

## Clinical Summary - PulsePoint

### Bystander Response to Cardiac Arrest is Critical to Improve Rates of Effective Resuscitation

#### Introduction

Utilizing laypeople as CPR/AED responders for out-of-hospital cardiac arrest has been occurring to some extent over the last decade. Advances in cellular technology are enhancing the ability to notify and direct laypersons trained in CPR/AED to the scene of a cardiac arrest. The key take-aways from the summaries of the four references in this paper are:

- A layperson alerting system increases bystander CPR rates (Ringh)
- CPR prior to EMS arrival more than doubles 30-day survival in a European urban setting (Hasselqvist-Ax)
- Similar results were seen in urban, suburban and rural communities in North Carolina (Hansen).
- The Institute of Medicine in Washington, DC released a report on strategies to improve cardiac arrest survival in July 2015. One of the eight recommendations discussed was that bystanders need to be prepared and willing to deliver basic life support before professional responders arrive. Additionally, it calls out the PulsePoint mobile app as an example of ways to empower bystanders to act quickly in emergency situations.

#### 1. Ringh M, Rosenqvist M, Hollenberg J, et al. Mobile-Phone Dispatch of Laypersons for CPR in Out-of-Hospital Cardiac Arrest. *New England Journal of Medicine*. 2015;372:2316-2325.

#### Background

Study investigated whether rates of bystander-initiated CPR could be increased with the use of a mobile-phone positioning system that could instantly locate mobile-phone users and dispatch lay volunteers who were trained in CPR to a patient nearby with out-of-hospital cardiac arrest. The primary endpoint was number of patients receiving bystander-initiated CPR. Calls requiring dispatcher-assisted CPR were excluded.

#### Methods

This blinded, randomized, controlled trial took place in Stockholm from April 2012 through December 2013. A mobile-phone positioning system was developed specifically for use in this study. Once emergency services were dispatched for a cardiac arrest call, the system located and notified trained volunteers who were within 0.3 miles (500 m) of the patients.

#### Results

A total of 5,989 lay volunteers who were trained in CPR were recruited initially, and overall 9,828 were recruited during the study. The rate of bystander-initiated CPR was 62% (188 of 305 patients) in the intervention group and 48% (172 of 360 patients) in the control group. No major adverse events were reported.

#### Conclusions

A mobile-phone positioning system to dispatch lay volunteers who were trained in CPR was associated with significantly increased rates of bystander-initiated CPR among persons with out-of-hospital cardiac arrest.

#### Physio-Control Discussion Points

**The notification system in the study is a more basic version of PulsePoint but comparable in its intention.**

#### PulsePoint may have similar and improved results due to:

- Registration is via free mobile app.
- Activation occurs instantly without any additional workflow from the dispatcher.
- The PulsePoint app shows an interactive map of the incident, user and nearby AEDs. The study used a web link in a standard text message; a better user interface is likely to drive better compliance and response.
- This study only looked at arrest occurring during the daytime. PulsePoint is active 24/7.
- While this study did not include children under 8 years old, the PulsePoint app has already played a part in the successful resuscitation of a 1-month old in Washington State.
- The conclusion states: "Future integration of mobile-phone positioning systems with AED registries may facilitate lay responders in locating the nearest AED and thereby increase efficacy in public-access defibrillation programs." PulsePoint already does this.

**2. Hasselqvist-Ax I, Riva G, Herlitz J, et al. Early Cardiopulmonary Resuscitation in Out-of-Hospital Cardiac Arrest. *New England Journal of Medicine*. 2015;372:2307-2315.**

**Background**

Three million people in Sweden are trained in cardiopulmonary resuscitation (CPR). But whether this training has an impact has been questioned. This study looked at whether bystander CPR was associated with 30-day survival of out-of-hospital cardiac arrest victims.

**Methods**

The study analyzed a total of 30,381 out-of-hospital cardiac arrests witnessed in Sweden from January 1, 1990, through December 31, 2011, to determine whether CPR was performed before the arrival of emergency medical services (EMS) and whether early CPR was correlated with survival.

**Results**

- CPR was performed before the arrival of EMS in 15,512 cases (51.1%) and was not performed before the arrival of EMS in 14,869 cases (48.9%).
- The 30-day survival rate was 10.5% when CPR was performed before EMS arrival versus 4.0% when CPR was not performed before EMS arrival ( $P < 0.001$ ).

**Conclusion**

CPR performed before EMS arrival was associated with a 30-day survival rate after an out-of-hospital cardiac arrest that was more than twice as high as that associated with no CPR before EMS arrival.

**Physio-Control Discussion Points**

- PulsePoint activates trained bystander during the crucial minutes before on-duty professionals arrive on scene.
- The Ringh study showed a 30% increase of bystander CPR in the group notified by the mobile system over the control group. This study showed that bystander CPR provided prior to EMS arrival improves 30 day survival more than 2 fold.
- Utilization of a system like PulsePoint has the potential to achieve survival rates similar to those in these studies.

**3. Hansen C, Kragholm K, Pearson D, et al. Association of bystander and first-responder intervention with survival after out-of-hospital cardiac arrest in North Carolina, 2010-2013. *JAMA*. 2015;314:255-264.**

**Background**

- In 2010, the HeartRescue Project in North Carolina introduced a statewide initiative to improve bystander and first-responder efforts. The initiative involved urban, suburban and rural communities.

**Purpose**

- To observe changes over time in bystander/first-responder resuscitation efforts prior to arrival of the emergency medical services (EMS).
- To examine the association between bystander/first-responder resuscitation efforts to survival and neurological outcome.

**Methods**

- 4,961 out-of-hospital cardiac arrest patients with attempted resuscitation who were identified through the Cardiac Arrest Registry to Enhance Survival (CARES) were included in the study.
- First responders included: dispatched police officers, firefighters, rescue squad or lifesaving crew trained to perform basic life support until arrival of EMS.

**Results**

- The combination of bystander CPR and first-responder defibrillation increased from 14.1% in 2010 to 23.1% in 2013 ( $P < .01$ ).
- Survival with favorable neurological outcome increased from 7.1 in 2010 to 9.7% in 2013 ( $P = .02$ ) and was associated with bystander-initiated CPR.
- Adjusting for age and sex, bystander and first-responder interventions were associated with higher survival to hospital discharge.
- Survival:
  - EMS-initiated CPR and defibrillation was 15.2% compared with 33.6% following bystander-initiated CPR and defibrillation.
  - 24.2% following bystander CPR and first-responder defibrillation.
  - 25.2% following first-responder CPR and defibrillation.

**Conclusions**

- The proportion of patients receiving bystander-initiated CPR and defibrillation by first responders increased and was associated with greater likelihood of survival.
- Bystander-initiated CPR was associated with greater likelihood of survival with favorable neurological outcome.

**Physio-Control Discussion Points**

- Initiatives such as the one in North Carolina that improve bystander CPR initiation have clinical impact on the survival of patients who experience out-of-hospital cardiac arrest, leading to statistically significant increase in survival with favorable neurological outcomes.
- PulsePoint is a tool for engaging CPR-trained bystanders, removing the reliance on chance and using technology to get bystanders to those that require CPR as quickly as possible to drive positive clinical outcomes.

**4. IOM (Institute of Medicine). 2015. Strategies to improve cardiac arrest survival: A time to act. Washington, DC: The National Academies Press.**

This report outlined a total of eight recommendations designed to improve low survival rates from cardiac arrest. One of these are highlighted below:

**Recommendation #2: Foster a Culture of Action Through Public Awareness and Training**

- State and local departments of health should promote public awareness creating a culture of action that prepares and motivates bystanders to respond immediately upon witnessing a cardiac arrest, p.12.

**Chapter 3: The Public Experience with Cardiac Arrest**

- “The immediate, hands-on response of bystanders to cardiac arrest is critical to improve rates of effective resuscitation and, thereby, increase the likelihood of survival and positive neurologic outcomes for out-of-hospital cardiac arrest (OHCA) across the United States.” p.103
- “For example, a definitive body of literature demonstrates statistically significant improvements to cardiac arrest survival rates when bystander CPR is performed. By preventing the degradation of ventricular fibrillation (VF)—a shockable cardiac arrest rhythm—to a nonshockable cardiac arrest rhythm, CPR increases the number of patients who can be successfully resuscitated through defibrillation.” p.103

- “Bystander CPR is also associated with improved health outcomes for individuals who survive cardiac arrest. A number of studies have also found increased quality of life following cardiac arrest for individuals who receive bystander CPR compared to individuals who do not receive bystander CPR.” p.104
- “Bystander CPR makes the next link in the chain of survival, early defibrillation, more effective by increasing the proportion of individuals who are found with a shockable rhythm.” p.105
- “Many national and international registry studies indicate that bystander CPR can increase survival rates for OHCA between 50 and 500 percent.” p.106
- “Other efforts—such as the PulsePoint Foundation in San Ramon, California—have focused on using smartphones to alert potential bystanders to cardiac arrest and AED locations in actual emergencies (PulsePoint Foundation, 2014)”. p.141
- “PulsePoint mobile apps share information about cardiac arrests in public locations with nearby bystanders. Occurring in real time, the alert system allows nearby participants to respond to the scene and use CPR and/or an AED for resuscitation. This program also uses crowdsourcing to empower bystanders to act quickly and responsibly in emergency situations.” p.142

**In summary, this body of literature indicates bystander-initiated CPR for out-of-hospital cardiac arrest patients has enormous implications that address the strategy for improving outcomes. Activation of trained bystanders in cardiac arrest situations can be greatly enhanced in communities that invest in a mobile system like PulsePoint.**

For further information, please contact Physio-Control at 800.442.1142 (U.S.), 800.895.5896 (Canada) or visit our website at [www.physio-control.com](http://www.physio-control.com).

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