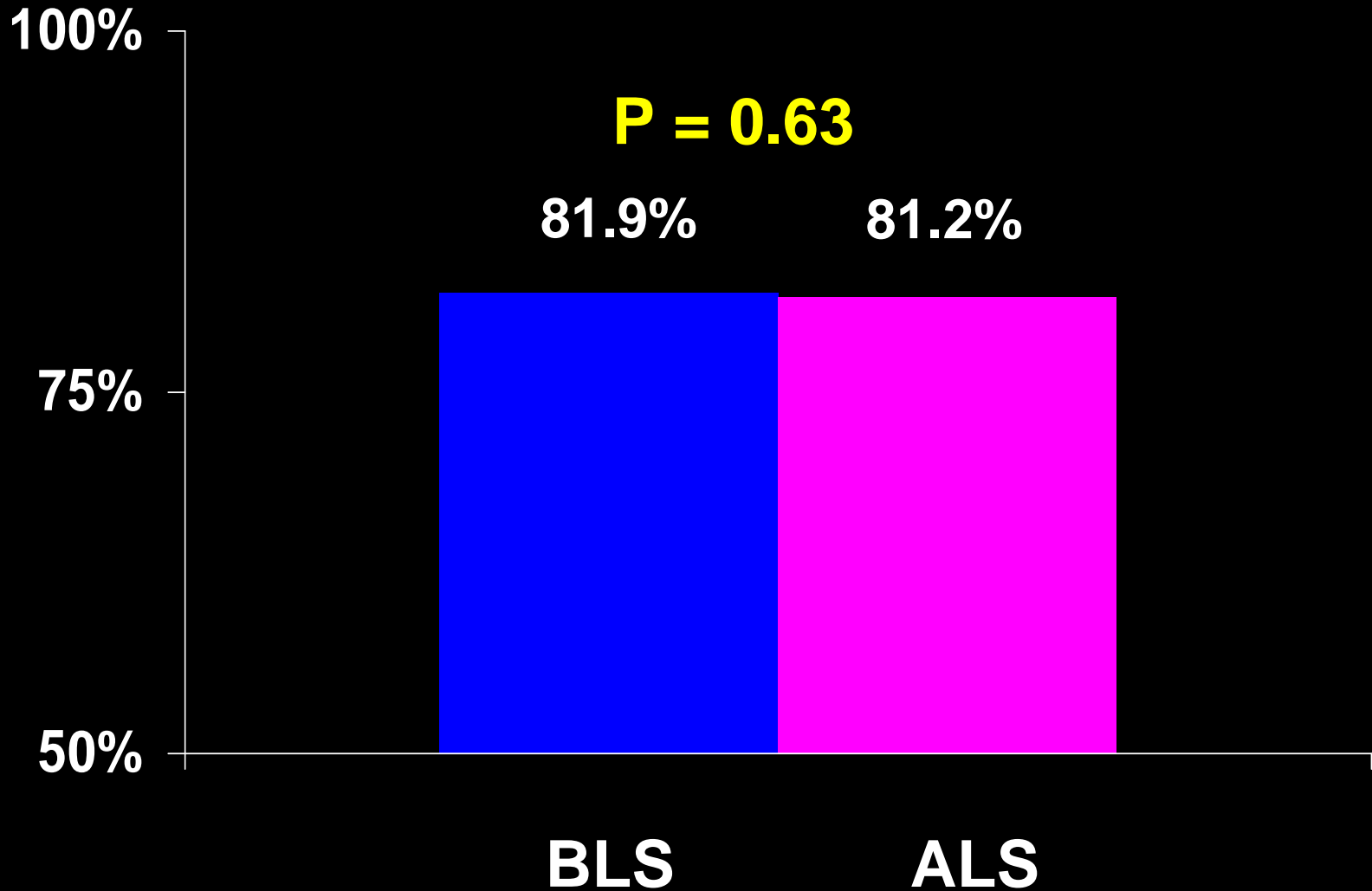
Background: To date, the benefit of prehospital advanced life-support programs on trauma-related mortality and morbidity has not been established

Methods: The Ontario Prehospital Advanced Life Support (OPALS) Major Trauma Study was a before–after systemwide controlled clinical trial conducted in 17 cities. We enrolled adult patients who had experienced major trauma in a basic life-support phase and a subsequent advanced life-support phase (dur-

Each year in the United States, an estimated 500 000 adult patients are transported to hospital after experiencing major trauma.^{1,2} Major trauma can be described as life- or limb-threatening injury due to blunt force, penetrating injury or burn injury. Considering both frequency and associated mortality, major trauma is the second most important condition for children and the fourth most important condition for adults treated by emergency medical service providers.² About 20% of these patients die, and many survivors are left with permanent disability.

Can Med Assoc J 2008;178(9):1141-52

Major Trauma: Overall Survival (N=2,884)



Adjusted Odds Ratios for Mortality

H-L G of Fit P = 0.44

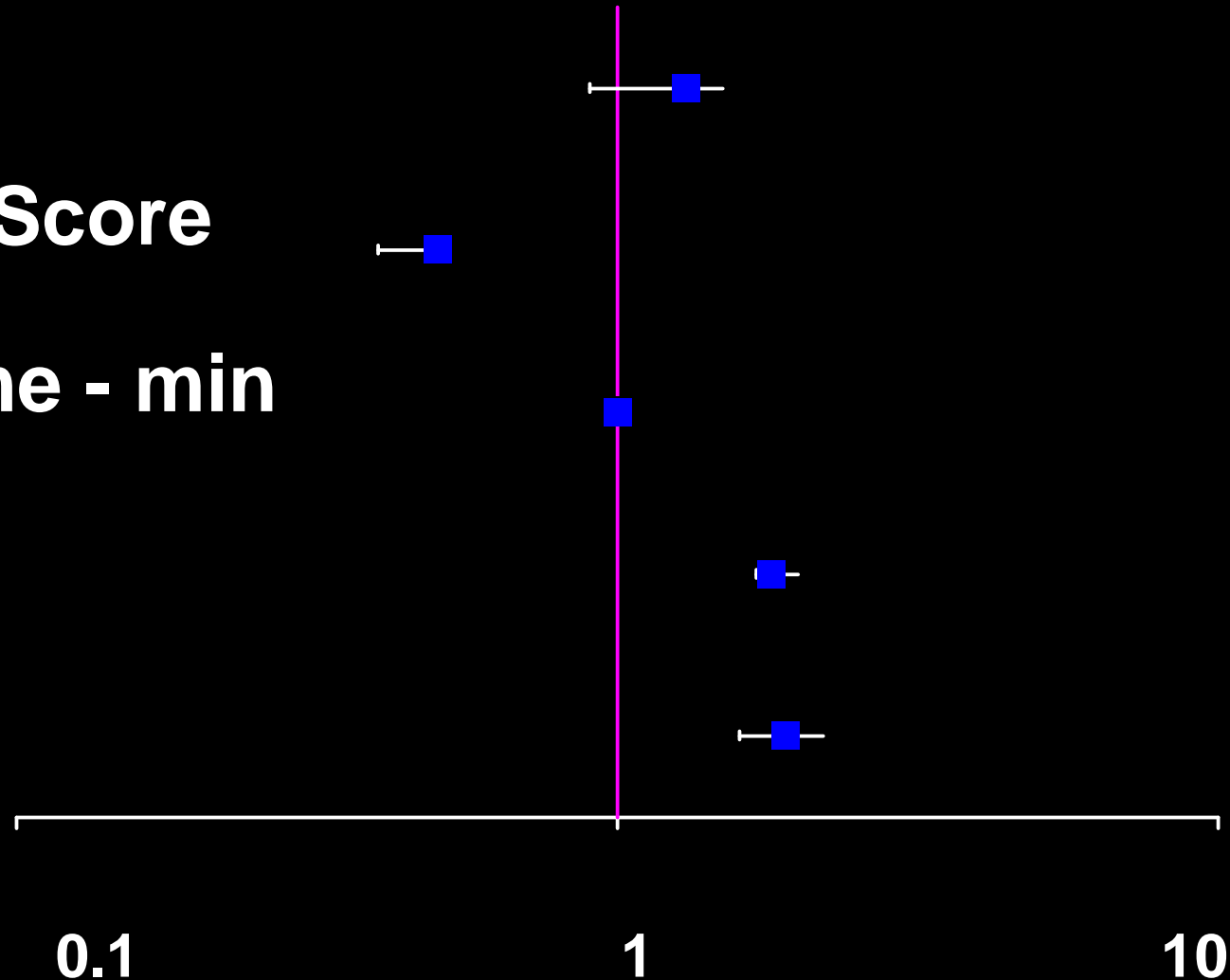
ALS Phase

Rev Trauma Score

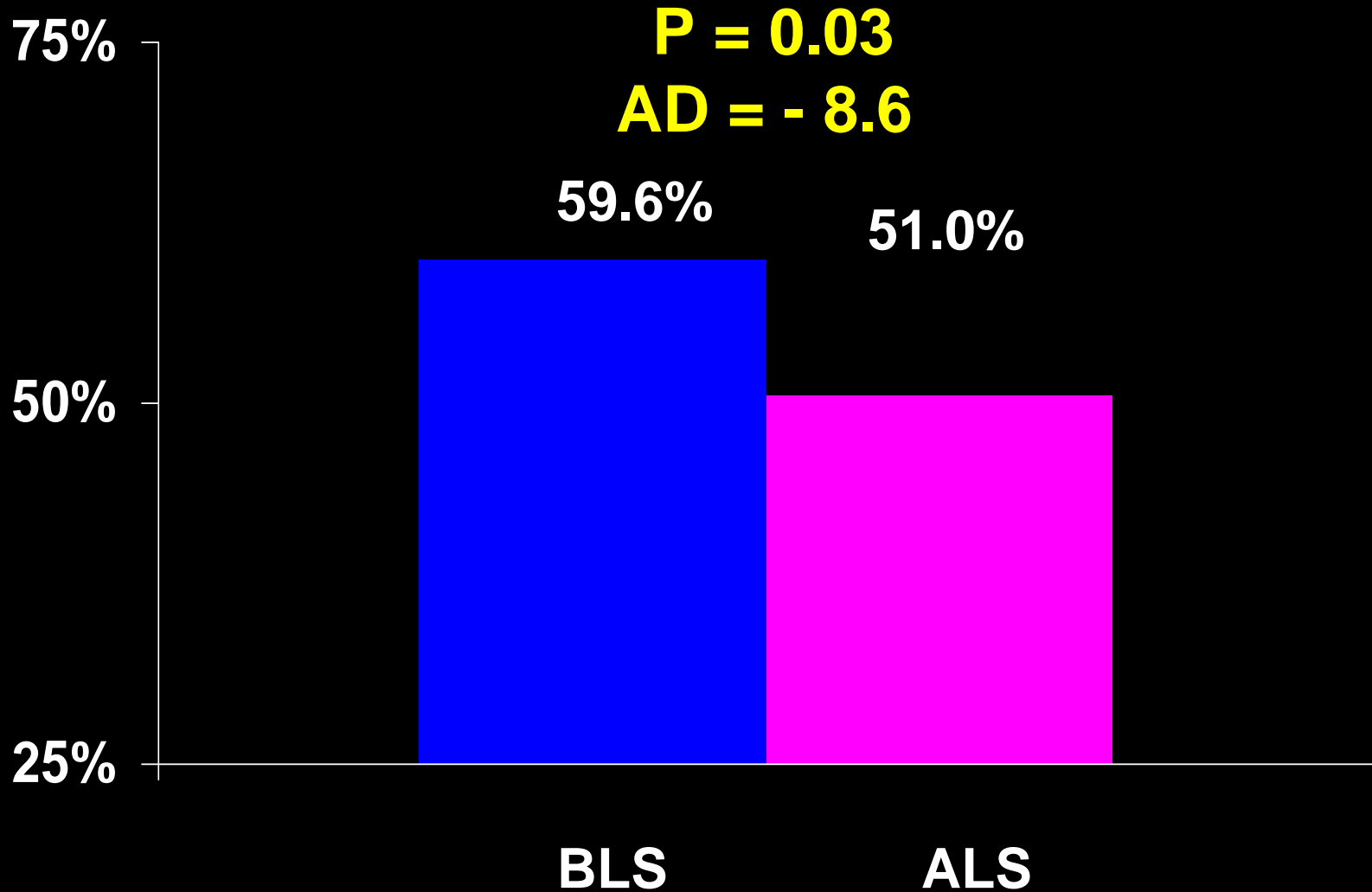
Response time - min

Age - years

ISS score



Subgroup GCS < 9: Overall Survival (N=664)



Adjusted Odds Ratios for Mortality

H-L G of Fit P = 0.03

Intubation in field

IV in field

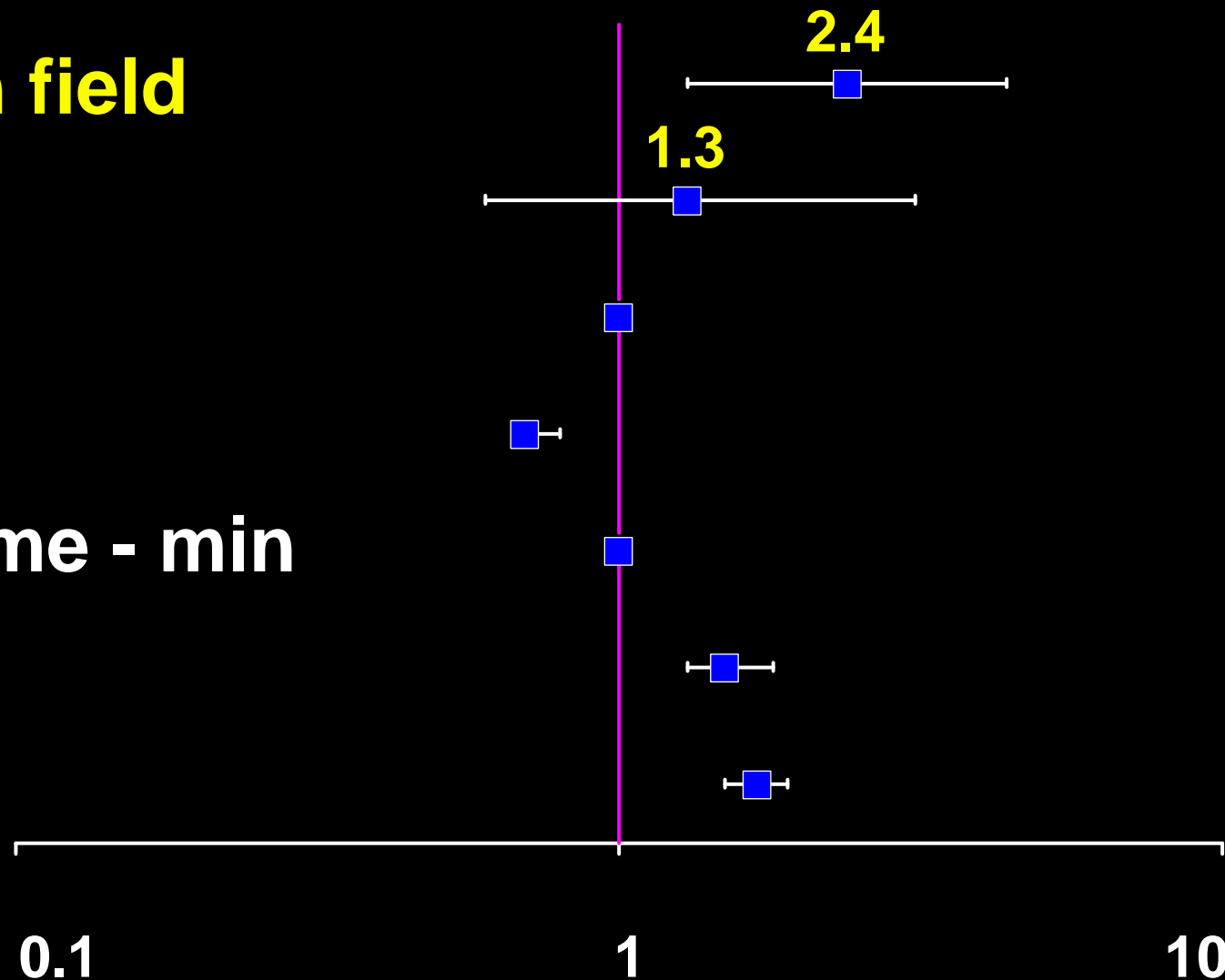
SBP initial

GCS initial

Response time - min

Age - years

ISS score



Research

Should invasive airway management be done in the field?

Daniel P. Davis MD

∞ See related article page 1141

Traumatic injuries result in more years of productive life lost than any other disease and represent the main cause of death among young people. Despite the public health importance of trauma, there have been few advances in early resuscitative care over the past several decades. In this issue, Stiell and colleagues¹ provide us with an important investigation into the relation between advanced prehospital care and outcomes from traumatic injury.¹ Stiell and colleagues used a before-and-after design to document the change in survival with implementation of an advanced life-support program. Their analysis is part of the Ontario Prehospital Advanced Life Support (OPALS) project, which has emerged as perhaps the most important and comprehensive investigation into prehospital resuscitation yet performed.

Advanced life-support includes the theoretical advantages

Key points

- The Ontario Prehospital Advanced Life Support (OPALS) project is a comprehensive investigation into prehospital resuscitation in different patient populations.
- In this latest OPALS study, advanced life-support was not found to improve outcomes in patients with traumatic injuries.
- Endotracheal intubation and positive-pressure ventilation, especially in patients with severe head injury, may result in more harm than good.
- It is unclear what elements of complex airway management in vulnerable patients should be modified or performed only in a more controlled hospital setting.

Health-Related Quality of Life Is Better for Cardiac Arrest Survivors Who Received Citizen Cardiopulmonary Resuscitation

Ian Stiell, MD, MSc, FRCPC; Graham Nichol, MD, MPH, FRCPC; George Wells, PhD; Valerie De Maio, MD, MSc; Lisa Nesbitt, RRCP, MHA; Josée Blackburn, BSc; Daniel Spaite, MD; for the OPALS Study Group

Background—This study evaluated the prehospital factors associated with better health-related quality of life for survivors of out-of-hospital cardiac arrest.

Methods and Results—This prospective, 20-community, cohort study involved consecutive, adult out-of-hospital cardiac arrest patients who survived to 1 year. Patients were contacted by telephone and evaluated for the Health Utilities Index Mark III (HUI3), which describes health as a utility score on a scale from 0 (dead) to 1.0 (perfect health). The 8091 cardiac arrest patients had overall survival rates of 5.2% to hospital discharge and 4.0% to 1 year. We successfully contacted and evaluated 268 of 316 (84.8%) of known 1-year survivors. The median HUI3 score was 0.80 (interquartile range, 0.50 to 0.97), which compares well with age-adjusted values for the general population (0.83). Logistic regression identified 2 factors independently associated with very good quality of life (HUI3 >0.90) and their odds ratios (95% CIs), as follows: age 80 years or older, 0.3 (0.1 to 0.84), and citizen-initiated cardiopulmonary resuscitation (CPR), 2.0 (1.2 to 3.4) (Hosmer-Lemeshow goodness-of-fit statistic, 0.74).

Comparison of the Cerebral Performance Category Score and the Health Utilities Index for Survivors of Cardiac Arrest

Ian G. Stiell, MD, MSc, FRCPC

Lisa P. Nesbitt, MHA

Graham Nichol, MD, MPH

Justin Maloney, MD, FRCPC

Jonathan Dreyer, MD, FRCPC

Tammy Beaudoin, CCHRA

Josée Blackburn, BSc

George A. Wells, PhD

For the OPALS Study Group

From the Department of Emergency Medicine (Stiell, Maloney), Department of Medicine (Wells), Department of Epidemiology and Community Medicine (Stiell, Wells), and Clinical Epidemiology Program (Stiell, Nesbitt, Beaudoin, Blackburn, Wells), Ottawa Health Research Institute, University of Ottawa, Ottawa, Ontario, Canada; the Department of Medicine (Dreyer), University of Western Ontario, London, Ontario, Canada; and the Department of Medicine (Nichol), University of Washington, Seattle, WA.

Study objective: The Cerebral Performance Category score is an easy to use but unvalidated measure of functional outcome after cardiac arrest. We evaluate the comparability of results from the Cerebral Performance Category scale versus those of the validated but more complex Health Utilities Index scale for health-related quality of life.

Methods: This prospective substudy of the Ontario Prehospital Advanced Life Support (OPALS) Study included adult out-of-hospital cardiac arrest patients treated in 20 cities. This prospective cohort study included all survivors of out-of-hospital adult cardiac arrest enrolled in phase II (rapid basic life support with defibrillation) and phase III (advanced life support) of the OPALS Study, as well as the intervening run-in phase. Survivors

Summary of Evidence from the OPALS Study: Cardiac Arrest

- Bystander CPR (2nd Link) increases survival 3-4x
- Rapid defibrillation (3rd Link) increases survival 3x
- ALS (4th Link) no clear additional benefit
- PAD has limited potential impact
- Quality of life of survivors very good

Summary of Evidence from the OPALS Study: Critically Ill Patients

- **Respiratory Distress:**
 - Clear benefit from ALS
 - Most important treatments not clear
- **Chest Pain:**
 - Also clear benefit from ALS
 - Which drugs most useful?
- **Major Trauma:**
 - No benefit and potential harm from ALS

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Cardiac Arrest ALS Response Targets

Defib at scene \leq 8 min	94%
ALS paramedic at scene	93%
ALS paramedic 11 min	87%
Successful intubation	94%
Successful IV insertion	85%