



## Hypertension identification via emergency responders: A randomized controlled intervention study

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### ABSTRACT

**Objective.** The objective was to test the effectiveness of a mail campaign that included blood pressure (BP) measurements from patients treated by emergency medical technicians (EMTs) to motivate them to (re) check their BP at a fire station. The mailing used a 2 × 2 research design tailoring on risk and source personalization.

**Method.** In this randomized controlled trial, participants were randomized into a control group or one of four experimental groups. Participants residing in one of four fire departments in a Pacific Northwest metropolitan area were eligible if they had a systolic BP ≥ 160 mm Hg and/or diastolic BP ≥ 100 mm Hg when seen by EMTs during the study period (July 2007–September 2009).

**Results.** Of 7106 eligible participants, 40.7% were reached for a follow-up interview. Multivariable logistic regression analysis showed that although the absolute number of fire station BP checks was low (4%), participants who received any mailed intervention had a 3 to 5-fold increase in the odds of reporting a fire station BP check over controls. Fire station visits did not differ by type of tailored mailing.

**Conclusion.** Partnering with Emergency Medical Services is an innovative way to identify high-risk community members for population health interventions.

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### Introduction

Heart disease is the number one killer of Americans, and stroke is the fourth leading cause of death in the U.S. (CDC, 2009). High blood pressure (BP) is a significant risk factor for heart disease and stroke (AHA, 2010) and affects about 76 million adult Americans (AHA, 2012; NHLBI, 2012). Randomized controlled trials have shown that lowering BP results in significant reductions in cardiovascular mortality and morbidity (Kriebhard et al., 2009). Current hypertension management guidelines recommend target BP measures below 140/90 mmHg (AHA, 2010).

Measuring BP is often part of routine procedures for patient evaluation in medical care facilities. However, the lack of a regular source of care is associated with untreated hypertension (Spatz et al., 2010) and lack of insurance with fewer BP checks and inadequate BP control compared to privately insured individuals (Duru et al., 2007). Individuals who are poor and/or uninsured are more likely to use emergency

care as a source of health care (Lucas and Sanford, 1998; Northington et al., 2005; Svenson, 2000).

In the prehospital care delivery system, emergency medical technicians (EMTs) and paramedics routinely collect medical information that might be indicative of chronic disease. Emergency Medical Services (EMS) take vital signs (including BP) on the majority of patients regardless of the reason for the call. These data have traditionally been archived without follow-up or feedback to the patients (Trevino et al., 2008). As EMS serves a broad cross-section of the population there might be an opportunity to identify community members at risk for uncontrolled high BP via emergency responders. Our study aims were (1) to report BP information back to patients identified by EMTs during lower-acuity 911 visits as potentially at risk for uncontrolled hypertension; and 2) to motivate them to have their BP checked again at a local fire station.

### Methods

#### Setting

The study was conducted in a large metropolitan area in the Pacific Northwest between July 2007 and September 2009. We partnered with

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four large fire departments for this project (Fig. 1). Together these four departments serve approximately one-quarter of the total population of King County, Washington. In King County, Washington, the EMS system responds to approximately 7% of the population annually (Trevino et al., 2008). Eligible participants were identified from the medical incident report form (MIRF) database maintained by Public Health Seattle-King County for the medical emergency responses in King County, Washington. EMS responders fill out an MIRF for each patient. The MIRF includes information on patient demographics, the reasons for the 911 call, procedures and diagnosis by EMTs, vital signs, patient contact information, and outcome of the EMS encounter, including whether the patient was transported to hospital.

*Eligibility criteria*

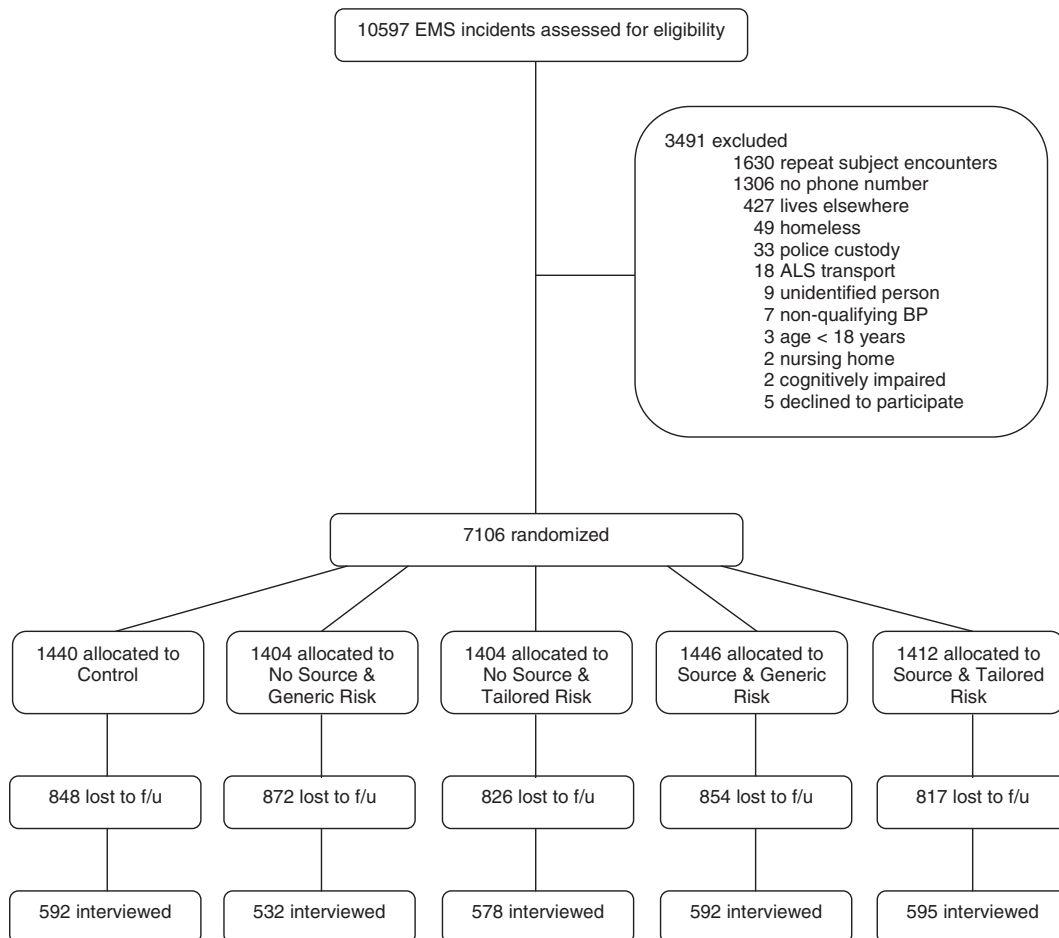
Patients were eligible for our study if the data recorded on the MIRF noted a systolic BP  $\geq$  160 mm Hg and/or diastolic BP  $\geq$  100 mm Hg. Even given the “white coat phenomenon”, where BPs increase due to situational factors (Baguet, 2012), these values were deemed high enough to be of concern. Participants had to be at least 18 years old, have an address in or near one of the areas served by the participating fire departments, and have a phone number recorded on the MIRF or publicly available on a web-based residential telephone directory. Patients transported by paramedics (rather than EMTs) to hospital were excluded from the study, as paramedic transport indicates a more serious medical problem. Patients transported by police or sheriff were excluded also, as were those attended by EMS at a jail or police station or other custodial setting. Residents of nursing homes were excluded due to their regular access to nursing care. Individual participants were

enrolled only once, even if they were seen multiple times by EMS during the study interval.

*Intervention*

Formative research (Meischke et al., 2012) informed all aspects of the intervention and study protocols. Eligible participants from each fire department were randomized by study staff using SPSS syntax to generate random assignments into a control group or one of four experimental groups. Randomization was conducted within each of the 4 participating fire departments within blocks of 100 cases, stratified so that within every 100 cases, 1/5 were assigned to each of the 5 study arms: 20 subjects to each of the 4 intervention groups and 20 to the control group. The randomization assignment template was devised in advance of case enrollment; within each 100 cases, individuals were assigned to the next randomization condition in pre-determined sequence according to the chronological date and time of their EMS response. Study staff who sent the intervention mailings were aware of the randomization assignments, as those determined the mailing content, but the study interviewers were blinded.

The intervention comprised a direct mailing to the experimental groups, consisting of a letter and a high BP alert card. The content was based on the Health Belief Model (HBM) with varied personalized risk information and source personalization. HBM is a value-expectancy model that suggests that risk perceptions (i.e. perceived threat to health) motivate behavior change if the perceived benefits of the recommended action outweigh the barriers to the action (Rosenstock, 1990; Rosenstock et al., 1988). All mailings included a letter with information about the participant’s risk of having uncontrolled hypertension, severity of having uncontrolled hypertension, benefits



<sup>a</sup>The study took place in four fire districts in a metropolitan area in the Pacific northwest from July 2007 through September 2009.

**Fig. 1.** The study took place in four fire districts in a metropolitan area in the Pacific northwest from July 2007 through September 2009.

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