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Enhancing Radiology Communication: Comparative Evaluation Of Structured Versus Conventional Reporting In Body Ct Imaging

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ABSTRACT

This was done in order to determine the effectiveness of structured radiology reporting as opposed to traditional free-text reporting in improving clarity, content satisfaction and overall clinical reporting. Radiology reports (chest, abdominal, and pelvic CT reports, 100 reports, in total) were examined in a mixed-effects model to determine the score of clarity and Perceived Overall Clinical Satisfaction (POCS). Structured reports showed much more clarity and content satisfaction with a mean score of 9.36 and 9.61, respectively, as opposed to conventional reporting. Structured formats were preferred by radiologists and referring physicians, of which the latter was more inclined to use it because of the need to obtain detailed written information. Although, structured reporting enhanced the level of clarity and variability was lower, POCS grades showed no statistically significant difference, meaning that there was insufficient direct influence on clinical decision-making. Such findings indicate that structured reporting improves the quality of reports and communication but needs further improvement and connection with PACS systems to become widespread.

Keywords: Structured reporting, Radiology, PACS, Diagnostic accuracy, Clinical communication

INTRODUCTION

In the recent years, interpretation and evaluation of the medical images have been increasingly challenging to the radiologists owing to the swift developments in imaging technologies [1]. In the present day, radiologists and referring physicians have to combine the information of imaging research, clinical examinations and lab research to provide reliable and in-depth diagnoses [2]. However, even with these technological advancements, radiology reporting has remained quite stagnant with a majority of the clinicians practicing by using their usual methods of reporting. Generally, radiologists make reports with high-level findings, the techniques used to perform the imaging and accompanying information about the clinical history of the patients [3]. Report writing is a distinct skill many radiologists believe in, and they are reluctant to embrace standardized ways of doing it [4]. The need of structured reporting has however increasingly become more evident with increased complexity of imaging data [5,6]. By adopting a standardized format, the number of diagnostic errors can be reduced, the workflow can be made more efficient, and the diagnostic accuracy can also be increased, as well as the communication between healthcare professionals. Structured reporting is organized and systematic in layout, like in checklists, unlike free-text reports, all important elements are represented by predefined templates and headings [7,8]. Other doctors prefer reports that are structured according to important initial information because they are easier to understand and comprehend [9]. To facilitate standardization of reporting, the Radiological Society of North America (RSNA) has come up with a standardized lexicon called RadLex which is an extensive set of standard vocabulary aimed at simplifying communication between radiologists, researchers, and data analysts. As an example, structured reporting, as specific to mammography, has been required almost two decades by FDA regulations, which resulted in the enhanced cooperation between radiologists and referring clinicians through the provision of diagnostic codes and specific recommendations [10]. Even though structured reporting has been successfully applied in most medical specialties, it has not been fully applied in radiology. Structured reporting in the surgical practice has facilitated the completeness and quality of operative notes, which have been useful in the integration of electronic medical records [11]. However, it has been sluggishly adopted by radiologists outside the breast imaging. The study will assess the performance of structured radiology reports by comparing different body computed tomography (CT) reports, with the involvement of referring physician, radiologists and radiology trainees.

MATERIALS AND METHODS

The study was conducted under the strict compliance with HIPAA regulations. It was designed as a quality improvement project that involved radiologists in Sree Balaji Medical College and Hospital, Chennai. A group of participants was selected to complete the survey by being a specialized diagnostic imaging group that includes radiologists that regularly

interpret body CT scans. Both surgical and medical oncologists referred patients to subspecialty care in situations where the patients were diagnosed with certain types of tumors which included colorectal, pancreatic, hepatobiliary, cervical, and uterine cancers. A well-formulated questionnaire was administered to the eligible participants to obtain the information of both the oncologists and radiologists. The total number of study participants was 100. This included radiologists that had at least two years of experience and each one reviewed an average of 60 radiology reports per day. The respondents were of different expertise with levels between two and 25 years. The average number of reports that were reviewed by those with two, seven, and 25 years of practice was approximately 44, 16 and five reports day. Also, body imaging radiology fellows stated that they read 15 to 25 reports per day. Two medical oncologists (40 and four years experience) with routine review of imaging reports were also included in the research.

Radiology Report Assignment and Selection.
One hundred CT reports were then randomly chosen to be evaluated with half of them consisting of traditional narrative reports and the other half consisting of structured reports. Such reports included chest, abdominal and pelvic imaging reports. All personal identifiers were eliminated to keep the information confidential. The number of reports each one of the participants evaluated was 450. The sample was randomly selected based on the imaging database of the hospital and different types of tumors were included. The radiologists and representatives of the five surgical and oncology subspecialities studied the reports during six months.

Organized reporting methodology.
Multidisciplinary disease management teams were used to come up with standard reporting templates to ensure uniformity. The number of CT templates made accessible reached 43 and featured such procedures as triphasic liver CT, preoperative pancreas CT, chest, abdominal, and pelvic CT scans. Such templates included the key aspects of reporting to make them complete and consistent. Prior to making the final reports, radiologists could amend the pre-written material. Structured reports were created by the use of PowerScribe software by Nuance Technology (Burlington, Massachusetts).

Statistical Analysis
Statistical analysis and comparison of conventional narrative report and structured report performance in terms of the clarity of the content and the Perceived overall clinical satisfaction (POCS) scores were conducted using a mixed-effects model.

The model incorporated:
Fixed effects to take into consideration the dissimilarities depending on the type of report (structured vs. conventional) and the practice type (radiologist vs. non-radiologist). Random effects to include individual differences amongst respondents to account variability that could not be attributed by the fixed factors. Moreover, the ratings of repeated measures between the respondent groups of each group were also assessed by the use of intraclass correlation coefficients (ICC) to establish the level of agreement and reliability. This was necessary in order to control dependency in the dataset as a result of numerous measures by the same participant. Histogram plots were created in order to further examine the pattern and variability of responses. These plots enabled a visual determination of the distribution of clarity and satisfaction scores in the various report forms and categories of clinical practices providing ideas on the consistency and dispersal of the ratings. This method of analysis has offered a solid statistical framework to identify the effectiveness of the structured reporting against the traditional one, at the same time, taking into account systematically and randomly determined variables, which guarantees the robustness and validity of the findings.

RESULTS

Satisfaction with Content

Table 1: Satisfaction with Content and Multivariate Mixed-Effects Model

Effect	Conventional Report	Structured Report	F Value	P Value
Report Type	8.55 (8.12–8.97)	9.61 (9.25–9.98)	28.74	<0.001
Practice Type	…	…	3.12	0.287
Radiologist	8.95 (8.33–9.58)	9.68 (9.28–9.95)	…	…
Non-Radiologist	8.20 (7.65–8.78)	9.42 (8.91–9.87)	…	…
Interaction of Report and Practice Type	…	…	5.06	0.052

Table 2: Mixture Effects Modeling and Adjusted Mean Models for Satisfaction with Clarity

Effect	Conventional Report	Structured Report	F Value	P Value
Report Type	8.56 (7.98–8.03)	9.36 (8.79–9.93)	35.72	<0.002
Practice Type	…	…	1.36	0.274
Radiologist	8.81 (7.71–8.42)	9.45 (8.75–9.25)	…	…
Non-Radiologist	8.26 (7.35–9.02)	9.25 (8.38–9.02)	…	…
Interaction of Report and Practice Type	…	…	2.68	0.309

Table 3: Mixed-Effect Modeling and Adjusted Mean Estimation of POCS Grades

Effect	Conventional Report	Structured Report	F Value	P Value
Report Type	5.38 (4.78–5.65)	5.72 (4.93–5.81)	3.23	0.257
Practice Type	…	…	0.05	0.822
Radiologist	5.25 (4.65–5.83)	5.43 (4.81–5.82)	…	…
Non-Radiologist	5.09 (4.54–5.83)	5.31 (4.66–5.95)	…	…
Interaction of Report and Practice Type	…	…	0.22	0.856

Table 1 demonstrates a clear advantage for structured reports regarding satisfaction with report content. The mean satisfaction score for structured reports was 9.61 (9.25–9.98), compared to 8.55 (8.12–8.97) for conventional reports. The F value of 28.74 and a highly significant p-value <0.001 confirm that this difference is statistically significant. Interestingly, radiologists reported slightly higher satisfaction scores (9.68) compared to non-radiologists (9.42), indicating a general preference for structured reports across both groups. The interaction between report type and practice type approached statistical significance ($p = 0.052$), suggesting that structured reporting may benefit both groups equally, though the effect varies slightly by specialty. Table 2 focuses on satisfaction with clarity using mixed-effects modeling. Structured reports again outperformed conventional reports with a mean score of 9.36 (8.79–9.93) versus 8.56 (7.98–8.03) for conventional formats. This yielded a strong F value of 35.72 and $p < 0.002$, emphasizing that structured reports significantly improve clarity. However, the practice type itself did not show a significant effect ($p = 0.274$), indicating that clarity improvement is consistent regardless of whether the user is a radiologist or a referring physician. The interaction effect was non-significant ($p = 0.309$), further supporting that both groups experience similar benefits in clarity. Table 3 explores POCS grades, where structured reports scored 5.72 (4.93–5.81) compared to 5.38 (4.78–5.65) for conventional reports. Although structured reports had slightly higher scores, this difference was not statistically significant ($p = 0.257$). Similarly, practice type ($p = 0.822$) and the interaction effect ($p = 0.856$) were non-significant, indicating that while structured reporting improves content and clarity, its impact on overall clinical satisfaction is more modest. In summary, these results strongly support the use of structured reporting in radiology. Structured reports significantly enhance content satisfaction and clarity, providing a more precise and standardized communication tool for radiologists and clinicians. While overall clinical satisfaction shows a positive trend, further studies with larger sample sizes may be needed to fully capture its benefits. These findings highlight the potential of structured reporting to improve diagnostic accuracy, reduce miscommunication, and streamline multidisciplinary clinical decision-making.

DISCUSSION

The implementation of the Picture Archiving and Communication Systems (PACS) has greatly minimized the face to face interface between radiologists and referring physicians and as such, radiology reports should be coherent, accurate and of the best quality to enable the best patient outcome. The structured reporting has been presented as efficient means of communication improvement, better interpretation, and increase in the overall quality of radiological documentation [14]. The structured formats were found to have significant implications on the clarity and content satisfaction of the referring physicians in this research that tested 100 radiology reports in comparison to the traditional narrative reporting. Over the past twenty years, radiologists have expressed their concerns regarding the perception and understanding of their reports by the referring clinicians [15]. It has been shown that about 32 percent of physicians making referrals want a summary statement to appear at the beginning of the reports because inconsistency in the structure and presentation of the reports, particularly in the area of chest radiography, can usually lead to different interpretations. In a single assessment, 65% of key diagnostic features were always reported in the form of uniformity. These observations can be said to be in line with the findings of this study and do indicate a significant increase in the satisfaction, especially amongst the referring physicians, although conventional reports still scored positively [16]. One of the differences that came out was how radiologists and referring physicians perceived the matter. Radiologists are well trained in image interpretation and due to the fact that they usually know the scan of the patient beforehand, they can draw the required information even when it was less structured in the report. On the contrary, referring physicians rely on the written report as such, which is one of the reasons why they prefer structured forms. Although this increased the level of clarity and satisfaction, the overall level

of grading of the two report types did not differ statistically. This implies that as much as structured reporting enhances the communication process, it may have no significant influence on the ultimate clinical decision-making process. The fact that structured formats might produce a bias in positive feedback and, therefore, diminish the chances of observing a significant variation in grading, can be seen as one of the reasons [16]. It has been proved that structured reporting does not always enhance diagnostic accuracy but completeness, organization, and consistency, are enhanced. As an example, resident trainees produced simulated reports that were later evaluated by a neuroradiologist in one study. It was observed that structured reports were more complete and comparatively easier to understand. These findings were supported by others assessments based on cases of mock clinical and real-world audits. The referring physicians and radiologists stated that they preferred structured formats because they were presented in a systematic way whereas free-text reports were more likely to be misinterpreted. On the same note, in the United Kingdom, general practitioners preferred using structured reports since such important information like the size of the lesions was well spelt out instead of being expressed in a vague manner. Nonetheless, structured reporting has technical and human issues as well. Other radiologists fear that the most inflexible templates will make diagnosis less flexible, and hence unwillingness to move to non-traditional prose-based reporting. This resistance is brought about by years of training in narrative reporting. On the other hand, the referring physicians are firm believers of the structured reporting because it helps to simplify clinical processes and decision-making. Other medical fields have been quicker than radiology to assume any structured format due to the fact that much of the imaging findings is better explained by individualized, and flexible descriptions than by an actual template. Structured reporting has been more successful in fields like cardiology and gastroenterology, where diseases in such specialties are more defined and are easier to classify. Lack of smooth integration between structured reporting platforms and available PACS workstations is one of the key obstacles to radiology. The individual needs of various specialties like medical oncology and emergency medicine must also be personalized and this necessitates a highly refined template. The structured reporting templates in this study were developed with close coordination with subspecialized radiologists and referring physicians to develop clinical relevance and accuracy. Notably, the evaluators were not new to structured reporting since the system had been in place in the institution a few months prior to the commencement of data collection. This was done to make sure that the findings would represent a real-world, steady-state assessment of structured reporting in normal clinical practice.

CONCLUSION

In this research, it is demonstrated that structured radiology reporting enhances the clarity of radiology reports significantly and leads to a higher level of physician satisfaction than unstructured free-text reporting systems. Structured reports reduce ambiguity, facilitate easier access to information, and facilitate more productive communication between radiologists and referring clinicians by providing them in a standard format. The enhancements contribute to the fact that valuable diagnostic information is communicated effectively and reliably, which aids in the more effective cooperation in patient care. Nevertheless, in spite of these advantages, the research established that organized reporting did not bring about much difference in terms of perceived clinical value of the reports. This means that although structured formats make the work easier to read and easier to organize, it does not necessarily have a direct impact on the clinical decision under consideration. This indicates that more refinements must be carried out to enhance congruency between structured reports and the particular practise of various clinical groups and their expectations. To achieve a successful adoption of structured reporting, it is important to make sure that it is well integrated with Picture Archiving and Communication Systems (PACS). Individualizing report templates to fit the distinct requirements of multiple medical specialties are also essential as well as offering an extensive training and guidance to radiologists who have been moved out of free-text to structured reporting regimes. Further studies should be conducted on creating more flexible and user-friendly templates and evaluating their effects in the long run on the accuracy of diagnoses, efficiency of reporting, and patient outcomes. Organized reporting can change the way radiology is reported by helping resolve technical issues and the user preferences, which will enhance the communication between multidisciplinary teams and eventually understanding the quality of healthcare delivery.

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