Fine-Needle Aspiration Utilization for Malignant Thyroid Neoplasms in the Community Hospital Setting: A Quality Improvement Study

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Background: Thyroid nodules are increasingly common. Although guidelines have been published, it is unclear whether recommendations for the use of fine-needle aspiration (FNA) and ultrasonography are followed.

Objective: To evaluate the impact of a quality improvement initiative regarding utilization of FNA and ultrasonography before resection of malignant thyroid neoplasms at a community-based hospital.

Methods: A retrospective medical record review of patients who received thyroidectomy with histologically proven malignant thyroid neoplasms at a community-based teaching center in the Midwest in 2014 revealed inconsistent use of FNA and ultrasonography per national guidelines. Thus, a quality improvement initiative was conducted using the PDSA (Plan, Do, Study, Act) method and included both an intradepartmental outreach effort and an interdisciplinary hospital cancer committee presentation. To determine the success of the initiative, medical records were reviewed from January 1, 2015, through July 1, 2016 (after the initiative) and compared with findings from 2014 (before the initiative).

Results: The medical records of 366 patients were reviewed over a 2.5-year period, and 23 records (12 in 2014 and 11 in 2015-2016) met the inclusion criteria. In 2014, FNA was performed on 58% of patients before operative management of thyroid malignancy. After the quality improvement initiative, FNA was performed on 100% of patients before operative management of thyroid malignancy ($P=.0155$). Before the quality improvement initiative, 75% of patients undergoing an operation for malignant thyroid neoplasms underwent preoperative ultrasonography, compared with 100% after the initiative ($P=.0753$).

Conclusion: A performance improvement initiative that used the PDSA framework effectively influenced physician adherence to national guidelines for thyroid neoplasms.

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Palpable thyroid nodules are present in 4% to 7% of the US population.^{1,2} It has been reported that 50% of patients have a thyroid nodule by age 50 years, and the percentage increases in direct proportion with age.³ Rates of malignant thyroid neoplasms have reportedly been rising 5% per year over the previous 10 years.⁴

In the United States, the estimated incidence of new thyroid cancers was 62,450 in 2015, encompassing 3.8% of all new cancer cases in the country.⁴

Fine-needle aspiration (FNA) for the evaluation of a thyroid nodule is the standard of care and the most accurate way to preoperatively evaluate nodules suspicious for malignancy.^{3,5} With proper technique, it has a high diagnostic yield (>50%), as well as high sensitivity (>83%) and specificity (>98%) in delineating occult malignant neoplasms from benign pathologic findings.⁶⁻⁸ Although national guidelines for FNA have been described and suggested, they are not universally adopted.⁹ In 2009, with the establishment of the Bethesda Thyroid Cytology Reporting System, a standardized approach was adopted to decrease ambiguity of FNA interpretation and terminology. This standardized approach facilitated the development of directed clinical recommendations for the management of thyroid FNA findings.¹⁰

Researchers have investigated the diagnostic accuracy of FNA both proceeding and succeeding Bethesda endorsement.^{9,11-13} The American Thyroid Association and the National Comprehensive Cancer Network (NCCN) have established clinical practice guidelines for the utilization of FNA in the diagnostic workup of thyroid nodules.^{5,14} Despite these recommendations, there is a wide variation of clinical practice patterns in the management of thyroid nodules and thyroid cancer.¹⁵ For instance, the use of FNA before thyroidectomy (hemi- or total thyroidectomy) varies widely between institutional settings. At our community hospital in 2014, we observed a case of a hemithyroidectomy that was performed in a patient in which preoperative FNA of a 2.7-cm solid nodule did not occur. Frozen sectioning was not performed in this case either. The specimen was histopathologically diagnosed as papillary carcinoma on permanent sectioning, ultimately requiring the patient to return to the operating room for completion thyroidectomy. This clinical scenario prompted a review of records to identify FNA utilization rates at the institution. We found that FNA was underutilized and convened a multidisciplinary quality improvement initiative

based on national guidelines aimed at improving treatment of patients with thyroid nodules. Our goal, as described in this report, was to evaluate the success of the quality improvement initiative.

Methods

A retrospective review of medical records of patients who underwent FNA, thyroidectomy (hemi-, completion, or total thyroidectomy), or both, was performed to identify all cases of pathologically proven malignant thyroid neoplasms before (January 1, 2014, through December 31, 2014) and after (January 1, 2015, through July 1, 2016) the implementation of a quality improvement initiative. This study took place in a community-based teaching hospital in the Midwest. Exclusion criteria included incidental micropapillary carcinoma found on final pathologic examination. The OhioHealth Research Institute Office of Regulatory Compliance approved this study as a quality improvement and research project. Our study construction is presented here and in a PDSA (Plan, Do, Study, Act) format (**Figure**). Statistical analysis was performed using χ^2 analyses, with $P < .05$ indicating statistical significance.

Plan

After the 2014 case of partial thyroidectomy followed by completion thyroidectomy, we reviewed medical records from 2014 to determine the extent of nonadherence with the national guidelines for the use of FNA and ultrasonography. We formulated a clear problem statement: In 2014, 58% of malignant thyroid neoplasm cases were managed in accordance with NCCN guidelines. The institutional target is for 100% of cancer cases to be managed in accordance with national guidelines. This performance gap is relevant because it exposes our patient population to poor quality outcomes, such as the need for re-operation and inappropriate surgery. Next, we scoped the problem to identify (1) the main categories of clinical management gaps underlying NCCN nonadherence and (2) which

Figure.

Steps for the current quality improvement and research project on ultrasonography and fine-needle aspiration for thyroid nodules using the PDSA (Plan, Do, Study, Act) method.

clinics or teams represented the major outliers in NCCN nonadherence. Based on the scoping analysis, we formulated our intervention to drive performance improvement.

Do

Outlier clinics and specific clinical management gaps identified in the planning session were targeted for intervention. Intervention included (1) communication with outlier practices to provide nonjudgmental awareness of their performance gaps, (2) efforts to understand underlying root causes for NCCN nonadherence among outliers (eg, lack of awareness, resources), (3) educational tactics to provide current knowledge regarding thyroid cancer clinical standards per NCCN,

and (4) elimination of any resource gaps required to improve performance (eg, ultrasonography access, FNA capabilities).

Study

After the scoping, targeting, and intervention, we measured clinical performance for the ensuing 18-month period (January 1, 2015, through July 1, 2016) while providing real-time performance feedback for all clinical teams.

Act

Based on the results of our interventions, new clinical training and performance measurement standards will be introduced at our health system.

Results

From January 2014 to July 2016, a total of 366 medical records of patients who underwent either FNA or thyroidectomy were reviewed retrospectively. These records were further narrowed down to 23 unique patients with histologically proven malignant thyroid neoplasms. Of these, 12 patients were identified from 2014 and 11 from 2015-2016. In 2014, 7 of 12 patients (58%) had preoperative FNA and 9 of 12 patients (75%) had preoperative ultrasonography.

Outlier clinics were targeted, and root cause analysis demonstrated that the underlying reason for guideline nonadherence was a lack of clinician awareness. One formal education session was held, and several other informal discussion sessions occurred among providers. Additionally, we presented our preliminary data and the NCCN ultrasonography guidelines for FNA thresholds at our institution's cancer committee meeting in early 2015. After this quality improvement initiative, 11 of 11 patients had preoperative FNA ($P=.0155$) and preoperative ultrasonography ($P=.0753$). Thus, over the study period, performance increased from 58% to 100% for FNA and from 75% to 100% for ultrasonography.

Based on the improvement, we implemented policies to optimize future performance. First, surgeons (including otolaryngologists and general surgeons, both of whom are credentialed to perform thyroidectomy at our institution) must readily adhere to the guidelines regarding utilization of preoperative FNA and ultrasonography. Second, the radiology department must be prepared to detail the description of sonographic features of thyroid nodules; such information may assist surgeons in following the guidelines.

Discussion

Variations in clinical practice patterns among physicians treating patients with thyroid disease may be related to a lack of awareness of clinical practice guidelines. Cannon¹⁷ suggested that physician age and geographic location have a substantial impact on FNA

utility, even showing that increasing age and FNA use were inversely proportional. To our knowledge, strict utility of FNA has not been looked at for more than a decade. Studies before the establishment of the national guidelines surveyed otolaryngologists to determine whether FNA was being used within practices in the United States. Results showed there were a subset of otolaryngologists (14%) not implementing FNA into routine pathologic workup of the head and neck.¹⁷ To our knowledge, there has been limited, if any, investigation of the rate of FNA utility after the endorsement of national guidelines.

Furthermore, studies investigating physician adherence to national guidelines have grouped adherence into knowledge, attitude, and behavior categories; the most effective behavior change stems from the modification in knowledge and attitude.¹⁸ Our study initially examined the preoperative use of FNA and ultrasonography during 2014 at a single community teaching hospital in the Midwest. The otolaryngology department at our institution has since adopted NCCN and American Thyroid Association management guidelines for malignant thyroid neoplasms, and the pathology department uses the Bethesda guidelines in interpreting FNA aspirates. The American Thyroid Association gives a strong recommendation that diagnostic ultrasonography "be performed in all patients with a suspected thyroid nodule, nodular goiter, or radiographic abnormality suggesting a thyroid nodule incidentally detected on another imaging study."⁵ Ultrasonography reports should contain important information such as nodule size and description of sonographic features (composition, echogenicity, margins, presence and type of calcifications, shape, and vascularity).¹⁶ Additionally, the NCCN established recommendations for FNA use based on ultrasonography findings ([Table](#)). Initial results in our study demonstrated that just over half (58%) of patients with malignant thyroid neoplasms in the 2014 records had preoperative FNA and 75% had preoperative ultrasonography. These findings were concerning, as there were potentially missed opportunities for

Table.
National Comprehensive Cancer Network
Guidelines: Recommendations for FNA Threshold
by Sonographic Features⁵

Clinical Pathologic Findings	FNA Threshold
Solid Nodule	
With suspicious sonographic features	≥1 cm
Without suspicious sonographic features	≥1.5 cm
Mixed Cystic-Solid Nodule	
With suspicious sonographic features	≥1.5-2 cm
Without suspicious sonographic features	≥2 cm
Spongiform Nodule	≥2 cm
Simple Cyst	Not indicated
Suspicious Cervical Lymph Node	FNA (node + nodule) ^a

^a If a suspicious lymph node is found on ultrasonography in addition to a thyroid nodule, fine-needle aspiration (FNA) should be performed on both.

thoroughly evaluating thyroid neoplasms before thyroidectomy.

The results of our initial medical record review in 2014 triggered a departmental and systems-wide investigation. First, the results from the 2014 data set prompted an intradepartmental outreach effort. When national guidelines were presented and used as a discussion tool, it became clear that some of the surgeons who had shied away from using FNA might have been misled to believe that the presence of calcifications in a nodule prevented the penetration of a fine needle. Misconceptions were addressed. Second, the results from the 2014 data set were presented by the otolaryngology department at the interdisciplinary hospital cancer committee in early 2015. In addition to the otolaryngology department, the audience included physicians from the fields of general surgery, pathology, radiology, oncology, radiation oncology, and palliative care. Clinical nursing care coordinators, administrators, and geneticists were also in attendance. We stated that

there was room for improvement according to these NCCN guidelines. The otolaryngology department pledged to review the postinitiative dataset to gauge utilization improvements.

We found that preoperative FNA and ultrasonography were performed on all 11 patients with malignant thyroid neoplasms after the quality improvement initiative. We attribute the improvement in our institution's adherence to the NCCN guidelines to increased clinician awareness. Through our detailed departmental in-services, we were able to rectify physician misconceptions about the utility of FNA in clinical practice. Additionally, by presenting at the interdisciplinary hospital cancer committee, we were able to influence a wide array of physicians who participate in thyroid disease workup and management, including general surgeons, pathologists, radiologists, oncologists, radiation oncologists, and palliative care physicians. Furthermore, because the audience included clinical nursing care coordinators, administrators, and geneticists, we had the added benefit of informing support staff of national guidelines. These support staff members, who provide another set of eyes on patient medical records, handle ultrasonography reports and theoretically become a safety net for potential missed situations in which FNA should be performed.

This study has a number of potential limitations. It is retrospective, and the sample size spanning 2.5 years is small. The small sample size resulted not only from the small size of the institution where the study was performed, but also from limiting our investigation to pathologically proven thyroid cancer cases at the request of the interdisciplinary hospital cancer committee. Despite this limitation, the initial results of the investigation demonstrate statistical significance and are provocative in the effectiveness of a guidelines-based quality improvement initiative to enhance patient care and management.

Additionally, it is noted that FNA is not a perfect procedure. Although it has a high diagnostic yield, its accuracy encompasses multiple factors: adequate aspiration, experience in head and neck pathologic findings

of the interpreting pathologists, standardized techniques in collecting FNA aspirates, implementation of ultrasound-guided FNA biopsy, and the presence of multinodular goiters. Furthermore, it may not be advantageous to perform FNA when encountering symptomatic nodules that may be compressing local structures. Additional awareness of FNA value is warranted. By increasing utilization, overall cost reduction could be achieved in the diagnostic paradigm of head and neck pathologic findings.^{17,19,20}

Conclusion

Thyroid nodules are an increasingly common finding. Preoperative utilization of FNA and ultrasonography when evaluating thyroid nodules has been endorsed as the standard of care. This study supports using the PDSA framework for performance improvement initiatives to improve physician adherence to national guidelines for the care of patients with malignant thyroid neoplasms.

Author Contributions

Drs Kieliszk and Jones provided substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; all authors drafted the article or revised it critically for important intellectual content; Drs Steward, Klapchar, Jones, Kieliszk, and Collar gave final approval of the version of the article to be published; and all authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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