

Improving procedural understanding in patients undergoing image-guided biopsy using PORTER

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Disclosures

None

Background

- Patients have limited understanding of medical jargon in diagnostic imaging reports [1]
- Due to limited time and resources, patients may not have discussed imaging findings with their ordering provider prior to referral for an image-guided biopsy
- We developed PORTER (Patient-Oriented Radiology Reporter), a web-based application that automatically annotates radiology reports with lay-language definitions [2,3]
- PORTER currently contains a lexicon of over 13,000 medical terms, including TI-RADS terminology
- PORTER has been shown to improve patient understanding of knee MRI reports [4], but has not been evaluated in the context of peri-procedural understanding prior to biopsy

PORTER Web Interface



Department of Radiology

Words = 615
Sentences = 29
Flesch-Kincaid = 9
Gunning Fog = 13
SMOG = 12
Avg score = 11.333333333333

Your report's reading grade level

11

PORTER – Patient-Oriented Radiology Reporter

Nodule #: 1: ("Right N1")

Maximum size: 15 mm

Other dimensions (AP x TR x Length): 15 mm x 14 mm x 14 mm

Location: right lower

Composition: solid/almost completely solid (2)

Echogenicity: hypoechoic (2)

Shape: not taller-than-wide(0)

Margin: (2)

Echogenicity: **TI-RADS 4 (abbrev. TR4)**

There is a finding in the thyroid that might be cancer.

ACR TI-RADS risk category: **TR4** (4-6 points)

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Significant change in size (>= 20% increase in 2 dimensions and minimal increase of 2mm, or >=50% increase in volume): No

Change in features: No

Change in ACR TI-RADS risk category: No

ACR TI-RADS recommendation: Ultrasound-guided fine needle aspiration

Nodule #: 2: ("Right N2")

Maximum size: 12 mm

Figure 1. PORTER interface with annotations of the diagnostic imaging report. Underlined words and phrases were automatically detected by PORTER. Lay-language definitions appear in a pop-up tooltip upon mouseover of the underlined word or phrase.

Methods

This project was reviewed and determined to qualify as quality improvement by the University of Pennsylvania IRB.

1. ***Inclusion Criteria:*** Adult patients requiring an US-guided biopsy following a diagnostic imaging study were identified and screened to participate during telephone scheduling from Nov 2018 to present. Thus far, seven patients (mean age of 55) have been enrolled. All patients, by chance, were undergoing thyroid biopsy.
2. ***Pre-Intervention:*** On the day of biopsy, prior to consenting for the procedure, patients were surveyed about their original diagnostic imaging report. This was to assess whether they had previously seen their report, their understanding of the report, and identify if they had any questions about the report or need for biopsy.
3. ***Intervention:*** Patients were shown an annotated version of their report using PORTER with up to 10 minutes to interact with the pop-up definitions.
4. ***Post-Intervention:*** Patients were surveyed to assess post-PORTER understanding of their diagnostic imaging report, need for biopsy, and whether questions were answered or new questions generated.

Patient Demographics

	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5	Patient 6	Patient 7
Age	45	61	56	61	61	51	63
Gender	Female	Female	Female	Male	Female	Female	Female
Race/Ethnicity	Black/AA	White/Cauc.	Black/AA	White/Cauc.	Black/AA	Black/AA	White/Cauc.
Primary Language	English	English	English	English	English	English	English
Highest Level of Education	College	College	College	Graduate/Professional school	College	College	College
Have you seen your imaging report?	No	No	No	Yes	No	Yes	Yes
Do you understand your imaging report?	N/A	3	4	3	4	3	1

Table 1. Patient demographic information and whether patients viewed and understood their radiology report prior to day of biopsy. If patients did not previously see their report, we provided the original report for them on the day of biopsy. Understanding scores: 1 - No, not at all; 2 - Maybe, but only a little bit; 3 - Yes, for the most part; 4 - Yes, absolutely. All patients reported limited to no discussions about the need for biopsy with their ordering provider.

Report Metrics

REPORT METRICS	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5	Patient 6	Patient 7	Average	STDEV
Words	339	850	538	565	615	353	495	536	173
Sentences	30	47	29	33	29	18	38	32	9
Flesch–Kincaid	4.2	9	9.3	8.5	9	9.5	7.2	8.1	1.9
Gunning Fog	8.8	13.1	13.8	12.4	13	12.7	10.8	12.1	1.7
SMOG	9.9	12	12	12	12	12	11.9	11.7	0.8
Average Readability Score	7.6	11.4	11.7	11.0	11.3	11.4	10.0	10.6	1.4
Number of terms annotated	78	184	122	155	183	105	147	139	40
Percent of report annotated	23.0%	21.7%	22.7%	27.4%	29.8%	29.8%	29.7%	26.3%	3.7%

Table 2. Report metrics with various readability scores, number of terms identified by PORTER, and percent of report annotated by PORTER.

Patient Questions – Pre & Post Intervention

Examples of free-text pre-PORTER questions:

- “How do you determine what nodule to biopsy?”
- “Getting stuck on the difference between a thyroid, parathyroid, nodule and their relationship to the whole of the procedure.”
- “Want to understand more about the nodule, it's size, and what they do with the sample they take after they analyze it.”
- “Size of nodules?”
- “What happens to the sample after it is analyzed?”

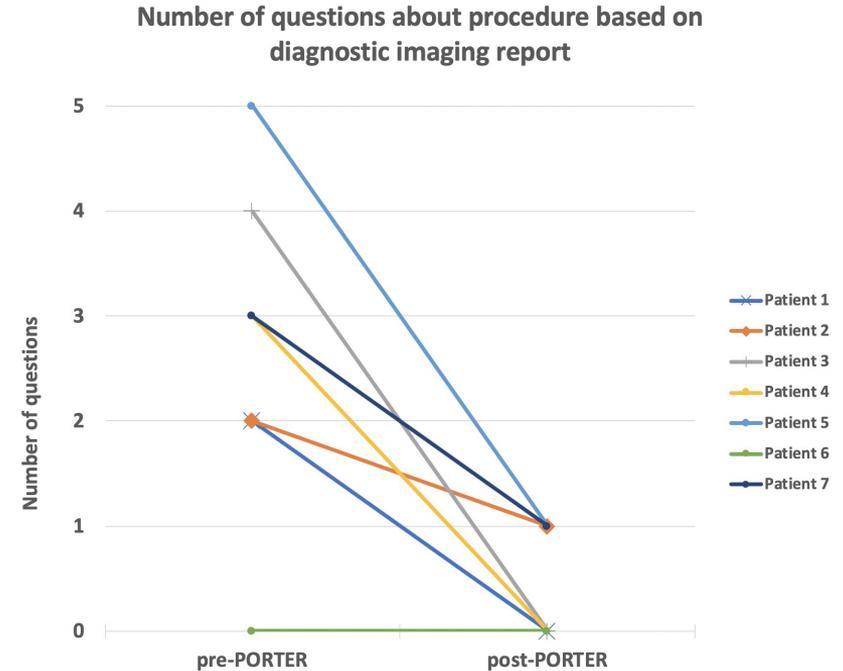


Figure 2. Number of questions patients had about their US-guided biopsy after viewing their raw diagnostic imaging report and following viewing of their report using PORTER.

Patient Surveys

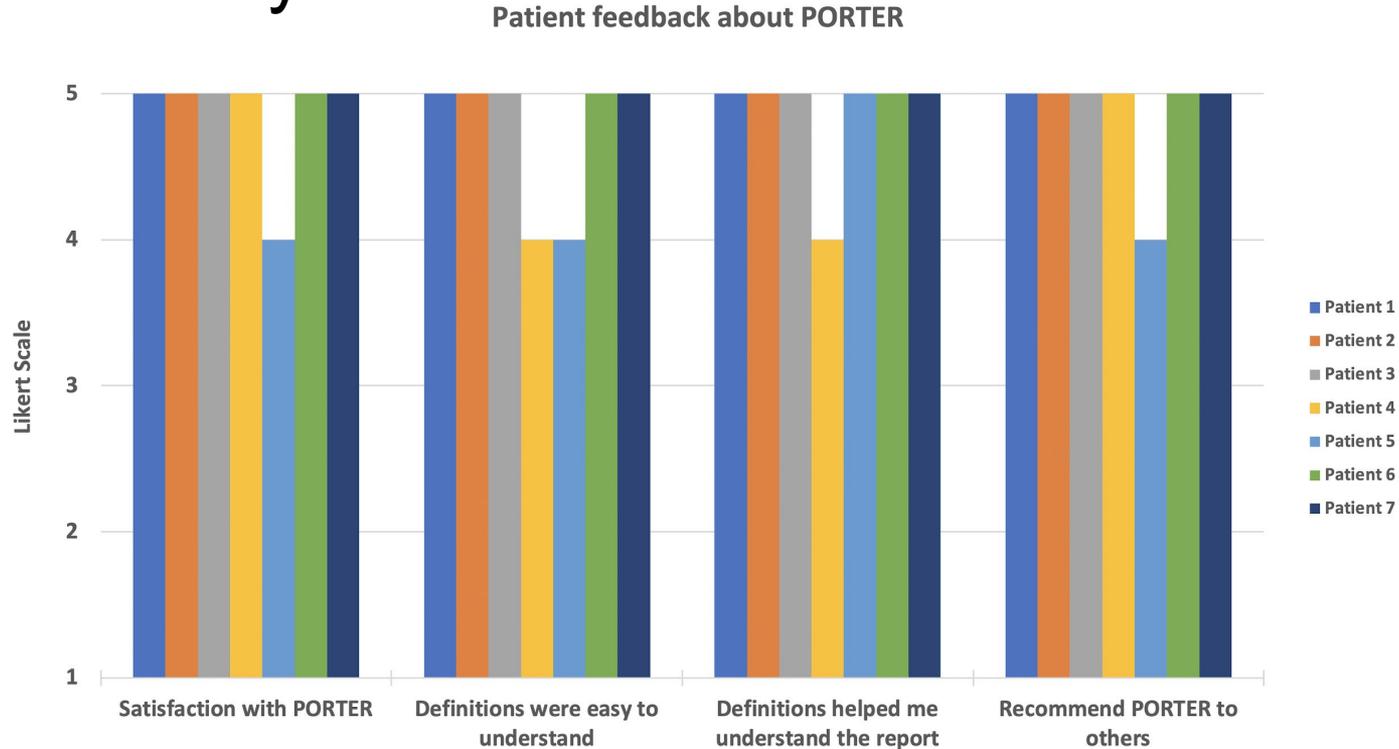


Figure 3. Post-intervention patient feedback about PORTER using Likert scale from 1 to 5 with 1 representing very dissatisfied or strongly disagree, and 5 representing very satisfied or strongly agree. Overall average score = 4.82.

Conclusions

- PORTER can improve patient understanding of their diagnostic imaging reports and need for having a biopsy
- PORTER reduced the number of questions patients had about their upcoming US-guided thyroid biopsy. Lay-language definitions were included for TI-RADS terminology, which can be difficult to understand.
- All patients were very satisfied and highly recommended the use of PORTER to others
- More patients will be needed to further generalize these preliminary findings

References

1. Martin-Carreras T, Cook TS, Kahn CE, Jr. Readability of radiology reports: implications for patient-centered care. *Clin Imaging*. 2019;54:116-120.
2. Oh SC, Cook TS, Kahn CE, Jr. PORTER: a Prototype System for Patient-Oriented Radiology Reporting. *J Digit Imaging*. 2016;29(4):450-454.
3. Martin-Carreras T, Kahn CE, Jr. Coverage and Readability of Information Resources to Help Patients Understand Radiology Reports. *J Am Coll Radiol*. 2018;15(12):1681-1686.
4. Cook TS, Oh SC, Kahn CE, Jr. Patients' Use and Evaluation of an Online System to Annotate Radiology Reports with Lay Language Definitions. *Acad Radiol*. 2017;24(9):1169-1174.