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WHAT DO RADIOLOGY RESIDENTS THINK OF CT ABDOMEN AND PELVIS STRUCTURED REPORTING SYSTEM?

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ABSTRACT

Objective: The objective of our study is to assess the knowledge, and attitude of radiology residents towards structured reporting and whether they practice report writing with SRS.

Materials and Methods: This is a cross-sectional study. A cross-sectional study was conducted among 168 residents from radiology residency programs in the Western region of Saudi Arabia. Participants were surveyed using an English questionnaire. The questionnaire included demographic data, and questions concerning residents' knowledge of SRS, attitude towards SRS, and utilization of SRS in abdominopelvic computed tomography (CT) reports. Ethics approval was obtained from the Institutional Review Board of the Faculty of Medicine.

Results: 78 residents participated in the survey. 10% of the residents were not familiar with SRS. 71% of the residents who did hear about it, did from a radiology consultant. 30% of the residents denied receiving training in reporting skills. 63.5% of residents preferred using SRS in the abdomen and pelvis CT studies. Compared to conventional reporting, residents agreed that SRS helped them spot findings, took less time, and decreased errors. On the other hand, residents thought that SRS limits their freedom of speech, and is harder to use in complex cases.

Conclusion: Most radiology residents have a positive attitude towards SRS and believe that they increase the efficiency and accuracy of their reports. The overall level of knowledge and positive attitude of residents will, hopefully, help institutions implement structured reporting systems in the future.

Keywords: structured reports, radiology reports, freetext reports, attitude, practice, knowledge

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1. INTRODUCTION:

Radiology reports have become a permanent part of medical records. They are considered an important tool to guide a patient's diagnosis, and management, and promote prognosis. These reports convey many types of information: the technique, timing of contrast injection, findings of the performed examination, overall impression or differential diagnosis, and the radiologist's recommendations for further diagnostic assessment and management [1]. To optimize patient care, a radiologist should interpret images accurately and communicates findings to referring physicians in a timely manner.

Traditional radiology reports are composed in free-text and narrative language style, with an introduction, a body, and a brief overall impression section. This method provides the radiologist with a clean slate with few boundaries and restrictions, enabling them to generate their artistic means of conveying their findings. It does, however, come with its limitations. Incompleteness and omissions of some important structures are important setbacks to this style. Additionally, the ability to sweep thousands of reports for scientific data is relatively hindered by the lack of structure and omission of radiological findings on normal structures.

In the past decade, a structured reporting method was developed to bypass such limitations and promote communicating important imaging findings. It presents a standard set of concepts in an orderly sequence. A structured report should be ordered with titles, such as clinical data with the indication, technique, findings, and conclusion, at its basic level. The next tier is where the "findings" part is ordered with subtitles, such as the different organs or anatomic structures. At the highest level, the structured radiology report has all the previously mentioned features and uses a systematized language based on a universally agreed lexicon [2].

Structured reporting improves the quality of radiology reports. In contrast to the free text (unstructured) reporting system, physicians, and radiologists saw structured reporting as more complete, accurate, and efficient [1]. Literature also suggests that using a checklist and a characterize search pattern aids in avoiding roots of diagnostic errors such as the radiologist's "satisfaction of search" bias. However, some radiologists believe that structured reporting limits the creativity of reporting by restricting the scope of what they can include in the report [3].

Because of the positive impact of well-written radiology reports on patient care, learning how to report imaging studies and obtaining excellent communication skills are necessary components of radiology residency training programs.

With the recently emerged to focus on structured reporting, the purpose of our study is to assess knowledge, attitude, and practice of structured reporting among radiologists

in training in the western region of Saudi Arabia. We chose to ask specifically about abdominopelvic CTs as it is one of the most performed and read studies in most institutions.

2. METHODOLOGY

2.1 Study design and subjects

This is a cross-sectional study with a total of 87 participants. The participants are residents of Saudi Arabian Western Region Radiology training programs.

2.2 Study method

A 22-question-survey tool was developed and distributed by an online link to 168 radiology residents during their scheduled half academic day. The questions collected demographic data and assessed the knowledge, attitude, and practice (KAP) of the trainees toward a structured reporting system. It was written in English and the data was collected using Google forms.

After an initial assessment of the participants' current understanding of the SRS, the main concepts of SRS were briefly explained before additional questions were asked to see if their opinions changed by knowing more about SRS. Those residents who didn't know anything about SRS were asked to skip the questions related to the knowledge and practice of SRS. The questionnaire is attached in appendix A.

2.3 Statistical analysis

The questionnaire consisted of 22 questions. 4 of them were demographic info and the following 18 questions were about the SRS. Each of the 18 questions was assigned a score depending on the given responses. Questions possessing only two possible responses were scored by giving 1 point for the positive response and zero points for the negative response. Likert-type questions were scored by giving 0 points to the lowest level of liking with a one-point increment as the scale moved to the higher levels. Two questions (Q10E and Q11E) were scored reversely because they show negative practice toward structured reporting. The highest score a respondent could get was 57 points, of which 10 points (17.5%) were dedicated to the knowledge domain, 6 points (10.5%) were dedicated to the practice domain, and 41 points (72%) were dedicated to the attitude domain. Respondents who achieved a total score of 50 points or more were considered to have a high level of KAP, respondents who achieved a total score between 25 to less than 50 were considered as having a moderate level of KAP, while those who achieved a total score of less than 25 were

considered as having a low level of KAP.

Categorical variables were presented as frequencies with their corresponding percentages, whereas the scores of the different domains or the total score were presented as mean ± standard deviation (SD). The significance of the difference in the mean scores was assessed using an independent-sample t-test for independent variables with two categories or an ordinary one-way analysis of variance (ANOVA) for independent variables with more than two categories. P-values < 0.05 were considered statistically significant.

3. RESULTS

3.1 Participants' demographics:

Seventy-nine radiology residents responded. Of which 53.2% (n=42) were females and 46.8% (n=47) were males. According to their position; 50.6% (n=40) were junior residents and 49.4% (n=39) were senior residents. The questionnaire respondents belonged to 11 hospitals from 3 different cities; most of the hospitals were in Jeddah (72.2%), followed by Makkah (22.8%), and then Taif (5%).

As shown in Table 1, the mean total KAP score of respondents was 31.6 ± 9.930 points reflecting moderate KAP toward structured reporting system in CT abdomen and pelvis.

Table 1 Mean total KAP score grouped by gender, position, and workplace.

	Mean	SD	P value
Gender			
Female	30.93	9.166	0.52
Male	32.38	10.807	
Position			
R1	34.78	8.722	0.49
R2	30.82	11.189	
R3	30.11	10.857	
R4	31.00	8.724	
Junior residents	32.6	10.2	0.372
Senior residents	30.6	9.6	
Workplace			
Jeddah	32.35	10.336	0.44
Makkah	30.39	8.610	
Taif	26.50	9.747	
Total	31.61	9.930	

No significant differences were observed in the mean total score between female and male residents (30.9 ± 9.2 vs. 32.4 ± 10.8, P = 0.52), among residents occupying different positions (P = 0.49), or residents belonging to different workplaces (P = 0.44).

3.2 Knowledge Domain:

The average score of respondents was 5.53 ± 1.2 points. No significant differences were observed in the mean knowledge score between female and male residents (5.57 ± 1.02 vs. 5.49 ± 1.45, P = 0.76), between junior and senior residents (5.73 ± 1.09 vs. 5.33 ± 1.34, P = 0.16), or residents belonging to different workplaces (P = 0.48) as in Figure 1.

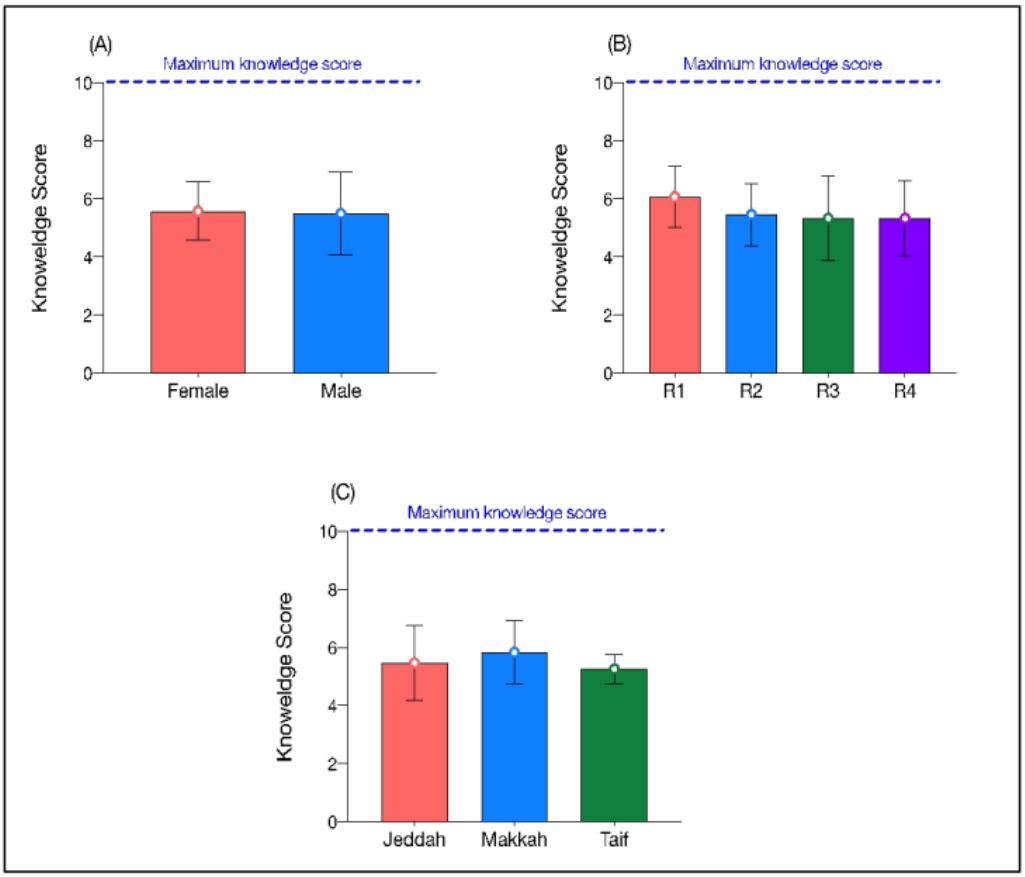

Figure 1 Knowledge score grouped by gender (A), position (B), and workplace (C). Data are presented as mean ± SD.

Only 10.3% (n=8/79) of the participants did not hear about SRS before the questionnaire. Of the 89.7% (n=71/79) who heard about SRS, 71% (n=50/71) knew about it from a radiology consultant and 33% (n=23/71) attended a lecture on SRS. Forty-three percent (n=10/23) of those who did attend lectures reported they spent 3-5 hours in these lectures. fourth eight percent (n=11/23) of those who had reporting skills lectures were from the institution where this study originated.

3.3 Attitude Domain:

In the attitude domain, the average score of respondents was 22.9 ± 8.2 points. There were no significant differences observed in the mean attitude score between female and male residents (22.38 ± 7.64 vs. 23.41 ± 8.87, P = 0.58), nor between junior and senior residents (23.58 ± 8.4 vs. 22.13 ± 8.08, P = 0.44), nor between residents belonging to different workplaces (P = 0.47) as shown in Figure 2.

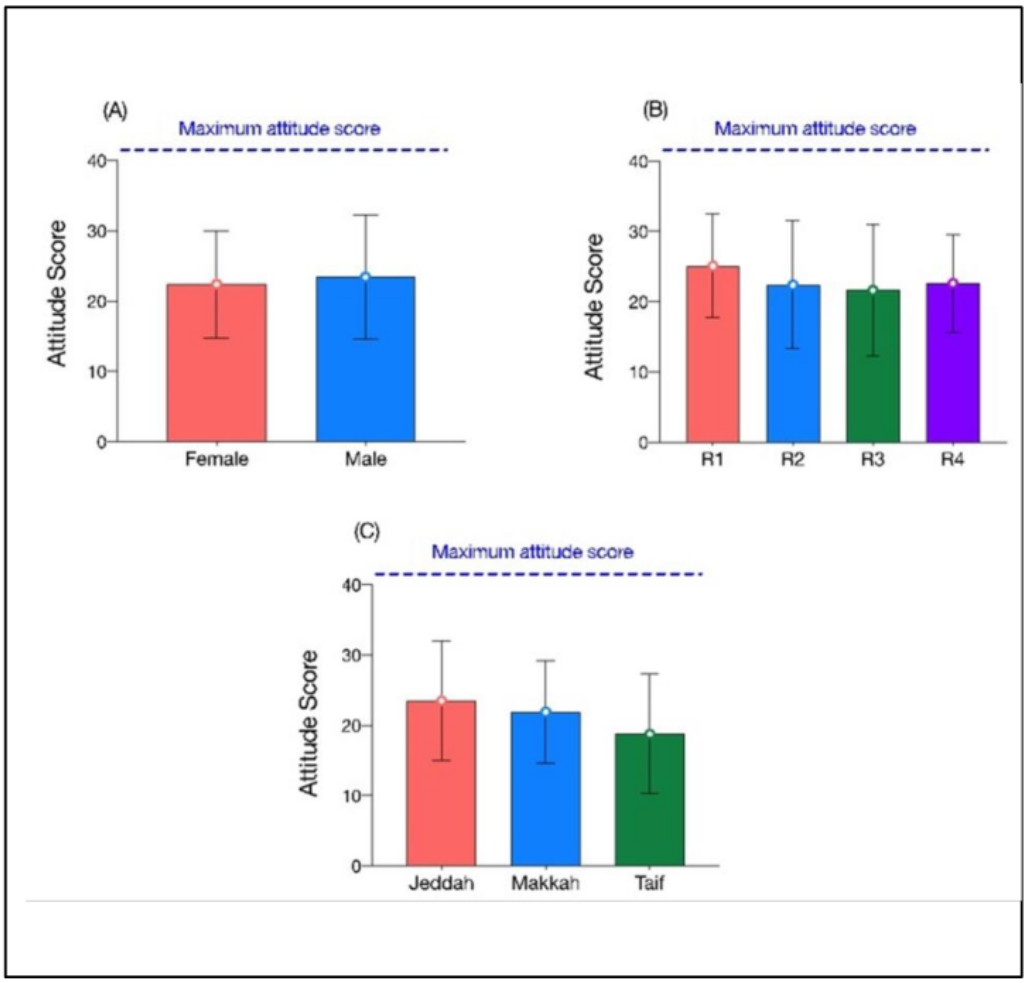

Figure 2 Attitude score grouped by gender (A), position (B), and workplace (C). Data are presented as mean ± SD.

Interestingly, the 71 individuals who reported hearing about SRS (89.7% of participants) mostly agreed on the benefits of SRS. Despite that, they stated that SRS makes it harder to describe complex findings involving more than one organ (Figure 4).

After giving brief information about SRS, most of the participants agreed on the benefits of SRS and agreed about it limits radiologists' freedom of writing. Figure 5 demonstrates

the attitude of residents after reading about SRS in the survey.

3.4 Practice Domain:

In the practice domain, the average score of respondents was 3.22 ± 1.8 points. There were no significant differences observed in the mean practice score between female and male residents (2.98 ± 1.88 vs. 3.49 ± 1.69, P = 0.21), between junior and senior residents (3.3 ± 1.6 vs. 3.13 ± 1.99, P = 0.17), nor between residents belonging to different workplaces (P = 0.21) as shown in Figure 3.

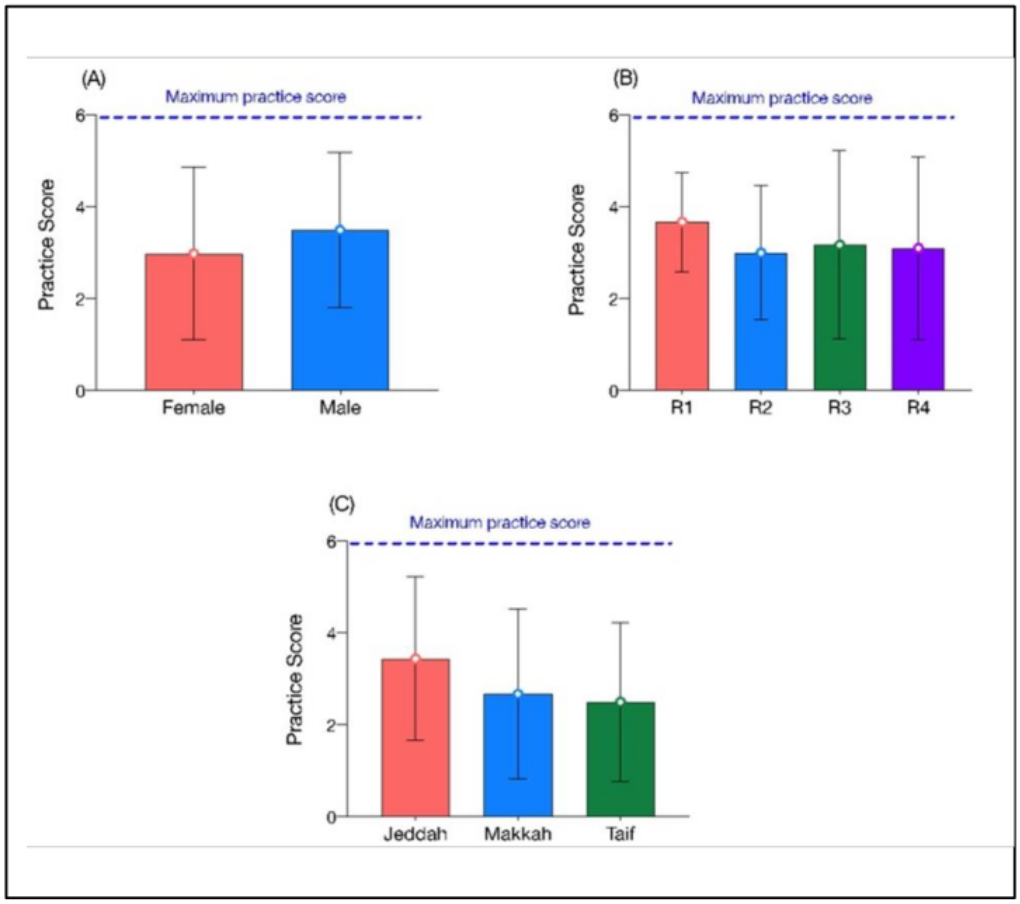

Figure 3 Practice score grouped by gender (A), position (B), and workplace (C). Data are presented as mean ± SD.

Of all the participants who heard of SRS; 18% (n=13/71) always use structured reports, 62% (n=44/71) use it sometimes and 20% (n=14/71) never used it before. Nineteen percent (n=11/56) of participants that use SRS use it in chest cases specifically, and the reported reason was the consultant's preference. Interestingly, all participants from Taif hospitals (n=4/4) use SRS in almost all their reporting. Of those who never used them, only 15%

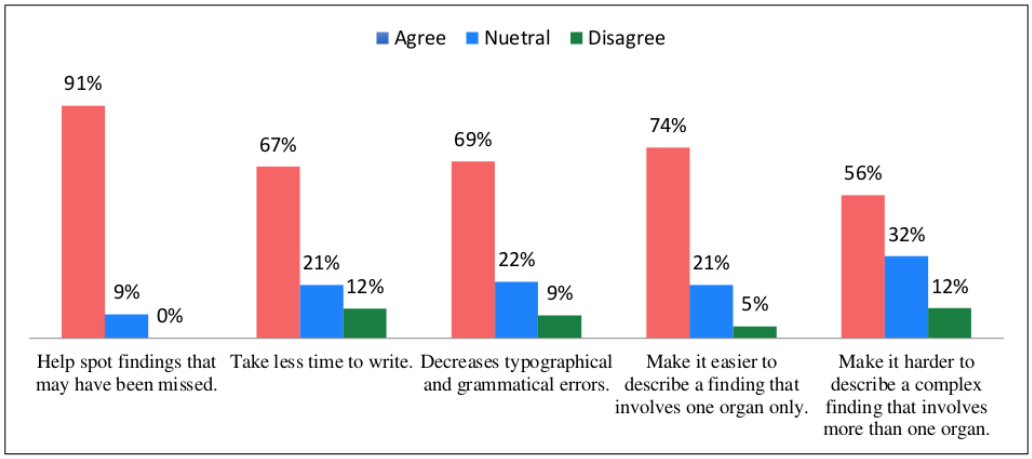

Figure 4 Attitude of residents before reading about SRS in the survey.

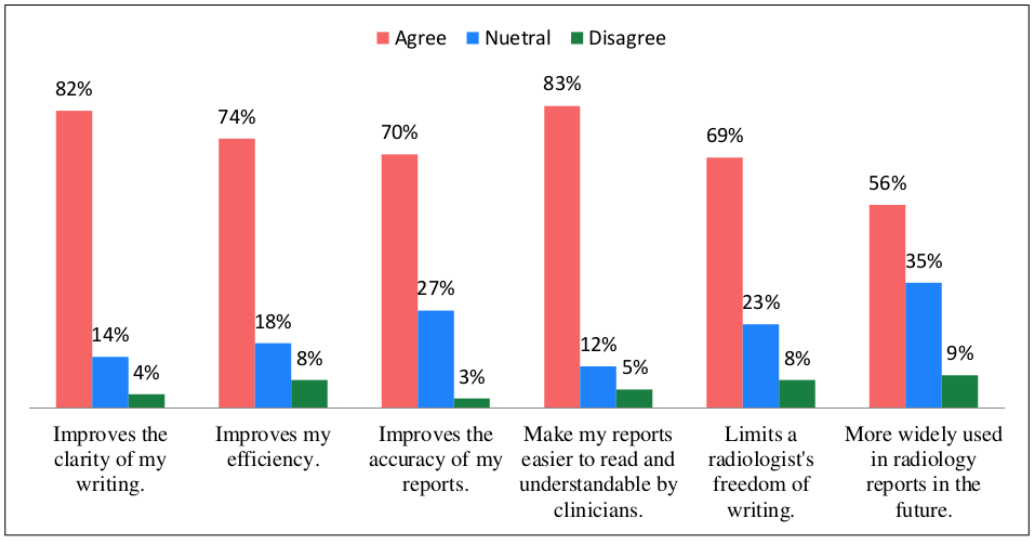

Figure 5 Attitude of residents after reading about SRS in the survey. This included the residents who never heard of SRS

(n=2/14) were from outside of Jeddah.

Regarding the utilization of SRS in CT abdomen and pelvis, 18% (n=13/71) always used SRS, while 44% (n=31/71) used it sometimes and 38% (n=27/71) never used it. Furthermore, 37% (n=16/43) of those who use SRS in CT abdomen and pelvis prefer using the free-text reporting style. Of those who were always utilizing SRS in CT abdomen and pelvis reports, 31% (n=4/13) were R3s, and 38% (n=5/13) were from KAUH. The R4s represent the highest percentage (37%) (n=10/27) of those who never use SRS.

At the end of the questionnaire, participants were asked if they would consider using structured reports. Responses are shown in Table 2. Eighty percent (n=11/14) of residents who never utilized SRS before were considering using it when asked after they were introduced to it in the survey. Additionally, 6 out of the 8 participants who never heard about SRS considered using it as well.

Table 2 Replies to the question of whether residents would use SRS in the future.

	Frequency	Percent
I might, I'd have to consider.	19	24.1%
I prefer traditional 'free text' reports.	9	11.4%
I see no reason to change.	2	2.5%
I want to, but I have to report in the same fashion that my consultant does.	31	39.2%
Yes! I definitely will.	18	22.8%
Total	79	100%

Lastly, we asked the residents if SRS will be widely used in abdomen and pelvis reporting and 57% (n=45/79) agreed that the future would be for SRS.

3.5 Optional personal opinion question:

Respondents were given the option to write any comments about SRS. Following are some of the highlights:

> "In normal cases, it is time-saving, in complicated cases I prefer free text".

> "I think it is a good way to report in which your report will be comprehensive. However, there are some limitations in which I cannot express my differentials or other extra comments".

> "As an R1, structured reports might make me depend on it. So, if I don't have it, I won't be able to write a full proper report".

> "I prefer to write a structured report in my way but having a "standard" structured report will consume more time and effort".

> "An argument about structured reports is I must read through unremarkable organs to finally get to finally reach the abnormality. There should be a mix of the two styles, free-text, and structured reports, depending on the case and what is suitable".

> "It helps clinicians to read and decreases our misses".

"I like structured reports, hope it gets used".

"It's better. It is less time-consuming".

4. DISCUSSION:

The structured report system was developed to overcome the disadvantages of free text. It can improve the quality of reports and hence many radiological societies promote its use. Radiology reporting styles in Saudi have not been studied before. To our knowledge, this study is the first study in the kingdom to investigate the practice of SRS among radiologists Saudi. We chose to ask about structured reporting of abdominopelvic CTs given their abundance in all institutions. Residents were targeted as they reflect the practices of their centers. Their knowledge and attitude toward SRS are also important to shape the future practice of radiology reporting.

A radiology report is one of the greatest editions of patients' medical records. Reports serve as a means to archive pertinent medical findings and monitor progress in patients' treatments. However, such reports, in the traditional free-text style, are subject to ambiguity and incompleteness [4–9]. Structured reports are more accurate, organized, complete, and easier to read. It is also more accessible for research and data collection [1, 2]. Our findings concur with the literature as a high number of participants agreed on various advantages of SRS (Figures 4 and 5). Most agreed that structured reports improve the clarity of reports and most saw that structured reports improve efficiency and take less time to write. Such advantages help residents and busy radiologists to save time on reporting.

Arabic is the main language spoken in Saudi. Many radiologists learn English as a second language. This might influence radiology reports through spelling and grammatical errors, especially if written in a free-text style. Structured reports can reduce these errors, something that is agreed upon by the majority of our residents.

Generating radiology reports during hospital after-hours (on-calls) is stressful and radiology reports are most vulnerable and prone to errors and miss during on-call times [1, 10]. The majority (91%) of our residents agreed that structured reports reduce misses. A similar survey conducted by the Association of University Radiologists showed that 35% of the respondents agreed that SRS minimized errors [11].

Many radiological societies are promoting SRS around the world. The radiologic Society of North America (RSNA) for example, has structured reporting templates in various languages on its website. The same is implemented by the European society of radiology (ESR) [12]. The ACR is an organization for radiologists in the US where one of its primary purposes is device guidelines and technical standards. One of these guidelines is

about the quality of radiology reports. Although SRS is not a standard yet, there are essential components for a high-quality report; the demographics, relevant clinical information, body of the report (procedure and material, findings, addressing the clinical concern, and comparison), and an impression (where a specific diagnosis, differential diagnosis, and recommendations should be included) [13]. Despite these benefits, structured reports are not widely implemented in the western region of Saudi. This is reflected in the mixed practices the residents have. Only 18% of the residents always use structured reporting. SRS is still not widely practiced in the States as well. In 2015, the AUR surveyed radiologists about their use of SRS. Only 51.3% (136 of 265) of all respondents come from groups that used SRS in at least half of their reports [11].

The lack of consistent SRS reporting is probably not related to the lack of knowledge since almost 90% of our residents knew about the system. It is also not related to their lack of awareness of the inherent benefits of SRS since 70-90% of the residents admitted to the benefits of SRS. The overall KAP score among residents was moderate and that was not affected by the institution they belonged to, their gender, or their level of training. One of the reported reasons why SRS is not used is that our participants believe SRS can make it harder to describe complex findings that involve more than one organ. The literature describes similar opinions. Johnson et al noticed a worsening in the accuracy and completeness of complex brain MRI cases while using SRS. This is probably due to the rigid template the software used with specific drop-down menus [14]. Additionally, structured reporting might limit radiologists' freedom of writing as 69% of our residents shared this concern. These are probably two of the main factors standing in the way of implementing SRS. Other obstacles are reluctance, personal preference, and lack of societal guidance, although nowadays the ESR and the RSNA are providing templates. Discussions about implementation limitations gained a good publishing momentum [12, 15].

According to the AUR survey, the most common influences in developing SRS were the standardization of style (51%), billing considerations (36%), minimization of error (34.5%), and resident education (34%). Since SRS is not a mandate, 100% adherence to it is lacking in any given institution [11]. Powell et al came to the same conclusion regarding residents' compliance to SRS in maxillofacial CT; residents will adopt SRS if properly encouraged but they may need to be "required" to adhere [16].

To change practices in institutions, the opinions of clinicians matter the most. They are the end-users of radiology reports. They do prefer structured reports, as they are better in readability and clinical utility [5, 15]. Clinicians' recall of important clinical findings is superior with SRS than that with unstructured reports [17]. Bosmans et al report that enumerated reporting was preferred by referring clinicians (84.5%) and radiologists (65.7%) for complex examinations [18]. Our residents admit to these facts; 83% of the residents

agree that SRS is easier to read and more understandable by clinicians (Figure 5).

Teaching residents how to report would likely come from the daily practice with supervising consultants that use structured reports. As shown with our residents, 71% had heard about this reporting style from their consultants. Lectures can play a part but are probably of less impact, as only 33% of residents had attended such lectures.

Another way to adopt SRS is to train residents to adopt these reporting styles. Most clinicians and radiologists thought that reporting training should be part of radiology training programs [18]. Even if residents report according to the preference of the consultant they are working with (as 39% of the residents mentioned in Table 2), once they graduate, they can adopt structured reports as their style.

As a first step to implementing SRS nationwide, we believe this study helps in shedding some light on the current reporting practices in Saudi. Our radiology residency curriculum should involve dedicated learning outcomes, teaching methods, and assessment tools to give residents feedback on their reporting skills. The American Board of Radiology has milestones that assess residents reporting skills. The ACGME requires residents to have clear concise reports that communicate findings to clinicians and that can be done via SRS [15]. Collard et al devised a curriculum that improves residents reporting. This was a 3-stage curriculum. Stages 1 and 2 involve instructions and formative feedback whereas stage 3 involves the assessment of written reports and written feedback. They found that residents' reports improved throughout the residency training in terms of succinctness, spelling/grammar, clarity, and responsible referral [19]. The curriculum development committee for the radiology residency program under the Saudi commission of health specialties (SCHS) had recently implemented reporting training workshops for first-year residents as part of the residents' competencies in the updated curriculum of 2022.

Our survey was limited to a small number of residents and didn't include the rest of the regions in the kingdom. We didn't include practicing radiologists either in this first step in assessing the reporting status in Saudi. Practicing radiologists have more experience with reporting and it would be helpful to get their perspective in future studies as they play a crucial part in influencing residents during their training. Despite that, we found valuable information regarding residents' knowledge, attitude, and practice around structured reports. We hope the information we are publishing can be used to build a curriculum suited for our trainees' KAP scores. An end goal we hope for is a nationwide adoption of SRS for better patient care.

In conclusion, despite the residents' moderate KAP scores, the use of SRS is quite limited. Teaching reporting styles in residency programs and including reporting skills in competency evaluations can play a role in changing residents' practices. A future step

would include building a curriculum for teaching SRS and reassessing residents' attitudes and practice throughout training years. Involving practicing radiologists, institutions and local societies would play a crucial role in implementing the best reporting practices.

CONFLICT OF INTEREST

All authors declare no conflict of interest

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Non

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