

## Review, Monitor, Educate: A Quality Improvement Initiative for Sustained Chest Radiation Reduction in Pediatric Trauma Patients

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# Review, Monitor, Educate: A Quality Improvement Initiative for Sustained Chest Radiation Reduction in Pediatric Trauma Patients

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## Background

- There are currently no national pediatric computed tomography (CT) guidelines <sup>1</sup>
- CT scans confer a considerable amount of radiation exposure to children <sup>1</sup>
- Due to the flexibility of the pediatric chest wall, thoracic injury due to blunt trauma presents differently in children and adults <sup>2</sup>
- Golden et al. demonstrated that chest CT scans can be limited to patients who have abnormal plain chest films <sup>3</sup>
- Literature supports that evidence-based guidelines minimize care variation and most importantly improve outcomes <sup>4</sup>

## Problem Statement

- We hypothesized that chest CT scans after a normal chest x-ray would not add clinically relevant information to justify the use of the imaging and that the addition of a radiation reduction guideline would reduce overutilization of chest CT scans

## Methods

- A retrospective chart review of all trauma alert patients < 15 years evaluated at our pediatric trauma center between January 2013 and June 2016 was performed
- Charts were reviewed to determine if there were significant findings that could alter clinical care
  - Pneumothorax >10%
  - Hemothorax
  - First rib fracture
  - Multiple rib fractures
  - Lung contusion
- Based on the retrospective review, a radiologic reduction guideline was established emphasizing
  - X-rays prior to CT
  - No CTs after normal x-rays
- A prospective review was performed from January 2017 to June 2019 to assess efficacy of the guideline
- Education was provided monthly

## Results Gathered

- Between study periods, there were statistically significant associations with:
  - Gender (p=0.0470)
  - Cause of injury (p=0.0007)
  - Injury severity score (p=0.0001)

Figure 1: Retrospective review from Jan 2013 to Jun 2016

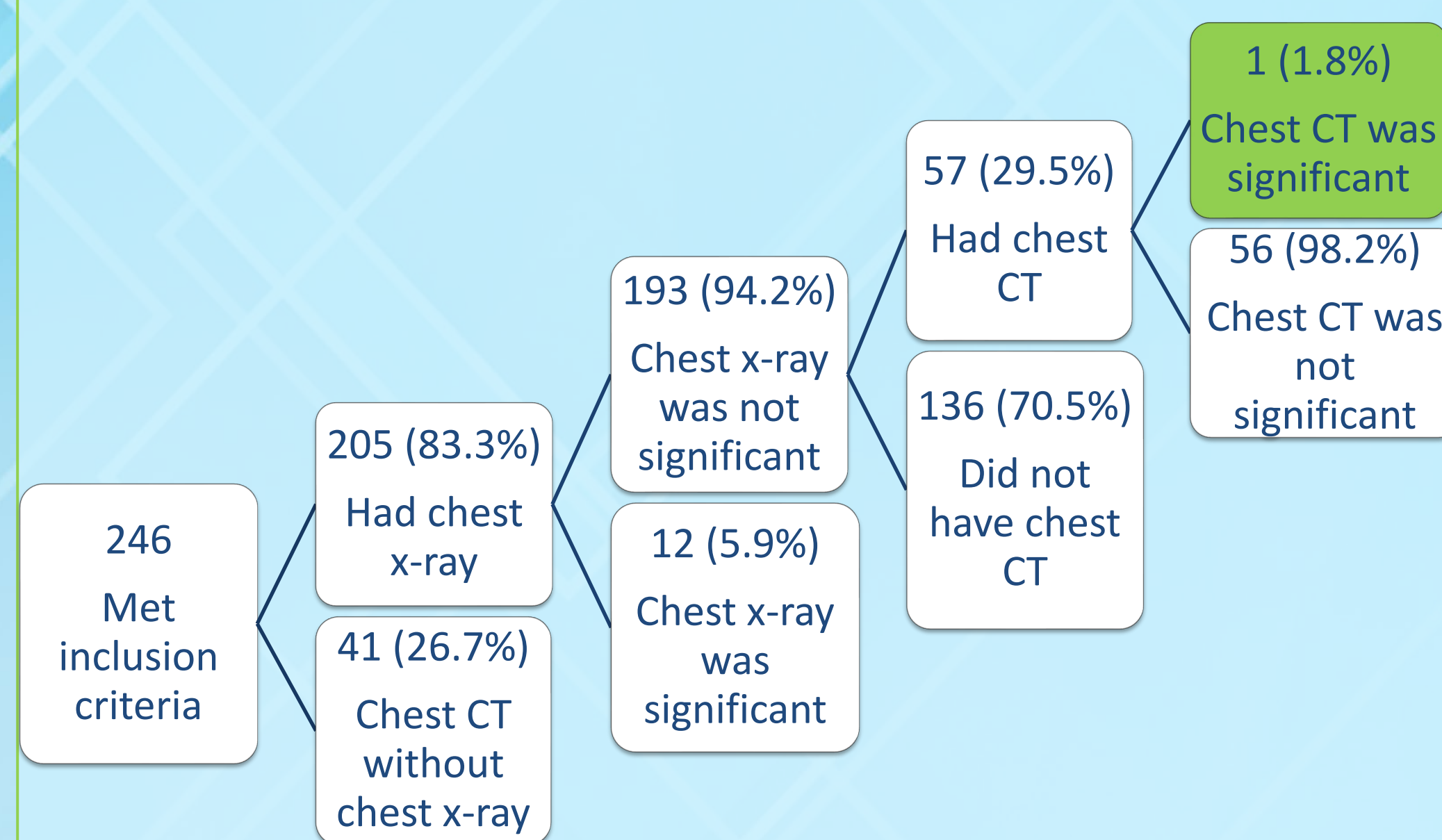


Figure 2: Prospective review from Jan 2017 to Jun 2019

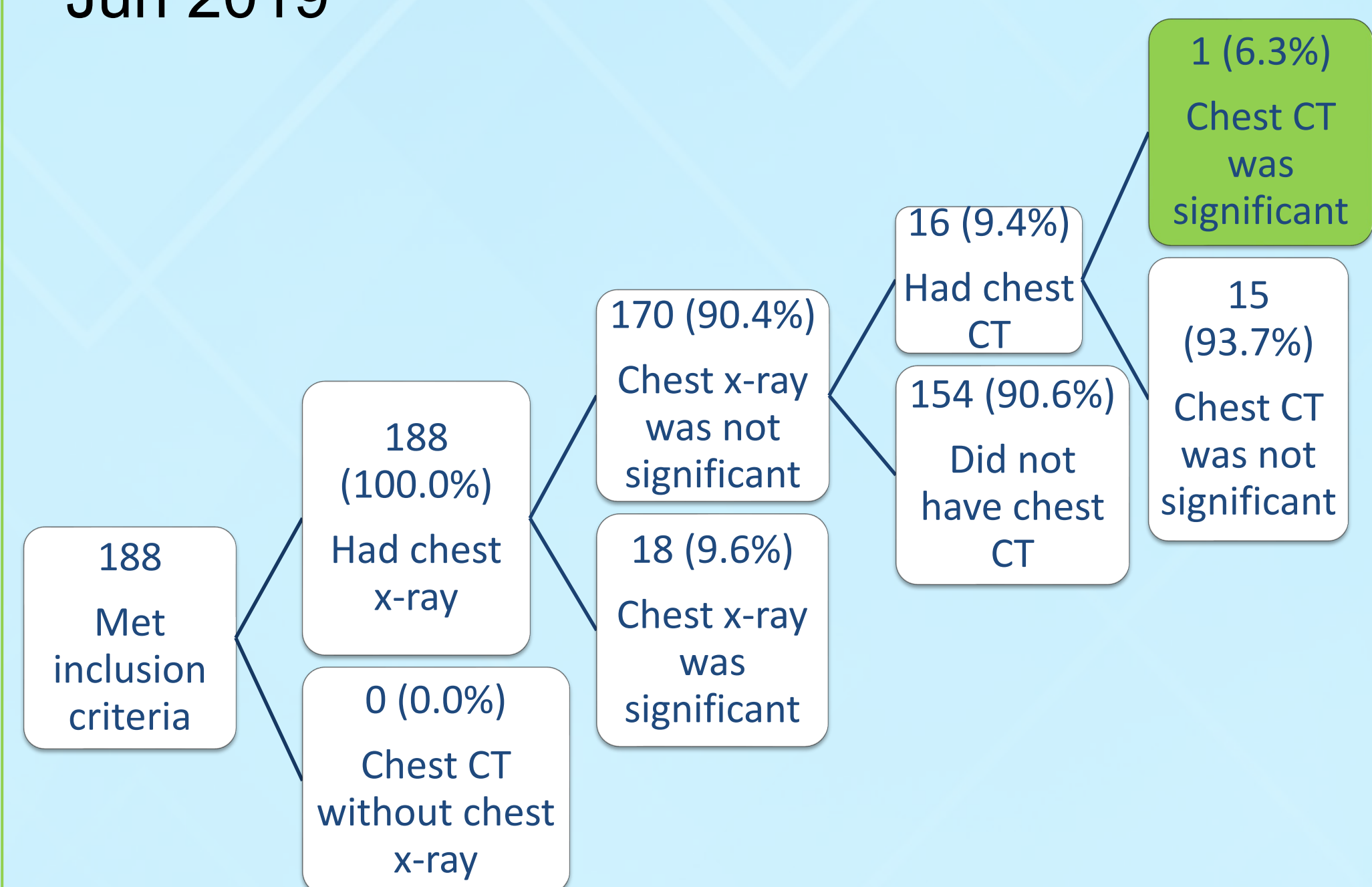


Table 1: Imaging before and after guideline implementation

	1/13 to 6/16	1/17 to 6/19
Had chest x-ray	83.3% (205/246)	100% (188/188)
Had chest CT	43.9% (108/246)	16.0% (30/188)
Had chest CT without prior x-ray	26.7% (41/246)	0% (0/188)
Had chest CT with normal x-ray	23.2% (57/246)	8.5% (16/188)

## Discussion

- In the two patients with significant chest CTs following normal x-ray, the CT did not result in additional interventions
- Guideline implementation and education reduced inappropriate CTs
- Guideline implementation required buy in from radiology, pediatric surgery, and trauma surgery
- This was part of a larger cultural change in our institution to reduce unnecessary radiation
- Drawbacks to unnecessary radiation include:
  - Possible increase in cancer risk <sup>1,5</sup>
  - Possibility of finding pulmonary incidentalomas, resulting in workup <sup>6,7</sup>
  - Increased costs: 2018 Medicare reimbursement for a chest CT was \$156.28 while a chest x-ray was \$19.79 <sup>8</sup>
- Study limitations
  - Partially retrospective
  - Differences between study period groups

## Conclusion and Implications

- Chest CTs following a normal chest x-ray largely do not change clinical management in pediatric trauma patients
- Judicious use of chest CTs reduces exposure to radiation, incidental findings, and unnecessary costs
- Implementation of a guideline can reduce the number of inappropriate CTs
- Continued monitoring and education following guideline implementation improves outcomes

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