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Original Research Article

Treatment patterns and documented early outcomes in a routine otolaryngology outpatient service: a retrospective record-based study

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ABSTRACT

Background: Background: Otolaryngology outpatient services manage many different conditions, but most outcome studies focus on a single diagnosis. Service-level data can show how care is delivered in routine practice, although comparisons between medical and procedural treatment are easily affected by case selection. The objective is to describe diagnoses and treatment patterns in a routine otolaryngology outpatient service and to examine the association between treatment category and documented cure.
Methods: We reviewed a 2024 outpatient dataset from a tertiary care centre. The source file contained 810 records. A conservative data-integrity audit removed exact duplicate copies, records belonging to conflicting duplicate-ID pairs, one unmapped diagnosis, and records without an observed cure/not-cure outcome. The primary analytic dataset contained 702 records, each with a unique ID. Cure proportions were reported with Wilson 95% confidence intervals (CIs). Crude risk ratios (RRs) and Newcombe confidence intervals for the absolute risk difference were calculated. Exploratory adjusted RRs were estimated with modified Poisson regression using robust standard errors and adjustment for age, sex, and diagnosis.
Results: Medical management was recorded in 617 of 702 records (87.9%), and surgical/procedural management in 85 (12.1%). Cure was documented in 421 of 617 medically managed records (68.2%; 95% CI, 64.5%-71.8%) and 77 of 85 surgically/procedurally managed records (90.6%; 95% CI, 82.5%-95.2%). The crude RR was 1.33 (95% CI, 1.22-1.45), and the absolute difference was 22.4 percentage points (95% CI, 13.5-28.3). In the complete-case adjusted model (n=699), surgical/procedural management remained associated with documented cure (adjusted RR [aRR], 1.40; 95% CI, 1.15-1.70). Results were similar in sensitivity analyses.
Conclusions: Surgical/procedural records had a higher frequency of documented cure, but this finding should not be interpreted as evidence that procedures are generally superior. Treatment choice was strongly linked to diagnosis, and important clinical differences between treatment groups were not measured. The study is best interpreted as a description of routine service delivery and an exploratory analysis of treatment-outcome associations.

Keywords: Otolaryngology, Outpatient care, Medical management, Procedural management, Treatment outcomes, Observational study

INTRODUCTION

Otolaryngology outpatient clinics treat a broad range of ear, nose, throat, head-and-neck, and hearing problems. Care may involve medicines, observation, conservative measures, office procedures, or surgery. The appropriate choice depends on the diagnosis, severity, expected course, patient preference and whether the problem can be corrected directly.[1,2]

Real-world clinical data are useful because they describe what happens in everyday practice rather than under tightly controlled trial conditions.[3] Indian studies have described prescribing patterns and patient experience in otolaryngology services, but broad service-level analyses of treatment patterns and early outcomes remain uncommon.[4,5] Most published evidence is condition-specific. For example, the management of acute otitis media, otitis media with effusion, and adult sinusitis follows different clinical pathways.[6-8] A pooled comparison of medical and procedural care therefore needs caution. In routine practice, treatment is chosen because of the clinical problem. Patients selected for a procedure may have a condition that can be corrected quickly, while medically treated patients may have inflammatory, chronic, recurrent, or less reversible disease. This is an important form of confounding by indication.

The aim of this study was to describe diagnoses and treatment patterns in a routine tertiary otolaryngology outpatient service and to examine the association between treatment category and documented cure. A second aim was to test whether the association remained after a conservative data-quality audit and adjustment for measured differences.

METHODS

Study design and setting

This was a retrospective, record-based observational study using routine otolaryngology outpatient data from a tertiary care centre for January 1 to December 31, 2024. Reporting was guided by the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement.[9]

Ethical considerations

The study used de-identified information from existing clinical records and involved no additional patient contact or intervention for this retrospective analysis. The study was conducted in accordance with the Declaration of Helsinki.

Data source and integrity audit

The supplied master dataset contained 810 data rows. Each row included a field named Unique Id, age, sex, diagnosis code, treatment code, and an immediate outcome code. Before analysis, we audited the source data because the field labelled Unique Id was not unique.

Fifty-four IDs appeared twice. Ten pairs were identical across the analytic fields of age, sex, diagnosis, treatment, and outcome. For each of these exact duplicate pairs, one copy was removed. Forty-four duplicate-ID pairs contained conflicting information in one or more analytic fields. The available files did not contain a visit date or a second identifier that could safely show whether these rows were legitimate repeat encounters or data-entry conflicts. We therefore used a conservative rule and excluded both rows in each conflicting pair. This removed 98 rows in total: 10 duplicate copies and 88 rows from 44 conflicting pairs. One additional record had diagnosis code 48, which was not present in the supplied diagnosis codebook, and was excluded so that all retained diagnoses had a verified mapping. After this integrity audit, 711 records remained. Seven had an outcome coded as Lost/Unknown and two had no recorded outcome; these were excluded from the primary cure analysis. The final primary dataset contained 702 records, and every retained Unique Id appeared once (Figure 1).

Figure 1. Data cleaning and analysis flow

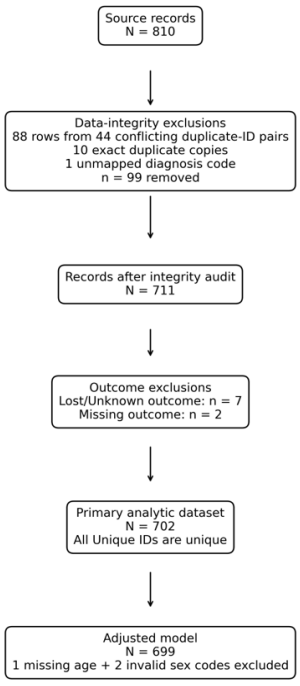

Figure 1: Data cleaning and analysis flow.

One age entry was recorded as '9M' and was converted to 0.75 years. One age value was missing. Sex codes 1 and 2 represented male and female. Two records contained codes 7 and 10, which did not match the coding scheme; these were treated as missing for adjusted analyses. The primary descriptive and crude outcome analyses retained these two records because treatment and outcome were valid.

Treatment and outcome variables

Treatment was analysed using the two categories present in the cleaned data: medical management and surgical/procedural management. The primary outcome was the clinician-recorded outcome category in the source data: Cured or Not cured. Records coded Lost/Unknown were not included in the primary analysis. The source analysis file did not contain the exact date or interval at which the outcome was recorded, and it did not contain a validated disease-specific outcome score. We therefore use the term documented early cure to describe the recorded outcome without implying a fixed follow-up interval or a standardized definition of cure.

Statistical analysis

For data entry and preparation of the master sheet, Microsoft Excel 2024 was used. For statistical analyses, JASP (0.98.1) and IBM SPSS (24) were used. Continuous variables are reported as mean and standard deviation (SD), and categorical variables as number and percentage. Cure proportions are shown with Wilson 95% CIs. The crude association between treatment category and cure was summarized with a risk ratio and 95% CI. The absolute risk difference was reported with a Newcombe 95% CI. A Pearson chi-square test was used for the unadjusted two-group comparison.

Because cure was common, odds ratios would overstate the relative association. We therefore used modified Poisson regression with robust (sandwich) standard errors to estimate adjusted risk ratios.[10] The exploratory adjusted model included treatment category, age as a continuous variable reported per 10-year increase, sex, and diagnosis as a categorical variable. One record with missing age and two records with invalid sex codes were excluded from this complete-case model, leaving 699 records.

Three sensitivity analyses were performed. First, the adjusted model was restricted to diagnoses represented in both treatment groups, reducing concerns about lack of diagnostic overlap. Second, records coded Lost/Unknown were treated as not cured. Third, the adjusted model was repeated in the earlier outcome-eligible dataset before the conservative duplicate-ID exclusions. These analyses were used only to assess whether the main association was sensitive to the cleaning decisions. All tests were two-sided, and $p<0.05$ was considered statistically significant.

RESULTS

Data quality and final analytic sample

The source dataset contained 810 records. The integrity audit removed 88 rows from 44 conflicting duplicate-ID pairs, 10 exact duplicate copies, and one record with an unmapped diagnosis code. Seven Lost/Unknown outcomes and two missing outcomes were then excluded. The final primary dataset contained 702 records with 702 unique IDs (Figure 1). Age was available for 701 records. Mean age was 29.9 years (SD 20.1), with a range from 0.75 to 87 years. There were 399 female records (56.8%), 301 male records (42.9%), and two records (0.3%) with unclassified sex (Table 1).

Diagnoses and treatment patterns

Ear conditions accounted for 545 records (77.6%), followed by throat/oral conditions (108; 15.4%) and nose conditions (34; 4.8%). Acute otitis media was the most common diagnosis (219; 31.2%), followed by impacted wax (79; 11.3%), secretory otitis media/eustachian tube dysfunction (74; 10.5%), and acute otitis externa (60; 8.5%) (Table 2). Medical management was recorded in 617 of 702 records (87.9%), while 85 records (12.1%) were classified as surgical/procedural. Treatment choice varied markedly by diagnosis. For example, 216 of 219 acute otitis media records (98.6%) were managed medically, whereas 53 of 79 impacted-wax records (67.1%) received surgical/procedural management (Table 4). This strong link between diagnosis and treatment is central to the interpretation of the outcome comparison.

Documented cure

Overall, cure was documented in 498 of 702 records (70.9%; 95% CI, 67.5%-74.2%). Cure was documented in 421 of 617 medically managed records (68.2%; 95% CI, 64.5%-71.8%) and 77 of 85 surgically/procedurally managed records (90.6%; 95% CI, 82.5%-95.2%) (Table 3; Figure 2). The crude risk ratio for surgical/procedural versus medical management was 1.33 (95% CI, 1.22-1.45; $p<0.001$). The absolute difference in documented cure was 22.4 percentage points (95% CI, 13.5-28.3). These are unadjusted associations and do not represent a causal treatment effect.

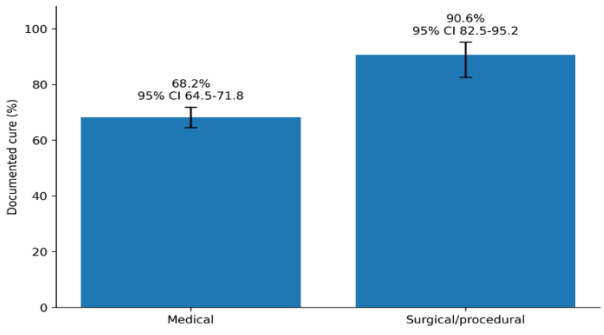

Figure 2: Documented cure by treatment group. Error bars show Wilson 95% confidence intervals.

Adjusted and sensitivity analyses

The adjusted model included 699 complete records. After adjustment for age, sex, and diagnosis, surgical/procedural management remained associated

with a higher probability of documented cure (aRR, 1.40; 95% CI, 1.15-1.70; P<0.001) (Table 3; Figure 3). Older age was associated with a modestly lower probability of documented cure (aRR per 10-year increase, 0.93; 95% CI, 0.91-0.96; P<0.001). Sex was not associated with cure (male versus female aRR, 0.98; 95% CI, 0.91-1.06; P=0.63).

The main treatment association was stable across sensitivity analyses. Restricting the model to diagnoses present in both treatment groups gave an aRR of 1.40 (95% CI, 1.15-1.71; n=441 complete records). Treating Lost/Unknown outcomes as not cured gave an aRR of 1.42 (95% CI, 1.16-1.73; n=706 complete records). Repeating the model in the earlier outcome-eligible dataset before the conservative duplicate-ID exclusions gave an aRR of 1.46 (95% CI, 1.20-1.78; n=795 complete records) (Table 5).

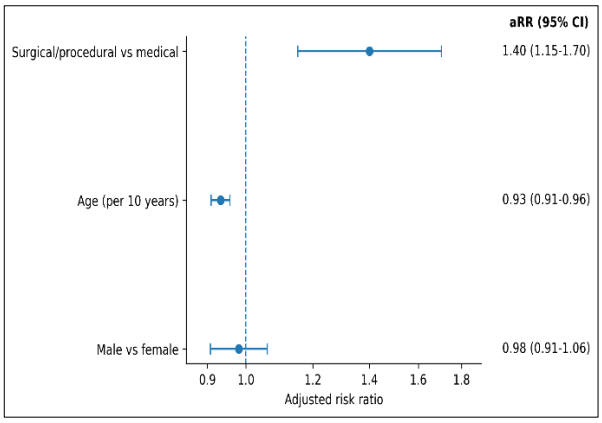

Figure 3: Adjusted risk ratios for documented cure. Estimates are from modified Poisson regression with robust standard errors and adjustment for treatment category, age, sex, and diagnosis. Diagnosis coefficients are not shown. The vertical dashed line indicates no association (RR=1.0).

Table 1: Characteristics of the final analytic sample (n=702).

Characteristics	Value
Age available, N	701
Age, mean (SD), years	29.9 (20.1)
Age range, years	0.75-87
Female, N (%)	399 (56.8)
Male, N (%)	301 (42.9)
Sex unclassified, N (%)	2 (0.3)
Ear conditions, N (%)	545 (77.6)
Throat/oral conditions, N (%)	108 (15.4)
Nose conditions, N (%)	34 (4.8)
Other/unclassified systems, N (%)	15 (2.1)
Medical management, N (%)	617 (87.9)
Surgical/procedural management, N (%)	85 (12.1)
Documented cure, N (%)	498 (70.9)

SD, standard deviation. One age was missing. Two sex values were outside the coding scheme and are shown as unclassified.

Table 2: Most common diagnoses and treatment distribution (n=702).

Diagnosis	Total N (%)	Medical N (%)	Surgical/procedural N (%)
Acute otitis media (AOM)	219 (31.2)	216 (98.6)	3 (1.4)
Impacted wax	79 (11.3)	26 (32.9)	53 (67.1)
Secretory otitis media / ETD	74 (10.5)	71 (95.9)	3 (4.1)
Acute otitis externa	60 (8.5)	60 (100.0)	0 (0.0)
Subacute/chronic pharyngitis	52 (7.4)	52 (100.0)	0 (0.0)
Chronic otitis media (COM)	43 (6.1)	39 (90.7)	4 (9.3)
Sensorineural hearing loss (SNHL)	35 (5.0)	35 (100.0)	0 (0.0)
Acute pharyngitis	22 (3.1)	22 (100.0)	0 (0.0)
Acute tonsillitis	20 (2.8)	20 (100.0)	0 (0.0)
Chronic otitis externa	13 (1.9)	13 (100.0)	0 (0.0)
Other diagnoses	85 (12.1)	63 (74.1)	22 (25.9)

Percentages in the treatment columns are row percentages within each diagnosis. 'Other diagnoses' combines all diagnoses outside the ten most common categories.

Table 3: Documented cure and adjusted associations.

Comparison/predictor	Estimate	95% CI	P value	Interpretation
Overall documented cure	70.9%	67.5%-74.2%	-	498/702; Wilson CI
Medical cure	68.2%	64.5%-71.8%	-	421/617; Wilson CI
Surgical/procedural cure	90.6%	82.5%-95.2%	<0.001	77/85; unadjusted group comparison
Crude risk ratio	1.33	1.22-1.45	<0.001	Surgical/procedural vs medical
Absolute risk difference	22.4 percentage points	13.5-28.3	<0.001	Newcombe CI; unadjusted
Treatment, adjusted RR	1.40	1.15-1.70	<0.001	Surgical/procedural vs medical; n=699
Age, adjusted RR per 10 years	0.93	0.91-0.96	<0.001	Adjusted for treatment, sex, diagnosis
Male sex, adjusted RR	0.98	0.91-1.06	0.63	Male vs female

CI, confidence interval; RR, risk ratio. Adjusted RRs were estimated using modified Poisson regression with robust standard errors and adjustment for treatment category, age, sex, and diagnosis. Adjusted estimates are exploratory and should not be interpreted causally.

Table 4: Diagnosis-specific treatment and cure summary in the primary analytic dataset (n=702).

Diagnosis	N	Medical	Surgical/ procedural	Cured n (%)
Acute otitis media (AOM)	219	216	3	198 (90.4)
Chronic otitis media (COM)	43	39	4	14 (32.6)
Impacted wax	79	26	53	69 (87.3)
Acute otitis externa	60	60	0	53 (88.3)
Chronic otitis externa	13	13	0	9 (69.2)
Sensorineural hearing loss (SNHL)	35	35	0	8 (22.9)
Deviated nasal septum (DNS)	12	3	9	9 (75.0)
Allergic rhinitis	5	5	0	5 (100.0)
Foreign body nose	5	0	5	5 (100.0)
Acute pharyngitis	22	22	0	20 (90.9)
Subacute/chronic pharyngitis	52	52	0	21 (40.4)
Acute tonsillitis	20	20	0	18 (90.0)
Chronic tonsillitis	8	6	2	0 (0.0)
Otomycosis	3	2	1	3 (100.0)
Vocal cord nodule	2	2	0	1 (50.0)
Mucous retention cyst (lip/oral cavity)	1	1	0	0 (0.0)
Secretory otitis media / ETD	74	71	3	45 (60.8)
Aphthous ulcer	1	1	0	1 (100.0)
Mixed hearing loss	6	6	0	1 (16.7)
Traumatic TM perforation	5	4	1	2 (40.0)
Acute rhinosinusitis	2	2	0	1 (50.0)
Thyroid swelling	4	4	0	1 (25.0)
Acute laryngitis	1	1	0	1 (100.0)
Epistaxis (unspecified/infective as written)	1	1	0	1 (100.0)
Preauricular sinus	1	0	1	1 (100.0)
TMJ disorder	2	2	0	1 (50.0)
Chronic rhinosinusitis	4	4	0	0 (0.0)

Continued.

Diagnosis	N	Medical	Surgical/ procedural	Cured n (%)
Acute lymphadenitis	3	3	0	2 (66.7)
Migraine	1	1	0	0 (0.0)
Tympanosclerosis	2	2	0	1 (50.0)
Acute infective rhinitis/cellulitis (complicated)	3	3	0	2 (66.7)
Chronic lymphadenitis	1	1	0	0 (0.0)
Hypertensive epistaxis	1	1	0	1 (100.0)
Foreign body ear	3	0	3	3 (100.0)
Nasal bone fracture / soft tissue injury	1	1	0	0 (0.0)
Submandibular swelling	1	1	0	0 (0.0)
Myalgia neck	2	2	0	0 (0.0)
Chronic oral lesion / leukoplakia (as written)	2	2	0	0 (0.0)
Vertigo	2	2	0	1 (50.0)

This table is descriptive. Cure percentages are not adjusted for age, sex, diagnosis severity, chronicity, or treatment selection.

Table 5: Sensitivity analyses for the treatment association

Analysis	Complete-case n	Adjusted RR	95% CI	P value	Purpose
Primary cleaned dataset	699	1.40	1.15-1.70	<0.001	Main exploratory adjusted analysis
Diagnoses with both treatments	441	1.40	1.15-1.71	<0.001	Reduces lack of diagnostic overlap
Lost/Unknown treated as not cured	706	1.42	1.16-1.73	<0.001	Assesses outcome-missingness assumption
Pre-deduplication outcome-eligible dataset	795	1.46	1.20-1.78	<0.001	Assesses effect of conservative duplicate-ID exclusions

All models used modified Poisson regression with robust standard errors and adjustment for age, sex, and diagnosis.

DISCUSSION

Principal findings

This study describes routine otolaryngology outpatient care after a detailed audit of the supplied source data. Medical management accounted for nearly nine out of ten records. Surgical/procedural management was much less common and was concentrated in selected diagnoses. Documented cure was more frequent in the surgical/procedural group, and the association remained after adjustment for age, sex and diagnosis.

The most important point is that this is not evidence that procedures are generally better than medical care. Treatment was chosen according to the clinical condition, not assigned randomly. The two treatment groups therefore differed from the beginning. The higher recorded cure rate in the procedural group is likely to reflect both treatment response and the type of conditions selected for a procedure.

Interpretation in clinical context

The data show a clear example of confounding by indication.[11] Almost all acute otitis media records were managed medically, while most impacted-wax records were managed procedurally. These are fundamentally different clinical situations. A removable wax plug may improve immediately after removal, whereas chronic inflammation, hearing loss, or recurrent disease may not meet a simple cure label over the same period. A pooled medical-versus-procedural comparison therefore cannot substitute for diagnosis-specific evidence.

This interpretation is consistent with the wider literature. Procedures can be useful when patients are appropriately selected, but the indication matters. Chronic rhinosinusitis surgery can improve outcomes in selected patients who remain symptomatic despite medical treatment, tonsillectomy can reduce recurrent severe throat infections in selected patients and tympanostomy tubes are recommended for specific middle-ear

indications rather than as a general treatment for all patients.[12-15]

The adjusted model reduced measured confounding from age, sex and diagnosis, but it cannot remove unmeasured differences such as disease severity, chronicity, previous treatment, comorbidity, patient preference, clinician judgement, or access to follow-up. The adjusted risk ratio should therefore be interpreted as an exploratory association.

Data-quality findings and robustness

The data audit materially improved the reliability of the analysis. The original outcome-eligible file contained repeated IDs, including pairs with conflicting ages, diagnoses, treatments, or outcomes. Because the source files did not provide enough information to identify legitimate repeat visits, the primary analysis excluded both entries in each conflicting pair. This conservative decision reduced the sample but produced a dataset with one unique ID per record and removed a major source of ambiguity. The main association changed only modestly after this cleaning: the adjusted RR was 1.40 in the primary cleaned dataset and 1.46 in the earlier pre-deduplication sensitivity dataset. The common-support and Lost/Unknown sensitivity analyses were also similar. This consistency makes the direction of the association more dependable, although it does not make the association causal.

Strengths and limitations

The main strengths are the transparent source-level audit, a fully traceable final dataset, one unique ID per retained record, direct reporting of risk ratios rather than odds ratios for a common outcome, diagnosis adjustment, and several sensitivity analyses. These steps make the analysis easier to reproduce and defend.

Several limitations remain. First, excluding conflicting duplicate-ID pairs may have removed some legitimate repeat encounters. This was necessary because the supplied files had no visit date or secondary identifier that could resolve the ambiguity. Second, the outcome was a routine coded label of Cured or Not cured. The exact timing of outcome assessment was not available in the analysis file, and no validated disease-specific outcome scale was recorded, such as the 22-item Sinonasal Outcome Test or the Nasal Obstruction Symptom Evaluation scale.[16,17] Third, Lost/Unknown outcomes were excluded from the primary analysis. Although a sensitivity analysis treating them as not cured produced a similar result, outcome-related loss can still introduce bias. Fourth, treatment groups were clinically heterogeneous and there was incomplete overlap between diagnosis and treatment. The common-support sensitivity analysis reduced but did not eliminate this problem. Fifth, the dataset did not include severity, chronicity, previous treatment, comorbidity, adverse events, costs, or patient-reported quality of life. Finally, this was a single-centre retrospective study, so the findings may not generalize to other services.

Implications

For clinicians, the results support diagnosis-based treatment rather than decisions based on the overall cure percentages in this study. For service planners, the data show that routine otolaryngology outpatient care is predominantly medical, with a smaller but important procedural workload. For researchers, the next step should be prospective, diagnosis-specific studies with clear eligibility criteria, standardized follow-up times, validated outcome measures, severity measures, adverse-event reporting, and patient-reported outcomes.

CONCLUSION

Medical management was the main treatment pathway in this routine otolaryngology outpatient service. Surgical/procedural records had a higher frequency of documented cure, and the association remained after conservative data cleaning and adjustment for age, sex, and diagnosis. However, the treatment groups were clinically different and treatment was selected according to indication. The findings should therefore be interpreted as real-world service data and an exploratory association, not as proof that procedures are generally superior to medical care.

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