

# Outcomes of a multidisciplinary Ear, Nose and Throat Allied Health Primary Contact outpatient assessment service

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## Abstract

**Background:** Traditionally, patients are seen by an ear, nose and throat (ENT) surgeon prior to allied health referral for treatment of swallowing, voice, hearing and dizziness. Wait-times for ENT consultations often exceed those clinically recommended. We evaluated the service impact of five allied health primary contact clinics (AHPC-ENT) on wait-times and access to treatment.

**Setting:** A metropolitan Australian University Hospital Outpatient ENT Department.

**Participants:** We created five AHPC-ENT pathways (dysphonia, dysphagia, vestibular, adult and paediatric audiology) for low-acuity patients referred to ENT with symptoms of dysphonia, dysphagia, dizziness and hearing loss.

**Main outcome measures:** Using multiple regression analysis, we compared waiting times in the 24-month pre- and 12-month post-implementation of the AHPC-ENT service. In addition, we measured the number of patients requiring specialist ENT intervention after assessment in the AHPC-ENT, adverse events and evaluation of service delivery costs.

**Results:** Seven hundred and thirty-eight patients were seen in the AHPC-ENT over the first 12 months of implementation (dysphagia, 66; dysphonia, 153; vestibular, 151; retro-cochlear, 60; and paediatric glue ear, 308). All pathways significantly reduced the waiting times for patients by an average of 277 days, compared with usual care. The majority of patients were able to be discharged without ongoing ENT intervention (72% dysphagia; 81% dysphonia; 74% vestibular; 53% retro-cochlear; and 32% paediatric glue ear). No adverse events were recorded.

**Conclusions:** The AHPC-ENT improved waiting times for assessment and access to treatment. Future research on cost-effectiveness and diagnostic agreement between AHPs and ENT clinicians would provide further confidence in the model.

## 1 | INTRODUCTION

People wait longer than clinically recommended for specialist outpatient assessment in the public health system.<sup>1</sup> Governments are focused on redesigning service delivery, aiming to provide more flexible and patient-focused services, whilst increasing access to

high-value care, at acceptably low costs.<sup>2</sup> Optimising and extending allied health practitioner (AHP) scope of practice can provide a responsive workforce whilst maintaining safe and quality health care.<sup>3</sup> Expanded roles for AHPs have gained popularity over the last decade, however, are not widely accepted as a sustainable alternative to the medical-led outpatient service model.<sup>4</sup>

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Delays in accessing ear, nose and throat (ENT) diagnostic services can result in longer wait-times for treatment, negatively impacting treatment outcomes and increasing healthcare costs.<sup>5</sup> The usual pathway in most outpatient ENT services is referral from primary care directly to the ENT surgeon for initial assessment. In this model, the "ENT pathway," priority for early assessment is given to patients with symptoms of suspected malignancy (ie persistent neck lump, otalgia, odynophagia)<sup>6</sup> who may require surgical management. Lower priority patients, including adults with unilateral hearing loss or teachers with a hoarse voice, wait longer for ENT assessment,<sup>1</sup> and are often referred to AHPs for investigation and treatment after medical diagnosis.<sup>7-9</sup> An alternative model is where lower priority patients are seen by an advanced-level AHP before or instead of the ENT specialist. AHP expanded scope models can positively impact health care through streamlined access to the right treatment services, improved patient outcomes, patient satisfaction and cost benefits.<sup>4,10-14</sup>

Our study aimed to evaluate the impact of multiple AHP Primary Contact ENT (AHPC-ENT) pathways, including dysphagia, dysphonia, vestibular, retro-cochlear and paediatric glue ear by addressing these questions:

1. What is the impact of the AHPC-ENT on wait-times for assessment, compared with the ENT pathway?
2. What percentage of patients seen in the AHPC-ENT returned to ENT for surgical or pharmacological management?
3. Were there any adverse events of the AHPC-ENT?
4. What are the staff costs required to deliver the AHPC-ENT compared with the ENT pathway?

## 2 | METHODS

### 2.1 | Ethical considerations

Ethical clearance was sought from the Hospital Human Research and Ethics committee who approved the study as a Quality Audit (HREC/17/QGC/126).

### 2.2 | Study design

This prospective cohort study compared 3 groups of patients: group 1 ENT pathway—ENT clinic patients seen only by ENT between July 2014 and June 2016 (24-month pre-implementation of the AHPC-ENT); group 2 combined pathway—ENT wait-list patients who transferred to the AHPC-ENT pathway in July 2016; and group 3 AHPC-ENT—patients referred directly to the AHPC-ENT between July 2016 and June 2017.

### 2.3 | Service credentialing

The Health Service Credentialing and Defining Scope of Clinical Practice Committee approved the AHPC-ENT. The SLP was

### Keypoints

- Waiting times for specialist ear, nose and throat (ENT) outpatient assessment services in the Australian public health system are often longer than clinically recommended.
- The allied health primary contact ear, nose and throat (AHPC-ENT) service is an alternative model where low-acuity patients with symptoms of dysphonia, dysphagia, dizziness and hearing loss are seen by an advanced AHP for assessment before ENT.
- Seven hundred and thirty-eight patients were seen in the AHPC-ENT over 12 months and wait-times for assessment reduced by an average of 277 days.
- The majority of patients could be discharged without ongoing ENT intervention, and managed by the AHP service.
- Thirty-one (4%) patients were recategorised for priority ENT management after the AHP assessment.

credentialed for extended scope of practice for endoscopic evaluation of voice and swallowing, previously described by Seabrook et al.<sup>14</sup>

### 2.4 | Study population

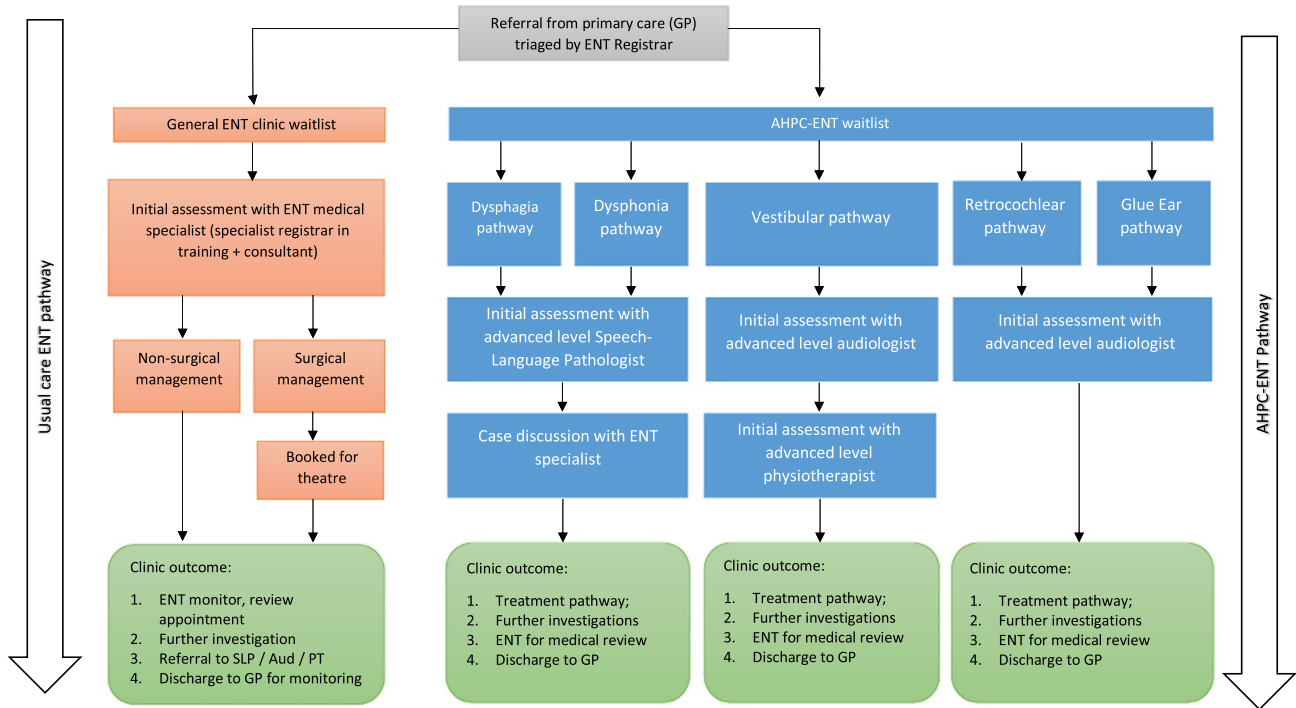
The ENT surgical team triaged patients as: "category 1" (urgent, assess < 30 days), "category 2" (complex care, assess < 90 days) and "category 3" (non-urgent, assess < 365 days). Relevant category 2 and category 3 referrals were then allocated to 1 of 5 AHPC-ENT pathways by the ENT surgical team based on symptomatology. The 5 clinics included the following: (a) SLP-led dysphagia, (b) SLP-led dysphonia, (c) physiotherapy/audiology-led vestibular, (d) audiology-led retro-cochlear and (e) audiology-led paediatric glue ear (Figure 1).

### 2.5 | Inclusion and exclusion criteria

Inclusion and exclusion criteria for each AHPC-ENT stream were developed by ENT and AHP senior clinicians and outlined in Table 1. All category 2 and category 3 referrals with symptoms matching the inclusion/exclusion criteria were recruited.

### 2.6 | AHPC-ENT assessment

Initial assessment conducted by the advanced AHP included the following: case history of presenting symptoms, medical/surgical intervention, symptom onset and progression, social history and clinical assessments appropriate for the presenting condition (ie vestibular



ENT = Ear, Nose and Throat Specialist; AHPC-ENT = Allied Health Primary Contact Ear, Nose and Throat; GP = primary care General Practitioner; SLP = Speech-Language Pathologist; Aud = Audiologist; PT = Physiotherapist.

**FIGURE 1** Care pathways for the "usual care" ENT clinic and the AHPC-ENT clinic

assessments utilising video Frenzel and video head-impulse test, audiometry, clinical voice and swallowing assessments). Extended scope assessments including flexible laryngoscopy, videostroboscopy, Flexible Endoscopic Evaluation of Swallowing (FEES) were included for the SLP. A standardised assessment protocol for laryngeal imaging was consistently used in order to document anatomical markers and movement parameters to aid visual-perceptual ratings. AHP assessment outcomes from vestibular and audiology clinics were discussed with a consultant ENT or senior specialist registrar in training when clinically indicated. For the SLP pathway, the ENT reviewed clinical details of all patients in a case-by-case discussion including case history and audio-visual review of the laryngeal imaging, for interpretation of structure and function and verification of the diagnostic impressions.

## 2.7 | Outcome measures and statistical methods

The primary outcome measure was mean number of days waiting from date of referral to initial assessment. Multiple regression analysis was used to evaluate the relationship between pathway type and wait-times for assessment. All analyses were carried out using STATA, version 16. Secondary outcome measures included the following: number of patients referred to ENT after AHP assessment, number of patients discharged from the AHPC-ENT, number of adverse events and staffing cost comparisons for AHPC-ENT and ENT pathways.

Cost comparisons were calculated by estimating the time each clinician typically sees a patient in both the AHPC-ENT and the ENT

pathway, based on the hourly cost of each professional. Assumptions are made that the ENT consultant sees every new patient in addition to the specialist registrar in training for an average of 15 minutes in the ENT pathway and that all patients seen in the ENT pathway would be referred to AHP for management. Costs for the ENT pathway include both ENT and AHP assessments to reflect the activity provided within the AHPC-ENT for the likely population.

## 3 | RESULTS

### 3.1 | Patient demographics

Group 1 ( $n = 399$ ) were seen in the ENT pathway, group 2 ( $n = 382$ ) commenced on the ENT wait-list and then transferred to the AHPC-ENT wait-list at the time of its inception (Table 2), and group 3 ( $n = 356$ ) entered the AHPC-ENT wait-list on referral and were seen in the AHPC-ENT (Table 2). There were no significant differences between the control group (group 1) and the experimental groups (groups 2 and 3) for age ( $P < .0001$ ) or gender ( $P < .001$ ). Group 1 ( $n = 566$ , 85%) had more category 2 patients, compared with groups 2 and 3 ( $n = 326$ , 45%).

### 3.2 | Waiting times for assessment

Linear regression demonstrated patients in group 1 waited significantly longer than those in group 2 and group 3, respectively

**TABLE 1** Triage criteria for the AHPC-ENT pathways

Service inclusion criteria	Service exclusion criteria
<i>Dysphonia pathway—adult</i>	
<ul style="list-style-type: none"> <li>• Symptoms of oropharyngeal dysphagia (ie food sticking, coughing/ choking on food/ liquids)</li> <li>• Symptoms of globus in the absence of any category 1 symptoms (ie current smoker, neck lump, otalgia)</li> <li>• Symptoms of regurgitation or reflux</li> </ul>	<ul style="list-style-type: none"> <li>• Any suspected category 1 condition (ie current smoker, neck lump, otalgia)</li> <li>• Any significant medical co-morbidities (ie endocrine/thyroid/Neoplasm)</li> <li>• Any condition already deemed to require surgical intervention that would not benefit from immediate speech pathology intervention (ie Barrett's oesophagus/pharyngeal pouch)</li> <li>• Odynophagia/ pain when swallowing</li> </ul>
<i>Dysphagia pathway—adult</i>	
<ul style="list-style-type: none"> <li>• Symptoms of dysphonia or hoarseness persisting for more than 4 wk</li> <li>• Existing diagnosis of functional dysphonia/muscle tension dysphonia</li> <li>• Symptoms of chronic refractory cough</li> <li>• Suspected symptoms vocal cord dysfunction</li> </ul>	<ul style="list-style-type: none"> <li>• Any suspected category 1 condition (ie current smoker, neck lump, otalgia)</li> <li>• Any significant medical co-morbidities (ie endocrine/thyroid)</li> <li>• Any condition already deemed to require surgical intervention that would not benefit from speech pathology intervention</li> </ul>
<i>Vestibular pathway—adult</i>	
<ul style="list-style-type: none"> <li>• Dizziness</li> <li>• Vertigo</li> <li>• Balance disorders</li> <li>• Possible Benign paroxysmal positional vertigo (BPPV)</li> <li>• Possible Meniere's disease</li> </ul>	<ul style="list-style-type: none"> <li>• Patients who have already completed a diagnostic workup elsewhere (ie vestibular diagnostic assessment by an audiologist or physiotherapist)</li> </ul>
<i>Retro-cochlear pathway—adult</i>	
<ul style="list-style-type: none"> <li>• Asymmetrical sensorineural hearing loss (SNHL)</li> <li>• Unilateral/asymmetrical tinnitus</li> <li>• Asymmetrical subjective hearing loss</li> <li>• Dizziness previously investigated with no known cause</li> </ul>	<ul style="list-style-type: none"> <li>• Recurrent outer/middle ear infections</li> <li>• Active perforations/mastoid cavities</li> <li>• Polyps/possible foreign bodies</li> <li>• Persistent ear pain/facial pain</li> <li>• Pulsatile tinnitus</li> <li>• Recent sudden hearing loss</li> <li>• Any other unusual presenting feature at the discretion of the audiologist</li> </ul>
<i>Glue ear pathway—paediatric</i>	
<ul style="list-style-type: none"> <li>• Routine middle ear disease: glue ear, recurrent acute otitis media, otitis media with effusion</li> <li>• Hearing loss/difficulties listening</li> <li>• Speech and language delays</li> <li>• Academic difficulties</li> <li>• Syndromes and other significant medical conditions (these patients will also continue to ENT appointment prior to discharge or for management)</li> </ul>	<ul style="list-style-type: none"> <li>• Otitis externa</li> <li>• Otorrhoea</li> <li>• Current tympanic membrane perforations</li> <li>• Chronic supportive otitis media (CSOM)</li> <li>• Pre-existing sensorineural hearing loss (SNHL)</li> <li>• Wax impaction</li> <li>• Cholesteatoma</li> <li>• Retraction pockets</li> <li>• Other ENT symptoms</li> <li>• Sudden hearing loss</li> </ul>

**TABLE 2** Demographic information of all patients included in the study

	All patients			Breakdown by pathway (groups 2 and 3)				
	ENT cohort <sup>a</sup> (group 1)	AHPC-ENT <sup>b</sup> (group 2)	AHPC-ENT (group 3)	Dysphagia	Dysphonia	Vestibular	Retro-cochlear	Glue ear
Number	399	382	356	66	153	151	60	308
Mean age (y, range)	39 (0-90)	37 (0-88)	36 (0-88)	58 (18-88)	59 (20-88)	60 (20-88)	58 (21-84)	6 (0-18)
Female	187	206	188	44	107	92	30	121
Triage category, Cat 2	342	179	203	21	87	10	17	192
Triage category, Cat 3	57	148	208	45	66	141	43	116

Abbreviations: AHP-ENT, allied health primary contact ear, nose and throat clinic; ENT = ear, nose and throat.

<sup>a</sup>Patients seen by ENT 24 mo prior to implementation of the AHPC-ENT, with symptoms recorded at the time of referral matching the AHPC-ENT triage criteria. Data obtained from the hospital health analytics outcomes database.

<sup>b</sup>Patients appropriate for the AHPC-ENT who were on the ENT wait-list at the time of AHPC-ENT implementation and seen in the AHPC-ENT.

**TABLE 3** Waiting times to initial assessment for the "usual care" ENT pathway and the allied health primary contact ENT (AHPC-ENT) pathway

Pathway/referral symptoms	Group 1 <sup>a</sup> ENT only cohort			Group 2 <sup>b</sup> AHPC-ENT (taken from ENT pathway)			Group 3 AHPC-ENT (referred after implementation)			Linear regression			
	N	Mean days waiting	SD	N	Mean days waiting	SD	N	Mean days waiting	SD	P-value	% variance from the mean (R-squared)	Mean difference in wait days (coefficient)	95% conf. interval
Dysphagia	44	410.95	203.07	35	119.69	150.41	31	62.09	44.64	.0000	0.5230	-355.544	-420.309, -290.779
Dysphonia	75	151.73	142.63	71	141.9	189.74	82	50.02	31.91	.0000	0.1938	-142.479	-180.575, -104.383
Vestibular	52	582.61	239.66	77	270.16	271.03	74	51.85	35.92	.0000	0.6454	-535.241	-590.425, -480.058
Retro-cochlear	72	467.68	231.99	41	193.22	85.7	19	98.89	75.38	.0000	0.3895	-383.660	-467.000, -300.321
Glue ear	156	240.28	155.74	158	141.34	100.22	150	83.69	61.19	.0000	0.3047	-163.108	-185.637, -140.579
All pathways	399	328.1	237.24	382	170.99	176.7	356	68.25	53.04	.0000	0.3515	-277.221	-299.1522, -255.2901

Abbreviation: SD, standard deviation.

<sup>a</sup>Patients seen by ENT 24 mo prior to implementation of the AHPC-ENT, with symptoms recorded at the time of referral matching the AHPC-ENT triage criteria. Data obtained from the hospital health analytics outcomes database.

<sup>b</sup>Patients appropriate for the AHPC-ENT were waiting on the ENT wait-list prior to implementation and therefore waited on both the ENT wait-list and AHPC-ENT wait-list.

(328 days vs 170 and 68 days), as outlined in Table 3. Wait-times reduced by an average of 277 days for patients seen in the AHPC-ENT (CI = -299.1522, -255.2901), compared with the ENT pathway,  $F(1, 1135) = 615.12$ ,  $P < .0001$ ,  $R^2 = .351$ . Priority (ie category 2 or category 3) did not significantly affect wait-times for assessment across all 3 groups,  $F(2, 1137) = 377.76$ ,  $P = <.0001$ ,  $R^2 = .399$ .

### 3.3 | Outcomes of AHPC patients

Discharge outcomes were recorded for patients seen only in the AHPC-ENT (group 2 and group 3) and are shown in Figure 2. Fifty-eight per cent ( $n = 426/738$ ) were discharged without the need for further ENT intervention. This included 31 patients (4.2%) who failed to attend 2 consecutive AHPC-ENT initial appointments and subsequently removed from the ENT wait-list. In the AHPC-ENT vestibular, dysphonia and dysphagia pathways, which offer treatment, patients received a mean of 2.25 (range: 1-14) occasions of service. Seventy-one of the 153 patients (46.4%) seen in the dysphonia pathway were referred to the SLP voice treatment service.

### 3.4 | Adverse events

There were no recorded adverse events, defined as unexpected clinical events involving the patient as a result of the AHP assessment.

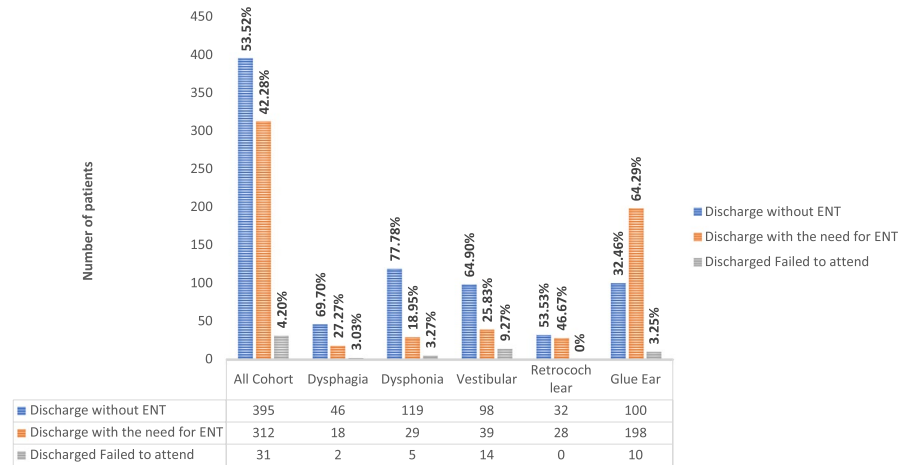
### 3.5 | Estimated costs of the AHPC-ENT service

Estimated staff costs to deliver the AHPC-ENT dysphonia and dysphagia clinics were AU\$96 per patient vs AU\$132 in the ENT pathway (27% saving); and AHPC-ENT audiology clinics = AU\$78 vs AU\$132 in the ENT pathway (40% saving). The AHPC-ENT vestibular clinic demonstrated a 21% cost reduction with physiotherapy and audiology staff costs of AU\$195 per patient vs AU\$249 (ENT pathway). Calculations are shown in the Appendix 1.

### 3.6 | Patients returned to ENT

Post hoc analysis was completed on the 312 (42%) patients who required further assessment or intervention with ENT after attending the AHPC-ENT (Table 4). Thirty-one (4%) were recategorised to a higher priority for urgent ENT intervention, including dysphagia ( $n = 7$ ), dysphonia ( $n = 11$ ) and paediatric glue ear ( $n = 13$ ). Twenty-five of these 31 patients were recategorised as urgent (cat-1), and the mean wait-times for all recategorised patients to see ENT was 15 days.

**FIGURE 2** Discharge outcomes from the allied health primary contact ENT (AHPC-ENT) clinics categorised into individual symptom pathways



## 4 | DISCUSSION

### 4.1 | Synopsis of key findings

To our knowledge, this is the largest study to evaluate the service impact of multiple AHP primary contact assessment clinics in a publicly funded Australian hospital ENT outpatient service. Five AHP pathways (AHPC-ENT) for dysphagia, dysphonia, vestibular, retro-cochlear and paediatric glue ear were included. The key driver for the AHPC-ENT was to reduce wait-times for assessment and streamline access to appropriate treatment pathways, allowing ENT surgeons to prioritise time and skills on complex patients and surgery. Our study demonstrated AHPs with advanced skills in ENT disorders enabled a faster “one-stop” assessment for patients waiting to see ENT. All patients in the AHPC-ENT were seen within clinically recommended time frames, improving hospital service performance.

### 4.2 | Comparison with other studies

Our findings on reduced wait-times and discharge without the need for surgical intervention are comparable with similar AHP-led services in fields including ENT, musculoskeletal, pelvic health and gastroenterology.<sup>10,12-16</sup>

The AHPC-ENT aimed to capture only patients suitable for AHP intervention without returning to ENT, supporting the “one-stop” approach. Most patients seen in the AHPC-ENT were managed by AHPs without a need for ENT intervention, although results differed across the 5 AHPC-ENT pathways. In the dysphonia and dysphagia pathways, relatively few patients returned to ENT as also reported in similar models.<sup>13,14</sup> A small number of these patients required ENT priority assessment following the AHPC-ENT and were seen by ENT in less than 4 weeks. Earlier identification of patients for ENT medical or surgical intervention was another benefit of this model for patients initially categorised as a low acuity, who would otherwise have remained on the wait-list with untreated symptoms. This raises

a question, can AHP assessment reliably triage patients for priority surgical assessment, whilst also providing better access to non-surgical treatments?

In the vestibular pathway, only 25.83% required ENT intervention, and to our knowledge, our study is the first to report on outcomes from physiotherapy-led primary contact vestibular assessment. In physiotherapy-led orthopaedic and pelvic health clinics, approximately 81% of patients seen by extended scope physiotherapists did not require surgical assessment.<sup>11,12</sup>

In our retro-cochlear pathway, 47% of patients returned to ENT for surgical assessment. One role of the retro-cochlear pathway is to identify the cause of unilateral hearing loss using audiometry assessments before the surgeon can decide on management. In the pre-existing ENT pathway, all patients were seen by ENT before referral for audiometry. If conductive or mixed hearing loss was identified, they returned to ENT for surgical intervention. In the AHPC-ENT, over 50% did not require ENT after audiology assessment, and for those who required surgery, only one ENT appointment was needed. Similar findings were reported in a primary care audiology service, where approximately 50% of patients with asymmetrical hearing loss required referral to ENT for surgical management after assessment by audiologist.<sup>17</sup>

The paediatric glue ear pathway had the largest number of patients (64%) returned to ENT for management. Most patients in this pathway have a conductive hearing loss, and the best practice is to monitor for 3 months before surgical intervention is considered.<sup>9</sup> In this study, children had waited longer than 3 months on the ENT wait-list prior to the AHPC-ENT. It is therefore likely patients in this pathway had chronic symptoms, at an age critical to language development, requiring immediate surgical intervention, accounting for the high return to surgery rate. A recent retrospective observational study predicted 59% of patients could have been managed by an audiology-led first contact assessment.<sup>18</sup> To our knowledge, our study is the first to report on the actual impact of a paediatric audiology-led primary contact service, and our findings provide a useful benchmark for other audiology-led services.

**TABLE 4** Details of the patients referred back to ENT for priority assessment and intervention following assessment in the allied health primary contact ENT (AHPC-ENT) clinics

Pathway	Age	Gender	Initial priority category	Wait-time before AHPC-ENT assessment	Reason for priority referral to ENT	Time from AHPC-ENT to ENT review	ENT intervention and outcome
Dysphagia	48	Female	2	67 d	Enlarged thyroid nodule	13 d	Conservative management with GP
Dysphagia	59	Female	2	60 d	Irregularity of the right true vocal fold	60 d	Conservative management with ENT monitoring and speech pathology
Dysphagia	88	Female	2	39 d	Candida laryngitis	0 d	Pharmacological monitoring with ENT
Dysphagia	54	Female	2	49 d	Left vocal fold leucoplakia	10 d	Microlaryngoscopy, no dysplasia or invasive carcinoma
Dysphagia	50	Female	2	150 d	Unilateral otalgia and smoking history	0 d	Reassurance and conservative management
Dysphagia	47	Male	3	13 d	Left vocal fold mid-membranous lesion	0 d	Microlaryngoscopy, vocal fold polyp excised followed by speech pathology
Dysphagia	54	Male	3	34 d	lesion in the left pyriform sinus	0 d	Pan endoscopy was normal
Dysphonia	76	Male	3	1229 d	Unilateral vocal fold granuloma	7 d	Pharmaceutical and speech pathology management, then surgical excision
Dysphonia	56	Male	2	188 d	Unilateral vocal fold leucoplakia, smoker	18 d	Microlaryngoscopy, confirmed dysplasia
Dysphonia	35	Female	2	39 d	Thyroid	4 d	Conservative management with GP
Dysphonia	28	Female	2	17 d	Required rescope with ENT	10 d	Pt cancelled appointment reporting symptoms resolved
Dysphonia	34	Female	2	31 d	Right vocal fold lesion, smoker	0 d	Microlaryngoscopy, no dysplasia or invasive carcinoma
Dysphonia	60	Female	2	20 d	Vocal fold irregularity and unilateral otalgia	20 d	Reinke's oedema, conservative management
Dysphonia	45	Female	2	55 d	Unilateral subglottic lesion	0 d	Microlaryngoscopy was normal
Dysphonia	57	Female	2	43 d	Bilateral vocal fold oedema, smoker	82 d	Patient failed to attend 2 appointments with ENT
Dysphonia	65	Female	2	30 d	Circumscribed pigmented lesion in nasopharynx	0 d	Conservative management and review, lesion was not present at review
Dysphonia	69	Male	3	36 d	Hyperkeratosis on the right true vocal fold	0 d	Microlaryngoscopy, confirmed dysplasia
Dysphonia	52	Male	3	29 d	Unilateral ventricular fold prominence	0 d	Microlaryngoscopy was normal
Glue ear	6	Male	2	434 d	Worsening hearing loss on review	4 d	Insertion of grommets
Glue ear	5	Female	2	331 d	Moderate conductive hearing loss	10 d	Insertion of grommets
Glue ear	5	Male	2	232 d	Tonsillitis	0 d	Insertion of grommets
Glue ear	4	Male	3	268 d	Wax removal	0 d	Insertion of grommets
Glue ear	4	Female	2	232 d	To discuss sedation/GA ABR	16 d	Auditory brain stem response under general anaesthesia
Glue ear	3	Male	2	176 d	To discuss audiology results	0 d	Conservative management
Glue ear	6	Male	2	167 d	Hearing loss	61 d	Conservative management

(Continues)

TABLE 4 (Continued)

Pathway	Age	Gender	Initial priority category	Wait-time before AHPC-ENT assessment	Reason for priority referral to ENT	Time from AHPC-ENT to ENT review	ENT intervention and outcome
Glue ear	14	Male	2	154 d	Ear pain, swelling behind the ear	28 d	Conservative management
Glue ear	4	Female	2	146 d	Moderate conductive hearing loss	0 d	Insertion of grommets
Glue ear	6	Male	2	163 d	Moderate conductive hearing loss, speech delay, listed for grommets	0 d	Adenoidectomy
Glue ear	7	Male	2	128 d	Conductive hearing loss	18 d	Tonsillectomy and Adenoidectomy
Glue ear	5	Female	2	131 d	Mod conductive hearing loss, speech delay	19 d	Insertion of grommets
Glue ear	10	Male	2	154 d	Persistent mild hearing loss	18 d	Insertion of grommets
Glue ear	5	Male	2	151 d	Tonsillitis, apnoea and snoring	73 d	Tonsillectomy
Glue ear	16	Female	2	110 d	Tympanic membrane perforation	0 d	Myringoplasty

Abbreviations: AHPC-ENT, allied health primary contact ear, nose and throat clinic; ENT, ear, nose and throat.

### 4.3 | Clinical applicability of the findings

Implementation of AHPC-ENT relies on AHPs working at advanced scope of practice, without overutilisation of ENT surgeons during the assessment. In our study, the AHP assessments were all within scope, with the exception of laryngoscopy. Endoscopic examination of voice and swallow is extended scope in Australia requiring additional credentialing, and SLPs cannot provide a medical diagnosis, that is anatomical or pathological presentations in larynx.<sup>19</sup> Visualisation of the pharynx and larynx to identify organic pathophysiology is critical, but clinical assessments used by SLPs also add diagnostic value where there is no organic pathophysiology.<sup>20</sup> Our SLP-led clinics (dysphagia, dysphonia) ran parallel to ENT clinics to enable case discussion with the surgeon whilst upholding the “one-stop” model; the surgeon was overall responsible for diagnostic decision-making. This increased burden to ENT clinical staff, when fewer than 10% of patients were found to have organic pathophysiology. Additionally, Medicare procedure rebates in Australia can only be claimed if laryngoscopy is performed by a medical doctor; thus, potential revenue to the health service may be lost despite the cost benefits of a more responsive service. Perhaps a more cost-effective model is where the SLP provides multidimensional clinical assessment before the ENT to triage the patients who need priority ENT assessment.

The point of triage for new referrals is critical when determining urgency for assessment. We found a 2-step triage process was effective in identifying the most suitable patients for the AHPC-ENT, demonstrated by the low number of patients returned to ENT for priority assessment. However, accurate referral triage was confounded by the lack of detail provided in the primary care referral. Most patients who returned to ENT in our study were for symptoms not documented in the referral, that is rhinosinusitis. The use of a pre-screening questionnaire for patients at the point of triage could be incorporated into the process to help determine the most direct assessment route for the patient.

### 4.4 | Study limitations and future research

Whilst this prospective clinical study has demonstrated positive outcomes, some limitations exist. Referral rates to AHP treatment for patients seen in the ENT pathway pre-intervention group were unable to be retrieved and would have provided comprehensive analysis of the service outcomes. Secondly, a validated health-related Quality of Life (HRQOL) tool to measure the impact on patient well-being was not used and should be considered in future studies to measure health economic benefit for the AHPC-ENT and more detailed cost analysis. Our cost comparison provides a simple overview of the likely cost benefit of the AHPC-ENT from a health service perspective; however, more detailed cost-effectiveness analysis from both the health service and societal perspectives would provide a clearer picture of the true cost benefit for the hospital, and the wider socio-economic burden of delayed access to health care.<sup>21</sup>

This study did not examine the reliability of the AHPC-ENT assessment compared with the ENT-led pathway for the purposes of diagnosis.



Future research could explore the level of agreement between AHPs and ENTs in forming a diagnosis to demonstrate validity of the AHPC-ENT.

For all pathways, further research is required to develop a robust triage process to better differentiate patients who will benefit from AHP intervention prior to initial assessment, vs those who require ENT.

## 5 | CONCLUSION

Our study investigating the service outcomes of five AHP primary contact pathways demonstrated that a locally credentialed AHPC-ENT resulted in shorter wait-times for initial assessment and improved access to AHP treatment; effectively highlighted patients for reprioritisation for surgical assessment and intervention; and had no increase in staffing costs to deliver the pathway safely. This study provides further evidence for wider implementation of AHP primary contact models for patients requiring ENT services. Further research is needed to measure validity of the AHP primary contact assessment to demonstrate the model is reliable, safe and cost-effective.

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### CONFLICT OF INTEREST

None to declare.

### DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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**APPENDIX 1**

Calculations of the staff costs required to see a patient for assessment in the "usual care" ENT clinic compared with the AHPC-ENT clinic.

*SLP-led dysphagia and dysphonia pathways*

"Usual care" ENT = ENT (15 min) + SP (60 min) = \$54 + \$78 = \$132

AHPC-ENT = SP (60 min) + ENT (5 min) = \$78 + \$18 = \$96 (18% cost saving)

*PT/Aud-led vestibular pathway*

"Usual care" ENT = ENT (15 min) + PT (90 min) + Aud (60 min) = \$54 + \$117 + \$78 = \$249

AHPC-ENT = PT (90 min) + Aud (60 min) = \$117 + \$78 = \$195 (12% cost saving)

*Aud-led retro-cochlear and paediatric glue ear pathways*

"Usual care" ENT = ENT (15 min) + Aud (60 min) = \$54 + \$78 = \$132

AHPC-ENT = Aud (60 min) = \$78 = \$78 (18% cost saving)

SLP = speech-language pathology; Aud = audiologist; PT = physiotherapist.

Costs obtained from the Hospital and health Service Finance Department.

Costs calculated in Australian dollars (AUS\$).

Costs of an ENT consultant per hour = \$217; cost of a HP5 AHP per hour = \$78.