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Ontario Pre-hospital Advanced Life Support (OPALS) Study

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Ian G. Stiell, MD, MSc, FRCPC

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Principal Investigator:

Ian G. Stiell, MD, MSc, FRCPC
Professor and Head Department of Emergency Medicine
University of Ottawa
Distinguished Investigator
Canadian Institutes of Health Research
Clinical Epidemiology Unit
Ottawa Hospital, Civic Campus
1053 Carling Ave., Rm. F657
Ottawa, Ontario K1Y 4E9

Telephone: (613) 798-5555, Ext. 18688
Fax: (613) 761-5351

E-mail: istiell@ohri.ca

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For more information on the Canadian Health Services Research Foundation, contact the foundation at:

1565 Carling Avenue, Suite 700
Ottawa, Ontario
K1Z 8R1
E-mail: communications@chrsf.ca
Telephone: (613) 728-2238
Fax: (613) 728-3527

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1565, avenue Carling, bureau 700
Ottawa (Ontario)
K1Z 8R1
Courriel : communications@fcrss.ca
Téléphone : (613) 728-2238
Télécopieur : (613) 728-3527

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Ian G. Stiell, MD, MSc, FRCPC^{1, 2, 3}

¹ University of Ottawa

² Canadian Institutes of Health Research

³ Ottawa Hospital

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Key Implications for Decision Makers

Sudden out-of-hospital cardiac death remains an important public health problem, and many believe that advanced life support (consisting of early airway management through intubation and intravenous drug therapy) will improve survival rates for those who suffer cardiac arrest.

- Advanced life support programs showed no improvement in survival rates, compared to basic life support with rapid defibrillation programs.
- Far more important in improving survival rates were people who witnessed the cardiac arrest doing CPR and emergency personnel administering rapid defibrillation.
- Start-up costs for an advanced life support program are approximately \$48,000 per 100,000 residents and \$70,000 per life saved.
- Annual costs for the program are estimated to be \$3,000 per 100,000 residents and \$3,500 per life saved.

Executive Summary

Outline of issues

Despite improved knowledge and the widespread availability of pre-hospital advanced life support, sudden out-of-hospital cardiac death remains an important public health problem with inherent social and economic impacts. With current estimates of overall survival ranging between two and 26 percent, major opportunity exists to do better, and even small improvements will lead to many lives saved.² Early advanced life support is believed by many to be of benefit, in that it affords the opportunity to provide early advanced airway management (endotracheal intubation) and intravenous drug therapy. Despite significant and proliferating EMS system investment in advanced life support interventions and systems, the incremental benefit of advanced life support has never been established for out-of-hospital cardiac arrest, let alone for other common and serious conditions for which patients are transported to hospital by paramedics, such as respiratory distress and chest pain.

In Ontario (a jurisdiction of 11 million people) provincial and local governments, who are now jointly responsible for emergency medical service provision, increasingly require evidence-based information to support budgetary arguments to maintain and improve EMS services. The OPALS Study, the largest multi-center controlled clinical trial ever conducted in a pre-hospital setting, sought to address these issues.

Main Findings

This before-after study was conducted in 20 communities across Ontario. The first phase of the study found that, for cardiac arrest, bystanders and emergency personnel doing CPR on the patient were independently associated with survival.⁴ Implementation of rapid defibrillation programs for cardiac arrest patients in the second phase of the study demonstrated a significant improvement in survival (3.9 percent to 5.2 percent; $P=.03$).¹ This 33 percent relative increase equates to 21 additional lives saved each year in these communities, which have a combined total population of 2.5 million people. While these results are clearly important, overall survival remains low compared with other published survival rates of up to 20 percent.⁸

The study enrolled 5,637 patients with cardiac arrest during the second (basic life support with defibrillation) and third (advanced life support) phases of the study. Emergency services successfully arrived at the scene of the cardiac arrest in eight minutes or less 93.3 percent of the time, and during the advanced life support phase, intubation and IV insertion were successful 93.7 percent and 89 percent of the time, respectively. Survival did not improve between the basic life support with defibrillation and the advanced life support phases. Therefore, in an EMS system that already has optimal rapid defibrillation, advanced life support interventions did not improve patient survival.

The study also examined the effect of advanced life support emergency services on patients with respiratory distress and chest pains; those results will be published in a separate report.

Economic analysis of the study intervention shows that pre-hospital life support is very expensive. Basic life support cost a median \$9,900 per quality-adjusted life years, basic life support with defibrillation cost a median \$112,500 per additional quality-adjusted life year, and advanced life support cost a median \$122,300 per additional quality-adjusted life year. These incremental costs are similar to those of other defibrillation interventions for cardiac arrest (such as implantable defibrillator) but more than those of prevention interventions for cardiovascular disease (such as *statin* therapy or lifestyle advice). The results were sensitive to changes in several variables, including response time intervals and the probability of survival from admission to discharge. The study found that basic life support with defibrillation and advanced life support are effective but expensive compared to basic life support. EMS systems reduce response time intervals and improve the cost-effectiveness of treatment for patients with cardiac arrest.