VIRGINIA COMMONWEALTH UNIVERSITY MEDICAL CENTER

Incidentalomas in the Workup of Asymmetric Hearing Loss

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Introduction

- Asymmetric sensorineural hearing loss (ASNHL) is generally defined as interaural difference >15dB HL at 3,000Hz
- Gadolinium-enhanced MRI is currently the gold standard utilized in the assessment of ASNHL
- Rates of identifying a lesion with MRI is <5%, while the rate for identifying an incidental intracranial finding is ~6.9%
- The cost associated with identifying a retrocochlear lesion is estimated at roughly $60,000/tumor and has been well-documented. However, to date ***the additional economic and social burden of incidental findings is poorly understood and has not been considered in cost-efficacy analyses of MRI for ASNHL.***
- The goal of this study is to understand the economic implications associated with work-up of incidental findings identified on MRI for ASNHL

Methods

- The study was designed as a retrospective cohort study
- Radiology records were queried for all MRI's ordered for ASNHL between January 2012 to November 2022 within the Virginia Commonwealth University Health Systems
- Results were characterized as **"Normal"**, **"Variation of Normal"**, **"Related to ASNHL"**, or **"Abnormal - Further Workup Warranted"**
- Patients identified within the **"Abnormal - Further Workup Warranted"** cohort were queried using the institutions electronic medical record (EMR) systems with a comprehensive review of their clinical visits, laboratory tests, and procedures associated with the findings from the MRI report
- Cost analysis was completed using the Medicare Physician Fee Schedule (PFS) to determine Medicare costs associated with various imaging, procedures, and encounters. The PFS is the primary method of payment for institutions providing services for Medicare patients.
  - The Congressional Budget Office (CBO) analysis of studies published between 2010 and 2020 comparing commercial insurers fees and Medicare fee schedule prices was used to estimate private insurance costs
  - Averaged across the 6 studies on outpatient services and 11 studies on inpatient services, commercial insurers' prices were 240 percent of Medicare FFS's prices for outpatient services and 182 percent of Medicare FFS's prices for inpatient services.
  - Among five studies of specialty services for clinic, commercial insurers' prices were 144 percent of Medicare FFS's prices for specialty services.
- These conversion rates were used to determine relative commercial insurance costs of interventions provided.

Results

- 600 patients met the inclusion criteria for this study
  - 387 (64.5%) were categorized as "Normal" while 154 (25.7%) were classified as "Variation of Normal"
  - 18 (3.0%) patients had findings related to ASNHL, and 41 (6.8%) had abnormal findings that warranted further workup
  - 4/41 patients were excluded from cost analysis due to lack of documentation
- Summary of the types of intervention resulting from incidental imaging finding

"Incidentaloma" Population Intervention		
Intervention	**Total Number**	**Percentage**
Additional Diagnostic Imaging	15	39.5%
Long-Term Surveillance Imaging/Encounter	9	23.7%
Laboratory Work	6	15.8%
Encounter with No Further Intervention	6	15.8%
Procedural Intervention	5	13.2%
Lost to Follow-Up	4	10.5%
Surgical Intervention in Operating Room	2	5.3%
Total Number of Patients	**38**	

Table 1. Types of intervention resulting from incidental imaging finding.

- Cost Analysis

Consulting Service Initial Encounter Costs				
Consulting Service (CPT 99203)*	**Encounters**	**Medicare PFS Cost**	**CBO estimate of Commercial Insurance cost of specialty services (x1.44)**	**Brookings Institute estimate of costs of uninsured (x2.5)**
Neurosurgery	12	1088.40	1567.30	3918.24
Neurology	8	725.60	1044.86	2612.16
Neuro-Ophthalmology	3	272.10	391.82	979.56
Endocrinology	3	272.10	391.82	979.56
Emergency Department (CPT 99285)**	1	192.88	277.75	694.368
Neuro-oncology	1	90.70	130.61	326.52
Otolaryngology	1	90.70	130.61	326.52
Hematology/Oncology	1	90.70	130.61	326.52
Surgical Oncology	1	90.70	130.61	326.52
Ophthalmology	1	90.70	130.61	326.52
Total	**32**	**3004.58**	**4326.60**	**10816.49**

Table 2. Number of initial clinical encounters since abnormal imaging finding, with associated initial encounter cost in USD.
***Initial encounter cost is $90.70 USD within all specialties.**
****Emergency department encounter cost is $192.88 USD.**

Consulting Service Subsequent Encounter Costs				
Consulting Service (CPT 99213)*	**Encounters**	**Medicare PFS Cost**	**CBO estimate of Commercial Insurance cost of specialty services (x1.44)**	**Brookings Institute estimate of costs of uninsured (x2.5)**
Otolaryngology	20	1443.80	2079.07	5197.68
Neurosurgery	17	1227.23	1767.21	4418.028
Neurology	5	360.95	519.77	1299.42
Endocrinology	4	288.76	415.81	1039.536
Surgical Oncology	2	144.38	207.91	519.768
Primary Care Physician	1	72.19	103.95	259.884
Hepatology	1	72.19	103.95	259.884
Hematology/Oncology	1	72.19	103.95	259.884
Total	**51**	**3681.69**	**5301.63**	**13254.08**

Table 3. Number of subsequent clinical encounters since abnormal imaging finding and associated subsequent encounter cost in USD.
***Subsequent encounter cost is $72.19 USD within all specialties.**

Imaging Costs						
Imaging	**CPT code**	**Medicare PFS cost**	**N**	**Medicare PFS Cost Overall**	**CBO estimate of Commercial Insurance cost of Outpatient services (x2.4)**	**Brookings Institute estimate of costs of uninsured (x2.5**
MRI Brain w/wo Contrast	70553	337.52	28	9450.56	22681.34	56703.36
MRI IAC w/wo Contrast	70553	337.52	4	1350.08	3240.19	8100.48
CTA Head	70496	318.02	4	1272.08	3052.99	7632.48
CT Chest w/ Contrast	71275	323.94	2	647.88	1554.91	3887.28
CTA Neck	70498	317.65	2	635.30	1524.72	3811.8
CT Temporal Bone w/o Contrast	70480	182.15	3	546.45	1311.48	3278.7
Transthoracic Echocardiogram	93306	216.95	2	433.90	1041.36	2603.4
MR Abdomen w/wo Contrast	74183	392.80	1	392.80	942.72	2356.8
Head CT w/o Contrast	70450	182.15	2	364.30	874.32	2185.8
Nuclear Medicine - Bone Scan	78306	305.43	1	305.43	733.03	1832.58
CTA/P w/ Contrast	74160	271.00	1	271.00	650.40	1626
Carotid Doppler	93880	212.14	1	212.14	509.14	1272.84
PET/CT Whole Body	78813	114.54	1	114.54	274.90	687.24
Sinus X-Ray	70210	35.91	1	35.91	86.18	215.46
Cervical Spine X-Ray	72020	27.40	1	27.40	65.76	164.4
			Total Cost	**16059.77**	**38543.45**	**96358.62**

Table 4. Further imaging resulting from incidental initial imaging finding and associated costs in USD.

Procedure Costs						
Procedures	**CPT code**	**Medicare PFS cost**	**N**	**Medicare PFS Cost Overall**	**CBO estimate of Commercial Insurance cost of Inpatient services (x1.82)**	**Brookings Institute estimate of costs of uninsured (x2.5**
CSF Leak Repair	62100	1756.98	1	1756.98	3197.70	7994.259
Skull base Cranioplasty	62140	1142.49	1	1142.49	2079.33	5198.3295
Mastoidectomy	69670	1056.23	1	1056.23	1922.34	4805.8465
Lymph Node Excisional Biopsy	38525	489.43	1	489.43	890.76	2226.9065
Lumbar Puncture	62328	94.41	3	283.23	515.48	1288.6965
Myringotomy - Local Anesthesia	69420	134.02	2	268.04	487.83	1219.582
Use of Operating Microscope	69990	240.27	1	240.27	437.29	1093.2285
Tympanostomy Tube - Local Anesthesia	69436	147.35	1	147.35	268.18	670.4425
Calvarial Bone Graft	62148	139.20	1	139.20	253.34	633.36
Bone Marrow Biopsy	38221	76.64	1	76.64	139.48	348.712
Intraoperative Facial Nerve Monitoring	92516	25.18	1	25.18	45.83	114.569
			Total Cost	**5625.04**	**10237.57**	**25593.93**

Table 5. Procedures resulting from incidental imaging finding and associated costs in USD.

Discussion

- The rate of identifying findings associated with ASNHL in our study was found to be 3.2%, while incidental findings requiring further work up was at 6.8%, which were consistent with other sources in the literature.
- The additional costs for imaging, consultations, and procedures in patients requiring further intervention for an incidental finding were approximately $750, $1540, and $3840 ***per person*** under Medicare pricing, commercial insurance estimates, and uninsured estimates, respectively.
- Laboratory testing costs were excluded from the calculations as they were unlikely to substantially affect overall costs and neither the CBO nor the Brookings Institute were able to provide data on the conversion rate of laboratory testing for individuals with commercial insurance and those without coverage.
- While this study quantified the direct costs associated with managing incidental findings in patients undergoing workup for ASHL, it is important to acknowledge the potential indirect costs that are challenging to measure. These may include the impact of patient anxiety and psychological distress, as well as the expenses related to decrease in patient productivity, travel, and appointment scheduling.

Conclusion

- Historical cost-efficacy analyses of MRI in the workup of ASNHL likely under-estimate the true costs by failing to account for the substantial expense of incidental findings.
- Further research is warranted in better understanding the entire scope of non-economic burdens associated with the management of incidental findings to guide evidence-based practice.

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