Radiology Reports - From Results to Action

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Background

The benefits of structured reporting are myriad. They include decreased ambiguity, increased consistency, improved data mining, and adherence to guidelines(1). Another benefit, as-yet unrealized, is an “actionable report”, where software can take automatic action based on structured report content. While there are many tiers of structure reporting implementation, the ultimate goal is the usage of standardized language(2). To these ends, the Digital Imaging and Communications in Medicine (DICOM) and HL7 joint Standards Committee Structured Reporting Working Group have developed DICOM Part 20 (PS3.20): Imaging Reports using HL7 Clinical Document Architecture (CDA) (3). Basically, Part 20, previously referred to as Supplement 155, specifies an HL7 CDA-based format for implementing structured radiology reports.

In an effort to gain support for adopting this standard, we describe two concrete use cases which highlight “actionable report” functionality enabled by DICOM Part 20. These use cases involve the communication of critical findings and recommendations, discussed in the context of the ACR’s classification of actionable findings(4).

For the first use case, consider an incidentally detected 6 mm solid pulmonary nodule in a patient with no history of smoking or lung cancer. We will consider this to be a category 3 actionable finding, requiring communication within days(4). In this case, the radiologist wants to communicate the finding to the referring provider, recommend a follow-up chest CT in 12 months(5), and confirm that they received the communication within a reasonable time period. With DICOM Part 20 section 9.8.10 (Communication of Actionable Findings) and section 9.8.11 (Recommendation), the following hypothetical workflow is possible:

- Within the reporting software, the radiologist selects “Communicate Actionable Finding”
- The radiologist completes the following (“Business Name” in DICOM included in <> brackets):
  - Finding: (impression text is automatically included and may be modified) <Content>
  - Category: 3 (confirm receipt within a specified number of days) <Content>
  - Contacted Provider: (defaults to ordering provider) <NotificationContactName>
  - Recommendation: CT of the Chest without contrast in 12 months <Recommendation>
  - Radiologist Contact Information: (default pager information is automatically included and may be modified) <ReportingPhysicianName and NotificationContactTelecom>
  - Contact Time: (defaults to now) <CommTime>
When the radiologist signs the report, it is sent as a structured CDA report to the electronic medical record (EMR). The EMR recognizes an actionable finding and recommendation, and routes a message to the ordering provider.

The referring provider opens the message in the EMR. The recommendation for a chest CT is seen as a link. When clicked, it launches an order interface with the desired exam type (Chest CT without contrast) and date (6 months in the future) pre-filled. The provider confirms the order.

If the referring provider does not read the message within the specified number of days or alters the recommended action, the EMR sends an alerting message to the interpreting radiologist.

For the second use case, consider an acute brain parenchymal hemorrhage, classified as a category 1 actionable finding. Category 1 findings require direct verbal communication to the ordering provider within minutes (4). The Joint Commission (TJC) requires facilities to define category 1 findings and monitor their performance in reporting them (4). In this case, DICOM Part 20 section 9.8.10 (Communication of Actionable Findings) enables the following workflow:

- The radiologist recognizes the parenchymal hemorrhage, and speaks with the referring provider.
- Within the reporting software, the radiologist selects “Document Communication”
- The radiologist completes the following (“Business Name” in DICOM included in <> brackets):
  - Finding: (impression text is automatically included and may be modified) <Content>
  - Category: 1 <Content>
  - Contacted Provider: (defaults to ordering provider) <NotificationContactName>
  - Recommendation: (defaults to none) <Recommendation>
  - Radiologist Contact Information: (default pager information is automatically included and may be modified) <ReportingPhysicianName and NotificationContactTelecom>
  - Contact Time: (defaults to now) <CommTime>
- With this codified information, it would be easier for software to track critical finding metrics.

Discussion

The above examples highlight potential functionality enabled by DICOM Part 20 for different urgencies of actionable findings. DICOM Part 20 enables this functionality by specifying interoperable structured data. In other words, 3rd party software can take a radiology report and go beyond simply displaying report text. It can actually take automatic actions based on a radiology report. As illustrated above, messaging based on report content becomes possible. Communication patterns within a department could be analyzed to identify quality issues and assist in compliance with TJC requirements. Specific radiologist recommendations become one-click ordering for a provider, saving them time and effort and hopefully improving on proven dismal follow-up rates (6). There are limitless other possibilities, including notifications when pathology results are available or when a follow-up imaging study is performed.

A potential limitation is that direct communication may be preferable to text-based communication. Critical category 1 findings require direct communication. Less urgent findings can be adequately handled by text-based communication only if the software enables “closing the loop”.

Another limitation relates to tracking communication of category 1 findings. Namely, how does one identify category 1 cases that were not communicated? Natural language processing or manual verification may be required to discover such outliers.
Finally, many challenges to these scenarios relate to implementation details. Namely, an intuitive interface with consistent radiologist use would be critical to successful adoption. A poorly designed system where many radiologists still free-dictate communication details would accomplish nothing.

Conclusion

When radiology reports contain structured data, it is possible for other systems to automatically act on and analyze that data. This interoperability creates endless opportunities for workflow and quality improvements. We presented two scenarios that illustrate such opportunities enabled by the new DICOM Part 20, and encourage vendors to support this new standard.

References


Keywords

DICOM Part 20, Structured Reporting, HL7, CDA