Mapping Opioid-Associated Resuscitative Emergencies for Targeted Intervention in Colorado

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Introduction: Opioid overdoses and overdose related deaths continue to increase in the United States. This epidemic is often described using data from death records, however these data only tell part of the story. While death records provide key insights to the individuals who died as a result of their opioid use, these records fail to describe the larger picture of opioid overdoses across the nation. In 2015, Colorado began allowing pharmacies, harm reduction agencies, and law enforcement officers to access the life-saving drug naloxone, a drug that EMS agencies have been using to combat opioid-associated resuscitative emergencies for decades. Using EMS patient care reports to describe opioid overdose trends can help describe who is affected by this epidemic as well as identify where targeted interventions should occur.

Objective: To quantify and describe opioid-associated resuscitative emergencies in Colorado; specifically who is affected, and where these emergencies occur throughout the state.

Methods: Using a retrospective observational study design, EMS prehospital care reports from the Colorado data repository at the Colorado Department of Public Health and Environment were used to identify opioid-associated resuscitative emergencies from 2013-2017. An opioid-associated resuscitative emergency refers to 'any clinical condition that is known or thought to be associated with opioids where a patient is obtunded without obvious signs of life'[1]. Cases were defined as having naloxone administration as well as a 911 response to remove any potential provider induced overdoses. ESRI, Inc. ArcMap v10.4 and Pitney Bowes MapMarker v 30 software were used to geocode incident and patient addresses to appropriate counties and create heat maps. Descriptive statistics were calculated to assess demographics (age, race, sex and EMS call volume by county). Rates were calculated using the non-duplicative number of incidents with naloxone administration in each defined area and the total number of EMS incidents or total population in that area.

Results: During the study period, 16,290 patients were administered naloxone in Colorado, and this number has been steadily increasing over time. Opioid-associated resuscitative emergencies account for about 0.57% of all EMS incidents reported to the state from 2013-2017. When broken down by year, we see an increase from 2013 (0.55% of EMS incidents) to 2017 (0.65% of all EMS incidents). Males were more commonly associated with these incidents (58%), and the average age of all patients was 47 years. Of the 12,008 incidents where patient home state was recorded (74%), most of the patients were Colorado residents (98%). The state of Colorado is divided into 64 counties ranging in population from less than 700 (San Juan County) to almost 700,000 (Denver County). Counties were divided by level of burden of opioid-associated resuscitative emergencies based on the number of incidents where naloxone was administered during the study period. Five counties (Denver, El Paso, Jefferson, Pueblo, and Arapahoe) had more than 1,000 naloxone administrations, and were, therefore, identified as high burden areas. Four of the five high burden counties were also among the five highest populations in the state; however one county (Pueblo) had the fourth highest number of opioid related incidents (1393) with only approximately 30% of the population size of the other high burden areas[2]. Pueblo only had the seventh highest count of opioid or heroin related deaths during the study period (128), indicating the high use of naloxone may have an impact on opioid-related mortality in that area. Other factors such as EMS call volume, patient home address and death records were used to identify high EMS utilization areas (rate of incidents with naloxone administration per 100,000 EMS responses), high mortality areas (rate of opioid-related deaths per 100,000 residents) and high destination utilization areas (proportion of non-resident patients per all patients receiving naloxone) for targeted interventions.

Conclusions: EMS prehospital care report data may be used to help describe and locate the ever growing population of patients suffering from opioid overdoses. By utilizing advanced geocoding and mapping technologies, such as Geographic Information Systems (GIS), these data can reveal key locations for high use,

high burden and high mortality. With the ability to identify this subset of population at risk, targeted interventions and more equipped EMS responses may be facilitated.

Citations:

[1] Drennan, I. R., ACP, BScHK,PhD(c), & Orkin, A. M., MD, MSc, MPH. (2016). Prehospital Naloxone Administration for Opioid-Related Emergencies. *Journal of Emergency Medical Services,41*(3). Retrieved April 1, 2018, from http://www.jems.com/articles/print/volume-41/issue-3/special-focus-resuscitation-recommendations/prehospital-naloxone-administration-for-opioid-related-emergencies.html

[2] United States Census Bureau / American FactFinder. "Annual Estimates of the Resident Population: April 1, 2010 to July 1, 2016". 2016 Population Estimates Program. Web. March 2017. http://factfinder2.census.gov.