## REVIEW ARTICLE

# A rapid review of evidence to inform an ear, nose and throat service delivery model in remote Australia

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## ABSTRACT:

**Introduction**: This rapid literature review aimed to inform the development of a new sustainable, evidence-based service delivery model for ear, nose and throat (ENT) services across Cape York, Australia. This work seeks to investigate the research question: 'What are the characteristics of successful outreach services which can be applied to remote living Indigenous children?'

**Methods**: A comprehensive search of three major electronic databases (PubMed, CINAHL and MEDLINE) and two websites (Health*Info* Net and Google Scholar) was conducted for peer-reviewed and grey literature, to elicit characteristics of ENT and hearing services in rural and remote Australia, Canada, New Zealand and the USA. The search strategy was divided into four sections: outreach services for rural and remote communities; services for Indigenous children and families; telehealth service provision; and remote ear and hearing health service models. A narrative synthesis was used to summarise the key features of the identified service characteristics.

**Results**: In total, 71 studies met the inclusion criteria and were included in the review, which identified a number of success and sustainability traits, including employment of a dedicated ear and hearing educator; outreach nursing and audiology services; and telehealth access to ENT services. Ideally, outreach organisations should partner with local services that employ local Indigenous health workers to provide ongoing ear health services in

community between outreach visits.

**Conclusion**:  The evidence suggests that sound and sustainable ENT outreach models build on existing services; are tailored to

local needs; promote cross-agency collaboration; use telehealth; and promote ongoing education of the local workforce.

Keywords:

Australia, ear and hearing health, health system improvement, Indigenous Australian, remote area services,telehealth/telemedicine.

## FULL ARTICLE:

### Introduction

Many remote-living Aboriginal and Torres Strait Islander communities reside in extreme disadvantage with household incomes lower than the Australian median and poor environmental conditions, including overcrowded houses and poor hygiene[1], which are established risk factors for ear disease in children. Such conditions promote high rates of bacterial carriage with increased likelihood of cross-infection, usually between siblings[2]. Aboriginal and Torres Strait Islander children (hereafter Indigenous) have one of the highest rates of otitis media (OM) in the world[3].

Remote Cape York, in north-eastern Australia, has a high Indigenous population[1] and similarly reports high rates of OM[4]. From this region, school hearing screening reported during 2012–13 indicated that 7 percent of children had identified ear perforations (one or both ears) and 12 percent had hearing loss over 35 decibels in one or both ears[4]. Despite these high rates of OM and associated hearing loss, there remains poor access to ear, nose and throat (ENT) services across the region. The state health organisation provides services in two out of 10 regional communities, offering biannual ENT specialist team outreach visits to Indigenous children aged under 18 years. However, for all remaining remote communities in the region, patients have to attend a hospital outpatient appointment at the nearest referral hospital (up to 800 km away) to access specialist ENT care, which requires extensive travel for each patient.

In December 2016, the Queensland Government put forward a recommendation to the Australian Government for a coordinated national approach to the challenge of OM and associated hearing loss among Indigenous children. Outcomes sought by such an approach would include early identification and management, within primary health, leading to reduction in chronic forms of the disease, and therefore lower costs associated with tertiary service provision[5]; consistency in referral pathways and clarity around the roles and responsibilities of health practitioners; improved collaboration and coordination, and therefore better information sharing and reduced duplication between health services; and better data collection to aid efficiencies to service planning[3]. However, to date, few policy actions have occurred in response to these recommendations.

This rapid literature review was conducted to investigate characteristics of successful outreach service models to inform the development of a revised service model for ENT services for this remote region, taking into account the above principles[3,5]. It is anticipated that the new service model will deliver increased primary health care while reducing hospital outpatient waitlists.

### Research question

To inform the development of culturally appropriate and sustainable ear health and hearing outreach service, we sought an answer to the research question: 'What are the characteristics of successful outreach services which can be applied to remote living Indigenous children?'

### Methods

'Rapid reviews streamline traditional systematic review methods in order to synthesize evidence within a shortened timeframe'[6]. They are often performed to inform decision-making or commissioned by health policy-makers[7]. This rapid review was written for the Queensland Government and prepared in accordance with the National Health and Medical Research Council guidelines[8]. A search strategy was developed in consultation with an accredited librarian.

### Search

A comprehensive search of three major electronic databases (PubMed, CINAHL and MEDLINE) and two websites (Australian Indigenous Health*Info* Net and Google Scholar) was conducted for peer-reviewed and grey literature, utilising Queensland Health Clinician Knowledge Network's EBSCO host as the interface. Searches were conducted between 9 December 2016 and 15 December 2016. Additional searches of Google Scholar were conducted in late January 2017. Database searching was supplemented by reviewing references from identified key articles for further relevant studies. Additional references were identified from the Health*Info* Net[9] and Google Scholar for ENT service delivery models.

The search was restricted to human studies published since 1997 in the English language. Each database was searched separately using the following keywords or combinations thereof:
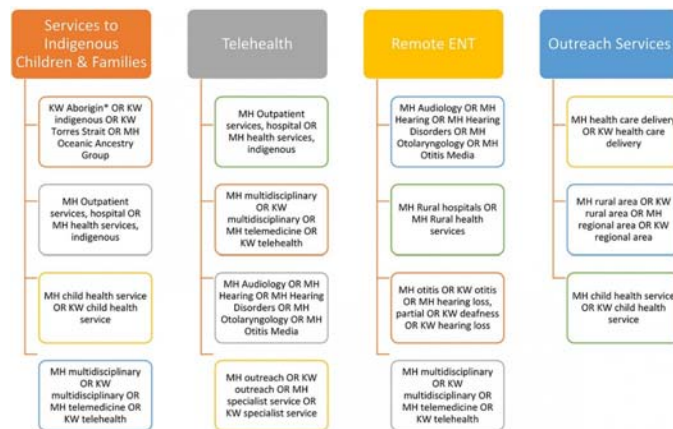
- MH = MeSH headings/subject headings. KW = general keyword term. Databases searched: CINAHL, Medline, PubMed.
- KW Aborigin* OR KW indigenous OR KW Torres Strait OR MH Oceanic Ancestry Group
- MH Audiology OR MH Hearing OR MH Hearing Disorders OR MH Otolaryngology OR MH Otitis Media
- MH Outpatient services, hospital OR MH health services, indigenous
- MH Rural hospitals OR MH Rural health services
- MH otitis OR KW otitis OR MH hearing loss, partial OR KW deafness OR KW hearing loss
- MH multidisciplinary OR KW multidisciplinary OR MH telemedicine OR KW telehealth
- MH health care delivery OR KW health care delivery
- MH rural area OR KW rural area OR MH regional area OR KW regional area
- MH child health service OR KW child health service

- MH outreach OR KW outreach OR MH specialist service OR KW specialist service

### Data collection and analysis

The search strategy was divided into four sections (A–D). It was anticipated that early sections (A–C) would inform remote ear (ENT) and hearing health service models (D). Figure 1 outlines the search strategy, prior to filtering off irrelevant abstracts and adding papers from the wider searches.

- Outreach services for rural and remote communities: searches 8 + 10 (AND 7) were combined
- Services for Indigenous children and families: searches 1 AND 3 AND 9 + 1 AND 3 AND 6 were combined
- The use of telehealth/telemedicine technology in service provision 3 AND 6 + 2 AND 6 + 6 AND 10 were combined
- Remote ear (ENT) and hearing health service models 2 AND 6 + 2 AND 4 (AND 5) were combined.



Figure 1: Outline of searches contributing to the final qualitative synthesis.

### Study selection

After the removal of duplicates, the titles and abstracts of retained studies were screened for relevance. The entire search list was divided and reviewed by the first author (SJ). Any discrepancies were resolved by consultation with a research-led clinician. All citations were exported to EndNote X7 referencing software.

**Inclusion criteria**:  The objective of the review was to examine service delivery models (routine and specialist care – outreach) for rural and remote areas, which may then be applied to a new ENT model of care in the Cape York region. Publications from countries known to deliver healthcare services to similar populations, such as Canada, New Zealand and the USA, were included. Research trials, reviews or evaluation studies, which described a current or revised service delivery method for ENT or other medical specialty areas (medical and surgical outreach), were retained.

**Exclusion criteria**:  Service delivery models for palliative care and cancer, mental health or childhood development (special healthcare needs) and acute care management (including asthma, cystic fibrosis and epilepsy) were excluded. Papers describing clinical outcomes to research interventions, including antibiotic trials, that did not include components of outreach or service delivery were excluded.

**Telehealth**:  Due to the vast volume of literature on telehealth, with several journals dedicated to only publishing on telehealth, this review only included telehealth studies limited to rural or remote service locations. 'Models of care that used telemedicine have the potential to address specialists' geographic misdistribution and address disparities in the quality of care delivered to people in underserved communities'[10].

### Synthesis of results

Summary tables were presented within each section as an easy-to-access format in order to avoid unnecessary repetition. The total counts of references within each section included the text and the table contents. Tables contained details of studies with particular

interest. Extracted information included first author, year published, article title, description of model of care/article type, components required for success/sustainability, and components that negatively impact on success/sustainability. This review did not assess research outcomes, no quality appraisal of research methods. Material were included if deemed relevant by the research team following predefined criteria set by Queensland Health. A qualitative synthesis presents the findings of the review.

### Ethics approval

As this study did not involve the collection of any patient data, an ethics exemption was granted by the Far North Queensland Human Research Ethics Committee, as a Quality Improvement Activity, reference number HREC/17/QCH/3-1111 QA.

### Results

After removing duplicates, 566 full texts were reviewed for suitability. Some references overlapped into more than one category, leading to a final list totalling 71 references, including 21 references under outreach services for rural and remote communities category; eight references under services for Indigenous children and families; 18 references under the use of telehealth technology in service provision; and 29 references under remote ear and hearing health service models (Fig2).
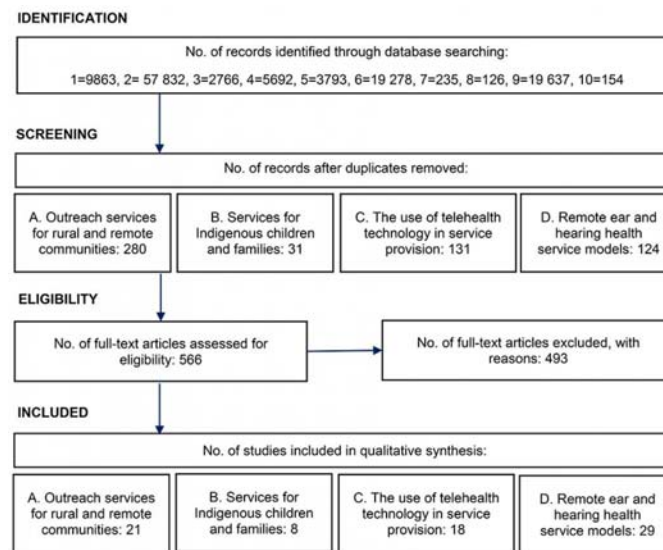


**IDENTIFICATION**

No. of records identified through database searching:

1=9863, 2= 57 832, 3=2766, 4=5692, 5=3793, 6=19 278, 7=235, 8=126, 9=19 637, 10=154

**SCREENING**

No. of records after duplicates removed:

| A. Outreach services for rural and remote communities: 280 | B. Services for Indigenous children and families: 31 | C. The use of telehealth technology in service provision: 131 | D. Remote ear and hearing health service models: 124 |

**ELIGIBILITY**

No. of full-text articles assessed for eligibility: 566 → No. of full-text articles excluded, with reasons: 493

**INCLUDED**

No. of studies included in qualitative synthesis:

| A. Outreach services for rural and remote communities: 21 | B. Services for Indigenous children and families: 8 | C. The use of telehealth technology in service provision: 18 | D. Remote ear and hearing health service models: 29 |

**Figure 2:  Database search results.**

### Outreach service models for rural and remote communities

Outreach services are mobile clinics, or satellite services offered by a hospital. They usually provide specialist services at an alternative location aimed to improve access to specialist services. Outreach usually costs less to deliver than hospital outpatient clinics because fewer people are required to travel (O'Sullivan et al 2014)[11]. However, not all outreach models are successful: some have poor patient attendance and are therefore not cost effective. The search identified 21 publications[11-31] on successful and sustainable outreach services from rural and remote communities (Table 1).

Common traits that could lead to successful and sustainable outreach service delivery include appropriate policies, governance, leadership and funding to support the service; undertaking community consultation and participation when planning a new model; flexible and innovative service provision to meet local needs; integrated services that collaborate with existing service providers; services that are regular and predictable in nature; services that are multidisciplinary and transdisciplinary in approach; and utilising telehealth and emerging technologies to support service provision.

**Table 1: Rural and remote outreach articles describing models of care[12,14-16,18,22,26-28,30]**

| First author, year published | Article title | Model of care/article type | Components required for success/sustainability | Components that negatively impact on success/sustainability |
|---|---|---|---|---|
| Allan 2007 [11] | Developing sustainable models of rural health care: a community development approach | Qualitative descriptive research study | First conduct a needs analysis for service planning; each community is different; flexibility in service provision | Part-time, fragmented services trying to do everything for everyone is not sustainable |
| Gruen 2006 [17] | Specialist outreach to isolated and disadvantaged communities: a population-based study | Surgical specialists outreach to Indigenous communities in Northern Territory | Needs to have an adequate and motivated workforce (specialists); linked with a functioning primary-health care service; be predictable in visits and responsive to local needs; integrate with local services; virtual outreach (telehealth) beneficial if appropriate infrastructure is available; consultative role and relationship-building is important | Outreach had no significant effect on initiation of elective referrals |
| Humphreys 2006 [21] | What do we mean by sustainable rural health services? Implications for rural health research | Conceptual framework description | Increased use of telehealth; periodic visiting services; service integration important; based on community needs; sustainability requires robust systems-based solutions that continue to monitor and adjust to the changing needs of a community; collaboration between service providers | Recruiting and retaining an adequate workforce; management structures are lacking; communities are geographically isolated; a sustainable model is not one that is dependent on one key element (such as a particular person or propped up by goodwill gestures) |
| Wakerman 2009 [28] | Feature of effective primary health care models in rural and remote Australia: a case-study analysis | Literature review | These three are required to make sustainable service; supportive policy, community readiness, governance, management and leadership | Poor coordination |
| Birks 2010 [14] | Models of health service delivery in remote or isolated areas of Queensland: a multiple case study | Primary health care – delivering nursing care in remote Queensland | Community participation essential to improving health outcomes across the community; multidisciplinary approach (including resident and non-resident health professionals); apply new technologies; consult with community to establish community needs, current resourcing, staffing mix, delivery modes; update policies | Inadequate community consultation; policies must align with service delivery models |
| Battye 2003 [13] | Development of a model for sustainable delivery of outreach allied health services to remote north-west Queensland | Primary healthcare model allied health professionals in north-west Queensland | Community input into development of service, service delivery and ongoing evaluation phase; Service meets needs of community; Regular services; hub and spoke model; recruitment and retention of allied health professionals; integration with other health service providers; appropriate client follow up when service not in town; primary healthcare framework; focusing on health education, health promotion, early intervention, primary prevention, treatment, secondary prevention and chronic disease management | Lack of notice when the visiting service was coming so poor attendance rates; poor coordination with other visiting services resulting in 'bombardment' of communities; visits being too short in duration and infrequent; inconsistent outreach personnel resulting in decreased ability to build rapport and trust with the client; inadequate cultural awareness; poor promotion of service to community and surrounding areas (stations/properties); communication inappropriate to the level of the community/culture |
| Wakerman 2009 [26] | Innovative rural and remote primary health care models: what do we know and what are the research priorities? | Primary healthcare medical model – rural and remote communities in Australia | Adequate funding; community participation; health information systems; adequate information technology; need to meet local needs; need to have capacity to change and adapt | Lack of evaluation and effective monitoring of the service; working in professional silos |
| Wakerman 2008 [27] | Primary health care delivery models in rural and remote Australia: a systematic review | Primary healthcare medical model – rural and remote Australia | Hub and spoke, fly-in/ fly-out, virtual clinics or telehealth models; environmental enablers – supportive policy, community readiness, appropriate workforce; essential service requirements – funding, governance, management and leadership, integrated services, appropriate infrastructure | Away from Australian coastal population centres sustainability is economically challenging |
| Carson 2009 [15] | Providing specialist services in Australia across barriers of distance and culture | Outreach specialist services for remote Northern Territory Aboriginal communities | Employment of Indigenous liaison officer within the hospital system; generalists when working with specialists can provide better services, than the alternative; models of cooperative care between specialists and generalists have the potential to maximise health effects | Need Indigenous qualified nurses and doctors; Indigenous languages barrier – need interpreter services; distance |
| Wilson 1999 [30] | Rural health professionals' satisfaction with a rehabilitation mobile outreach program | Mobile service delivery outreach model from Ontario, Canada, that explored referring rural health professionals (medical and allied health) satisfaction | Health professionals were largely satisfied with the outreach model; the greatest asset was interdisciplinary care; family education and collaboration with existing services were all elements of a successful model of care | Most negative were frequency of community visits; long wait times for an appointment |

### Services for Indigenous children and families

The benefits of providing outreach services for remote Indigenous children and families include less travel for patients and fewer disruptions to families, with an increased likelihood of higher attendance rates[19,20]. Outreach health services can address some of the barriers to access and inequitable service provision to Indigenous children and families[19]. Clinical specialist services offered in communities can increase extended family involvement in healthcare consultations[18]. The search identified eight publications[18-20,31-35] describing success and sustainability of health service provision for Indigenous populations. Table 2 provides a summary of five selected studies identifying the principles of success and sustainability.

Sustainable and culturally safe models of care for Indigenous populations relies heavily on building positive relationships. Successful services are developed on the premise of respect with community ownership and self-empowerment as the goal, which are best described as 'partnerships': between family groups and health services, between health professionals and community, between health services providers from different primary health agencies. Partnering with local Aboriginal health workers was considered essential for a successful outreach model.

**Table 2: Outreach health services delivering services to Indigenous children and families[32-35]**

| First author, year published | Article title | Principle for success and sustainability | Key points/recommendations |
|---|---|---|---|
| Mares 2012 [33] | Culture, context and therapeutic processes: delivering a parent–child intervention in a remote Aboriginal community | Communication | Utilise local community members and IHWs where possible during service provision to assist with language and cultural differences, resulting in improved family engagement |
| Champion 2008 [32] | Increasing community participation in an Aboriginal health service | Community, engagement | There are strong links between family groups and it is integral for health professionals to form relationships with extended family supports<br>When mainstream health models are not representative of the Indigenous group's interest or needs, there becomes a lack of community unity |
| Medlin 2014 [34] | Indigenous respiratory outreach care: the first 18 months of a specialist respiratory outreach service to rural and remote Indigenous communities in Queensland, Australia | | Well trained and supportive professionals, who work in partnerships with the community, are essential for a successful outreach model<br>Partnerships developed on the premise of mutual respect, open communication, equity, community ownership and self-empowerment were most successful |
| Ou 2011 [35] | Ethnic and Indigenous access to early childhood healthcare services in Australia: parents' perceived unmet needs and related barriers | | For successful community engagement the service should: respond to the community needs, have good communication with stakeholders and be well integrated and coordinated with local services for the community<br>They should adopt a multidisciplinary team approach, be regular and predictable and provided in a timely manner |
| Medlin 2014 [34] | Indigenous respiratory outreach care: the first 18 months of a specialist respiratory outreach service to rural and remote Indigenous communities in Queensland, Australia | Cultural awareness, and sensitivity | Local IHWs play a vital role assisting service delivery<br>Role includes sharing of community knowledge, liaison, advocacy and assisting with follow-up |

### *Use of telehealth/telemedicine technology in service provision*

Telehealth/telemedicine has become an increasingly viable solution addressing resource limitations, workforce shortages and geographical barriers that affect service delivery in rural areas[36]. It supports provision of speciality consultation for patients within their own community, while facilitating care that is more accessible, family centred and coordinated with local service providers[10]. Throughout rural and remote Australia, distances between regional centres and remote communities are often considerable; under these conditions telehealth/telemedicine offers an alternative method of delivering services[37]. This review identified 18 publications[10,24,31,36,38-51] reporting the use of telehealth or telemedicine, which can offer insight into a remote Cape York service delivery model (Table 3).

When costed, the telehealth model of service delivery reported savings of A$600,000 (combining fixed and variable costs over a 5-year period) compared to face-to-face service delivery[51]. Other benefits of telehealth include facilitating continuing medical education, contacts with peers, and access to a second opinion, which is known to foster the retention of local expertise[41].

Telehealth and telemedicine services are recognised nationally and internationally as cost-effective service delivery methods; other benefits include improved patient outcomes, reduced costs and time, and reduced carbon impacts[10,37-40,44,47,49]. Although most reviewed studies reported on the benefits to service providers, including cost savings, a few studies concentrated their focus on patient and family experiences with telehealth. One study from remote northern Canada identified many benefits to families: lessening the burden (costs of travel, accommodations, lost wages, lost time and physical limitations), maximising supports (access to family, friends, familiar home environment, nurses and other care providers), and tailoring specific health care to patient and family needs, such as male and female household responsibilities[46]. Interviewees in this study considered that these combined benefits improved their quality of life and made accessing health care easier and more convenient. For patients, telehealth/telemedicine lessens the burden of health for patients and families in rural communities because it opens up patient choices.

**Table 3: Selected telehealth/telemedicine service models[10,24,37,39,42,46,48]**

| First author, year published | Article title | Model of care/article type | Components required for success/sustainability | Components that negatively impact on success/sustainability |
|---|---|---|---|---|
| Krupinski 2011 [42] | Successful models for telehealth | Telemedicine, state funded for schools, hospital Indian medical centres, homes | Education and training offered as professional development; evaluation and review of telemedicine process with capacity to update and improve when needed | No negative impacts reported |
| Bradford 2016 [39] | Telehealth services in rural and remote Australia: a systematic review of models of care and factors influencing success and sustainability | Literature review | Identified six key factors associated with the success and sustainability of services: vision, ownership, adaptability, economics, efficiency and equipment | Clinicians need to be motivated or the system doesn't work |
| Moffatt 2010 [23] | The reported benefits of telehealth for rural Australians | Literature review – reviewed 143 papers from a range of specialty areas, although these did not include ear, nose and throat speciality | Benefits: lower costs, reduced inconvenience, improved access, improved quality of services, improved professional education, networking, collaboration, enhanced local services | Telehealth presently underutilised in rural Australia. Need to improve skills and confidence with this technology |
| Marcin 2016 [10] | Addressing health disparities in rural communities using telehealth | Literature review to address the use of telemedicine for the provision of paediatric subspecialty consultations in the settings of ambulatory care, acute and inpatient care, and perinatal and newborn care | By providing paediatric subspecialty care in more convenient settings such as local primary care offices and community hospitals, paediatric patients are more likely to receive care that adheres to evidence-based guidelines; telemedicine have the potential to address paediatric specialists' geographic misdistribution and address disparities in the quality of care delivered to children in underserved communities | Models of care that use telemedicine have the potential to address paediatric specialists' geographic misdistribution and address disparities in the quality of care delivered to children in underserved communities |
| Smith 2003 [48] | The use of online health techniques to assist with the delivery of specialist paediatric diabetes services in Queensland | Service integrated telepaediatrics into an existing outreach program for children with diabetes and endocrine conditions | There were three levels: the coordination of routine specialist clinics via videoconference; ad hoc patient consultations for collaborative management during acute presentations and at times of urgent clinical need; and the delivery of education to staff and patients throughout the state. | No negative impacts reported |
| Smith 2007 [37] | The costs and potential savings of a novel telepaediatric service in Queensland | Cost-minimisation study in telemedicine | Telepaediatrics was a cheaper method for the delivery of outpatient services | Telepaediatrics started late in telehealth, but is now catching up |
| Sevean 2009 [46] | Patients and families experiences with video telehealth in rural/remote communities in Northern Canada | Exploring patients' and families' experiences with video telehealth consultations as a method of health care delivery | Three main benefits: lessening the burden (costs of travel, accommodations, lost wages, lost time and physical limitations), maximising supports (access to family, friends, familiar home environment, nurses and other care providers), tailoring specific e-health systems to enhance patient and family needs | Little evidence that telehealth impeded quality of care |

### *Remote ear and hearing health service models*

Outreach services offered in rural and remote areas report the importance of a multidisciplinary team for ear and hearing health service delivery. The search identified 29[10,31,38-40,44,47,49,51-71] publications reporting on ENT outreach, including the use of telehealth within outreach models (Table 4). Most literature found that the team needed to comprise an ear health educator or specialist nurse plus an audiologist[52,67,71]. The most comprehensive team worked on the Western Australia Earbus mobile health clinic, employing an audiologist, a GP or nurse practitioner, an ENT nurse educator, a nurse audiometrist and a data collection officer[67,71]. Smaller staffing models offered routine outreach from a clinical nurse specialist with an audiologist[52]. Most outreach models only offered direct ENT service delivery via telehealth[52,66]. Smith et al presented an outreach model with visiting ENT surgeons plus telehealth reviews[68,70]. The literature also identified a tendency towards the use of store-and-forward telemedicine over live video. As argued by Kokesh et al (2011), store-and-forward telemedicine allows greater flexibility and convenience for both the sender and the receiver. The sender can collect images and clinical information from the patient without the ENT specialist being physically present[61].

Studies from remote locations nationally and internationally report the benefits of telehealth or telemedicine for reviewing ENT patients, including benefits for patient outcomes, reduced costs and time, and reduced carbon impacts[56]. Further, a telehealth scoping study identified that face-to-face consultations for ENT consultations could be reduced by 89% if telehealth were used appropriately[53].

**Table 4: Selected ear, nose and throat models of service delivery**[31,52,57,59-61,63,66,67,70]

| First author, year published | Article title | Model of care | Components required for success/sustainability | Components that negatively impact on success/sustainability |
|---|---|---|---|---|
| Royle 2016 [67] | Heading outback for ear health, Western Australia | Ear bus mobile unit with multidisciplinary team of nurses and doctors, plus audiometry. GP-led team, with occasional ENT visits | Consistent membership of the multidisciplinary team; rapport with children, families, school staff, and local medical health service providers; educator travels with them | Working hours are long; distances travelled on rough roads – tyre blowouts and delays |
| Smith 2015 [70] | Monitoring ear health through a telemedicine-supported health screening service, Queensland | Mobile ear screening services west of Brisbane – IHW screens children at school, sends images to ENT specialist. Telehealth video otoscopic images reviewed to plan surgical lists biannually. ENT outreach services are offered alongside telehealth review | Community based screening integrated with specialist services; IHW-led program – assesses children at school; mobile earbus clinic; store-and-forward images reviewed by ENT specialist prior to face-to-face review in specialist outreach clinic | This program did not replace ENT surgeon outreach, but facilitated it |
| Reeve [66] | Evaluation of an ear health pathway in remote communities: improvements in ear health access | The implementation of a new MOC delivering an electronic referral template, ear health nurse, ear health educator with telehealth ENT specialist review | Combined changes reduced ENT waitlists; Wider rollout of program across the state would also help maintain sustainability | No longer retrospective data entry for referrals; referrals reduced when ear health nurse was on leave as no leave cover offered |
| Anand 2016 [52] | Hearing health referral pathways | Clinical nurse specialist and audiologist team do outreach with store-and-forward for ENT review | The system has been established to by-pass routine referral processes, so that this team can directly refer for surgery and any clinician can refer to this team for assessment (not only GP); the system offers diagnostic audiology and can refer for rehabilitative audiology services; they support and coordinate case-management for families who have complex ear disease: Priority 1 – infants under 12 months with recurrent AOM or CSOM or abnormal newborn hearing screen; Priority 2 – children aged 1–3 years with recurrent AOM, persistent OME or CSOM; Priority 3 – children aged 3–5 years with recurrent AOM, persistent OME or CSOM | Nil reported |
| Nyugen 2015 [31] | Cost-effectiveness analysis of a mobile ear screening and surveillance service versus an outreach screening, surveillance and surgical service for Indigenous children in Australia | Mobile bus unit with telehealth versus specialist outreach | Relies on highly trained IHW who travels in a specially designed and constructed bus. Found to be cost-effective, improves access for rural and remotes communities, it reduces travel for patients and specialists | Nothing reported, however this service relies on specialist IHW and was undertaken in locations with road access all-year round |
| Garritano 2011 [57] | Successful telemedicine programs in otolaryngology | A review of different telemedicine programs, ie benefits of store and forward versus live feeds | Alaskan model of care found success using store and forward; telehealth overcame distances and long wait times; audiologist lead store-and-forward programs more efficient; clinician experience with telehealth technology important for sustainability; store-and-forward reviews take on average 6 minutes, making it cost and time efficient | Nil reported |
| Kokesh 2004 [60] | Telehealth in Alaska: delivery of health care services from a specialist's perspective | Telehealth use for specialist services (ENT); used a store-and-forward model for ENT service delivery, after validation; images were all sent to a central repository rather than to individual specialists; all specialists can access the central repository of cases, but they are rostered on to review cases- with an on-call roster and 24-hour turn around period; telehealth used for pre- and post-surgery review; aim to create image archive for each patient under care; store and forward can be used for routine clearance for hearing aids; store and forward improves provider efficiencies; improves standards of care and patient safety | Essential to success is that the program is clinically driven, there is a clinical need for the service- for which a telehealth solution is going to be applied; telehealth review improved triage; weather conditions in Alaska harsh, telehealth enables service continuity regardless of weather conditions; ENT images can be used pre–post operatively for patient education; can improve provider efficiencies | Staff need to be early adopters and patients need to be willing to use telehealth, especially when sparsely located with long distances and harsh weather conditions |
| Hofstetter 2010 [59] | The impact of telehealth on wait time for ENT specialty care | 16 years of ENT data compared; standard face-to-face consultation wait times verses store and forward wait times | Wait times from 5 months to 2.1 months; telehealth success for increased efficiencies | Massive time and cost savings using telehealth for ENT. No negative issues |
| Kokesh 2009 [63] | Traveling an audiologist to provide otolaryngology care using store-and-forward telemedicine | Travelling audiologist sends store-and-forward images to ENT team for review; data analysed over 57 months (5 years) | Costs reduced, travel reduced in 85% cases, travel cost avoidance of US$496,420 Audiologist highly skilled – 2 years telehealth experience prior, audiologist clears for hearing aids, system inefficiencies, such as inappropriate referrals cause delays; Store and forward allows for quick triage and this reduces the burden of these inefficiencies; return on investment 250%, increased efficiency and productivity of ENT team | Improved efficiencies using telehealth |
| Kokesh 2011 [61] | The Alaska experience using store-and-forward telemedicine for ENT care in Alaska | Experience of ENT store-and-forward in Alaska | Clinician involvement creating protocols and improving software key to success, referring service providers believe telehealth improves clinical outcomes and patient satisfaction, face to face option should exist when appropriate care can't be delivered through only telemedicine, system needs robust processes for initial and ongoing training, technical and clinical supports and technology assessment, providers strongly recommended the use of telehealth reporting that it increased quality of care, increased communication, improved patient satisfaction, makes work more fun, plays a role in patient education | Nil reported |

AOM, acute otitis media. CSOM, chronic suppurative otitis media. ENT, ear, nose and throat. IHW, Indigenous health worker. MOC, model of care. OME, otitis media (with) effusion.

## Discussion

This rapid review, undertaken to inform the development of a new sustainable, evidence-based model for future ENT services, provides a synthesis of evidence for what works to deliver remote outreach services. Findings indicate that sound and sustainable outreach models build on existing services; they have the capacity to be tailored to local needs and to promote cross-agency collaboration. The review identified a number of essential characteristics of successful sustainable outreach services, including a flexible, multidisciplinary and well-integrated team with

existing service providers. Further, services for Indigenous people need to be developed on the premise of respect, best described as 'partnerships'. Employment of local Aboriginal health workers is considered essential for a successful outreach model. Outreach services that offer interdisciplinary assessment and collaboration were found to be highly valued by health professionals[29].

Presently, specialist services are offered across the state using three methods: patient travel, outreach clinics and telehealth[17,29]. For a clinician, the most conventional service method is for the patient to travel; however, the costs required to support this model are approximately A$54 million per year (2012)[21]. However, hospital administrators advocate for specialist outreach clinics in rural and remote areas that are supported by or replaced by telehealth services[21,29]. Telehealth services have been shown to be adaptable to the needs of patients, clinicians and health services; they are cost effective and often much more efficient than the alternative face-to-face services. While some literature recommends that telehealth should not completely replace traditional clinician–patient relationships[18], others suggest it is a step forward and is a technology 'we need to embrace in this day and age'[24].

There are limitations to this study, including that this review was conducted as a 'rapid review' rather than a systematic review; as such it is possible that some literature was missed. However, this study did employ a rigorous search strategy developed by an accredited librarian to reduce the impact of this. Also, this review

did not assess research outcomes or quality appraisal of research methods; materials were only included if considered relevant by the research team.

## Conclusion

The evidence generated from this rapid review highlights a number of traits for successful and sustainable ENT service delivery in rural and remote areas, specifically, the literature advocated for the employment of a dedicated ear and hearing health educator (nursing), outreach nursing and audiology, and supported ENT access using telehealth[41]. Services need to work in collaboration with existing services and offer respectful partnerships within communities and, where possible, offer ongoing education to local health workers who support the outreach team when in community.

## Acknowledgements

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