Tailored Radiologist Reports Regarding Clinician Notification of Cerebral Infarct or Hemorrhage Exacerbations or Complications Improve Overall Compliance Rates
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Purpose

Timely reporting of Critical Values enhances health care delivery.

We recognize that it is important not only to report new/acute findings in those patients characterized prospectively as suspicious for undergoing "acute stroke", but also to notify clinicians about new or expanded infarcts, or consequences thereof including mass effect or hydrocephalus, even for patients not specifically introduced as undergoing stroke alert studies.

The aim of this quality initiative was to determine if a tailored notification regimen could improve notification rates by radiologists in this patient population.
Methods

At the end of each month (Feb 2013-Sep 2014) we mined all CT Head and MRI Brain reports from our practice.

Using key phrases and excluding negating language, we developed a technique in Microsoft Excel to automatically refine the candidate exam list to about 6% of studies with highest probability for acute findings.

Cases designated as discrete Stroke Alert CT’s were excluded from consideration, since those exams have a discrete workflow and notification regimen.

The reports for these remaining studies were then reviewed individually for signs of new or increased infarction or hemorrhage, as well as increased mass effect, hydrocephalus, and other consequences meriting notification.

Methods

Radiologists were provided with monthly customized reports summarizing their notification performance.

We undertook several PDSA cycles. The first provided gross reporting success percentages for these critical values, follow by successive waves of increasing information:

1. specific language from reports that warranted notification for each individual, then
2. examples of (anonymized) reporting failures to the entire group, then
3. report verbiage which indicated specifically why each case should have been reported, then
4. section-wide imaging examples and associated reports
PDSA Methods

3

Cycle 1:
Email advising radiologists (fellows and attendings) of this new monitoring project with presentation of baseline data

Neuroradiologists:
We have begun to monitor compliance for notifying clinicians of:
NEW OR EXPANDED INFARCTS OR HEMORRHAGES, OR SECONDARY COMPLICATIONS THEREOF (including developing hydrocephalus or herniation), regardless of whether these findings may be expected in any given percentage of cases.

For notification of new or expanded infarcts and hemorrhages, we documented clinician notification in 65.0% (12/18). Note that both missed opportunities came in cases where the findings were made, but communication of findings directly with clinicians was not documented.

We will continue to follow performance of notification in these cases. Please do not hesitate to contact me with questions about the goals of this project or the mechanics of data collection.

Thanks.

PDSA Methods

Cycle 2:
More detailed report with individualized emails to radiologists identifying specific cases the did not meet our goal

<table>
<thead>
<tr>
<th>Acute Infarct/Hemorrhage Notifications</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>10</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Week 2</td>
<td>9</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Week 3</td>
<td>8</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Week 4</td>
<td>7</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

Summary Data

New "Stroke" Notification Documentation

<table>
<thead>
<tr>
<th>Month</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feb 2013</td>
<td>15</td>
<td>10</td>
<td>12</td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td>Mar 2013</td>
<td>16</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td>Apr 2013</td>
<td>17</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
</tr>
</tbody>
</table>

I appreciate your continued support.
PDSA Methods

Personalized e-mail example:

Dr.

This case was dictated by a resident, but it fell on the attendings to ensure that there is adequate documentation of communication for new or expanded strokes or hemorrhages. Please let me know if there is anything I can do to increase compliance.

<table>
<thead>
<tr>
<th>Date</th>
<th>Acc</th>
<th>Newly diagnosed acute intracerebral hemorrhage</th>
<th>Notification</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>87</td>
<td>New right lacunar infarct</td>
<td>--</td>
</tr>
</tbody>
</table>

Thank you.

Cycle 2:
More detailed report with individualized emails to radiologists identifying specific cases that did not meet our goal

Cycle 3:
Even more detailed report with verbatim reports and Q&A-style teaching points for all radiologists to internalize

There may be some lingering questions regarding when notification is necessary regarding acute or expanded infarcts or hemorrhages, or expanding consequences of these entities.

It is important to document notification to a clinician about these findings if:
- The clinician is notified by email or
- The clinician had ordered the previous last lacunar infarct

Please review these illustrative examples by which it is helpful when notification is necessary.

- **CASE 1:** Consider the following from a head CT report.
  - **DIAGNOSIS:** Acute Hemorrhagic Left Frontal Infarct
  - **TREATMENT ALGORITHM:** High-risk hemorrhage
  - **ACUTE MANAGEMENT:** Intravenous administration of 1000 cc of LR
  - **ACUTE MANAGEMENT:** Intravenous administration of 1000 cc of LR
  - **ACUTE MANAGEMENT:** Intravenous administration of 1000 cc of LR
  - **EXTERNAL BEHAVIOR:** Evacuated

- and the brain MRI report from a study 24 hours later:
  - **DIAGNOSIS:** Acute hemorrhage
  - **TREATMENT ALGORITHM:** Intravenous administration of 1000 cc of LR
  - **ACUTE MANAGEMENT:** Intravenous administration of 1000 cc of LR
  - **ACUTE MANAGEMENT:** Intravenous administration of 1000 cc of LR
  - **ACUTE MANAGEMENT:** Intravenous administration of 1000 cc of LR

- G: Do the MRI findings warrant notification?
  - **A:** No, because even though there was such change in the first model, the determination of age was inconclusive. It was only upon interpreting the brain MRI that we could establish the acute nature of this event.

- **CASE 2:** Consider the head CT report.
  - **DIAGNOSIS:** Acute Hemorrhagic Left Frontal Infarct
  - **TREATMENT ALGORITHM:** High-risk hemorrhage
  - **ACUTE MANAGEMENT:** Intravenous administration of 1000 cc of LR
  - **ACUTE MANAGEMENT:** Intravenous administration of 1000 cc of LR
  - **ACUTE MANAGEMENT:** Intravenous administration of 1000 cc of LR

- G: Do these CT findings warrant notification?
  - **A:** No, because even though there had been described previously, the study shows extension of the infarct and...
Cycle 4:
Most detailed report images and verbatim report examples to illustrate why target was not achieved.

Results
The reporting compliance increased from 83.3% to 94.0% (three month rolling averages), including six individual months at 100%.

Notification Rates (3m Average)
Results

Subjectively, there is greater awareness of the need to notify when imaging findings grew more conspicuous.

Success is now documented and monitored by the Performance Improvement Committees of both Radiology and the Stroke Service.

Conclusion

Customized monthly reports informing radiologists of their specific success in documenting clinician notification of new or expanded infarcts and hemorrhages, and consequences thereof, enhances performance.

Progressive PDSA cycles, with more illustrative presentation in each wave, led to even better performance overall.

This method serves as a model that can be extended to other sections in the Department to enhance overall communication with clinicians.