OUTCOMES OF BASIC VERSUS ADVANCED LIFE SUPPORT FOR OUT-OF-HOSPITAL MEDICAL EMERGENCIES

Journal Club Appraisal: Sanghavi P, Jena AB, Newhouse JP, Zaslavsky AM. Ann Intern Med. 2015 Oct 13.

Abstract

Background: Most Medicare patients seeking emergency medical transport are treated by ambulance providers trained in advanced life support (ALS). Evidence supporting the superiority of ALS over basic life support (BLS) is limited, but some studies suggest ALS may harm patients.

Objective: To compare outcomes after ALS and BLS in out-of-hospital medical emergencies.

Design: Observational study with adjustment for propensity score weights and instrumental variable analyses based on county-level variations in ALS use.

Setting: Traditional Medicare.

Patients: 20% random sample of Medicare beneficiaries from nonrural counties between 2006 and 2011 with major trauma, stroke, acute myocardial infarction (AMI), or respiratory failure.

Measurements: Neurologic functioning and survival to 30 days, 90 days, 1 year, and 2 years.

Results: Except in cases of AMI, patients showed superior unadjusted outcomes with BLS despite being older and having more comorbidities. In propensity score analyses, survival to 90 days among patients with trauma, stroke, and respiratory failure was higher with BLS than ALS (6.1 percentage points [95% CI, 5.4 to 6.8 percentage points] for trauma; 7.0 percentage points [CI, 6.2 to 7.7 percentage points] for stroke; and 3.7 percentage points [CI, 2.5 to 4.8 percentage points] for respiratory failure). Patients with AMI did not exhibit differences in survival at 30 days but had better survival at 90 days with ALS (1.0 percentage point [CI, 0.1 to 1.9 percentage points]). Neurologic functioning favored BLS for all diagnoses. Results from instrumental variable analyses were broadly consistent with propensity score analyses for trauma and stroke, showed no survival differences between BLS and ALS for respiratory failure, and showed better survival at all time points with BLS than ALS for patients with AMI.

Limitation: Only Medicare beneficiaries from nonrural counties were studied.

Conclusion: Advanced life support is associated with substantially higher mortality for several acute medical emergencies than BLS.

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Analysis:

1. Did the study address a clearly focused issue?

Yes…in a way.

2. Was the cohort recruited in an acceptable way?

No. Only Medicare beneficiaries from non-rural counties were studied. The authors chose a "random" 20% sample of Medicare fee-for-service beneficiaries who lived in non-rural counties, who were transported to hospital for trauma, stroke, AMI or respiratory failure. These additional exclusion criteria alone mean that the sample could not be random, introducing selection bias, reducing the internal valiity, and therefore the reliability of the results, of the study. *(An internally valid trial is one which has accounted for and reduced all potential sources of bias and error, thus ensuring reliability of results.)*

Patients were selected and analysed based on ICD-9 codes in the Medicare database, and no clinical or direct observation data was utilised. This is a considerable methodological flaw. Of note is that patients were studied from January 2006 to October 2011. Changes to clinical practices, international guidelines and evidence-based interventions throughout this period cannot be controlled for.

Medicare provides health insurance for Americans aged 65 and older who have worked and paid into the system. It also provides health insurance to younger people with disabilities, end stage renal disease and amyotrophic lateral sclerosis. While they attempted to control for the effects of patient age within their sample, it doesn't account for the fact that the sample contains an age-related bias. This reduces the external validity of the results from this study. *(An externally valid trial is one in which the results can be generalised to the "real world".)*

3. Were the exposure and outcome accurately measured to minimise bias?

The conclusions of this paper are based on a billing code for BLS or ALS care. The authors claim that it is possible that ALS providers billed

for ALS care after initial assessment of the patient even though the patient may have required only BLS level care possible, but unless they can support this with some evidence, then it's merely an allegation against ALS providers.

Because they relied on generic billing categories (BLS v ALS), there's no way for the authors, or readers to distinguish between the exact interventions performed by crews at scene or en-route. Calls billed as ALS may have been treated by BLS crews or first responders for an unknown period of time prior to the arrival of advanced life support crews.

No direct observations of patients took place in this study. Any conclusions drawn from these results must be tempered with regard to the lack of internal validity inherent to this type of study design. This is a retrospective, observational study, which can only demonstrate a correlative relationship. It did not utilise any clinical data or observation of patients. Remember that no statistical analysis can establish a cause and effect relationship using retrospective data.

4. Have the authors identified all confounding factors? Have they taken account of the confounding factors in the design and/or analysis?

The authors address several confounding factors in the text. The authors had no way of directly assessing the quality of care for emergency patients that was not susceptible to potential confounding by characteristics of ambulance services. No direct observations of patients took place in this study.

5. Was the follow up of subjects complete enough? Was it long enough?

There was no follow up with patients. This was a retrospective observational review of billing data, not clinical data. The sample only included patients with hospital Medicare claims. Patients who refused transport, or died at scene could not be accounted for.

6. What are the results of this study?

- Much of the difference in trauma survival between ALS and BLS was explained by higher mortality among ALS patients in the days immediately after trauma. At 1 year and 2 years, survival was higher with BLS but not statistically significantly.
- Much of the difference in stroke survival between ALS and BLS was explained by higher mortality among ALS patients in the days immediately after stroke. There was no statistically significant difference in neurologic functioning between BLS and ALS patients in instrumental variable analysis.
- AMI – Survival to 30 days did not statistically significantly differ between ALS and BLS in propensity score analysis. Neurologic performance did not statistically differ between BLS and ALS patients in instrumental variable analysis.
- Respiratory failure – no statistically significant survival differences between ALS and BLS. Early survival gains among patients receiving BLS narrowed with time.
- Of note is that BLS transports were more likely from a skilled nursing facility, while ALS transports were more likely from a home residence. Early recognition and intervention by other healthcare providers in the skilled nursing facility may affect the results of the BLS arm.

7. How precise are the results?

- This is a retrospective, observational study, which can only demonstrate a correlative relationship.
- It is a 'registry type' study, however, it did not utilise any clinical data or observation of patients.
- Twenty percent sample therefore small chance of inadequate sample sizing.
    - For example, in the stroke population studied (119,989) only 19,985 received BLS billed care.
    - In the AMI population (114,469) only 14,434 received BLS billed care.
    - In the respiratory failure population (82,530) only 9,502 received BLS billed care.
- Only non-rural patients were studied. The benefits of BLS treatment and rapid transport to a nearby trauma centre in urban settings is obvious. However, not all patients have access to timely BLS (or ALS) response, or live near a trauma centre.
- We suggest ALS ambulances generally carry sicker patients.

8. Should you believe the results?

The paper raises some interesting questions, but changes to care or policy should not be made based on this study's results.

9. Can the results be applied to the local population?

No. This study is based on uniquely US-centric data (Medicare billing). Medicare patients are aged 65 and older, are younger with disabilities, end stage renal disease or amyotrophic lateral sclerosis. This is not applicable to many populations. The entire population studied were also based in non-rural settings.

10. Do the results of this study fit with other available evidence?

The evidence of better outcomes in BLS or ALS systems is poorly understood, and poorly researched. Studies with poor methodology such as this one do little to advance our understanding of this issue.

11. What are the implications of this study for practice?

There should be none. A retrospective, observational study does not provide sufficiently robust evidence to recommend changes to clinical practice or policy decision making.