

University of Groningen

## Radiologist-patient consultation of imaging findings after neck ultrasonography

Kasalak, Omer; Yakar, Derya; Dierckx, Rudi A. J. O.; Kwee, Thomas C.

*Published in:*  
Clinical imaging

*DOI:*  
[10.1016/j.clinimag.2021.09.022](https://doi.org/10.1016/j.clinimag.2021.09.022)

**IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.**

*Document Version*  
Publisher's PDF, also known as Version of record

*Publication date:*  
2022

[Link to publication in University of Groningen/UMCG research database](#)

*Citation for published version (APA):*

Kasalak, O., Yakar, D., Dierckx, R. A. J. O., & Kwee, T. C. (2022). Radiologist-patient consultation of imaging findings after neck ultrasonography: An opportunity to practice value-based radiology. *Clinical imaging*, 81, 87-91. <https://doi.org/10.1016/j.clinimag.2021.09.022>

### Copyright

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: <https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment>.

### Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

*Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.*



## Body Imaging

# Radiologist-patient consultation of imaging findings after neck ultrasonography: An opportunity to practice value-based radiology

Ömer Kasalak<sup>\*</sup>, Derya Yakar, Rudi A.J.O. Dierckx, Thomas C. Kwee

Medical Imaging Center, Department of Radiology, Nuclear Medicine and Molecular Imaging, University of Groningen, University Medical Center Groningen, the Netherlands



## ARTICLE INFO

## Keywords:

Communication  
Neck  
Patient-centered care  
Ultrasonography

## ABSTRACT

**Objective:** To investigate how patients experience a radiologist-patient consultation of imaging findings directly after neck ultrasonography (US), and how much time this consumes.

**Materials and methods:** This prospective randomized study included 109 consecutive patients who underwent neck US, of whom 44 had a radiologist-patient consultation of US results directly after the examination, and 65 who had not.

**Results:** The median ratings of all healthcare quality metrics (friendliness of the radiologist, explanation of the radiologist, skill of the radiologist, radiologist's concern for comfort during the examination, radiologist's concern for patient questions/worries, overall rating of the examination, and likelihood of recommending the examination) were either good/high or very good/very high, without any significant differences between both patient groups. Patients who did not discuss the US results with the radiologist, were significantly more worried during the examination ( $P = 0.040$ ) and had significantly higher anxiety levels after completion of the US examination ( $P = 0.027$ ) than patients who discussed the US results with the radiologist. Fifty-one out of 55 responding patients (92.7%) indicated a radiologist-patient consultation of US results to be important. The median duration of US examinations that included a radiologist-patient consultation of US results was 7.57 min (range: 5.15–12.10 min), while the median duration of US examinations without a radiologist-patient consultation of US results was 7.34 min (range: 3.45–14.32 min), without any significant difference ( $P = 0.637$ ).

**Conclusion:** A radiologist-patient consultation of imaging findings after neck US decreases patient anxiety, is desired by most patients, and does not significantly prolong total examination time.

## 1. Introduction

Ultrasonography (US) is a well-established method for the evaluation of many pathologies in the neck area.<sup>1</sup> It should be performed by experienced examiners to achieve the highest accuracy.<sup>1,2</sup> At our institution, all neck US examinations (including soft tissue evaluations) are performed and interpreted by radiologists, and not by US technicians. Currently, there is no consensus on whether or not the US results should be directly discussed between the radiologist and the patient at the time of the examination. Direct communication of US results may be regarded as a potentially valuable service to patients, as part of the patient-centered medicine concept.<sup>3,4</sup> However, as long as its value has not been proven, it can be argued that a radiologist-patient consultation of US results is time-consuming and slows down work pace, which

particularly may be an issue in busy radiology practices with high volumes per time unit. In addition, a radiologist-patient consultation of US results can be considered redundant because it is standard practice to transfer the US findings to the referring physician by means of a radiology report, who will then discuss them with the patient. Furthermore, referring physicians may have a better understanding of the full clinical picture of the patient to judge the importance of the US findings.

In a previous study in outpatients who underwent computed tomography (CT) or magnetic resonance imaging (MRI) of different body regions, most patients indicated that they want to be informed of their imaging results as soon as possible.<sup>5</sup> In another study in outpatients who underwent CT of the torso, abdominopelvic CT, or abdominal US, and who actually received the imaging results from a radiologist in a consultation directly after the examination, most patients found the

<sup>\*</sup> Corresponding author at: University Medical Center Groningen, Department of Radiology, Nuclear Medicine and Molecular Imaging, Hanzplein 1, P. O. Box 30.001, 9700 RB Groningen, the Netherlands.

E-mail address: [o.kasalak@umcg.nl](mailto:o.kasalak@umcg.nl) (Ö. Kasalak).

<https://doi.org/10.1016/j.clinimag.2021.09.022>

Received 19 July 2021; Received in revised form 14 September 2021; Accepted 29 September 2021

Available online 12 October 2021

0899-7071/© 2021 The Authors. Published by Elsevier Inc. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

consultation beneficial.<sup>6</sup> In yet another study in outpatients who underwent MRI of different body regions, and who were given the opportunity to discuss their imaging findings with the radiologist, patients also perceived a discussion with the radiologist of high value.<sup>7</sup> However, the previous studies on this topic did not involve patients who underwent neck US.<sup>6,7</sup> Therefore, the value of a radiologist-patient consultation and the time required to perform such a consultation in this specific population are still unknown. It is hypothesized that patients who undergo a US examination of the neck area are often worried, and that a direct communication of imaging findings from the radiologist to the patients decreases anxiety, improves patient satisfaction, and requires only a little additional time.

The purpose of this study was therefore to investigate how patients experience a radiologist-patient consultation of imaging findings directly after neck US, and how much time this consumes.

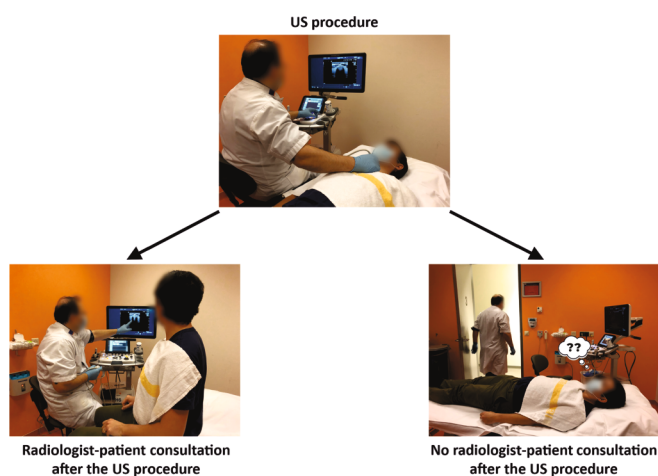
## 2. Materials and methods

### 2.1. Patient population

The local institutional review board approved this prospective study and all participating patients provided informed consent. All consecutive outpatients who were scheduled to undergo diagnostic neck US by a single radiologist (Ö.K.), with 6 years of experience in neck US) as part of clinical care at a tertiary care center (University Medical Center Groningen, the Netherlands) between February 2019 and February 2020, were potentially eligible for inclusion in this study. Patients who refused to participate and patients who were unable to read or write Dutch were excluded.

### 2.2. Randomization

Included patients were randomized into one of two arms (Fig. 1). In the first arm, patients received the US results from the radiologist in a face-to-face communication at the end of the examination. In the second arm, patients did not receive the US results from the radiologist at the end of the examination.



**Fig. 1.** Photographs demonstrating the US procedure and the two arms in which patients were randomized: in the first arm patients received the results from the radiologist directly after the US procedure and in the second arm patients did not receive the US results from the radiologist at the end of the examination. If patients in the latter group still asked the results of their US examination (or if they had questions about the US images on the monitor), the radiologist would answer that these would not be discussed during the examination and that the referring physician would answer any questions related to the results of the US examination. All other questions were answered by the radiologist who aimed to be respectful, communicative and empathetic towards each patient during the examination.

### 2.3. US procedure and time measurement

A doctor's assistant prepared all patients enabling the radiologist to perform the procedure. Results of any prior imaging examinations were viewed by the radiologist before starting the ultrasound examination. Therefore in this study there was no need to compare current with previous imaging findings during or after the US examination. Upon entrance of the radiologist in the examination room, a digital timer was started. Depending on the randomization group, the radiologist informed the patient that he would either discuss or not discuss the US results with the patient after completing the examination. If patients in the latter group still asked the results of their US examination (or if they had questions about the US images on the monitor), the radiologist would answer that these would not be discussed during the examination and that the referring physician would answer any questions related to the results of the US examination. All other questions were answered by the radiologist who aimed to be respectful, communicative and empathetic towards each patient during the examination. US was performed by the radiologist with either one of two systems (Toshiba, Xario XG or Siemens Acuson S2000) using 12-MHz transducers. Depending on the clinical request and the US findings, the US examination was either limited to certain organs (carotid artery, lymph nodes, parathyroids, thyroid, and/or salivary glands) or the evaluation of a focal area but not a specific organ (e.g. local swelling, or a known abscess, cyst, or lipoma), or involved the whole neck (if US findings could not explain the origin of a presumed local swelling or were suggestive of a malignant lesion). If a radiologist-patient consultation of US results was provided, it was done in the same examination room. Consultation meant giving the entire result and conclusion on the spot. The radiologist also demonstrated images on the monitor of the US machine (Fig. 1), and answered all questions related to the diagnostic findings on US. For any questions related to therapy and prognosis, the patient was asked to discuss them with his or her referring physician. Patients in both randomization arms were also explicitly instructed to further discuss the US findings and the management plan with their referring physician. At the moment the radiologist left the examination room after completing the examination (and finishing the discussion of US results with those patients who were selected to have this consultation), the digital timer was stopped.

### 2.4. Survey

Patients in both randomization arms were asked to fill in a paper-based survey to share their experience with the US examination and their view on a radiologist-patient consultation of US results at the end of the examination (Table 1). This survey contained items derived from questionnaires on patient satisfaction and radiologist-patient communication that were used in previous studies.<sup>7,8</sup> All surveys were anonymous and all patients were instructed to fill in the survey after leaving the radiology department to avoid any potential influence of the radiologist or other radiology staff on the patients' ratings. The patients were also asked to return the survey to the radiology department in a prepaid envelope that they were provided with.

### 2.5. Statistical analysis

Patients in the two randomization arms were compared in terms of age, gender, referring specialty (endocrinology, family medicine, general internal medicine, general surgery, hematology, otorhinolaryngology, oncology, or other), anatomic area that was evaluated with US (which organ(s), a focal area but not a specific organ, or the whole neck), and US findings (completely normal or any abnormality). Subsequently, the ratings of the survey items regarding the patients' experience with the US examination and their view on a radiologist-patient consultation of US results, were compared between the two groups. Unpaired *t*-tests were used to compare normally distributed continuous data, Mann-Whitney tests were used to compare ordinal data, and

**Table 1**

Survey items and questions to analyze patients' experience with the US examination and their view on a radiologist-patient consultation of US results, based on questionnaires that were used in previous studies.<sup>7,8</sup>

Survey item/question	Grading scale
Friendliness of the radiologist	Very poor/poor/sufficient/good/very good
Explanation given by the radiologist	Very poor/poor/sufficient/good/very good
Skill of the radiologist	Very low/low/sufficient/high/very high
Radiologist's concern for comfort during the examination	Very low/low/sufficient/high/very high
Radiologist's concern for patient questions/worries	Very low/low/sufficient/high/very high
Overall rating of the examination	Very poor/poor/sufficient/good/very good
Likelihood of recommending the examination	Very low/low/intermediate/high/very high
Did you worry during the examination?	Not at all/hardly/a little/much/very much
Did you worry after the examination?	Not at all/hardly/a little/much/very much
A radiologist-patient consultation after a US examination is important	Yes/No

Fisher's exact tests were used to compare nominal variables. *P*-values less than 0.05 were considered statistically significant. MedCalc version 17.2 Software (MedCalc) was used to perform all statistical analyses.

### 3. Results

#### 3.1. Patients

Of 114 patients who were potentially eligible for inclusion, 4 were excluded because they refused to participate, and 1 was excluded because of inability to read and write in Dutch. One hundred and nine patients were included, of whom 33 men and 76 women, with a median age of 55 years (range: 18–86 years). After randomization, 44 patients had a radiologist-patient consultation of US results, and 65 patients did not have such a consultation. Age, gender, anatomic area of the US examination, and US findings were equally distributed between the two groups (Table 2). However, there was a significant difference (*P* = 0.004) between both groups with regard to referring specialty. The two largest referring specialties were endocrinology and family medicine, with less referrals from endocrinology and more referrals from family medicine in the group of patients who had a radiologist-patient consultation of US results (25.0% and 31.8%, respectively) than those in the group of patients who did not have a radiologist-patient consultation of US results (47.7% and 15.4%, respectively) (Table 2).

#### 3.2. Patient ratings of the US examination

Fifty-eight out of 109 patients (53.2%) returned the questionnaire, of whom 21 had a radiologist-patient consultation of US results and 37 did not have a radiologist-patient consultation of US results. The median ratings of all healthcare quality metrics (friendliness of the radiologist, explanation of the radiologist, skill of the radiologist, radiologist's concern for comfort during the examination, radiologist's concern for patient questions/worries, overall rating of the examination, and likelihood of recommending the examination) were either good/high or very good/very high, without any significant differences between both groups (Table 3). Only one patient was unsatisfied with the service provided. This patient, who did not receive the US results from the radiologist directly after the examination, rated the explanation given by the radiologist as poor, rated the radiologist's concern for comfort during the examination as very low, rated the radiologist's concern for patient questions/worries as very low, gave a poor overall rating of the

**Table 2**

Comparison of characteristics of patients who had a radiologist-patient consultation of US results vs. those who did not.

Variable	Radiologist-patient consultation of US results	No radiologist-patient consultation of US results	<i>P</i> -value
Age (years)	51.8 ± 18.6	52.3 ± 17.8	0.889
Gender (M/F)	13/31	20/45	0.939
Anatomic area of US examination			
-Thyroid and lymph nodes	22 (50.0%)	39 (60.0%)	0.337
-Lymph nodes	9 (20.5%)	10 (15.4%)	
-Whole neck	4 (9.1%)	5 (7.7%)	
-Thyroid	1 (2.3%)	4 (6.2%)	
-Focal area, not a specific organ	3 (6.8%)	2 (3.1%)	
-Salivary glands	4 (9.1%)	1 (1.5%)	
Referring specialty			0.004
-Endocrinology	11 (25.0%)	31 (47.7%)	
-Family medicine	14 (31.8%)	10 (15.4%)	
-General internal medicine	6 (13.6%)	8 (12.3%)	
-General surgery	1 (2.2%)	9 (13.8%)	
-Hematology	4 (9.1%)	1 (1.5%)	
-Otorhinolaryngology	3 (6.8%)	1 (1.5%)	
-Oncology	0 (0.0%)	3 (4.6%)	
-Other	5 (11.4%)	2 (3.1%)	
US findings (completely normal/any abnormality)	28/16	30/35	

**Table 3**

Comparison of ratings of the US examination and view on a radiologist-patient consultation of US results, for patients who actually received a radiologist-patient consultation of US results vs. those who did not.

Variable	Radiologist-patient communication of US results	No radiologist-patient communication of US results	<i>P</i> -value
Friendliness of the radiologist	High (sufficient to very high)	High (sufficient to very high)	1.000
Explanation given by the radiologist	Good (sufficient to very good)	Good (poor to very good)	0.392
Skill of the radiologist	High (sufficient to very high)	High (sufficient to very high) <sup>a</sup>	0.688
Radiologist's concern for comfort during the US examination	High (sufficient to very high)	High (very poor to very high)	0.705
Radiologist's concern for patient questions/worries	High (sufficient to very high)	High (very poor to very high) <sup>a</sup>	0.612
Overall rating of the examination	High (sufficient to very high)	High (poor to very high)	0.130
Likelihood of recommending the examination	High (intermediate to very high) <sup>a</sup>	High (low to very high) <sup>b</sup>	0.713
Did you worry during the examination?	A little (not at all to very much)	Hardly (not at all to much) <sup>b</sup>	0.040
Did you worry after the examination?	Hardly (not at all to much)	A little (not at all to very much) <sup>b</sup>	0.462
A radiologist-patient consultation of imaging findings after a US examination is important (yes/no)	21/0	30/4 <sup>c</sup>	1.000

Notes:

Median scores with ranges between parentheses are displayed for each group (except for the final survey item), and *P*-values for the comparisons between both groups are indicated.

<sup>a</sup> Two missing values.

<sup>b</sup> One missing value.

<sup>c</sup> Three missing values.



examination, and indicated a low likelihood of recommending the examination. This patient also wrote down on the survey form: “I had to wait 15 minutes in the waiting room while the US examination lasted only 3 minutes. The radiologist performed the examination in a formal and hasty manner as if he were in a hurry and had no time for the patient. I am disappointed, and not satisfied with how I was dealt with and the inattentive formal examination”. None of the other 57 patients was unsatisfied with the service provided.

### 3.3. Patient anxiety levels

Patients who did not receive the US results from the radiologist directly after the examination, were more worried ( $P = 0.040$ ) during the examination than the ones who received the US results from the radiologist directly after the examination (Table 3). Anxiety levels after completion of the US examination were not significantly different ( $P = 0.083$ ) from anxiety levels during the US procedure in patients who received the US results from the radiologist directly after the examination. However, anxiety levels after completion of the US examination were significantly higher ( $P = 0.027$ ) than anxiety levels during the US procedure in patients who did not receive the US results from the radiologist directly after the examination.

### 3.4. Patient views on a radiologist-patient consultation of US results

Fifty-one out of 55 responding patients (92.7%) (note that 3 patients did not fill in this part of the questionnaire) indicated a radiologist-patient consultation of imaging findings after a US examination to be important, without any significant differences ( $P = 1.000$ ) between those who actually had this consultation and those who had not (Table 3).

### 3.5. Examination time

The median duration of US examinations that included a radiologist-patient consultation of US results was 7.57 min (range: 5.15–12.10 min), while that for US examinations without a radiologist-patient consultation of US results was 7.34 min (range: 3.45–14.32 min), without any significant difference ( $P = 0.637$ ).

### 3.6. Discussion and conclusion

The patients who underwent neck US in this study were generally satisfied about the radiological service that was provided. However, anxiety levels can be decreased and the patients' wish can be fulfilled by informing patients of their US results directly after the examination. This can be achieved by adding little time to the US examination that is statistically insignificant on a group level. This additional time is relatively insignificant, because in our series it was observed that patients are usually relieved and have no additional questions when informed about negative US findings, while patients generally reserve any questions about the management of positive US findings for their scheduled follow-up consultation with their referring physician. Value-based health care is a concept that aims at improving patient outcomes by considering first those factors that matter most to patients without increasing costs.<sup>9,10</sup> Our results indicate that a radiologist-patient consultation of imaging findings after neck US can be considered as value-based healthcare. Therefore, it can be recommended for routine implementation in clinical practice. This can be done by informing the patient before performing the actual US procedure that the radiologist will focus on the US procedure and that the patient will receive the results from the radiologist afterwards. This clear description of what can be expected generally calms down patients, and usually avoids any questions or other interruptions from the patient during the US procedure. During the explanation of the US findings after the examination, patients generally appreciate it when the radiologist supports his or her

explanation by demonstrating the stored images on the monitor of the US machine. Moreover, showing the US images often reduces explanation time, because of the well-known adage that “a picture is worth a thousand words”. A potential pitfall in a radiologist-patient consultation of imaging findings after neck US is to actually answer patients' questions related to therapy and prognosis, because the authors of this study believe that this belongs to the domain of the referring physician. If a radiologist would answer patients' questions related to therapy and prognosis, it may contradict and/or conflict with the referring physician's advice to the patient, and it would also increase total examination time. Further research is warranted to finetune how a radiologist-patient consultation of imaging findings after neck US can be best performed in terms of patient satisfaction and time efficiency.

The number of previous studies on radiologist-patient communication of imaging results is limited. A study by Pahade et al.<sup>6</sup> investigated 86 patients who underwent CT of the torso, abdominopelvic CT, or abdominal US to assess patient preferences about receiving radiology results and reviewing the images and findings directly with a radiologist after completion of an examination. Before imaging, 81% preferred hearing results from both the ordering provider and the radiologist.<sup>6</sup> This percentage increased to 91% after consultation.<sup>6</sup> Before consultation, 98% indicated they would be comfortable hearing normal results or abnormal results from the person interpreting the examination.<sup>6</sup> This percentage was 99% after consultation.<sup>6</sup> Almost all patients (99%) agreed or strongly agreed that reviewing their examination findings with a radiologist was helpful, and almost all patients (98%) indicated they wanted the option of reviewing or always wanted to review future examination findings with a radiologist.<sup>6</sup> After consultation, anxiety decreased in 48%, increased in 15%, and was unchanged in 37%. The average duration of consultation for US (without the US procedure itself) was 7.1 min (range: 2–19 min) and that for CT (without the CT procedure itself) was 10.4 min (range: 3–22 min).<sup>6</sup> Another study by Gutzeit et al.<sup>7</sup> investigated 202 patients who underwent MRI of various body regions to investigate patients' perception of the radiology service when the radiologist communicates the findings to patients. After the MRI examination, patients in group 1 ( $n = 101$ ) were given the opportunity to discuss the findings with the radiologist.<sup>7</sup> Patients in group 2 ( $n = 101$ ) left the radiology department without any personal communication.<sup>7</sup> Overall, 76% of all patients were concerned about their imaging findings without significant difference between both groups.<sup>7</sup> Significantly more patients in group 1 (81%) vs. group 2 (14%;  $P < 0.001$ ) perceived the opportunity to discuss their imaging findings with a radiologist to be a characteristic of a good radiology consultation.<sup>7</sup> A larger number of patients in group 1 experienced significantly higher bonding to the radiology department and only wanted to be examined in the department with communication in the future ( $P = 0.001$ ) (93% vs. 75%).<sup>7</sup> Significantly more patients in group 1 regarded the radiology department they attended as being more competent than patients in group 2 (mean score 4.72/4.09,  $P < 0.001$ ).<sup>7</sup> The duration of the discussion of the MRI results in group 1 averaged 3.47 min (range: 1–15 min).<sup>7</sup> The results of Pahade et al.<sup>6</sup> and Gutzeit et al.<sup>7</sup> match those of the present study, because they all showed a clear preference of patients to have a discussion of imaging findings with the radiologist. However, the additional time for a patient consultation was considerably longer in the studies by Pahade et al.<sup>6</sup> and Gutzeit et al.<sup>7</sup> This is probably related to the fact that all US examinations in the study by Pahade et al.<sup>6</sup> were performed by a sonographer, as a result of which the radiologist was less familiar with the patient and the US findings, thus requiring more time to explain the results to the patient. Furthermore, CT and MRI scans contain far more data for review than a selection of US images. This may interfere with the speed of workflow in a radiology practice. Finally, Pahade et al.<sup>6</sup> and Gutzeit et al.<sup>7</sup> did not include any patient who underwent neck US.

The present study had several limitations. First, our results are only applicable to neck US performed by radiologists. The results may be different in other body regions (e.g. patients who undergo US of the

abdomen or musculoskeletal system may have different expectations and concerns) or when a sonographer performs the US as an intermediary between the radiologist and the patient (which requires another workflow to incorporate a radiologist-patient consultation of US results). Second, there were significant differences in the frequencies of referring specialties (particularly endocrinology and family medicine) between the group of patients who had a radiologist-patient consultation of US results and the group of patients who had not. Nevertheless, there is no clear reason to assume that this would have influenced our results. Third, a single radiologist performed all US examinations to maximize homogeneity. The results of this study may not be generalizable to other radiologists in terms of different styles of practice. Future studies are required to determine the generalizability of our results. Fourth, there was potential of selection bias, because only 53.2% of patients returned the survey. Fifth, because all surveys that were returned were anonymous, it was impossible to determine which patients did not go to the referring physician after the consultation with the radiologist. This interesting topic requires future investigation.

In conclusion, a radiologist-patient consultation of imaging findings after neck US decreases patient anxiety, is desired by most patients, and does not significantly prolong total examination time.

#### Declaration of competing interest

None (all authors).

#### Acknowledgements

None.

#### Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

#### References

1. Koischwitz D, Gritzmann N. Ultrasound of the neck. *Radiol Clin North Am* 2000;38:1029–45.
2. Badran K, Jani P, Berman L. Otolaryngologist-performed head and neck ultrasound: outcomes and challenges in learning the technique. *J Laryngol Otol* 2014;128:447–53.
3. Bardes CL. Defining "patient-centered medicine". *N Engl J Med* 2012;366:782–3.
4. Itri JN. Patient-centered radiology. *Radiographics* 2015;35:1835–46.
5. Basu PA, Ruiz-Wibbelsmann JA, Spielman SB, Van Dalsem III VF, Rosenberg JK, Glazer GM. Creating a patient-centered imaging service: determining what patients want. *AJR Am J Roentgenol* 2011;196:605–10.
6. Pahade J, Couto C, Davis RB, Patel P, Siewert B, Rosen MP. Reviewing imaging examination results with a radiologist immediately after study completion: patient preferences and assessment of feasibility in an academic department. *AJR Am J Roentgenol* 2012;199:844–51.
7. Gutzeit A, Heiland R, Sudarski S, et al. Direct communication between radiologists and patients following imaging examinations. should radiologists rethink their patient care? *Eur Radiol* 2019;29:224–31.
8. Lang EV, Yuh WT, Ajam A, et al. Understanding patient satisfaction ratings for radiology services. *AJR Am J Roentgenol* 2013;201:1190–5.
9. Brady A, Brink J, Slavotinek J. Radiology and value-based health care. *JAMA* 2020;324:1286–7.
10. European Society of Radiology (ESR). ESR concept paper on value-based radiology. *Insights Imaging* 2017;8:447–54.