

Our Work is Never Done: Continuous Quality Improvement in the EC

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The Problem

- In our busy level III trauma center in the county hospital in Houston, Radiology has always been in high demand. Matching the national trend, EC utilization of radiologic services, particularly CT, had slowly but continuously increased over the years.
- In some patients imaging is the primary triage method for determining whether an emergency medical condition exists or if the patient can be safely discharged home, therefore Radiology throughput becomes the bottleneck in the disposition of those pts.
- After speaking with our EC colleagues CT was chosen as the primary target for throughput optimization. The volumes were higher than US and MR, and x-ray throughput was not considered an issue. We therefore targeted our project and efforts around this modality.

Our EC colleagues informed us that they place an order, it goes into a “black box”...and at some point in the EMR they get a **report they can act on** (whether that be prelim or final). They have no concept -or interest - in where the radiologist vs the technologist TATs fall inside that workflow, only **how long it takes for a written result to come back**. Therefore we changed our metric to:

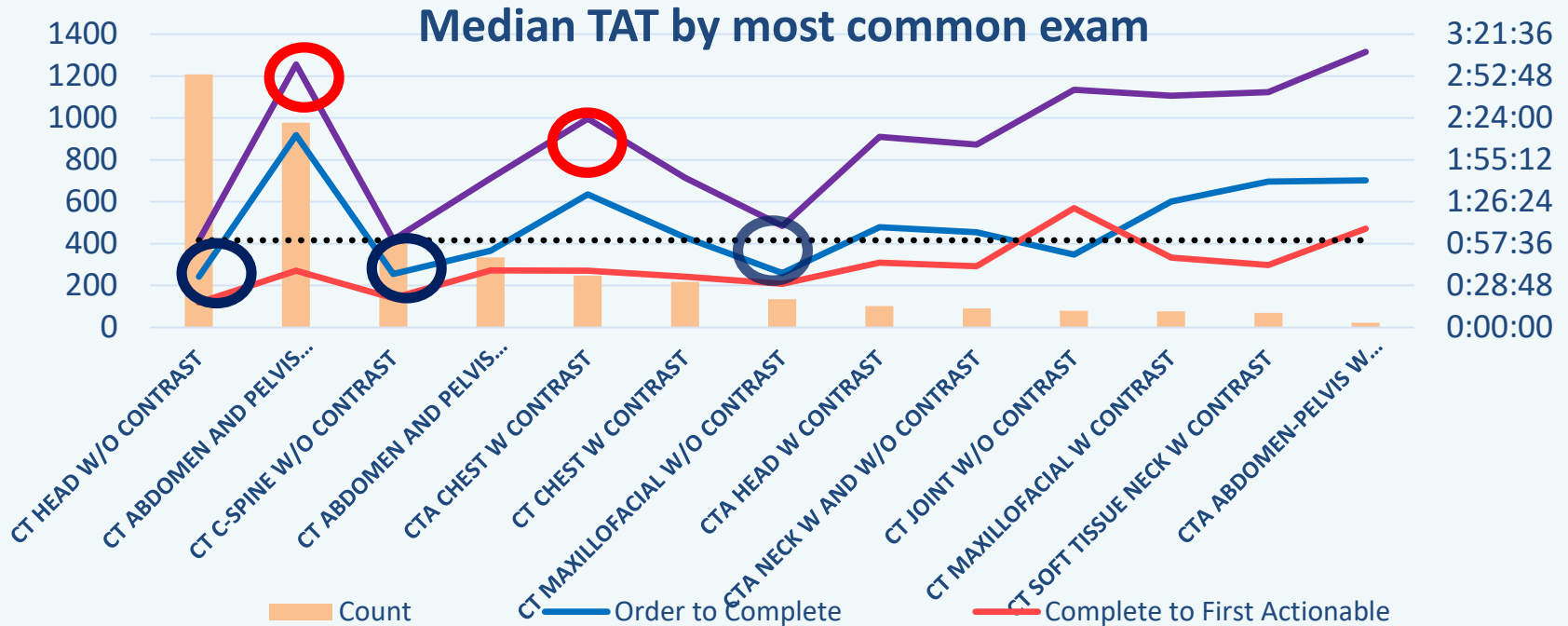
Order to First Actionable Report

And got to work!

We needed a starting point. On basic analysis 13 Exam Types make up 97.5% of EC CT volume
 =>focus our TAT analysis on the most common exam types

Purple line shows the median time for BOTH the technologist and radiologist components to be completed: Order to 1st Report Time

These exams are listed like a Pareto chart, most common exams to the left. **CT abdomen pelvis is both the 2nd most common exam and by far the slowest => It became our first target.**

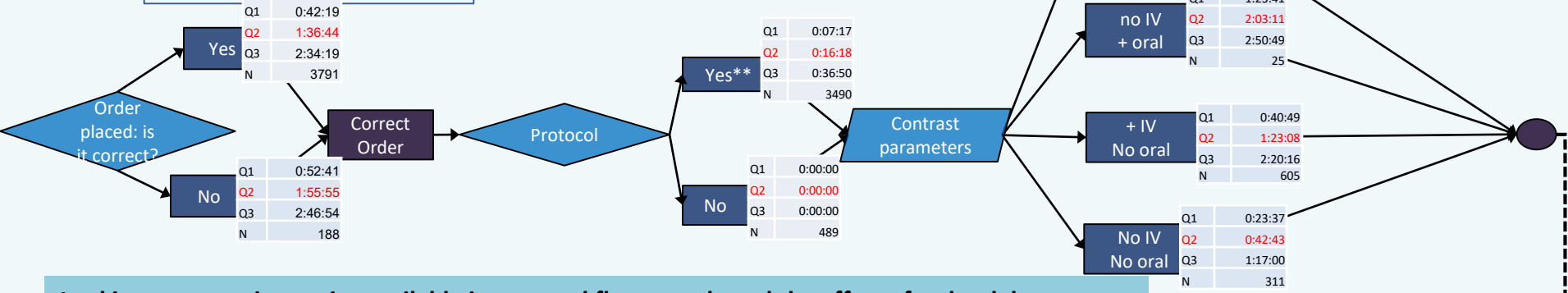


CT A-P (EC)

- BEFORE START, all pts:
- +/-Pregnancy
 - +/- wait for Oral
 - Out of Street clothes*

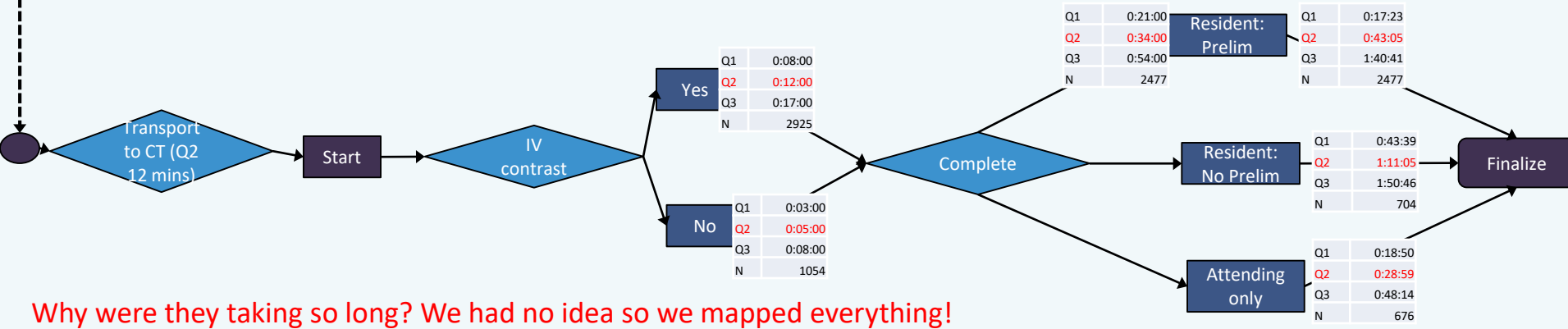
- BEFORE START: IV contrast pts only:
- GFR
 - Contrast Allergy
 - Dialysis (?Urine production)*
 - IV present*

* Must be checked in person by the tech



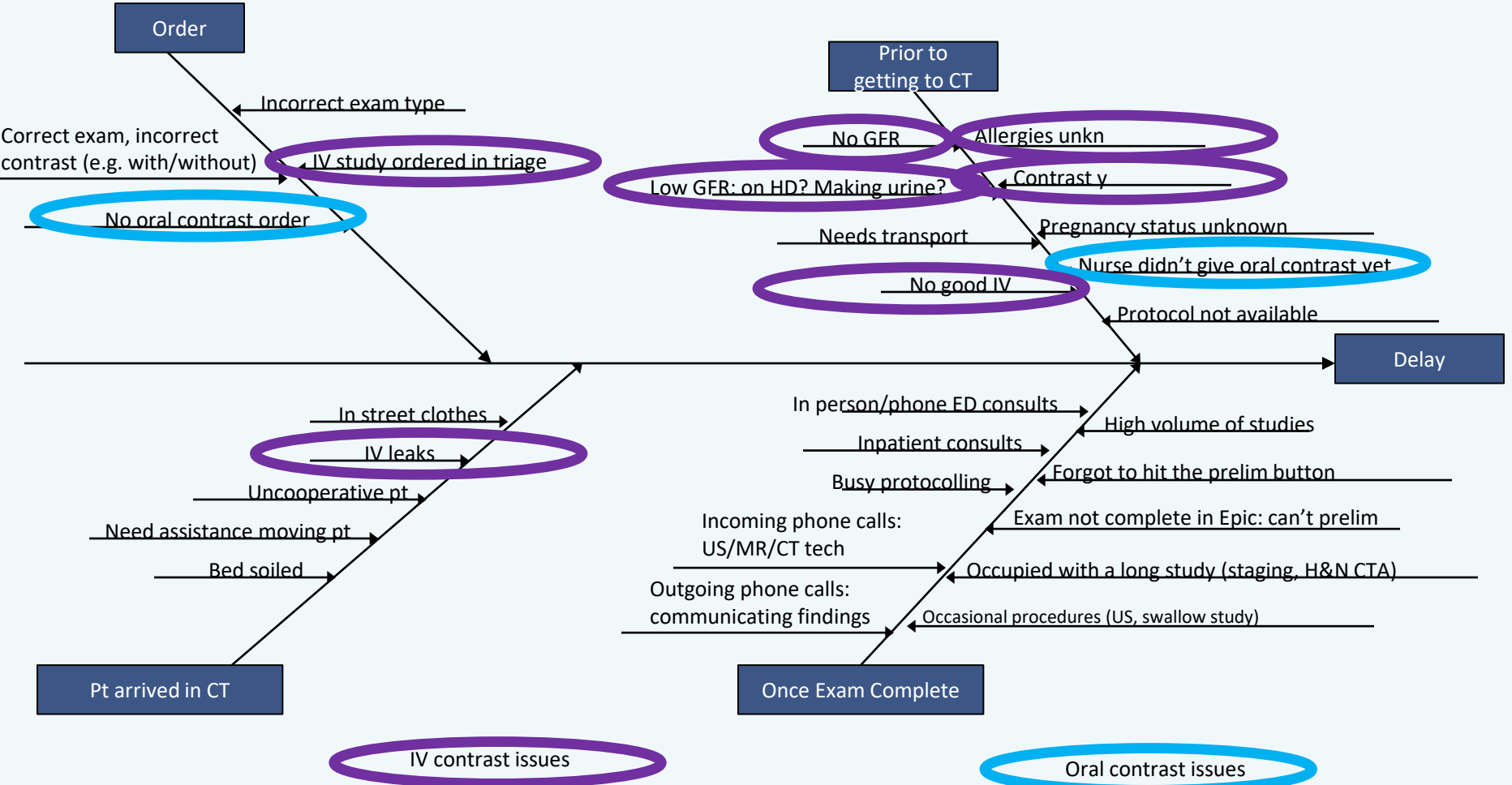
Estimated extra time oral contrast pts are waiting: 78.4 days/year

Looking at every time point available in our workflow, we plotted the effect of order delays, preparation prior to the exam, transport, faculty vs resident reads etc. Any type of contrast added time, but **by far the longest exams were in those pts receiving oral contrast!**



Why were they taking so long? We had no idea so we mapped everything!

CT Abdomen-Pelvis (all EC)



So we focused our attention on oral contrast. After an extensive literature review oral contrast was dropped for all routine indications (kept for suspected bowel leak, fistula or perforation)

New Oral
Contrast
Protocol

July 2016

Drop Delayed
Phase Abdomen

Jan 2017

Drop Iodixanol →
simplify contrast policy

Jun 2017

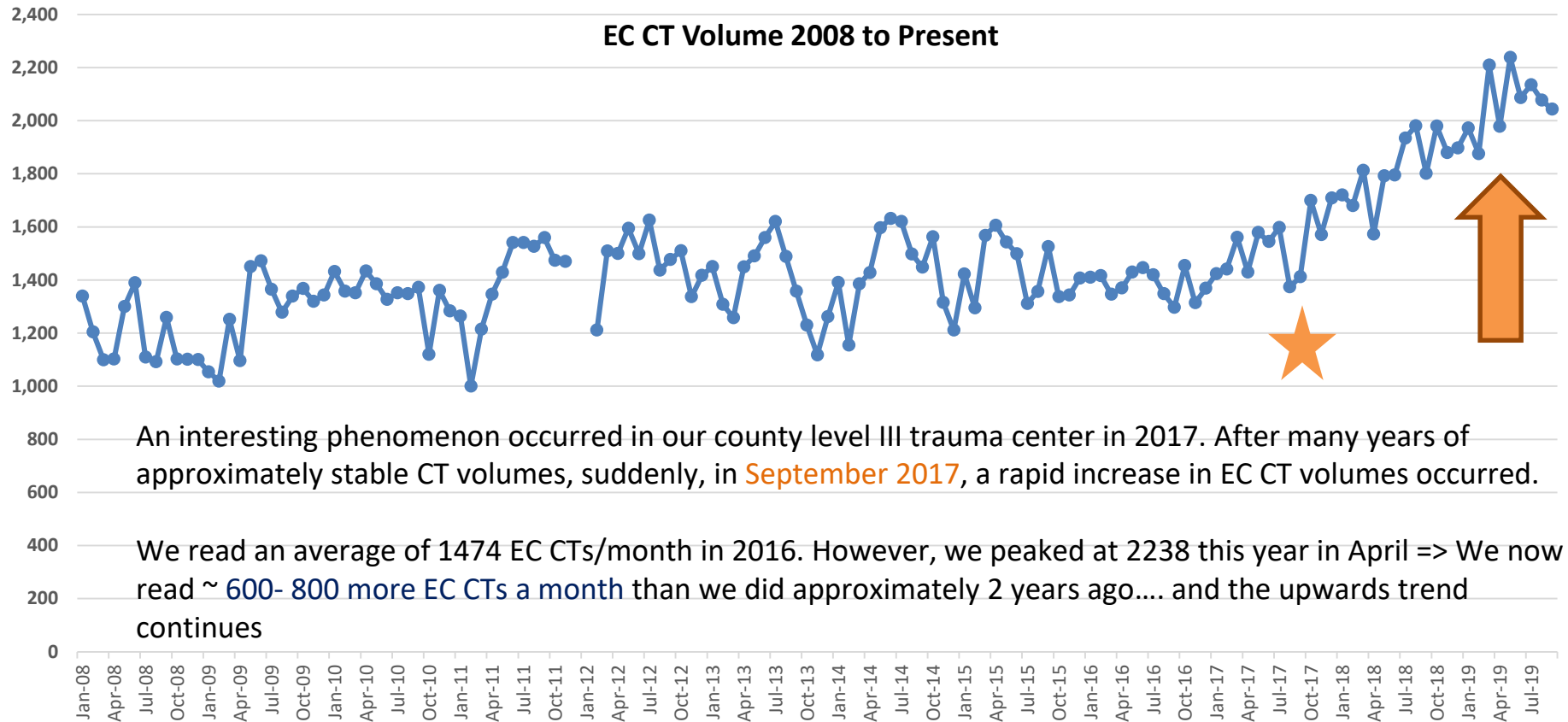
But we didn't stop there!

We reviewed all our contrast parameters, reviewed the literature, and dropped the routine delayed phase imaging on CT A/P in Jan 2017 (dose and time benefits)!

We also simplified our IV contrast protocol, dropping from 3 to 2 contrast agents in routine use for CT

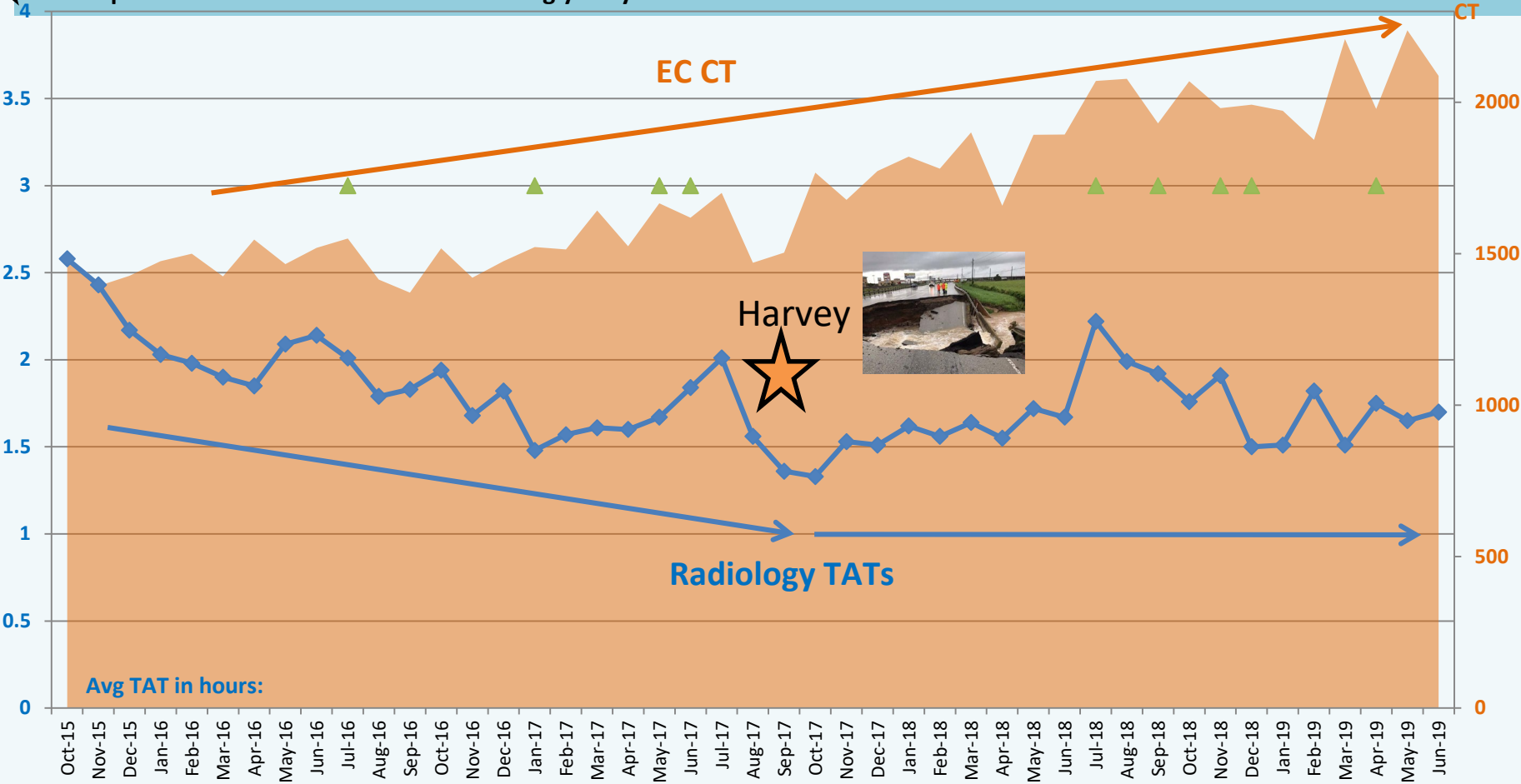
Median TAT (Order to Report) for CT Abdomen-Pelvis with contrast decreased from 3:00:47 → 1:46:00 by mid 2016

But then, in 2017, something else happened....





What happened? Hurricane Harvey closed 2 other local hospitals, leaving the county hospital a much larger catchment area. Since then volumes (in orange) have increased continuously and rapidly. At this point most interventions are targeted at just maintaining the status quo of turnaround times in an increasingly busy environment.



Small faculty coverage expansion 6-10 → 5-11pm, cover 7-8am

May 2017

Bring 2nd CT tech over to EC from inpt

July 2018

7-9pm supplemental

Sept 2018

Unified Protocol List

Jan 2019

Just before Harvey we expanded to 24-7 faculty coverage from our previous 21 hour/day model. This pre-Harvey intervention obviously wasn't specifically aimed at the Harvey volume increase but was targeted to mean to allow for 24/7 faculty availability. However, this stood us in good stead to withstand the initial onslaught of additional cases.

We found the techs were more efficient working together than running two separate scanners independently after hours. So on the evening shift the inpatient tech was brought over to the EC CT scanner, so that one could be scanning while the other was prepping the next patient, with both EC and inpt cases scanned in the same place unless two urgent cases came up simultaneously. We did not hire any additional tech

EC radiology volumes follow the EC arrival pattern. Therefore the biggest hit received was during the hours of approximately 2-3pm to midnight.

When the rapid increase in volume on the evening shift overwhelmed the single faculty member and resident a short "swing shift" was added with a second faculty member assisting with catching up the list in the middle of the biggest rush

The overnight resident is responsible for protocolling all EC CTs, MRs, as well as inpt CTs and MRs of all body parts. This resulted in checking numerous different protocolling lists through the night and delays in some protocols. Therefore a unified "overnight" list was created that included all pending inpt/EC CT/MR studies needing to be protocollated. This was both more efficient and a huge satisfaction for the residents.

Electronic Clinical
Decision Support
live

Our Clinical Decision support software went live across the system in April 2019 and is in the process of ongoing optimization.

Apr 2019

Coming up:
CT Order Set

Picking the right test is just the beginning. As you can see from our prior fishbone diagram the tech is waiting on GFRs, pregnancy tests etc as well. The CT order set provides a one stop shop for ordering everything needed to get the scan going

- So despite continued increase in EC CT exams performed per month we have not only decreased our prior TATs compared to our 2015 baseline but managed to maintain that improvement despite increases in volume year after year.
- We have had 24/7 faculty coverage since 2012, so we have neither added overnight faculty coverage nor an extra resident or tech. We did not add a CT scanner or upgrade our current scanner. We did close 3 hours of faculty coverage “gaps” in the day and added an additional 2 hour 'swing' shift of a second faculty member during peak evening hours - both to balance neuro coverage and to improve TATs at a time when we were reaching 'critical mass' with a single attending and resident. However, as you can see, the majority of our interventions are workflow related. There’s always more to do!