



NAEMSP

NAEMSP

BLS is more than basic, it's fundamental to good care

The Ontario Prehospital Advanced Life Support (OPALS) Study — a must read for EMS, investigates cardiac arrest, major trauma and respiratory distress

Mar 5, 2020

By Erin Brennan, MD, MPH
EMS MEd Editor, Maia Dorsett, MD, PhD, FAEMS

Recently on Twitter, one of our colleagues, Joshua Stilley, an EMS Physician, tweeted the following:



His description suggests an important change in our lexicon. The way we describe things assigns value – and basic implies that it is easy to do and sounds much less attractive than “advanced.” But there is a large body of evidence that suggests that not only is BLS care is fundamental to good

outcomes, but that some aspects of “advanced” care can distract/detract from the “fundamentals” that really make a difference to patients.



There is a large body of evidence that suggests that not only is BLS care is fundamental to good outcomes, but that some aspects of “advanced” care can distract/detract from the “fundamentals” that really make a difference to patients. (AP Photo/Julie Bennett)

OPALS

The 800-pound gorilla of literature on this topic is the Ontario Prehospital Advanced Life Support (OPALS) Study, which is a must read for any EMS physician or professionals [1-5]. The OPALS study was a before and after study which examined patient outcomes before and after the introduction of advanced life support with the province of Ontario, Canada. The OPALS investigators focused on three conditions: [cardiac arrest](#), major trauma and respiratory distress.

CARDIAC ARREST

The OPALS investigators enrolled 5638 patients: 1319 consecutive patients in a 12-month rapid defibrillation (basic life support) phase and 4247 in an advanced-life-support phase of their study [3]. Their primary study outcome, rate of survival to hospital discharge, did not improve significantly when they moved from the rapid-defibrillation phase to the advanced life support phase (5.0% to 5.1%, $P = 0.83$) [6]. They did see improvement in rates of [ROSC](#) (12.9% to 18.0%, $P < 0.001$) and survival to hospital admission (10.9% to 14.6%, $P < 0.001$) but no increase in the number of survivors with good neurologic outcome (cerebral performance category 1) (78.3% vs 66.8%, $P = 0.83$) [3].

Despite the lack of evidence for the effectiveness of advanced life support in out of hospital cardiac arrest, Phase I of the OPALS trial highlighted the importance of other components of the chain of survival including EMS response intervals, [bystander CPR](#), CPR by police or fire and early defibrillation [6]. After optimization of BLS defibrillation the Ontario community saw a rise in OHCA survival from a previously published 2.5% to 3.5% overall [6]. The strength of the OPALS study is in the large number of patients enrolled across a variety of community settings. Although, none of the settings could be considered rural and applications of these findings to a rural population may not produce the same outcomes.

The findings from the OPALS trial are consistent with those of an observational cohort study of a sample of Medicare beneficiaries who experienced OHCA done by Sanghavi et al. from 2009 – 2011 [7]. The authors found that survival to hospital discharge was greater in those treated by BLS (13.1% v 9.2%) [7]. Ninety-day survival (8.0% vs 5.4%) and neurologic function among hospitalized patients (21.8% vs 44.8%) were also found to be greater in the BLS group [7].

The question is why? While there are certainly confounders that can be considered, subsequent work has found no to minimal benefit for “core” ALS-specific interventions such as [epinephrine](#), [anti-arrhythmics](#), or [endotracheal intubation](#) in cardiac arrest for neurologically-intact survival in adult patients who have suffered OHCA [8-11]. It is possible that, in the absence of prioritization of interventions, the “availability” of such ALS interventions interferes with the most *fundamental* components of resuscitation from out of hospital cardiac arrest by EMS – early defibrillation and [quality compressions](#).

MAJOR TRAUMA

The data is compelling for BLS care in cardiac arrest but is it the same in severe trauma? The OPALS study investigated whether ALS care (endotracheal intubation, IV fluid administration) improved survival to hospital discharge in patients with recent traumatic injury (less than 8 hrs) and an injury severity score greater than 12 [1]. They found no substantial difference in survival to hospital [discharge between BLS and ALS care](#) (81.8% for BLS v 81.1% for ALS). In fact, in those with GCS <9 ALS care increased mortality (60.1% v 51.2%).

The reasoning for this may be due to delayed hospital transport while ALS interventions are performed on scene or complications of endotracheal intubation. A meta-analysis by Lieberman et al performed before the publication of the OPALS trauma study came to the same conclusion – there is no benefit to on-site ALS intervention for patients with major trauma [12].

The authors also postulate that the delay in definitive care to perform ALS interventions on scene is the underlying cause of the findings. A more recent study by Rappold et al evaluated survival in patients with penetrating trauma in an urban environment who were transported via ALS, BLS or police [13]. Their findings are consistent with previous data. They found the overall adjusted OR identified a 2.51-fold increased odds of dying if treated with ALS care. The outcomes of these studies emphasize that definitive care for severely injured trauma patients is most likely to be in the operating room rather than on the side of the highway.

Additionally, as our knowledge evolves about the effect of permissive hypotension in trauma patients, the findings supporting BLS care as optimal make more and more sense [14,15].

RESPIRATORY DISTRESS

There is evidence supporting the importance of BLS care in severely injured trauma patients and patients experiencing out of hospital cardiac arrest, but does the BLS vs ALS difference hold true for respiratory distress? OPALS evaluated the addition of ALS interventions to a BLS life support system and found an overall decrease in death rate of 1.9%age points for patients admitted to the hospital [2].

However, deaths in the emergency department were unchanged. Interestingly, even in the ALS phase of the study, ALS crews only responded to 56% of the calls and ALS interventions were rarely used even then (endotracheal intubation 1.4%, IV medication administration 15%). There was a large increase in medications used for symptom relief (15.7% to 59.4%) and an increase in the paramedic evaluation of patient improvement during transport (24.5% to 45.8%). With the addition of CPAP to the BLS scope of practice, the need for ALS level care for patients in acute respiratory failure may be changing.

A meta-analysis by Williams et al in 2013 pooled data from 5 studies representing just over 1000 patients. They found a significant decrease in the number of intubations (odds ratio 0.31) and deaths (odds ratio 0.41) in the CPAP group [16].

BEYOND OPALS

Understandably, OPALS did not study every prehospital diagnosis. Indeed, there are time sensitive illnesses where ALS-level of care makes a difference in patient outcome.

MYOCARDIAL INFARCTION

The ability to perform, interpret a [12-lead EKG](#), prenotify and transport to the correct destination can shorten the door-to-balloon time resulting in smaller infarct size and reduction in morbidity and mortality [17-19]. The benefit for these patients seems to come from the ability to communicate critical EKG findings to the hospital. This can be done by paramedic interpretation and radio report or BLS EKG acquisition and transmission to the hospital for physician interpretation.

SEPSIS

A King County based study evaluated the effect of IV catheter placement and IV fluid resuscitation in patients with severe sepsis and found decreased hospital mortality for both subsets of patients [20]. The authors hypothesize that, as in MI, the benefit for patients may be related to early hospital notification and aggressive early ED management of these patients in addition to prehospital fluid resuscitation. Subsequent studies have identified benefit for fluid resuscitation itself in septic patients who present with initial hypotension [21].

THE CRASHING EMS PATIENT

The best outcome from a cardiac arrest is the one that was prevented from happening in the first place. In an effort to reduce the incidence of EMS-witnessed cardiac arrest, recent research from Pinchak et al out of Pittsburg EMS looked at a critical care bundled “stay and play” package for EMS providers to stabilize critically ill medical patients in an attempt to reduce the incidence of post EMS contact cardiac arrest [22].

This research is not yet published but is exciting. Care providers in this urban EMS systems were encouraged to stay on scene until the critical care objective were met. These objectives include aggressive management of the airway and respiratory distress/failure, aggressive management of hypotension and management of underlying dysrhythmias.

This protocol emphasizes the importance of BLS care initially in managing the airway with BVM and OPA/NPA with advanced airway placement done after fluid resuscitation and dysrhythmia management. After the initial BLS airway maneuvers ALS care become necessary with IV/IO insertion and dysrhythmia recognition and management as well as initiation of vasopressors where appropriate. With implementation of this critical care bundle, Pittsburgh EMS saw a decrease in the rate of post EMS contact cardiac arrest from 12.1% to 5.8% (p = 0.0251). This care bundle is now part of the statewide EMS protocols in Pennsylvania.

TAKE HOME POINTS ON ALS VS. BLS CARE

The standard of EMS care has evolved over time towards ALS level care in many communities around the world. To justify the cost of maintaining this level of care and skill for providers there should be considerable improvements in patient-oriented outcomes, such as neurologically intact survival after out of hospital cardiac arrest and decreased morbidity and mortality after major trauma.

The results of several large studies question the benefit to ALS interventions when BLS care is optimized. Review of the literature suggests that an understanding by EMS systems and providers of what interventions lead optimal outcomes is more complex than just the distinction between BLS and ALS care.

Some patients will benefit from advanced interventions such as fluid resuscitation and dysrhythmia management, while others require rapid transport to definitive care in the operative suite. While the issue of what level of care is best for each individual patient is far from settled, it is clear that the prehospital phase of care for all patients is critically important for outcome.

Read next: [Does ALS really matter?](#)

REFERENCES

1. Stiell, I. G., Nesbitt, L. P., Pickett, W., Munkley, D., Spaite, D. W., Banek, J., . . . for the OPALS Study Group. (2008). The OPALS major trauma study: Impact of advanced life-support on survival and morbidity. *CMAJ : Canadian Medical Association Journal = Journal De L'Association Medicale Canadienne*, 178(9), 1141-1152.
2. Stiell, I. G., Spaite, D. W., Field, B., Nesbitt, L. P., Munkley, D., Maloney, J., . . . OPALS Study Group. (2007). Advanced life support for out-of-hospital respiratory distress. *The New England Journal of Medicine*, 356(21), 2156-2164.
3. Stiell, I. G., Wells, G. A., Field, B., Spaite, D. W., Nesbitt, L. P., De Maio, V. J., . . . Lyver, M. (2004). Advanced cardiac life support in out-of-hospital cardiac arrest. *N Engl J Med*, 351(7), 647-656.
4. Stiell, I. G., Wells, G. A., Spaite, D. W., Lyver, M. B., Munkley, D. P., Field, B. J., . . . DeMaio, V. J. (1998). The ontario prehospital advanced life support (OPALS) study: Rationale and methodology for cardiac arrest patients. *Annals of Emergency Medicine*, 32(2), 180-190.

5. Stiell, I. G., Wells, G. A., Spaite, D. W., Nichol, G., O'Brien, B., Munkley, D. P., . . . Anderson, S. (1999). The ontario prehospital advanced life support (OPALS) study part II: Rationale and methodology for trauma and respiratory distress patients. *Annals of Emergency Medicine*, 34(2), 256-262.
6. Stiell, I. G., Wells, G. A., DeMaio, V. J., Spaite, D. W., Field, B. J., Munkley, D. P., . . . Ward, R. (1999). Modifiable factors associated with improved cardiac arrest survival in a multicenter basic life support/defibrillation system: OPALS study phase I results.
7. Sanghavi, P., Jena, A. B., Newhouse, J. P., & Zaslavsky, A. M. (2015). Outcomes after out-of-hospital cardiac arrest treated by basic vs advanced life support. *JAMA Internal Medicine*, 175(2), 196-204.
8. Perkins, G. D., Ji, C., Deakin, C. D., Quinn, T., Nolan, J. P., Scopin, C., . . . PARAMEDIC2 Collaborators. (2018). A randomized trial of epinephrine in out-of-hospital cardiac arrest. *The New England Journal of Medicine*, 379(8), 711-721.
9. Kudenchuk, P. J., Brown, S. P., Daya, M., Morrison, L. J., Grunau, B. E., Rea, T., ... & Larsen, J. (2014). Resuscitation Outcomes Consortium–Amiodarone, Lidocaine or Placebo Study (ROC-ALPS): Rationale and methodology behind an out-of-hospital cardiac arrest antiarrhythmic drug trial. *American heart journal*, 167(5), 653-659.
10. Bengert, J. R., Kirby, K., Black, S., Brett, S. J., Clout, M., Lazaroo, M. J., ... & Smartt, H. (2018). Effect of a strategy of a supraglottic airway device vs tracheal intubation during out-of-hospital cardiac arrest on functional outcome: the AIRWAYS-2 randomized clinical trial. *Jama*, 320(8), 779-791.
11. Wang, H. E., Schmicker, R. H., Daya, M. R., Stephens, S. W., Idris, A. H., Carlson, J. N., ... & Puyana, J. C. J. (2018). Effect of a strategy of initial laryngeal tube insertion vs endotracheal intubation on 72-hour survival in adults with out-of-hospital cardiac arrest: a randomized clinical trial. *Jama*, 320(8), 769-778.
12. Liberman, M., Mulder, D., & Sampalis, J. (2000). Advanced or basic life support for trauma: Meta-analysis and critical review of the literature. *The Journal of Trauma: Injury, Infection, and Critical Care*, 49(4), 584-599.
13. Rappold, J. F., Hollenbach, K. A., Santora, T. A., Beadle, D., Dauer, E. D., Sjöholm, L. O., . . . Goldberg, A. J. (2015). The evil of good is better: Making the case for basic life support transport for penetrating trauma victims in an urban environment. *The Journal of Trauma and Acute Care Surgery*, 79(3), 343-348.
14. Silbergleit, R., Satz, W., McNarnara, R. M., Lee, D. C., & Schoffstall, J. M. (1996). Effect of permissive hypotension in continuous uncontrolled intra-abdominal hemorrhage. *Academic Emergency Medicine*, 3(10), 922-926.
15. Wiles, M. D. (2017). Blood pressure in trauma resuscitation: 'pop the clot' vs. 'drain the brain'? *Anaesthesia*, 72(12), 1448-1455.



16. Williams, T. A., Finn, J., Perkins, G. D., & Jacobs, I. G. (2013). Prehospital continuous positive airway pressure for acute respiratory failure: A systematic review and meta-analysis. *Prehospital Emergency Care*, 17(2), 261-273.
17. Kobayashi, A., Misumida, N., Aoi, S., Steinberg, E., Kearney, K., Fox, J. T., et al. (2016). STEMI notification by EMS predicts shorter door-to-balloon time and smaller infarct size. *The American Journal of Emergency Medicine*, 34(8), 1610-1613.
18. Kontos, M. C., Gunderson, M. R., Zegre-Hemsey, J. K., Lange, D. C., French, W. J., Henry, T. D., . . . Garvey, J. L. (2020). Prehospital activation of hospital resources (PreAct) ST-segment-elevation myocardial infarction (STEMI): A Standardized approach to prehospital activation and direct to the catheterization laboratory for STEMI recommendations from the american heart association's mission: Lifeline program. *Journal of the American Heart Association*, 9(2), e011963.
19. Shavadia, J. S., Roe, M. T., Chen, A. Y., Lucas, J., Fanaroff, A. C., Kochar, A., ... & Bagai, A. (2018). Association between cardiac catheterization laboratory pre-activation and reperfusion timing metrics and outcomes in patients with ST-segment elevation myocardial infarction undergoing primary percutaneous coronary intervention: A report from the ACTION registry. *JACC: Cardiovascular Interventions*, 11(18), 1837-1847.
20. Seymour, C.W., Cooke, C.R., Heckbert, S.R. et al. Prehospital intravenous access and fluid resuscitation in severe sepsis: an observational cohort study. *Crit Care* 18, 533 (2014).
21. Lane, D. J., Wunsch, H., Saskin, R., Cheskes, S., Lin, S., Morrison, L. J., & Scales, D. C. (2018). Association between early intravenous fluids provided by paramedics and subsequent in-hospital mortality among patients with sepsis. *JAMA network open*, 1(8), e185845-e185845.
22. Pinchalk, M., Palmer, A., Dlutowski, J., Mooney, J., Studebaker, A., Taxel, S., Reim Jr., J., Frank, P. (2019) Utility of a prehospital "crashing patient" care bundle in reducing the incidence of post EMS Contact cardiac arrest of critically ill medial patients.

About the author

The [National Association of EMS Physicians](#) (NAEMSP) is an organization of physicians and other professionals partnering to provide leadership and foster excellence in the subspecialty of EMS medicine. The NAEMSP promotes meetings, publications and products that connect, serve and educate its members, and acts as an advocate of EMS-related decisions in cooperation with organizations throughout the country.

Tags > [ALS](#) • [Basic Life Support \(BLS\)](#) • [Cardiac arrest](#) • [NAEMSP](#) • [Respiratory Distress](#) • [Trauma](#)

RECOMMENDED FOR YOU

| | | | | | | | |
|---|--|--|--|---|--|---|---|
|  | | Man collapses at meeting where residents questioned reduced emergency services | | Calif. mandate requires EMTs to receive advanced training | | Ohio FD to start ambulanc |  |
|---|--|--|--|---|--|---|---|




JOIN THE DISCUSSION



Be the first
to comment

Please [sign in](#) or [register](#) to write your own comments below.
Before commenting, please read [EMS1 's Commenting Policy](#)

EMS1 TOP 5

- 1 Proactively expanding the EMT and paramedic scope of practice  2
- 2 EMT asked to remove thin line, half-Confederate flags at racetrack
- 3 Study: Stress cardiomyopathy cases doubled during pandemic
- 4 EMS physician assistants: Are they the next paramedic practitioner?  4
- 5 La. offers \$250 in hazard pay on first-come, first-served basis  1

[MORE EMS1 ARTICLES >](#)

Copyright © 2020 ems1.com. All rights reserved.