Introducing Radiology Report Checklists among Residents:

Adherence Rates When Suggesting versus Requiring Their Use and Early Experience in Improving Accuracy

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Rationale and Objectives: To retrospectively compare resident adherence to checklist-style structured reporting for maxillofacial computed tomography (CT) from the emergency department (when required vs. suggested between two programs). To compare radiology resident reporting accuracy before and after introduction of the structured report and assess its ability to decrease the rate of undetected pathology.

Materials and Methods: We introduced a reporting checklist for maxillofacial CT into our dictation software without specific training, requiring it at one program and suggesting it at another. We quantified usage among residents and compared reporting accuracy, before and after counting and categorizing faculty addenda.

Results: There was no significant change in resident accuracy in the first few months, with residents acting as their own controls (directly comparing performance with and without the checklist). Adherence to the checklist at program A (where it originated and was required) was 85% of reports compared to 9% of reports at program B (where it was suggested). When using program B as a secondary control, there was no significant difference in resident accuracy with or without using the checklist (comparing different residents using the checklist to those not using the checklist).

Conclusions: Our results suggest that there is no automatic value of checklists for improving radiology resident reporting accuracy. They also suggest the importance of focused training, checklist flexibility, and a period of adjustment to a new reporting style. Mandatory checklists were readily adopted by residents but not when simply suggested.

Key Words: Structured reporting; checklists; resident education; resident accuracy; radiology reporting; safety; quality improvement.

Standardized radiology reporting aims to improve patient safety and accuracy by providing a clear and thorough template. The growing emphasis on structured reporting in the radiology community (1), which is internationally recognized (2), borrows from work in many areas (3–11). Universal protocols and checklists are taking hold throughout medicine: for bedside procedures, in the operating room, and for infection control in hospital units (3,4). The use of checklists has been found to decrease catheter-related septicemia by more than five-fold (5,6), surgical hospitalization complications by more than one-third to one-half (7–9), and overall anesthesia-related mortality (10). Such checklists, inspired by safety measures enacted in the airline industry, have been advocated for radiology reporting (11). Specific areas of radiology have benefited from efforts at standardizing terminology, recommendations and reporting, such as through the Breast Imaging Reporting and Data Systems, the developing Liver Imaging Reporting and Data Systems, and the Fleischner Society guidelines for pulmonary nodules (12–14). Similarly, there are ongoing efforts to standardize reporting language, for instance the RadLex database (15).

Although there is increasing evidence that radiologists and referrers prefer structured reporting (1), universal reporting standards are in variable states of maturity in the field of radiology, and the inconsistency of reporting style and language remains a concern. One study found 14 terms used to describe the same entity on chest radiographs (16). The clarity of reports is paramount in providing valuable information and ensuring safety (17–19).

Two recent single-institution studies have shown good results with adoption of structured reports: with strong adherence to a checklist-style report and largely favorable feedback at one institution (20) and higher ratings of clarity and clinical

Acad Radiol 2014; 21:415–423

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http://dx.doi.org/10.1016/j.acra.2013.12.004

relevance for structured reports compared to conventional reports among radiologists and referrers at another institution (21).

However, structured reporting has encountered problems and resistance to implementation. Studies have not shown improved productivity or accuracy with the use of structured reports and even dissatisfaction on the part of referring physicians (22). Resistance to its use has been attributed to a steep learning curve, loss of normal search patterns, decreased dwell time, poor suitability to complex cases, and loss of the theorized cognitive benefit of spoken reporting (23–25). Structured reports have been described as rigid and inefficient (22–24). Interestingly, structured reports have not been shown to improve accuracy in radiology reporting among medical students (21). Moreover, a prospective study of 34 residents from 2009 showed a decrease in accuracy and completeness with structured reports in comparison to freely dictated reports for brain magnetic resonance imaging in the setting of suspected stroke (25).

More recently, there has been interest in further improving templates by linking them directly to image tags, although, like many templates, these products are still in development, and limitations to workflow remain a major obstacle to radiologist support (26).

Rates of resident–faculty interpretation discrepancy have been widely studied. The rates range from 0.4% to 10%, without differences across specialties (27,28). Various methods have been used to categorize the differences in interpretation, for instance, as minor or major ("variances", "discrepancies", or "errors") (29,30). Discrepancies ranked with a RADPEER (American College of Radiology, Reston, VA) score have demonstrated a strong correlation between higher scores and increased level of clinical significance (31). One study used four simplified categories for comparison: agree, finding not affecting management, finding that may affect non-ED management, and finding that may affect ED management (31). These ranking systems were influential in how we categorized our results.

The technical tools of standardized checklist-style templates, in conjunction with standardized language, can arguably create a strong backbone on which to build adaptive skills, and they seem particularly suited to radiologists in training. The neuroradiologists at our institution noticed an aberrantly high (although still within acceptable range) reporting discrepancies on maxillofacial computed tomography (CT) among residents compared to other types of studies. As such, we sought to assess whether instituting a checklist structure for maxillofacial CT from the emergency department (ED) would improve reporting accuracy by residents, decreasing the rate of undetected pathology.

We hypothesized two things: individual and overall resident accuracy would be improved using a new checklist because it would guide their search pattern and serve as a reminder, particularly for secondary findings (such as in the soft tissues); and that residents would be resistant to using the checklist, a format they were not familiar with, so there would be better adherence by the required group.

History: [ ]

MAXILLOFACIAL CT

TECHNIQUE:
Thin axial images were obtained from the hyoid bone to the superior aspect of the frontal sinuses. No intravenous contrast was administered. Axial, sagittal, and coronal reconstruction images were reviewed.

COMPARISON: [None].

FINDINGS:
Frontal, Ethmoid, Maxillary, Sphenoid: [No fracture]
Orbital Floor/Walls: [No fracture]
Pterygoid Plates: [No fracture]
Zygoma/Arch: [No fracture]
Nasal Bone: [No fracture]
Nasal Septum Fracture/Hematoma: [No fracture]
Mandible/Condyles: [No fracture]
Odontoid/Visualized Cervical Spine: [No fracture]

Globes/Lenses: [Intact]
Retrobulbar Space: [Intact]

Visualized Intracranial Structures: [Please refer to CT of the head performed concurrently.]

IMPRESSION:

[No evidence of fracture.]

Figure 1. Reporting checklist template developed for resident interpretation of maxillofacial bones computed tomography (CT) from the emergency department. Bracketed text represents fill-in fields with default content.

SUBJECTS AND METHODS

Checklist

We presented a checklist-style reporting template in the Powerscribe 360 (Nuance, Burlington, MA) dictation system to the residents at our two different radiology residency programs for use during independent reporting of maxillofacial CT from the ED. Three neuroradiology-trained faculty members and one radiology resident developed a succinct checklist template based on Radiologic Society of North America structured reports (https://rsna.org/Reporting_Initiative.aspx) and a compilation of frequently missed pathology by residents at our institutions (Fig 1). No targeted training was provided, either in use of the checklist or the specific findings of interest, in order to assess the de novo use of a checklist to enhance accuracy and search patterns independent of directed training. Residents were allowed to provide ad lib descriptions under each heading without specific structured language requirements.

Study Subjects

Program A was conducted in two community hospitals in New York City with a total of 1076 beds and a level 1 trauma center, and Program B was also based in two community hospitals in New York City with 1580 total beds. The residents in program A (where the faculty members who designed the template primarily teach) were informed at a meeting and later in follow-up emails that a checklist template had been developed. It was introduced as a requirement from that point