

Head and Neck Ultrasound Utilization Rates: 2012-2015

Courtney Shires¹, Aaron Smith², Theodore Klug¹, and Mary Sebelik³

¹West Cancer Center

²The University of Tennessee Health Science Center

³Emory University Woodruff Health Sciences Center

April 28, 2020

Abstract

Objectives: Utilization of clinician-performed head and neck ultrasound among diagnostic radiologists, otolaryngologists, endocrinologists, and general surgeons, using Medicare Provider Utilization and Payment Data available through CMS.gov. **Estimation of the potential impact** clinician-performed ultrasounds may have on the traditional model of radiology-based ultrasound exams. **Design:** From 2012-2015, the files were filtered to include 4 provider types: Diagnostic Radiology (DR), Endocrinology (ENDO), General Surgery (GS), and Otolaryngology (OTO). Billable procedures are listed by HCPCS code and a filter was applied to include the following codes: 76536 Ultrasound, soft tissues of the head and neck, diagnostic; 76942 Ultrasonic guidance for needle placement; 10022 Fine needle aspiration, with imaging guidance. **Setting:** The Medicare Provider Utilization and Payment Data: Physician and Other Supplier Public Use File, available through the Centers for Medicare & Medicaid Services. **Participants:** Diagnostic Radiology (DR), Endocrinology (ENDO), General Surgery (GS), and Otolaryngology (OTO). **Main outcome measures:** Charges submitted, facility vs. non-facility, reimbursements, and superusers. **Results and Conclusions:** In 2015, OTOs submitted charges for 2.1% of all head and neck diagnostic ultrasounds (76536) performed on Medicare beneficiaries. DRs submitted more 76536 charges from 2012-2015, ENDOs to a lesser degree, and OTO and GS remained flat in charges. 10.5% of OTOs in the PUF submitted more than 100 charges apiece during 2015, as compared to a smaller proportion of radiologists (4.5%) who did so. Among surgeons in 2015, OTOs performed more diagnostic HNUS than GSs, and the percentage of OTOs performing US compared to their specialty peers was 3.5 times higher than GSs.

Introduction

Clinician performed ultrasound is a valuable tool to gain timely access to diagnostic imaging, facilitate image guided procedures such as biopsy and therapeutic injections, and to enhance the value of the patient-physician visit. Increasingly, training opportunities are available to the non-radiologist, in the form of head and neck ultrasound courses offered by professional specialty societies[1], with positive impact on patient care[2].

Several subspecialties perform head and neck ultrasounds on a routine basis including general surgery, otolaryngologists, radiologists, and endocrinologists. However, the utilization of this powerful tool by each of these subspecialties is largely unknown. This study seeks to measure the magnitude of utilization of clinician-performed ultrasound among otolaryngologists, general surgeons, endocrinologists, and diagnostic radiologists.

Methods

We queried the Medicare Provider Utilization and Payment Data: Physician and Other Supplier Public Use File (PUF) available through the Centers for Medicare & Medicaid Services (CMS.gov)[3]. The Physician Utilization and Other Supplier PUF through CMS.gov was developed as part of the Obama Administration's efforts to make the US healthcare system more transparent, affordable, and accountable. The data file is

fully open to public scrutiny, does not require a fee, and does not require identification to query the file. Patients (beneficiaries) are not identifiable; however, providers are listed by their National Provider Identifier (NPI) number, full name, and facility address.

Billable procedures are listed by Healthcare Common Procedure Coding System (HCPCS) code and we included the following HCPCS code: 76536 - Ultrasound, soft tissues of the head and neck (e.g. thyroid, parathyroid, parotid), real time with image documentation. As 76942 - Ultrasonic guidance for needle placement (e.g. biopsy, aspiration, injection, localization device), imaging supervision and interpretation, and 10022 - Fine needle aspiration, with imaging guidance, are not specific to the head and neck, these two HCPCS codes were not included.

For each of the years available in the dataset (2012-2015), the files were filtered to include 4 provider types: Diagnostic Radiology (DR), Endocrinology (ENDO), General Surgery (GS), and Otolaryngology (OTO).

Statistics were performed using Microsoft Excel 2011 (Microsoft Corporation, Redmond, WA). Descriptive statistics were used for all 4 years; however, since the same providers are included year after year, we chose to perform student t-test and one way ANOVA between the years 2012 and 2015 to analyze trends. As this is an analysis of a public database, institutional review board exemption was obtained.

Results

DRs submitted more 76536 charges each year from 2012-2015, ENDOs to a lesser degree, and the surgical specialties, OTO and GS, remained flat in charges.

2012

In 2012, DR had the highest number of ultrasound providers (12682) followed by ENDO (1241), OTO (224) and GS (191). Consequently DR (416712) performed the most ultrasounds followed by ENDO (108124), OTO (11464) and GS (7488). Overall ANOVA showed a difference in the average numbers of ultrasounds performed by providers of each specialty ($p < 0.001$). ENDO averaged the most (87.05 ± 3.17) while OTO averaged 51.18 ± 4.87 and GS and DR had no significant different in average numbers performed (39.2 ± 2.57 vs 32.86 ± 0.32 , $p > 0.05$) (rest $p < 0.01$).

Charges submitted

An overall difference existed on ANOVA ($p < 0.001$). There was no difference between GS and ENDO ($\$233.52 \pm 8.04$ vs $\$223.94 \pm 2.54$, $p > 0.05$)

OTO ($\$253.80 \pm 9.78$) was more than the other three ($p < 0.01$). ENDO and GS was more than DR ($\$149.98 \pm 0.87$) ($p < 0.01$)

Reimbursements

Overall differences existed ($p < 0.001$). ENDO ($\$86.27 \pm 0.64$) and OTO ($\83.18 ± 1.40) collected the same average, and also remained higher than both of the other specialties, GS $\$73.05 \pm 2.10$ and DR $\$37.71 \pm 0.28$ ($p < 0.01$). All three point of care specialties collected more than DR ($p < 0.01$)

Superusers

The number of super users, those with >100 US/year were OTO (22/224, 10.0%), GS (11/191, 5.8%), ENDO (340/1242, 27.4%), and DR (430/12682, 3.4%) (one way ANOVA $p < 0.001$). Further breakdown of the ANOVA with Tukey HSD test demonstrates that ENDO has more superusers than all three of the other subspecialties (vs OTO $p < 0.01$, vs GS $p < 0.01$, vs DR $p < 0.01$). There were also more OTO superusers than GS ($p < 0.05$) and DR ($p < 0.01$) superusers. No difference existed between GS and DR.

Subanalysis taking into account type of charges by facility versus non-facility

OTO had (13) providers utilizing facility and (211) utilizing non-facility charges. Facility fees average submitted $\$154.72 \pm 77.67$ versus reimbursed $\$21.44 \pm 1.15$ (t-test, $p < 0.001$). Non-facility fees submitted were

\$259.90 \pm 19.92 vs reimbursed \$86.98 \pm 2.02 ($p < 0.001$). Facility versus non-facility submitted (\$154.72 \pm 77.67 vs \$259.90 \pm 19.92, $p < 0.01$) and reimbursed (\$21.44 \pm 1.15 vs \$86.98 \pm 2.02, $p < 0.001$).

GS had (36) providers utilizing facility and (155) utilizing non-facility charges. Facility fees average submitted \$169.86 \pm 37.03 versus reimbursed \$21.42 \pm 0.5121 (t-test, $p < 0.001$). Non-facility fees submitted were \$248.30 \pm 17.03 vs reimbursed \$85.05 \pm 2.65 ($p < 0.001$). Facility versus non-facility submitted (\$169.86 \pm 37.03 vs \$248.30 \pm 17.03, $p < 0.001$) and reimbursed (\$21.42 \pm 0.5121 vs \$85.05 \pm 2.65, $p < 0.001$).

ENDO had (80) providers utilizing facility and (1161) utilizing non-facility charges. Facility fees average submitted \$143.52 \pm 21.00 versus reimbursed \$20.25 \pm 0.40 (t-test, $p < 0.001$). Non-facility fees submitted were \$229.48 \pm 5.04 versus reimbursed \$90.82 \pm 0.87 ($p < 0.001$). Facility versus non-facility submitted (\$143.52 \pm 21.00 vs \$229.48 \pm 5.04, $p < 0.001$) and reimbursed (\$20.25 \pm 0.40 vs \$90.82 \pm 0.87, $p < 0.001$).

DR had 8831 (69.6%) providers utilizing facility and 3851 (30.4%) utilizing non-facility charges. Facility fees average submitted \$109.24 \pm 0.88 versus reimbursed \$20.08 \pm 0.04 (t-test, $p < 0.001$). Non-facility fees submitted were \$243.39 \pm 3.91 vs reimbursed \$78.13 \pm 0.94 ($p < 0.001$). Facility versus non-facility submitted (\$109.24 \pm 0.88 vs \$243.39 \pm 3.91, $p < 0.001$) and reimbursed (\$20.08 \pm 0.04 vs \$78.13 \pm 0.94, $p < 0.001$).

There was a difference in the ratio of those charging facility versus non-facility charges (ANOVA $p < 0.001$). OTO (13/244, 5.3%) and ENDO (80/1241, 6.4%) had the same ratio. GS (36/191, 18.8%) had a higher ratio than OTO and ENDO. DR (8831/12682, 70.0%) had more facility chargers than all three of the other subspecialties (all $ps < 0.01$).

2015

In 2015, DR (13659) had the highest number of US providers followed by ENDO (1344), OTO (266) and GS (206) (Figure 1). This accounted for head and neck ultrasound (HCPCS 76536) charge submissions on medicare beneficiaries of 505,568, 124,502, 13,490, and 9,298, respectively (Figure 2). The average numbers of ultrasounds were DR 37.01 \pm 0.36, ENDO 92.64 \pm 3.05, OTO 50.71 \pm 4.20, and GS 45.12 \pm 3.12 ($p < 0.001$). ENDO performed more average US than the other subspecialties (vs OTO $p < 0.01$, vs GS $p < 0.01$, vs DR $p < 0.01$). OTO performed more average US than DR ($p < 0.01$) (Figure 3). There was no difference in average US performed between OTO and GS and for GS versus DR.

Among surgeons in 2015, OTOs performed more diagnostic HNUS than GSs (13490 vs 9298) (Figure 4), and the percentage of OTOs performing US compared to their specialty peers (266/9320, 2.9%) was 3.5 times higher than GSs (206/25185, 0.82%) (Figure 5).

Charges Submitted

An overall difference existed on ANOVA ($p < 0.001$). There was no difference between GS and ENDO (\$242.34 \pm 8.21 vs \$243.84 \pm 2.98). OTO (\$270.35 \pm 10.81) was more than the other three ($p < 0.01$). ENDO and GS were more than DR (\$160.36 \pm 0.10) ($p < 0.01$).

Reimbursements

Overall ANOVA shows differences existed ($p < 0.001$). ENDO (\$79.39 \pm 0.61) and OTO (\$77.06 \pm 1.25) collected the same average, and also remained higher than both of the other specialties, GS (\$65.73 \pm 1.96, $ps < 0.01$). All three point of care specialties collected more than DR (\$36.55 \pm 0.24), $ps < 0.01$

Superusers

Superuser breakdown included: OTO (27/266, 10.2%) GS (22/206, 10.7%), ENDO (403/1344, 30.0%), DR (628/13659, 4.6%) (one way ANOVA $p < 0.001$). Following Tukey HSD, ENDO again had more superusers (vs OTO $p < 0.01$, vs GS, $p < 0.01$ vs DR $p < 0.01$). OTO and GS had more than DR ($p < 0.01$ and $p < 0.01$). There was no difference in superusers between OTO and GS (Figure 6).

Subanalysis taking into account type of charges by facility versus non-facility

OTO had (19) providers utilizing facility and (247) utilizing non-facility charges. Facility fees average submitted $\$134.58 \pm 52.28$ versus reimbursed $\$21.43 \pm 0.92$ (t-test, $p < 0.001$). Non-facility fees submitted were $\$280.80 \pm 22.32$ vs reimbursed $\$81.34 \pm 1.75$ ($p < 0.001$). Facility versus non-facility submitted ($\$134.58 \pm 52.28$ vs $\$280.80 \pm 22.32$, $p < 0.001$) and reimbursed ($\$21.43 \pm 0.92$ vs $\$81.34 \pm 1.75$, $p < 0.001$).

GS had (46) providers utilizing facility and (160) utilizing non-facility charges. Facility fees average submitted $\$144.86 \pm 23.14$ versus reimbursed $\$21.54 \pm 0.34$ (t-test, $p < 0.001$). Non-facility fees submitted were $\$270.36 \pm 17.68$ vs reimbursed $\$78.43 \pm 2.70$ ($p < 0.001$). Facility versus non-facility submitted ($\$144.86 \pm 23.14$ vs $\$270.36 \pm 17.68$, $p < 0.001$) and reimbursed ($\$21.54 \pm 0.34$ vs $\$78.43 \pm 2.70$, $p < 0.001$).

ENDO had (112) providers utilizing facility and (1233) utilizing non-facility charges. Facility fees average submitted $\$125.45 \pm 16.16$ versus reimbursed $\$20.33 \pm 0.41$ (t-test, $p < 0.001$). Non-facility fees submitted were $\$254.60 \pm 5.94$ vs reimbursed $\$84.76 \pm 0.78$ ($p < 0.001$). Facility versus non-facility submitted ($\$125.45 \pm 16.16$ vs $\$254.60 \pm 5.94$, $p < 0.001$) and reimbursed ($\$20.33 \pm 0.41$ vs $\$84.76 \pm 0.78$, $p < 0.001$).

DR had 9509 facility charge users and 4150 nonfacility charge users. Facility fees submitted were $\$114.15 \pm 1.25$ vs reimbursed $\$20.36 \pm 0.04$ ($p < 0.001$). Non-facility fees average submitted $\$266.24 \pm 4.30$ versus reimbursed $\$73.66 \pm 0.80$ (t-test, $p < 0.001$). Facility versus non-facility submitted ($\$114.15 \pm 1.25$ vs $\$266.24 \pm 4.30$, $p < 0.001$) and reimbursed ($\$20.36 \pm 0.04$ vs $\$73.66 \pm 0.80$, $p < 0.001$).

ANOVA for facility fee reimbursement ($p < 0.001$) included no difference in reimbursement for OTO ($\$21.43 \pm 0.44$) versus GS ($\21.54 ± 0.18) nor for ENDO ($\$20.33 \pm 0.21$ versus DR ($\$20.36 \pm 0.02$), however, OTO received more than ENDO ($p < 0.05$) and DR ($p < 0.05$). Likewise, GS received more than ENDO ($p < 0.01$) and DR ($p < 0.01$).

Non-facility fee reimbursements were different overall (ANOVA, $p < 0.001$). There was no difference in reimbursement between OTO ($\$81.3351 \pm 0.8793$) and GS ($\78.4341 ± 1.3588) nor OTO and ENDO ($\$84.7592 \pm 0.3929$). Differences occurred between GS with ENDO ($p < 0.05$) and DR ($\$73.6561 \pm 0.4035$, $p < 0.01$), as well as a differences existed between OTO versus DR ($p < 0.01$) and ENDO versus DR ($p < 0.01$).

There was a difference in the ratio of those charging facility versus non-facility charges (ANOVA $p < 0.001$). OTO (19/266, 7.1%) and ENDO (112/1344, 8.3%) had the same ratio. GS (46/206, 22.0%) had a higher ratio than OTO and ENDO. DR (9509/13659, 70.0%) had more facility chargers than all three of the other subspecialties (all $ps < 0.01$).

Between 2012 and 2015

The average number of OTO US billed did not change ($\$51.18 \pm 9.69$ vs 50.71 ± 8.36 , $p < 0.94$). Submitted charges were less over time ($\$253.80 \pm 19.45$ vs $\$104.30 \pm 3.16$, $p < 0.001$). Reimbursement also declined ($\$83.18 \pm 2.79$ vs $\$77.06 \pm 2.49$, $p < 0.001$). The number of superusers did not change (22 vs 27, $p < 0.90$).

The average number of GS US billed did not change (39.20 ± 5.11 vs 45.14 ± 6.18 , $p < 0.15$). Submitted charges did not change over time ($\$233.52 \pm 16.00$ vs $\$242.34 \pm 16.33$, $p < 0.44$). Reimbursement declined ($\$73.05 \pm 4.19$ vs $\$65.73 \pm 3.91$, $p < 0.01$). The number of superusers did not change (11 vs 22, $p < 0.08$).

The average number of ENDO US billed did not change (51.18 ± 9.69 vs 50.71 ± 8.36 , $p < 0.94$). Submitted charges were less over time ($\$253.80 \pm 19.45$ vs $\$104.30 \pm 3.16$, $p < 0.001$). Reimbursement also declined ($\$83.18 \pm 2.79$ vs $\$77.06 \pm 2.49$, $p < 0.001$). The number of superusers did not change (22 vs 27, $p < 0.90$).

The average number of DR US billed did not change (51.18 ± 9.69 vs 50.71 ± 8.36 , $p < 0.94$). Submitted charges were less over time ($\$253.80 \pm 19.45$ vs $\$104.30 \pm 3.16$, $p < 0.001$). Reimbursement also declined ($\$83.18 \pm 2.79$ vs $\$77.06 \pm 2.49$, $p < 0.001$). The number of superusers did not change (22 vs 27, $p < 0.90$).

The number of those users charging facility vs nonfacility charges did not change for DR (8831/12682, 70.0%, vs 9509/13659, 70%, $p < 0.98$), ENDO (80/1241, 6.4%, versus 112/1344, 8.3%, $p < 0.07$), OTO (13/244, 5.3%, versus 19/266, 7.1%, $p < 0.55$) and GS (36/191, 18.8%, versus 46/206, 22.0%, $p < 0.40$).

Discussion

Ultrasound examination has been likened to the “stethoscope of the fingers” and carries great value in its immediacy. The ability to clean it with ease and portability allow for ease in use. Point-of-care ultrasound allows same visit service and management decisions. Its use has expanded to include ultrasound examination of the thyroid gland, vocal cord motion, parotid gland, submandibular gland, lymph nodes, head and neck primary biopsy, arterial evaluation, TEP placement, abscess drainage, and submucosal cleft evaluation.

Stark differences exist between the subspecialties in terms of billing procedure. Radiologists (~70%) vastly bill under a facility while general surgeons (~20%) to a lesser degree and endocrinologists (~8%) and otolaryngologists (~5%) much less.

We believe endocrinologists average a higher number of ultrasounds performed due to spending more time in clinic allowing for point of care ultrasound. This point is illustrated by the higher number of superusers within endocrinology (27%). Point of care ultrasound attains a higher billing rate and reimbursement compared to traditional radiologist performed ultrasound due to the overwhelming majority of radiology ultrasonography is performed at a facility. Our study illustrates that, once adjusting for facility versus non-facility charging, the gap between the subspecialties lessened. Historically, the non-facility reimbursement is roughly 3-4 times more –as continued within this study.

As in other clinical specialties, otolaryngology has been adopting the concept of point-of-care ultrasound in the new millennium, while encountering barriers of time, training, confidence, and expense [5]. There have been concerns that increasing utilization of clinician performed ultrasound will threaten radiology case volume and reimbursement [6]. This is the first study that measures relative utilization between traditional radiology-performed HNUS and that performed by point-of-care otolaryngologists, general surgeons, and endocrinologists.

Conclusion

1. OTOs accounted for 2.1% of head & neck diagnostic ultrasounds performed on Medicare beneficiaries in 2015.
2. Non-radiology point-of-care HNUS appears to have little impact on DR volume over the years 2012-2015.
3. A greater proportion of OTOs than DRs (10.5% vs 4.5%) are “super-users”, performing more than 100 exams/year.
4. When seeking a surgeon, patients are 3.5 times more likely to have access to point-of-care HNUS by visiting an otolaryngologist than a general surgeon.

References

1. Sharma GK, S.R., Armstrong WB, Evaluation of the American College of Surgeons Thyroid and Parathyroid Ultrasound Course: Results of a Web-Based Survey. *The Laryngoscope*, 2016: p. 1-9.
2. Bumpous JM, R.G., The Expanding Utility of Office-Based Ultrasound for the Head and Neck Surgeon. *Otolaryngol Clin N Am*, 2010. 43: p. 1203-1208.
3. Medicare Fee-For-Service Provider Utilization & Payment Data Physician and Other Supplier Public Use File: A Methodological Overview, in *The Centers for Medicare and Medicaid Services, Office of Enterprise Data and Analytics*. 2016: CMS.gov. p. 1-23.
4. Hall MK, H.J., Gross CP, Harish NJ, Liu R, Maroongroge S, Moore CL, Raio CC, Taylor RA, Use of Point-of-Care Ultrasound in the Emergency Department Insights from the 2012 Medicare National Payment Data Set. *J Ultrasound Med*, 2016. 35: p. 2467-2474.

5. Nagarkatti SS, M.M., Sofferman RA, Parangi S, Obstacles to Setting Up Office-Based Ultrasound for Thyroid and Parathyroid Diseases. *The Laryngoscope*, 2010. 121: p. 548-554.
6. Levin DC, R.V., Parker L, Frangos AJ, Sunshine JH, Medicare Payments for Noninvasive Diagnostic Imaging Are Now Higher to Nonradiologist Physicians Than to Radiologists. *J Am Coll Radiol*, 2011. 8: p. 26-32.

Captions for Figures and Tables

Figure 1. Proportionate utilization in 2015 of 76536, diagnostic ultrasound of head and neck. DR submitted 77.4% of charges, ENDO 19.1%, OTO 2.1%, and GS 1.4%.

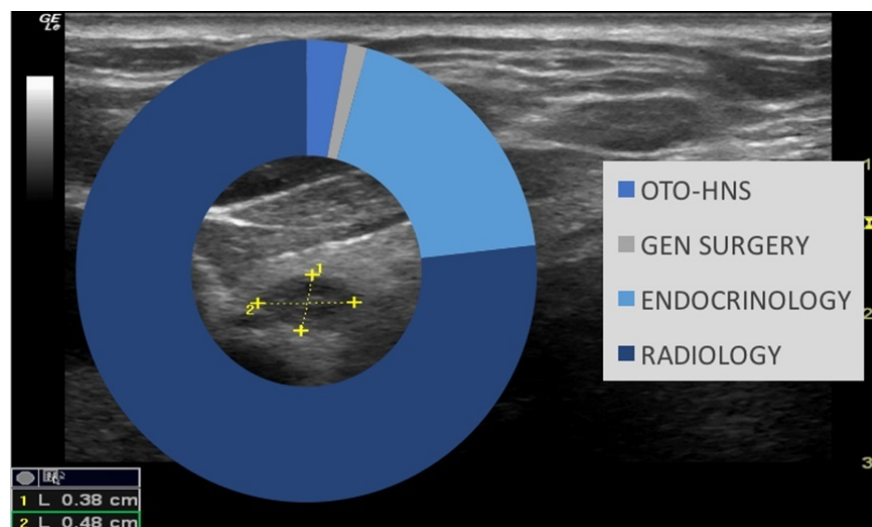
Figure 2. Submitted charges over time, by specialty, for code 76536 (diagnostic ultrasound of head and neck).

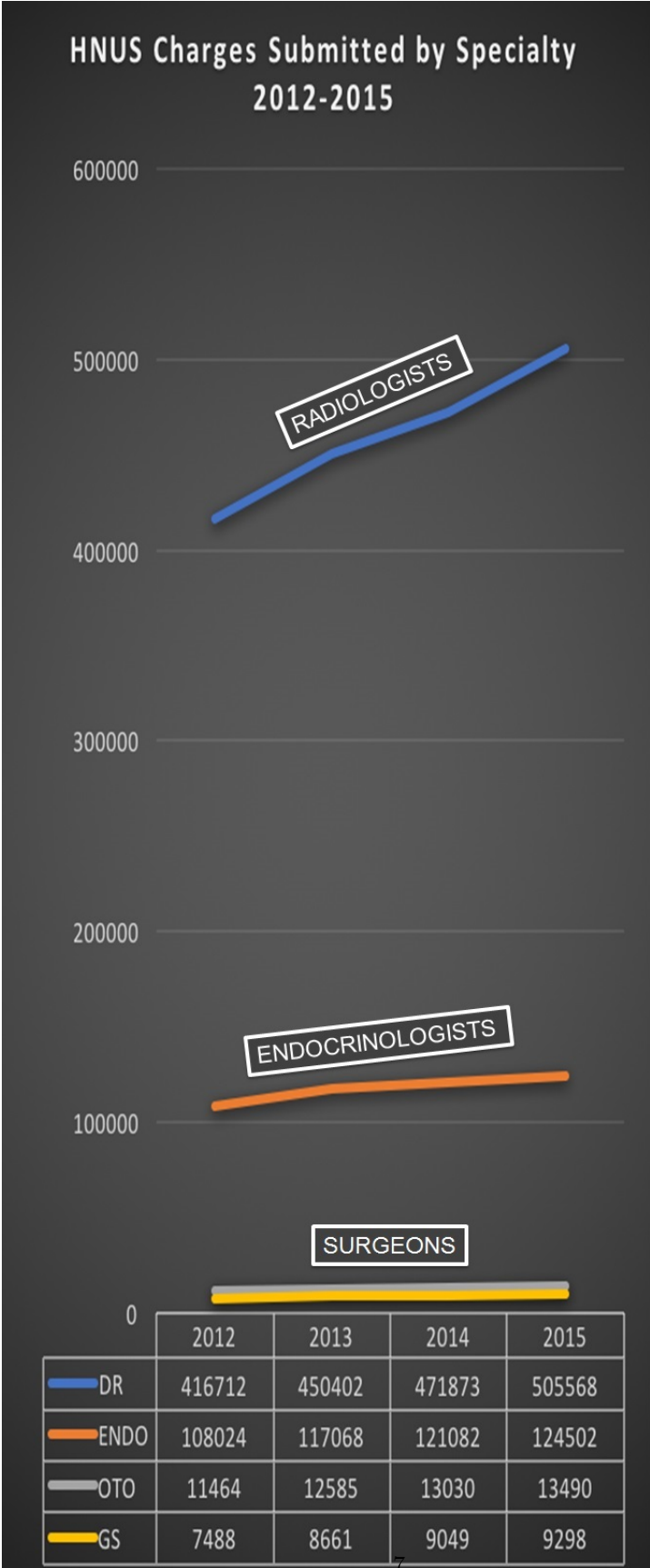
Figure 3. Individual HN-related ultrasound charges submitted by OTOs in 2015. 76536 is diagnostic HNUS. 76942 is ultrasound for needle placement. 10022 is needle biopsy with image guidance.

Figure 4. Comparison between surgical specialties. Number of diagnostic HNUS charges submitted in 2015, GS vs OTO.

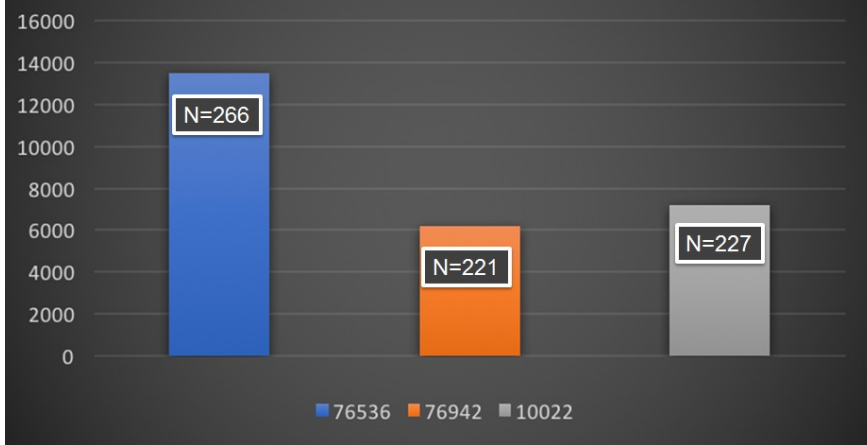
Figure 5. Proportion of those who perform HNUS compared to number of practicing surgeons.

Figure 6. Percentage of providers submitting more than 100 charges for 76536 in 2015, i.e. “Super-Users”. Radiology on the left and Otolaryngology on the right.





OTO-Submitted HN-Related Charges 2015



Diagnostic HNUS Performed by Surgeons-2015

