Radiologists to help each other to improve efficiency by decreasing time to look up patient’s relevant clinical history in electronic medical record.

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Purpose:

• The aim of the study is to prove that it takes less time to look up relevant clinical history from electronic medical record (EMR), if the information is already provided in a specific space in the EMR by a fellow radiologist. This space is easily viewable and editable by an interpreting radiologist. It is recommended that pertinent history be placed in this space and subsequently be updated by fellow radiologists after each complex imaging exam.

• The time needed to gather this information is one of the factors contributing to increase in turn around time for radiologists. Patient's with complex oncological and surgical histories need frequent imaging and every time a radiologist may spend significant amount of time to look up the same clinical information as his/her peers.
Materials and Methods:

• In collaboration with ACMIO (Assistant chief medical officer) and Radiant Epic team, a space labelled as "Specialty Comments" was added to the SNAPSHOT of patient's charts in EMR (Fig.1). The Specialty Comment was available, viewed and edited by radiologist's logged in through radiology department. For our research purpose the specialty comment was labelled as boxed history as a variable for data analysis. If the history was not provided in that space, then it was labelled as without boxed history.

• Inclusion criteria included outdoor, adult patients with oncological histories undergoing CT chest, abdomen and pelvis with IV contrast. The time to look up history were documented in total minutes and seconds, when the boxed history was provided as well as when the boxed history was not available, and the interpreting radiologist had to search the EMR to gather the relevant information. The stopwatch function of a smart phone was used to calculate time in minutes and seconds.

• A general guideline was provided for obtaining pertinent clinical history (Fig.2). It included the type of cancer, time of diagnosis followed by treatment or recurrences with their dates. Additional complex procedures with dates, for e.g. biopsies, surgeries, drain placement or removal as well as path results were to be included as deemed necessary. The reason for obtaining the current study was one of the last factors.
(Fig. 1). The dashboard on EMR (EPIC) shows the snapshot of the patient’s information. The yellow arrow indicates the specialty comment that can be edited by the radiologist. The red arrow points towards the edit button to document the findings.
Clinical History for a Radiologist- Quality improvement project

Selection of cases:
Outpatients adults with history of cancer for CT C/A/P.

Components of history:
- Include the type of cancer and year of diagnoses, if it was diagnosed with in a year, then mention the date.
- Status post surgery/ chemotherapy/ radiation dated (date when completed).
- Mention if currently on chemotherapy or radiation therapy (last radio/chemotherapy date).
- Other surgeries.
- Lastly mention why the current study is being done? For e.g. for annual follow up, rising tumor markers or new symptoms etc.

Effective extraction of history from EMR charts:
- Look at recent note from hem/onc or radiation oncologist.
- Look at recent note from department specialty of the cancer for which the study is being read.
- Look up prior reports to see if some one wrote better history as well as read previous imaging findings.
- Click on surgical history in any of the notes.
- If Interval surgery/procedure is done, then look for it on procedure log/procedure Result tab in top row.
- Path result available on AP tab in top row.
- Lab results are available through Result review in left hand column.

How to calculate time:

Without boxed history:
Start the stop watch on your smart phone as soon as you start looking for history in EPIC chart. Stop the timer when you are done. If you have to go back to EPIC to look for more information while dictating report, then add the additional time.

Boxed history:
Start the stop watch on your smart phone as soon as you start reading the boxed history. Stop the timer when you are done. If you have to go back to EPIC to look for more information while dictating report, then add the additional time.

Sample of a history:

Your help is greatly appreciated.

(Figure 2): Criteria for acquisition of patient’s relevant clinical history.
68 yrs. old male. History of smoking, diagnosed with squamous cell carcinoma of right upper lobe in 2016 status post right upper lobectomy and radiation therapy ended in 02/01/2017. Status right adrenalectomy for metastatic lesion on 01/11/2018. Last CT chest dated 16/01/2019 showed stable exam without recurrence. Now presenting with dysphagia for past 02 months.


(Fig. 3). Sample history of patient undergoing CT C/A/P with IV contrast.
Results:

• A total of 85 cases were included in the study. Two reading radiologists provided the time for reading history from EMR labelled as without boxed history and reading from provided boxed history by another radiologist. 46 cases without boxed history and 41 with boxed history. 19 cases were included to document time taken to create the boxed history.

• Descriptive statistics, including means, medians and 95% confidence intervals for the means, were computed for the lookup times for cases with and without boxed history for each reader.

• The p-value and confidence interval for this statistic were obtained using the GLM procedure in SAS statistical software to fit an analysis-of-variance (ANOVA) model with test, history and their interaction included as predictors in the model. We used a significance level of alpha = 0.05 for testing. All tests and confidence intervals were two-sided.

• All the lookup times for reader 1 were higher when boxed history was present, compared to when it was not present. For reader 2, we saw that all but 3 of the cases without boxed history had longer look-up times (Table.1). For each reader, the lookup time for cases without box histories was significantly higher (each \( p < 0.0001 \)), (Graph 1 and 2). Comparing the averages of the reader means with respect to history, the mean lookup times significantly differed by 1.46 minutes: 0.57 (with) versus 2.03 (without), \( p < 0.0001 \). The mean time for creating the boxed histories was 3.81 minutes [95% CI: 3.41, 4.21].
Table 1: For each reader, the lookup time for cases without box histories was significantly higher than with boxed history (each $p < 0.0001$).

- N = number of cases; CI = 95% confidence interval; $p$-value is for testing if the difference in history means is zero.

<table>
<thead>
<tr>
<th>Reader</th>
<th>History</th>
<th>N</th>
<th>Mean reading time in minutes and seconds [CI]</th>
<th>Median reading time in minutes and seconds</th>
<th>Difference in History means [CI]</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Without boxed</td>
<td>22</td>
<td>1.95 [1.64, 2.26]</td>
<td>1.97</td>
<td>1.56 [1.24, 1.88]</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td></td>
<td>With boxed</td>
<td>20</td>
<td>0.39 [0.34, 0.44]</td>
<td>0.39</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Without boxed</td>
<td>24</td>
<td>2.11 [1.71, 2.51]</td>
<td>1.93</td>
<td>1.36 [0.94, 1.78]</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td></td>
<td>With boxed</td>
<td>19</td>
<td>0.76 [0.61, 0.89]</td>
<td>0.72</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
(Graph 2): Comparison of reader averaged lookup times
Conclusion:

• A pertinent history directed to radiologist's needs resulted in statistically significant decrease in time spent by interpreting radiologist to look through the electronic medical records for patients with complex oncological histories.

• Radiologist can help each other by documenting the relevant clinical history and updating it on a regular basis after each advanced radiological cross-sectional study. This has potential wide-ranging advantages, including quality reporting, decrease in turnaround time, reduction in interpretation errors as well as radiologist's continued learning.

• Due to wide use of EMR, the space for documenting the clinical history may be reproduced or some similar space may be developed by optimizing the electronic health records.