



Unread List Length:

**Impact on Turnaround Times and
Report Lengths**

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No disclosures



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Background

The problem we are trying to understand

1. Does an accumulation of unread studies affect the way radiologists work?

The questions we asked to try to understand

1. Relationship between unread list length and turnaround times (TATs)
2. Relationship between unread list length and report length



Background – Local practice

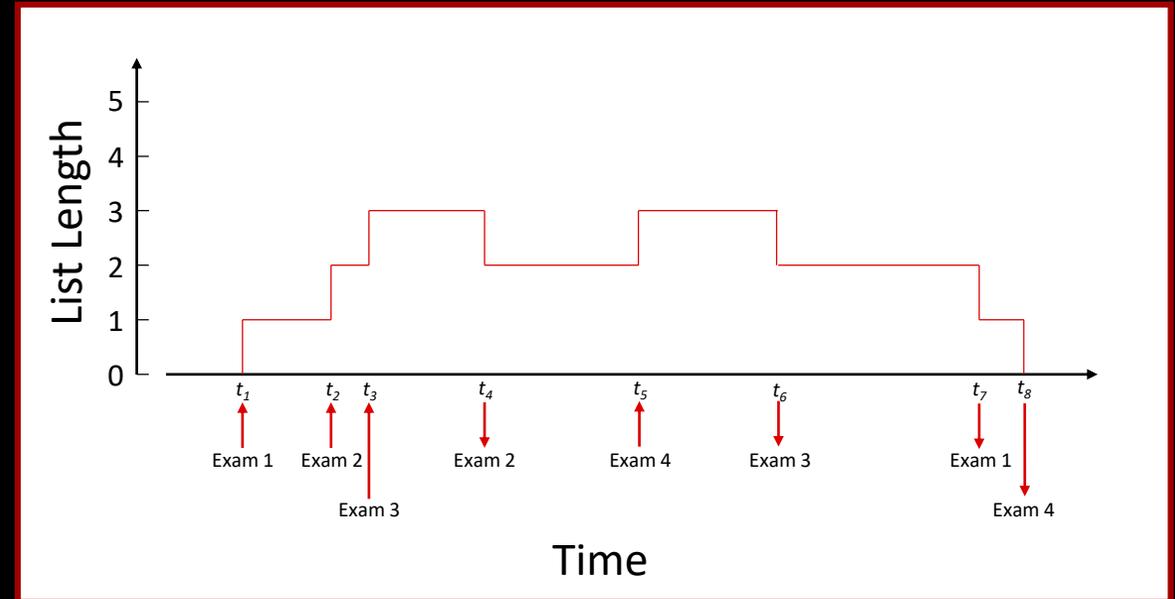
- Academic children's hospital
- 7am – 5pm weekdays, radiographs read off shared worklist
 - 1-2 dedicated radiograph readers but too high volume for these readers
 - Remaining exams (wide variability between 100-400 exams daily) responsibility of other 8-9 on service body radiologists
 - Tally of unread radiograph list length is displayed on the common worklist
 - Throughout day, radiologists can know number of remaining unread studies that need to be read



Methods & Materials

List length reconstruction

- January 1, 2015 – July 31, 2018
- 586,867 radiographs
 - Unread list length is accurate after all exams completed prior to Jan. 1, 2015 have gone off the list
 - Study start date of February 1, 2015, allows exams completed prior to Jan. 1, 2015, one month to go off list
- RIS timestamps of completed, draft, and preliminary status to reconstruct unread list length
 - Exam on-list at completion timestamp
 - Exam off-list at earliest of draft, preliminary, or signed timestamp



Materials & Methods

Linear Regression on Turnaround Times

- 344,255 radiographs
 - Subset of exams, on-list time between 7am – 5 pm weekday non holidays
- Turnaround times defined as difference between completed and signed timestamps
- Variables calculated for each 7am – 5pm weekday non-holiday rotation
- Dependent variable: Median radiograph turnaround time
- Independent variables
 - Average unread radiograph list length
 - Radiograph volume



Methods & Materials

Report length analysis

- Report length calculations
 - Standardized reports implemented Fall 2015
 - Calculated report length on exams Jan. 1, 2016 – Jul. 31, 2018
 - Number of characters used to quantify report length
- Software
 - R: A language and environment for statistical computing
 - URL <http://www.R-project.org/>



Materials & Methods

Linear Regression on Report Length

- Variables calculated for each exam
- Dependent variable: Radiograph report length
- Independent variables
 - Unread list length at exam completion timestamp
 - Exam priority (stat, urgent, asap, routine)
 - Time of day (hour during which exam was dictated)
 - Signing radiologist
 - Exam type (IMG code)



Results

Linear Regression on Turnaround Times

- Statistically significant positive relationship between turnaround times and unread list length (coefficient=0.698, $p < 0.001$)
- Non-significant positive relationship between turnaround times and volume (coefficient=0.003, $p = 0.387$)
- $R^2=0.582$

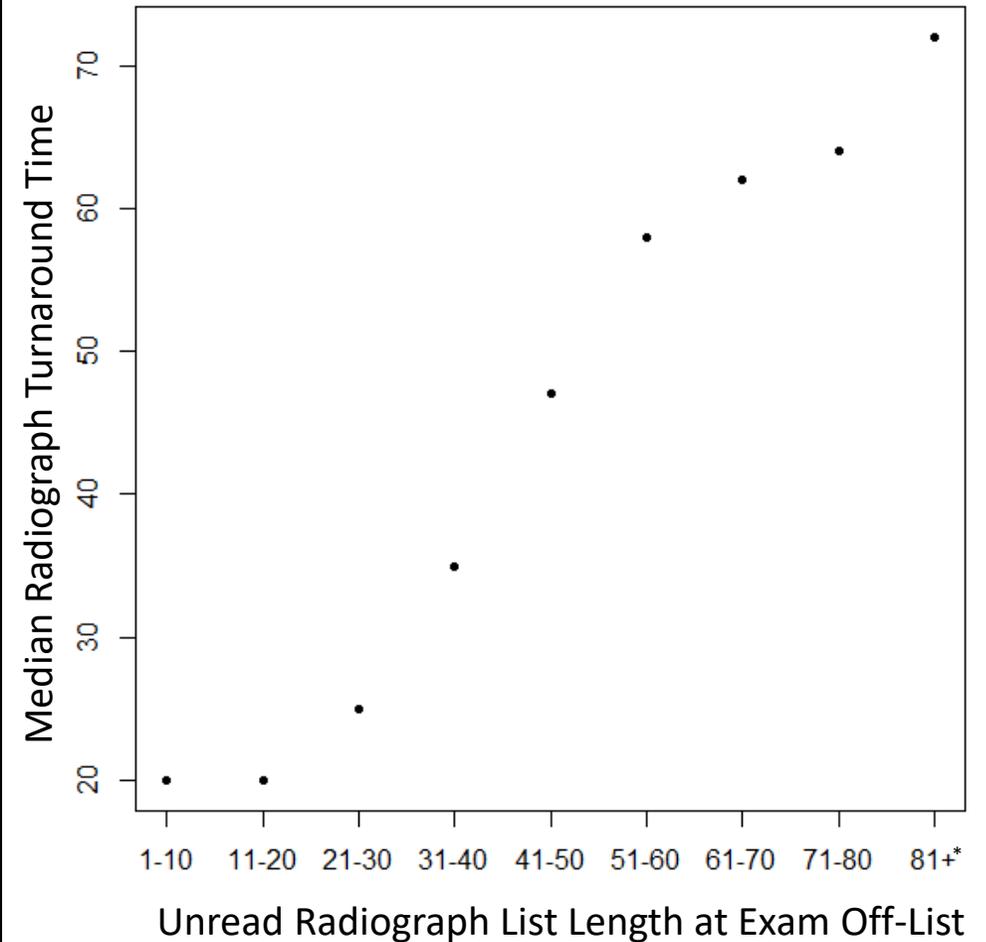


Results – TATs

Each data point represents the median turnaround time for radiographs dictated at a set list length range. List length ranges were aggregated by 10 unread exam increments. For example, the median turnaround time was 20 minutes for radiographs dictated when the unread list length was between 1-10 exams (first tic mark on X axis)

*97.7% of exams were completed with a list length of 80 or less

The median radiograph turnaround time generally increased as the radiograph list length increased



Results

Linear Regression on Report Length

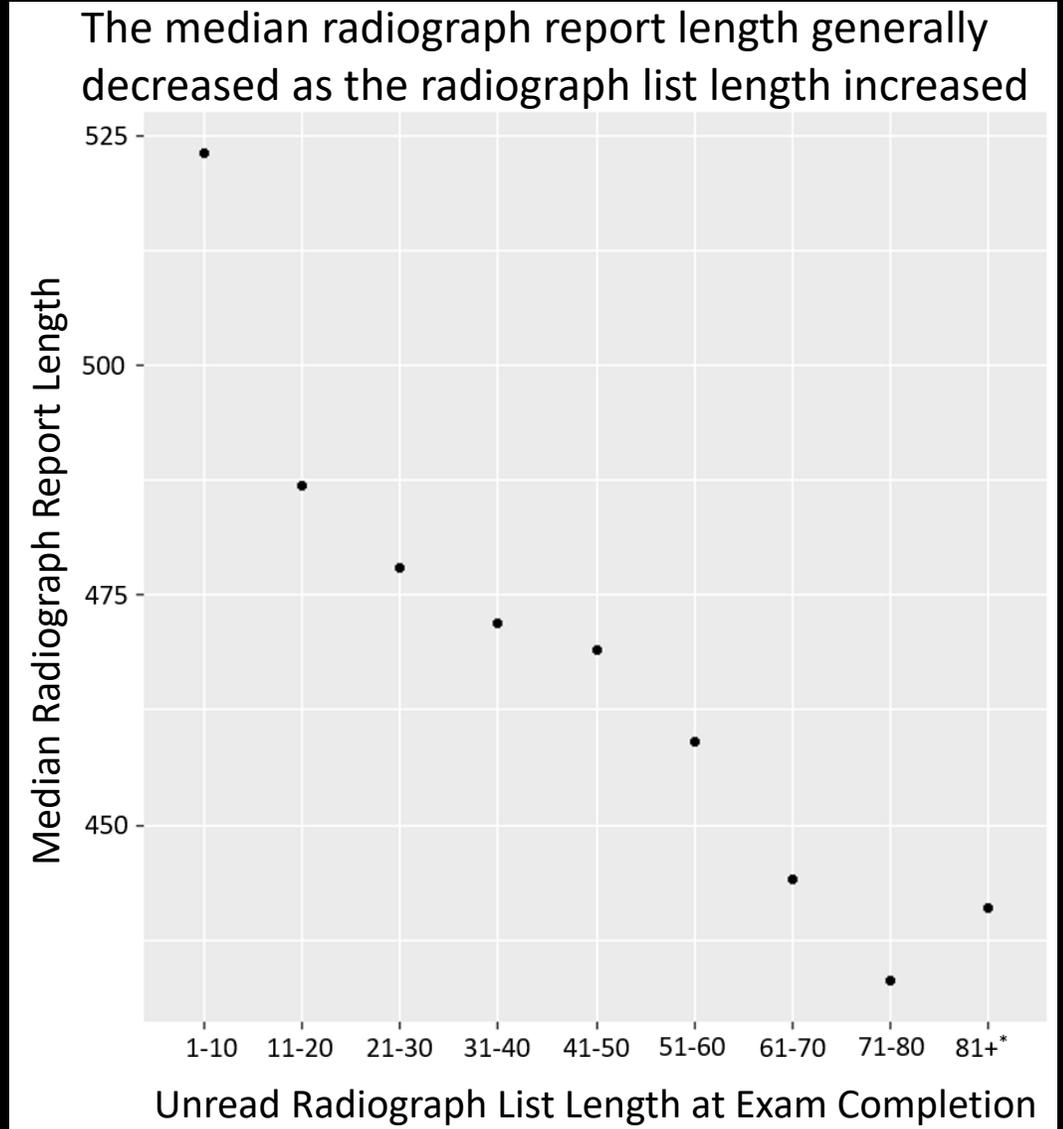
- Statistically significant negative relationship between length of reports and length of unread radiograph list (coefficient -0.471, $p < 0.0001$).
- Statistically significant relationship between length of reports and most covariates
- $R^2 = 0.378$



Results - Report length vs unread list length

Each data point represents the median report length for radiographs dictated at a set list length range. List length ranges were aggregated by 10 unread exam increments. For example, the median report length was just under 525 characters for radiographs dictated when the unread list length was between 1-10 exams (first tic mark on X axis)

*97.7% of exams were completed with a list length of 80 or less. As the list length increased above 80, the median report character count did not follow a discernable pattern.



Limitations

- Uncertain correlation between report length and report quality
- Further analysis needed to understand mechanism relating report length and list length
- Does not answer question of what causes long list lengths or what can be done to mitigate them



Conclusions

- Slower TATs were more directly correlated to long unread list lengths than daily volume
- Longer list lengths correlated with shorter report character counts
- Most studied covariates (including exam priority, time of day, and reading radiologist) had a significant impact on report length



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