

Impact of the Implementation of a Critically Ill Patient Bundle of Care on the Performance of Key Medical interventions for Respiratory Distress Patients by Paramedics in the Field

Mark E Pinchalk, MS, EMT-P
Patient Care Coordinator
City of Pittsburgh EMS

Mark Tomassi, EMT-P
Ronald Roth, MD
James Dlutowski, NREMT-P
Simon Taxel, BS, NREMT-P
Jeff Reim, Jr., BS, NREMT-P
Tom Goode, BS, NREMT

Disclosures

- None

Background

- Bundles of care have been advocated as a process based system to improve patient care and outcomes using evidenced based guidelines.
- For prehospital patients with specific medical (non-traumatic) conditions execution of key, evidenced based interventions in the field by EMS providers is associated with reduced mortality.

Impact for prehospital intervention for Sepsis

Model	+ Catheter, no fluid	+ Catheter, + fluid
	OR (95%CI)	OR (95%CI)
Unadjusted	1.27 (0.71, 2.27)	2.05 (1.71, 2.46)
Partial adjustment: demographics & prehospital physiology**	0.58 (0.32, 1.06)	1.27 (0.98, 1.62)
Full adjustment**	0.31 (0.17, 0.57)	0.45 (0.25, 0.89)

Sensitivity analyses: *

Prehospital hypotension (SBP < 110 mmHg)	0.40 (0.28, 0.67)	0.28 (0.20, 0.85)
Advanced life support only	0.24 (0.14, 0.39)	0.31 (0.12, 0.80)

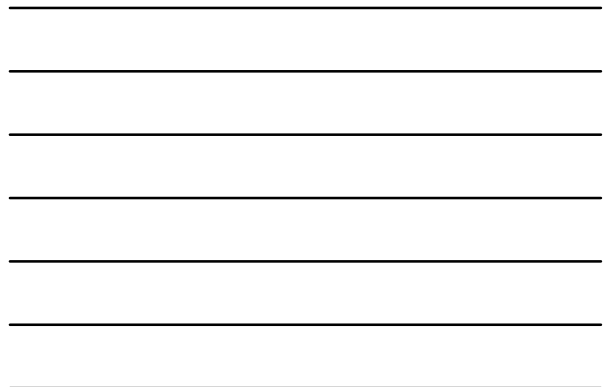
Adjustment variables: demographics, prehospital physiology, transport intervals, EMS interventions, transport mode, EMS diagnostic category, prehospital location

55% reduction in the odds of death comparing severe sepsis patients who did and did not receive prehospital fluid

Similar reduction if patient received catheter alone

Seymore, et al., *Ann Emergency Med.* (2012)

Intravenous access during pre-hospital emergency care of non-injured patients: a population-based outcome study



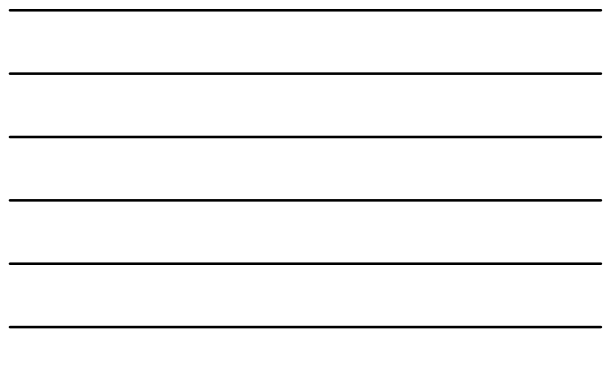
Prehospital Interventions for Respiratory Distress: OPALS Trail

Steill, et al., *New England Journal of Medicine* (2007)

Outcome	Basic Life Support Phase (n=1089)	Advanced Life Support Phase (n=1078)	Mean Rank Change (95% CI)	P Value
Functional status at arrival (N)	568 (51.4%)	507 (47.0%)	1.4 (0.4 to 2.4)	0.01
Cardiac arrest on arrival (N)	189 (17.3%)	170 (15.8%)	0.1 (0.7 to 0.6)	<0.001
Intubated on arrival (N)	117 (10.7%)	137 (12.7%)	-0.2 (-0.5 to 0.1)	0.12
Status of patient on arrival				<0.001
Improved	527 (48.4%)	487 (45.2%)	0.2 (0.2 to 0.2)	
Unchanged	36 (3.3%)	33 (3.1%)	0.2 (0.0 to 0.4)	
Worsened	14 (1.3%)	17 (1.6%)	-0.3 (-0.4 to -0.2)	
Unstable on arrival	3 (0.3%)	3 (0.3%)	0.0 (0.0 to 0.0)	<0.001
Died	176 (16.2%)	182 (17.0%)	-0.2 (-0.2 to -0.2)	
Discharged	45 (4.1%)	47 (4.4%)	0.2 (0.1 to 0.3)	0.08
Transferred to hospital	49 (4.5%)	46 (4.3%)	0.0 (0.0 to 0.0)	0.17
Admitted to hospital (N)	347 (31.9%)	347 (32.3%)	0.0 (0.0 to 0.0)	0.10
Length of stay - mean	3.6 (2.2)	3.6 (2.2)	0.0	0.88
Discharge to home - no. (%)	245 (22.5%)	245 (22.8%)	0.0 (0.0 to 0.0)	0.92
Discharge to other facility - no. (%)	3 (0.3%)	4 (0.4%)	1.1 (0.4 to 1.8)	0.06

CONCLUSIONS

The addition of a specific regimen of out-of-hospital advanced life support interventions to an existing EMS system that provides basic life support was associated with a decrease in the rate of death of 1.9 percentage points among patients with respiratory distress.

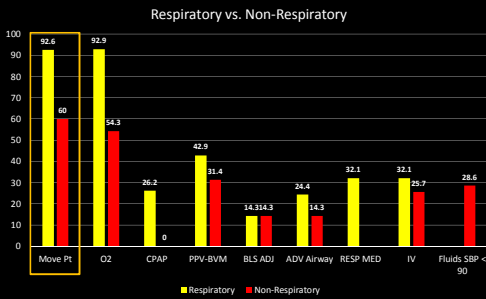


Pittsburgh EMS: 2010-2013

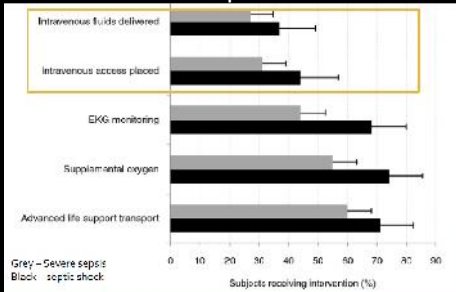
- Failure to accomplish critical interventions for medical patients associated with post EMS contact cardiac arrest
 - Respiratory Distress
 - Altered Mental Status
 - Medical Shock
 - Cardiac
- Mean time from EMS contact to arrest = **16.03 minutes**



Documented Interventions Prior to Arrest



Interventions in Sepsis: 206 Philadelphia EMS Patients



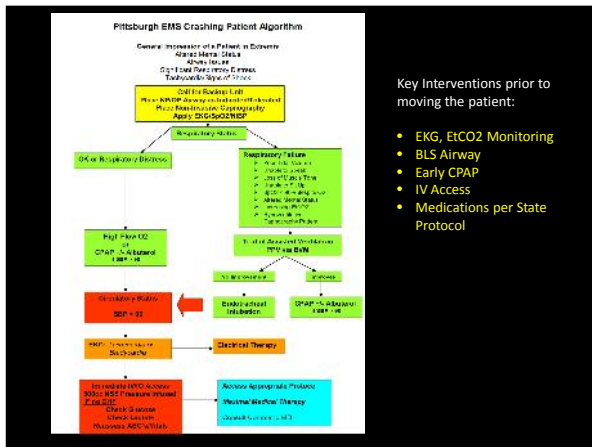
Seymour et al., 2020, J Crit Care

Hypothesis

- The implementation of a Prehospital "Crashing Patient" Critical Care Bundle would improve the execution of key prehospital interventions for patients presenting with respiratory distress and decrease the incidence of system post EMS contact cardiac arrest.

Methods

- Urban all paramedic municipal (third service) EMS System
- 63,000+ responses per year
- 3600+ Respiratory Distress calls per year
- “Crashing Patient” Critical Bundle implemented 2012-2014



- Key Interventions prior to moving the patient:
- EKG, ETCO2 Monitoring
 - BLS Airway
 - Early CPAP
 - IV Access
 - Medications per State Protocol

BRONCHOSPASM - ASTHMA		
MILD/MODERATE	MODERATE	SEVERE
<ul style="list-style-type: none"> • SpO2, ETCO2, RR, EKG • DuoNeb • Repeat albuterol as needed • IV access • Monitor for improvement or worsening 	<ul style="list-style-type: none"> • SpO2, ETCO2, RR, EKG • DuoNeb • Repeat albuterol as needed • IV access • IV Salmeterol 12.5mg • Monitor for improvement/worsening • Transition to CPAP if needed • Move to severe column if needed 	<ul style="list-style-type: none"> • SpO2, ETCO2, RR, EKG • Early CPAP • BVM if A&B • Continuous Incentive Spirometry • Early DE Epinephrine 0.2mg 1-1000 • IV access • IV Salmeterol 12.5mg • IV Magnesium 2g over 10min • Ventilation/Intubate if no improvement or worsening

COPD EXACERBATION STRATEGY		
MILD	MODERATE	SEVERE
<ul style="list-style-type: none"> • SpO2, ETCO2, RR, EKG • DuoNeb • Repeat albuterol as needed • IV access • Monitor for improvement/worsening 	<ul style="list-style-type: none"> • SpO2, ETCO2, RR, EKG • DuoNeb • Repeat albuterol as needed • IV access • IV Salmeterol 12.5mg • Monitor for improvement/worsening • Transition to CPAP if needed • Move to severe column if needed 	<ul style="list-style-type: none"> • SpO2, ETCO2, RR, EKG • Early CPAP • BVM if A&B • Continuous Incentive Spirometry • IV Salmeterol 12.5mg • IV Magnesium 2g over 10min • Ventilation/Intubate if no improvement or worsening • Response for pt's that are loaded toward admission, even if B&B

Methods

- Implementation 2012-2017:
 - Bureau wide training
 - Classroom, skill & scenario based
 - Field Case Based Scenario Training
 - QI Feedback on cases and system performance

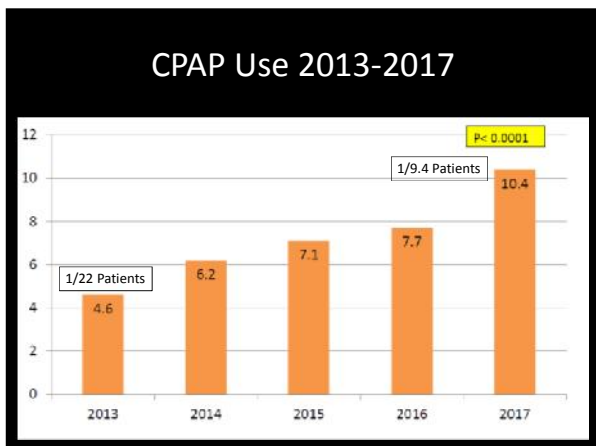


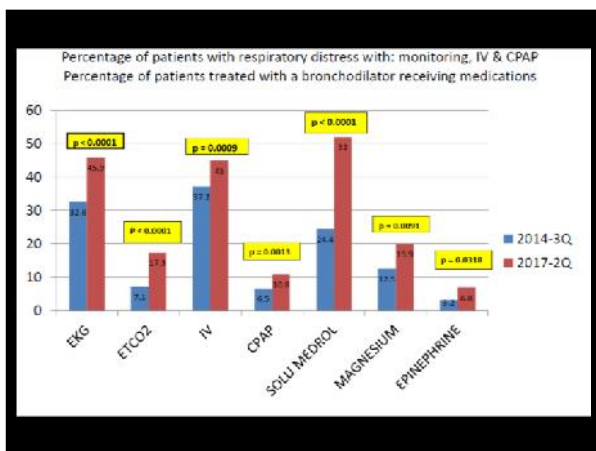
Methods – Data Collection

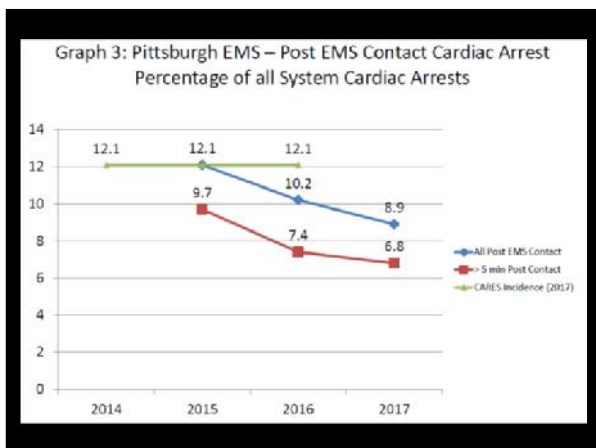
- Data collected out of ePCR: EMSCharts®
- Calls coded “Respiratory Distress”
 - 3rd Quarter (July-September) 2014: 905 Cases
 - 2nd Quarter (April-June) 2017: 885 Cases
- Measured
 - EKG monitoring
 - EtCO₂ monitoring
 - IV initiation
 - CPAP Use (also measured CPAP use per year 2013-2017)

Methods – Data Collection

- For patients with bronchospasm receiving Albuterol® or Atrovent® measured use of:
 - Solu-Medrol®
 - Magnesium Sulfate
 - 1:1000 Epinephrine
- 3rd QTR 2014: 408 of 905 cases (45.1%)
- 2nd QTR 2017: 306 of 885 cases (34.6%)







Results

- Significant increases in CPAP usage from 2013-2017
- Significant increases in EKG monitoring, EtCO₂ monitoring & IV access in 2017 vs. 2014.
- Significant increases in the administration of medications for patients with bronchospasm
 - Solu-Medrol ®
 - Magnesium Sulfate
 - 1:1000 Epinephrine

Decrease in the incidence of post EMS contact cardiac arrest that was not significant

Effect of Out-of-Hospital Noninvasive Positive-Pressure Support Ventilation in Adult Patients With Severe Respiratory Distress: A Systematic Review and Meta-analysis

Suzanne Mui, MD, FRCPC¹; Shafiqul Islam, MD²; Ma Ina Park, MD, FRCPC³; Miki Mori, MD, PhD⁴; Miki Mori, MD, PhD⁵; Michael Liew, MD, FRCPC⁶

¹Corresponding Author. Email: smui@stj.org

Study objectives: Noninvasive positive-pressure ventilation (NPPV) is increasingly being used by emergency medical services (EMS) for treatment of patients in respiratory distress. The primary objective of this systematic review is to determine whether out-of-hospital NPPV for treatment of adults with severe respiratory distress reduces in-hospital mortality compared with "standard of care" (respiratory therapists are to determine the need for invasive ventilation, intubate and ICU length of stay) and conditions.

Methods: Electronic searches of MEDLINE, EMBASE, Cochrane Central Register of Controlled Trials, and Cumulative Index to Nursing and Allied Health Literature were conducted and reference lists of relevant articles hand-searched. Randomized controlled trials comparing out-of-hospital NPPV with standard therapy in adults (aged > 18 years) with severe respiratory distress published in English were included. Two reviewers independently screened abstracts, assessed quality of the studies, and extracted data. Data were pooled with random-effects models and reported as risk ratios (RR) with 95% confidence intervals (CI) and number needed to treat (NNT).

Results: Seven randomized controlled trials were included with a combined total of 832 patients (513 in the standard therapy group and 319 in the NPPV group). In patients treated with NPPV, the pooled estimate showed a reduction in both in-hospital mortality (RR 0.68, 95% CI 0.38 to 0.95, NNT = 18) and need for invasive ventilation (RR 0.51, 95% CI 0.24 to 0.58, NNT = 8). There was no difference in ICU or hospital length of stay.

Conclusions: Out-of-hospital administration of NPPV appears to be an effective strategy for adult patients with severe respiratory distress. (RR: *Chest* 2018;153:1002-1012.)

Please see page 1012 for the CMAJ's Complete Summary of this article.

A full-text version of this article is available at www.ccmjournal.com.
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NNT to prevent one death = 18
NNT to prevent one intubation = 8

Limitations

- Retrospective data review that did not take into account the initial severity of patient presentation
- No data on patient outcome other than the incidence of post EMS contact cardiac arrest

Conclusions

- The implementation of a prehospital critical (“crashing”) patient bundle of care resulted in significant performance improvements in accomplishing key interventions for respiratory distress patients by paramedics in the field setting.
- Patient care bundles may have significant utility to improve patient care and safety in the prehospital setting

Questions ?

