

# Improving Emergency Care For Anaphylaxis: Impact Of A Clinical Pathway In A Pediatric Emergency Department

Julie C. Brown, MDCM, MPH, FAAAI<sup>1,2</sup>, Jeffrey L Foti, MD<sup>1,2</sup>, Sara Fenstermacher, RN, MSN, CPN<sup>1</sup>, Katherine Kazmier, MD<sup>1,2</sup>, Elena Shephard, MD, MPH<sup>1,2</sup>, Nathan Deam, MHA<sup>3</sup>, Holly Clifton, MPH<sup>3</sup>, Lori Rutman, MD, MPH<sup>1,2</sup>

(1)Seattle Children's Hospital (2)University of Washington (3)Seattle Children's Research Institute

## BACKGROUND

- Emergency Department management of anaphylaxis has not kept pace with advances in knowledge.
- Epinephrine use and utilization of guideline-based practice recommendations remains sub-optimal, particularly in children.

## OBJECTIVE

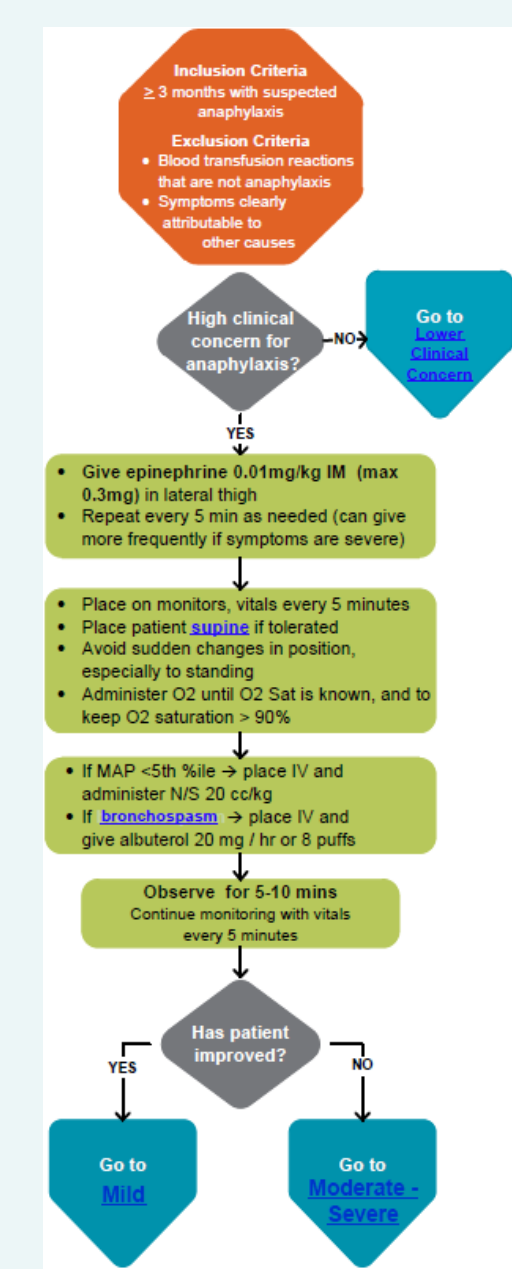
To standardize and improve anaphylaxis care in the emergency department, 3 affiliated urgent cares, hospital wards and intensive care units.

## METHODS

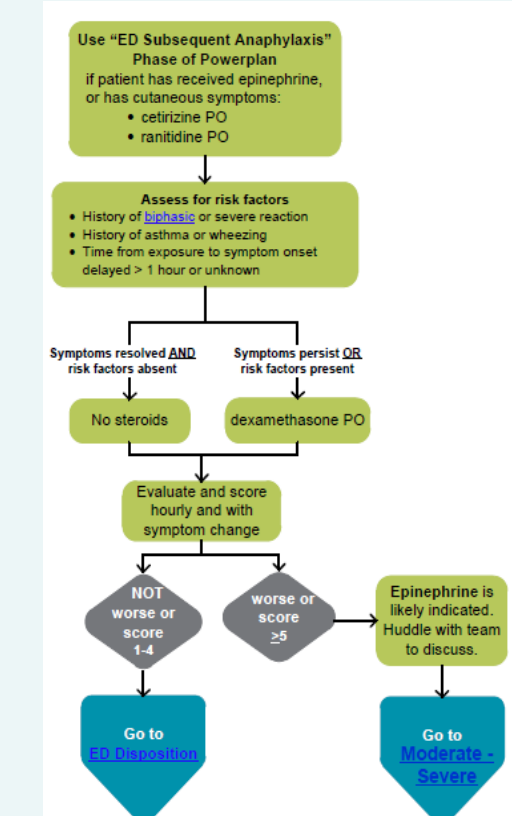
- Diagnosis of anaphylaxis
    - ICD-9: 995.0, 995.6x, 999.4x;
    - ICD-10: T78.0x, T78.2x, T80.5x, T88.6x
  - Diagnosis consistent with allergic reaction + intramuscular epinephrine
  - We included visits 3 years before to 16 months after initial pathway implementation.
- Timeline of important events:
- Sept 2014: Simulations, RN education
  - Sept 2014: Epinephrine supply kits
  - Sept 2016: Clinical Standard Work
  - Jun 2017: Changed from ampules to vials
  - Aug 29, 2017: Go-live
  - Sep - Oct 2017: Hospital-wide RN competency on epi administration

## CSW RECOMMENDATIONS

### Initial Phase – Higher Clinical Concern



### ED Management – Mild Symptoms

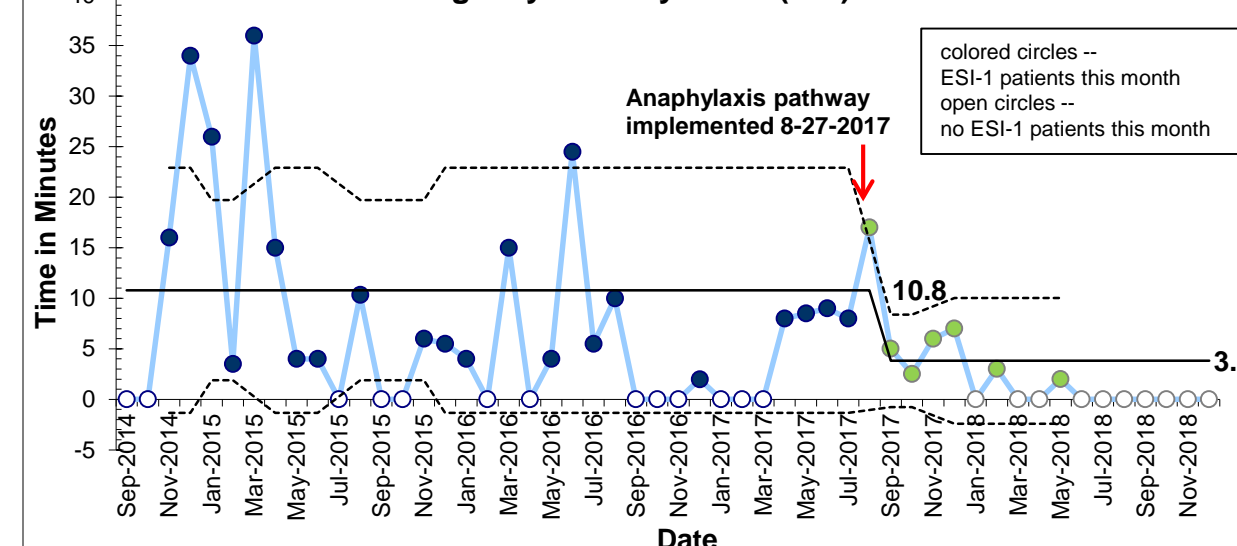


In anaphylaxis:

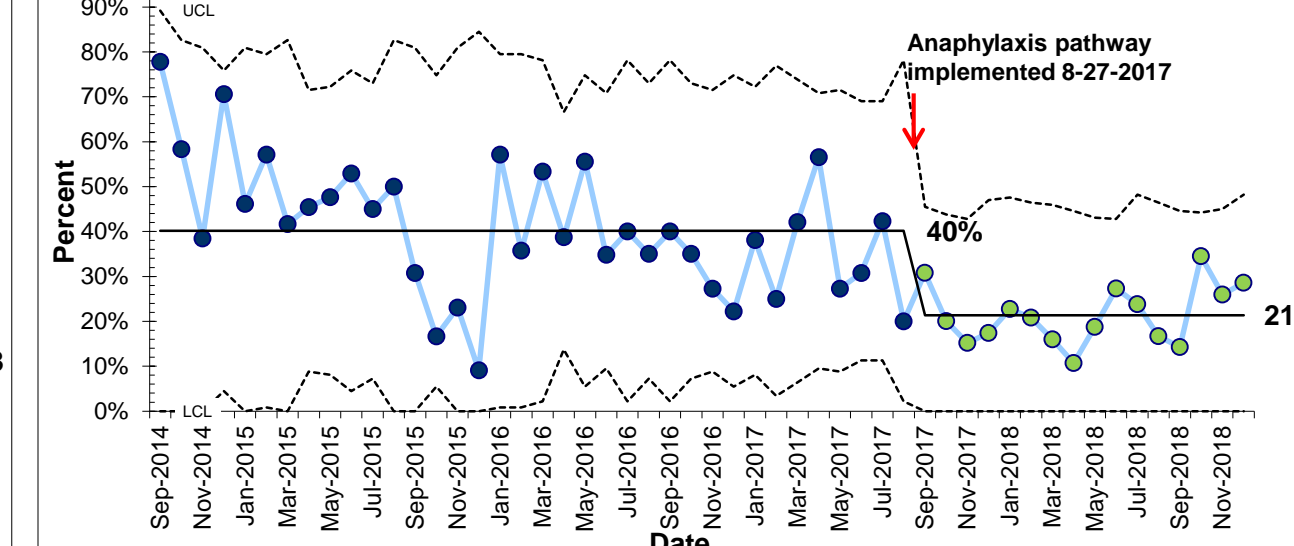
- Epinephrine is the only first line medication.
- Epinephrine should be given as soon as the diagnosis is suspected.
- There are no absolute contraindications to the use of intramuscular epinephrine.
- Intravenous (IV) fluids are indicated for patients continued signs of shock after treatment with epinephrine:
  - Place IV line on arrival if hypotensive or in bronchospasm,
  - Place IV line for severe symptoms after 1<sup>st</sup> dose of epinephrine.
- Antihistamines do not need to be given immediately.
- After epinephrine, treat all patients with at least one dose of H1 antihistamine (e.g. cetirizine po for those who can tolerate po, diphenhydramine IV otherwise).
- Patients receiving an antihistamine for cutaneous symptoms should also receive an H2 antagonist (e.g. ranitidine).

## RESULTS

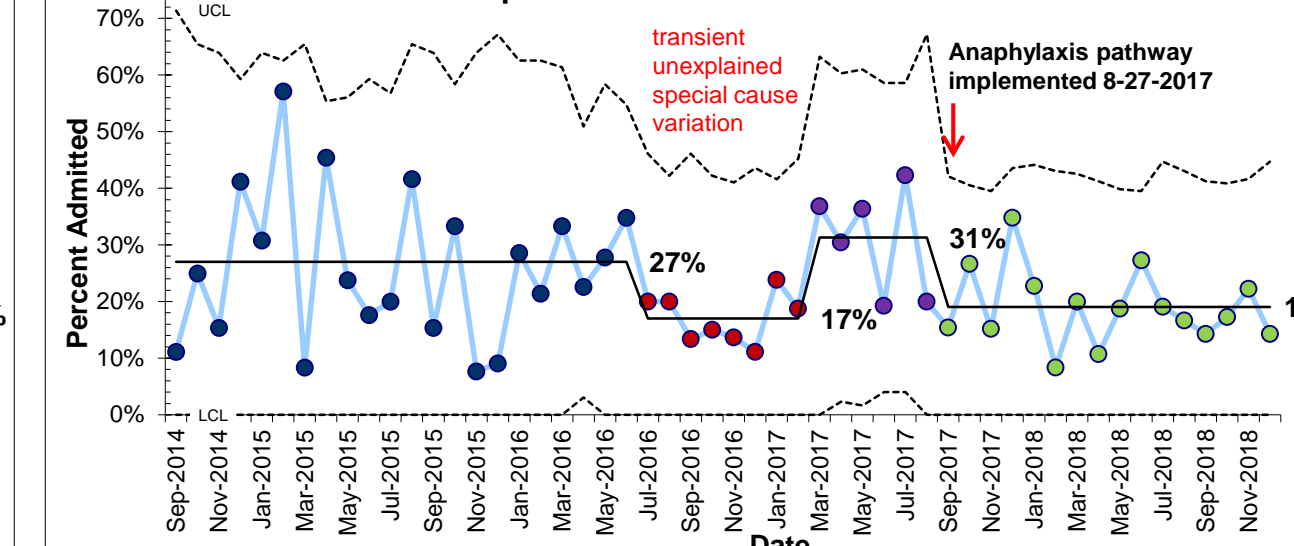
**X-bar Chart: Mean Time to Epinephrine, Patients with Emergency Severity Index (ESI) Level 1**



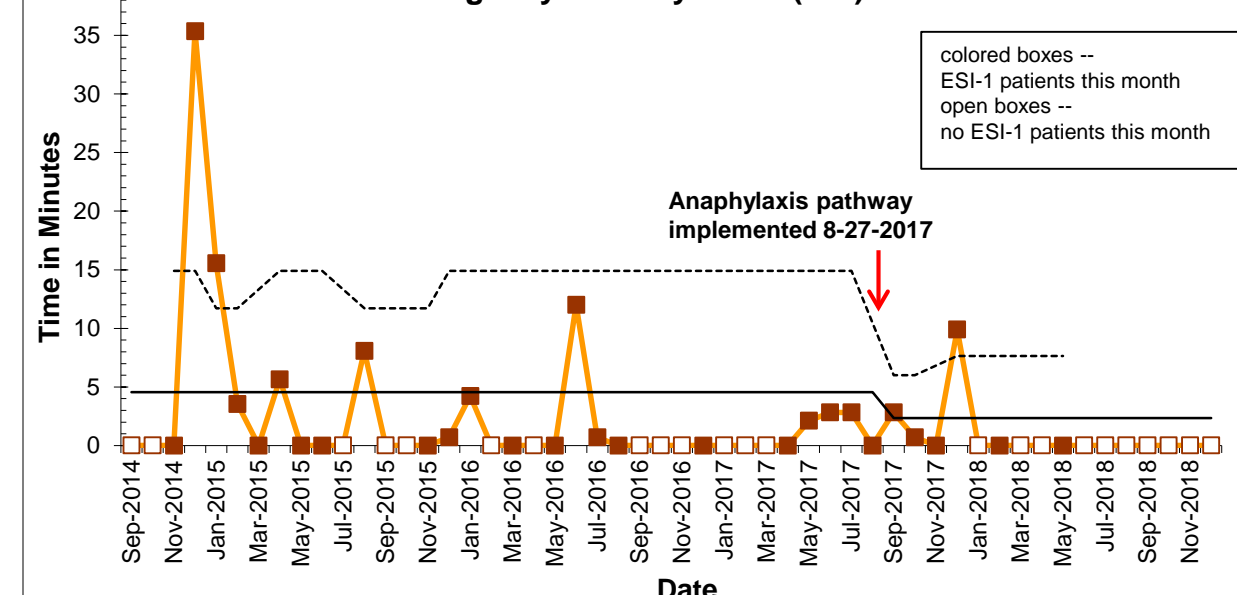
**P Chart: Proportion of Anaphylaxis Patients with Peripheral Intravenous Line Placements in the Emergency Department**



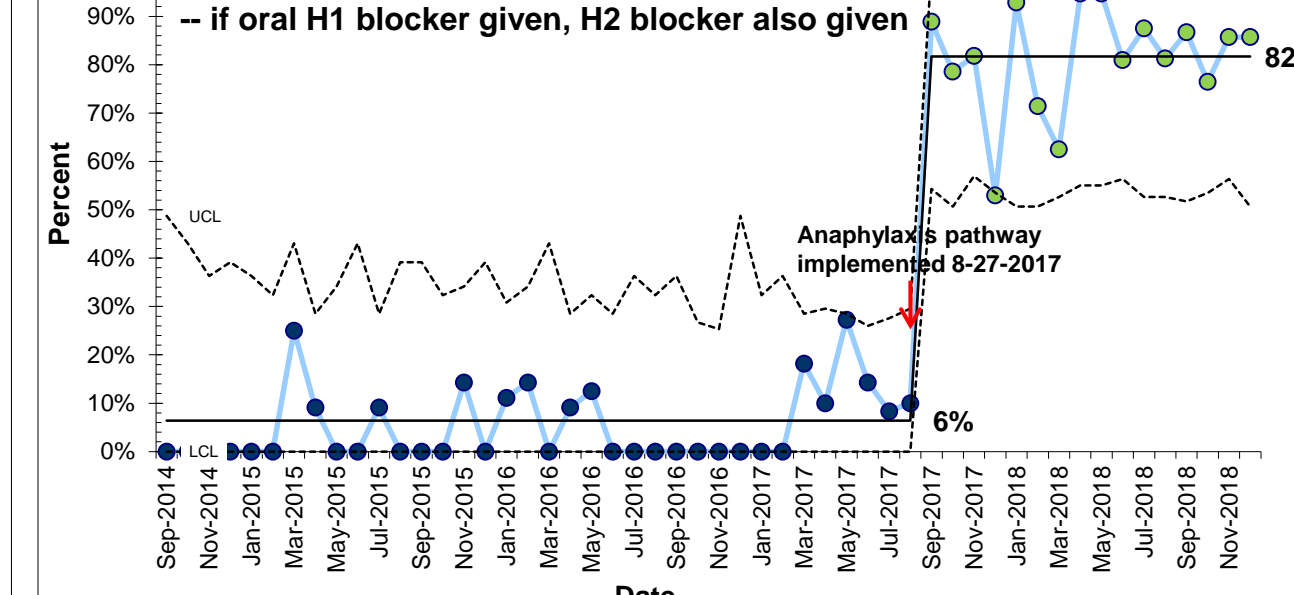
**P Chart: Proportion of Emergency Department Anaphylaxis Visits Admitted to the Hospital**



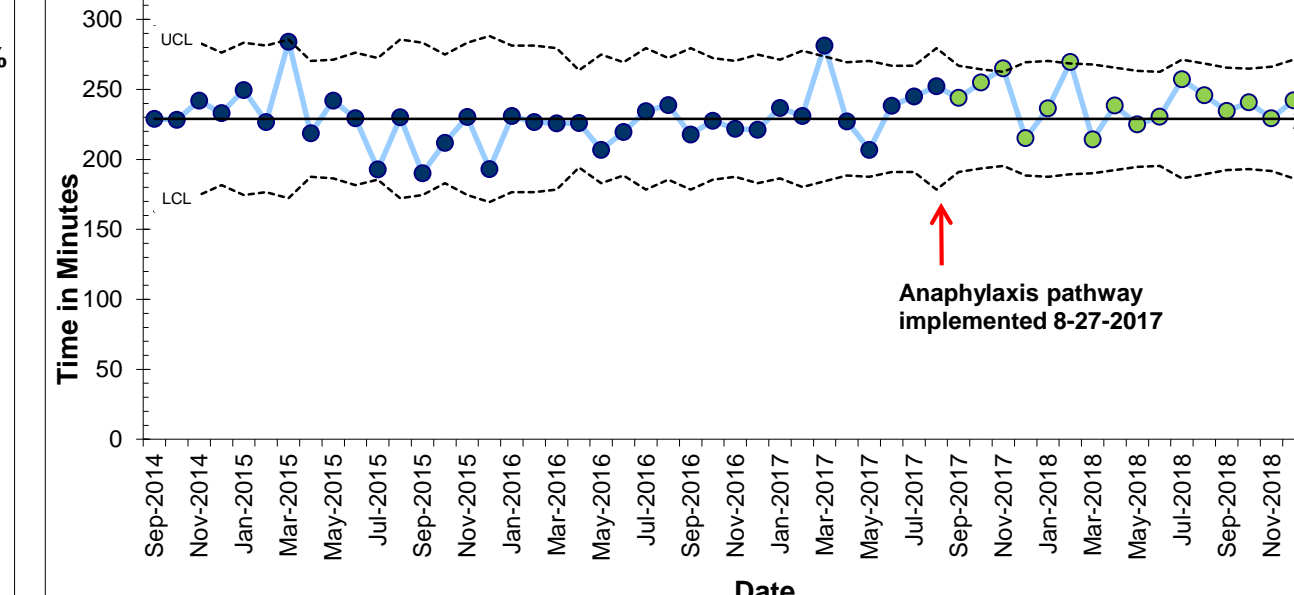
**S Chart: Standard Deviation of Mean Time to Epinephrine, Patients with Emergency Severity Index (ESI) Level 1**



**P Chart: Proportion Receiving Appropriate antihistamines: -- if oral, less sedating H1 blocker used, AND -- if oral H1 blocker given, H2 blocker also given**



**X-bar Chart: Mean Length of Stay, Discharged ED patients**



**Time to Epinephrine:** After pathway implementation, we found special cause variation with a downward shift in the mean time to epinephrine for Emergency Severity Index 1 patients from 10.8 to 3.8 mins.

**IV line placement:** The proportion of anaphylaxis patients receiving ED IV line placement decreased from 40% to 21%.

**Optimal H1 and H2 Antihistamine use:** When an H1 antihistamine was used, the choice of a less-sedating H1 blocker in combination with an H2 blocker increased from 6% to 82%.

**Hospital admissions:** Proportion of patients admitted to the hospital decreased from 27% before to 19% after pathway implementation.

**ED length of stay:** Mean ED length of stay (LOS) for discharged patients with anaphylaxis (229 mins) did not change after pathway implementation.

## CONCLUSIONS

Anaphylaxis Clinical Standard Work improved many outcome measures, including time to epinephrine for ESI-1 patients, decreased IV line placement, increased optimal antihistamine use, and decreased hospitalizations.

ED length of stay was unchanged. Improvements in efficiency may have been offset by increased adherence to 4-hour observation.



Much appreciation to the Seattle Children's Hospital Quality Improvement Scholar's Program for funding and mentorship