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ORIGINAL ARTICLE

Understanding the ongoing learning needs of Australian metropolitan, rural and remote paediatricians: Evaluation of a neurology outreach programme

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Aim: The purpose of this study was to evaluate whether a neurology outreach teaching programme delivered via video-teleconferencing (6 × 60 min live sessions every 6–8 weeks) is acceptable, contributes to understanding and meets the neurology learning needs of Australian paediatricians from metropolitan, rural and remote areas.

Methods: A sample of six NSW sites that joined the neurology outreach programme between 2017 and 2019 (Arm 1) and six interstate sites from QLD, WA and TAS who commenced the programme in 2020 (Arm 2) participated. A mixed-methods survey explored participants' learning needs and value of the programme.

Results: Forty-six participants submitted programme evaluation surveys (26 arm 1, 20 arm 2); 9 were removed due to insufficient data ($n = 37$). Quantitative and qualitative data showed the programme was acceptable in format, relevant to practice, appropriate for clinician learning needs, and engaging. Clinicians reported improvement in understanding and confidence. Participants felt more connected/less isolated and up-to-date. Participants reported a positive impact from the programme on approach to neurological problems and ensuing consults, and more differentiated and appropriate paediatric neurology referrals.

Conclusion: This study validates the live video-teleconference outreach model as an acceptable, effective and important means of providing continuing neurology education for Australian paediatricians.

Key words: education; learning needs; neurology; paediatrics.

What is already known on this topic

1 Gaps have been identified in paediatric neurology training and clinician confidence in managing neurological presentations.
2 New investigative techniques, procedures, pharmacotherapies, gene therapies, and the imperative for early diagnosis, highlight the need for ongoing neurology education to improve clinician confidence and patient outcomes.
3 Information on how to meet the ongoing neurology-related educational needs of time-poor paediatricians is limited.

What this paper adds

1 This study validates the live video-teleconference outreach model as engaging, acceptable in format, relevant to practice, and appropriate for clinician learning needs.
2 Clinicians reported improvements in understanding, increased confidence, and feelings of being more connected/less isolated and up-to-date.
3 The study further demonstrated a positive impact on participants' approach to neurological problems covered, ensuing consults, and propensity to undertake more differentiated and appropriate paediatric neurology referrals.

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Research has identified deficiencies in paediatric neurology training commencing in medical school and extending through to physician training, resulting in gaps in clinician knowledge. Neurophobia, coined by Jozefowicz in 1994 to reflect fear of clinical neurology and neural sciences, has been described amongst

medical students,[1] and residents.[2] Of a cohort of Canadian internal medicine residents, 81% felt their neurology skills remained average or below average following their neurology rotation.[2] Lack of confidence and perceptions of difficulty in learning neurology persists beyond residency programmes. While a cohort of general practitioners in the UK felt neurology was as interesting as other medical specialties, they perceived it to be the most difficult and their area of least confidence compared to other specialties.[3] Similarly, only 22% of a US graduate paediatrician cohort felt very comfortable with paediatric neurology presentations after 1–5 years of practice, despite 'fairly frequently' encountering these presentations across general and subspecialty practice.[4] With the field of neurology rapidly evolving with new investigative techniques, procedures, pharmacotherapies and gene therapies,[5] and the imperative for early diagnosis to maximise treatment efficacy (e.g. immune therapy), these findings highlight the need for ongoing neurology education to improve clinician confidence and patient outcomes.

Yet, information on how to meet the ongoing neurology-related educational needs of paediatricians who are time-poor, burdened with the need for knowledge acquisition across many paediatric subspecialties, and who may work remotely, is limited. Moreover, evidence demonstrates that professional isolation and limited access to continuous learning opportunities are key determinants affecting the recruitment and retention of rural and remote clinicians.[6] The use of telehealth technologies to provide synchronous (i.e. real-time/live/interactive[7]) hub-and-spoke style educational programming has been recommended as a means of providing efficient ongoing medical education for remote clinicians[8] and has the potential to decrease professional isolation, remove travel times and improve equity of access. While asynchronous (i.e. flexible/self-paced/non-live[7]) teaching modalities such as computerised tutorials and video-taped lectures can also improve equity of access and have comparable efficacy to traditional face-to-face lectures,[9–14] several studies suggest the latter is preferred[10,11,13,14] and may elicit greater engagement[13] and motivation to participate in future learning.[10,11,14]

Given ongoing improvements in technology and internet access, tertiary-based clinicians with specialty expertise can increasingly deliver live/interactive tutorials and case-based teaching to paediatricians across metropolitan, rural and remote areas. A 2017 survey of 242 Australian paediatricians representing all states/territories, revealed that 98% had reliable internet access.[15] Given the subsequent increased public and private investment, the roll-out of 5G mobile, and the completion of the National Broadband Network (NBN) in 2020,[16] access is now likely universal. Moreover, numerous video-teleconferencing* platforms (e.g. Zoom, Microsoft Teams and Skype) enable the coming together of disparate parties and can facilitate didactic and case-based teaching accompanied by screen-sharing of slides and clinical videos, as well as allowing opportunities for live discussion between attendees via video-camera and/or text-chat.

In this paper, we aim to evaluate whether a neurology outreach teaching programme delivered via video-teleconferencing is acceptable, contributes to understanding and meets the current neurology learning needs of Australian paediatricians living in metropolitan, rural or remote areas. More specifically, we will explore *acceptability* in terms of the programme's format, relevance, appropriateness and interest to general paediatricians and whether it is perceived to increase understanding. Second, we will determine the self-reported *impact* of the programme on participants' approach to neurological problems, consults and referrals, confidence and feelings of being connected and up-to-date. Finally, we will explore the value of a pre-recorded didactic teaching video (minus the live Q&A component) as an alternative option, to elucidate preferences for different modalities of learning.

Methods

Neurology outreach programme development

The neurology outreach programme commenced in 2017 with a small group of centres from the Greater Sydney area and expanded in 2019 to include 36 centres across NSW (18 rural/regional, 18 metropolitan). The programme was created to increase general paediatrician and paediatric trainee knowledge of common neurological presentations, increase confidence in managing these, and influence the nature of referral patterns, maximising appropriateness.

The programme consists of 60-min live teaching sessions every 6–8 weeks (maximum six per year) offered via video-teleconference (currently Zoom). As clinical commitments and availability differ across sites, teaching is repeated to accommodate varied settings. The sessions were designed to include a mix of: didactic teaching on common neurological topics with reference to current literature/best-practice guidelines, illustrative cases, and regular opportunities for questions and answers (Q&A) between the presenter (senior paediatric neurologist AB) and online attendees. Typically 2–3 topics/cases are discussed per session with Q&A after each. This modality differs to flipped classroom teaching models, wherein students engage with online content (e.g. pre-recorded video-based-lectures) in their own time, prior to in-person interactive sessions where teaching materials are then discussed.[17,18]

To better understand and evaluate the needs of paediatricians and paediatric trainees across diverse Australian settings, the programme was expanded to six interstate sites in 2020. The initial step was to extend the NSW programme to include metropolitan, rural and very remote centres that reflect variations in resources

* **Video-teleconferencing** (or videoconferencing) – refers to video and audio meetings held via room-based videoconferencing systems and/or internet based video-teleconferencing platforms on a variety of devices, for example, laptops or desktop computers with connected web cameras, smartphones or tablets. In contrast to webinars, both presenter and participant cameras are typically activated during video-conferences to facilitate the exchanging of ideas. When videoconferencing technology is used for informal purposes, it is commonly called a video call or video chat.

Webinars – combining the words 'web' denoting the internet, and 'seminar', can broadly be described as any seminar, presentation, lecture or similar, conducted via the internet. The term is sometimes used interchangeably with webcast, web lecture, virtual event or online event. Webinars commonly involve the presenter/s being viewable on camera, while participant cameras are not activated. Interaction between the presenter and online attendees is often facilitated via text chat functions or similar.

Table 1 RRMA codes for participating Australian sites in the neurology outreach programme†

Study sites	RRMA code
NSW sites (retrospective arm)	
Gosford Hospital	Metropolitan Zone, Code 1
St George Hospital	Metropolitan Zone, Code 1
Campbelltown Hospital	Metropolitan Zone, Code 1
Northern Beaches Hospital	Metropolitan Zone, Code 1
Tamworth Hospital	Rural Zone, Code 3
Coffs Harbour Health Campus	Rural Zone, Code 4
QLD, WA and TAS sites (prospective arm)	
Royal Hobart Hospital, TAS	Metropolitan Zone, Code 1
Townsville Hospital, QLD	Metropolitan Zone, Code 2
Cairns and Hinterland Hospital, QLD	Rural Zone, Code 3
Bunbury Hospital, WA	Rural Zone, Code 4
Kalgoorlie Health Campus, WA	Remote Zone, Code 6
Broome Health Campus, WA	Remote Zone, Code 6

† Coding determined using the Australian Government Health Workforce Locator tool, available via: https://www.health.gov.au/resources/apps-and-tools/health-workforce-locator/health-workforce-locator.

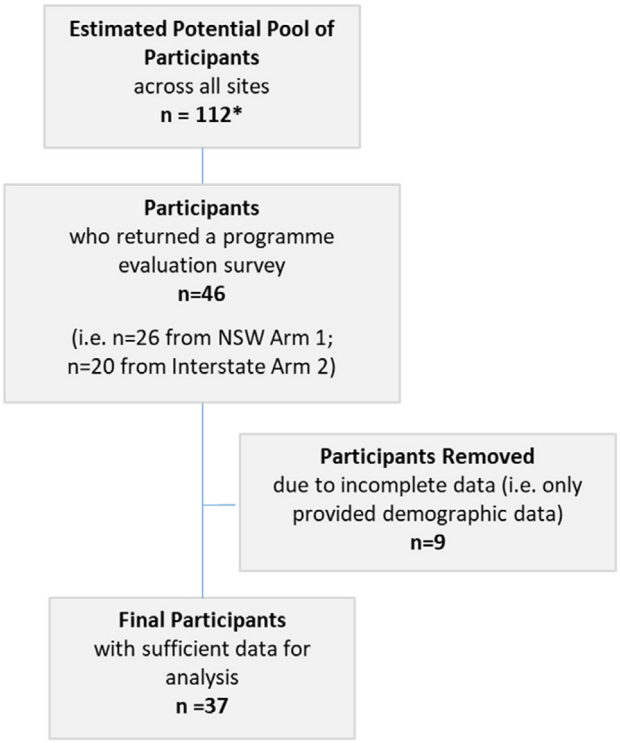

Fig. 1 Participant recruitment. *Potential pool of participants was calculated by summing numbers across sites as determined by local site investigators.

and service delivery in Western Australia (WA), Queensland (QLD) and Tasmania (TAS), to improve their access to neurology education. The centres were selected following consultation between author AB and the neurology head of department in the major paediatric teaching hospital of each state. The NSW and interstate programmes are evaluated together in this study.

Study recruitment

This study was approved by the Sydney Children's Hospitals Network Human Research Ethics Committee (HREC: 2019/ETH13755). A sample of six NSW sites representing rural and metropolitan centres and who had joined the programme between 2017 and 2019 (Arm 1) were invited to participate in a cross-sectional retrospective programme appraisal (Coffs Harbour, Tamworth, Gosford, St George, Campbelltown and the Northern Beaches Hospital). NSW participants who previously attended at least three neurology outreach sessions were invited to participate via email with an online link to the participant information sheet, consent and programme evaluation questionnaire (details below), circulated by the nominated site investigator.

In addition, the six interstate sites commencing the programme in 2020 were included in a prospective arm of the study (Arm 2). Interstate participants were invited to join the programme and associated study via an email circulated by their nominated site investigator. The email included links to the online participant information sheet, consent and a pre-programme scoping survey (not reported here) designed to explore preferences in terms of topics to cover, format of teaching delivery, preferred number of sessions and session duration. Informed by this data, topics previously offered via the NSW programme were selected to cater for interstate preferences. Session dates were determined by consultation with site investigators. The authors explored technical and access issues post-session and advised solutions (not reported further here). At the conclusion of the teaching series, the programme evaluation survey (detailed below) was circulated by site investigators.

Table 1 illustrates the degree of remoteness of participating sites according to the Australian Government Department of Health Rural, Remote and Metropolitan Area (RRMA) classification system.[19]

Measures

The mixed-methods programme evaluation survey was designed by the authors to explore the neurology learning needs of participants and obtain feedback. It included demographic questions regarding service location, employee type, and number of sessions attended. Questions to assess the acceptability and impact of the programme utilised forced-response categorical choices (e.g. yes/no), 5-point Likert-type scales (e.g. 1 = strongly disagree, 5 = strongly agree), and qualitative open-ended free-text responses.

Data analysis

Mixed methods analysis was used. Quantitative data pertaining to participant demographics and programme evaluation parameters are presented as frequency counts and/or percentages. Participating sites were coded as either metropolitan or rural/remote to examine differences between groups. Pearson's Chi-square *P* values are reported for binary outcome measures (or Fisher's

Table 2 Participant's training level and primary location

	n	%
Training level		
Consultant paediatrician	34	91.9
Junior Medical Staff (Resident, Registrar, Fellow)	3	8.1
Primary location		
NSW Hospital/Health Service	21 (Metro = 15, Rural = 6)	56.8
QLD Hospital/Health Service	4 (Metro = 3, Rural = 1)	10.8
WA Hospital/Health Service	8 (Rural = 5, Remote = 3)	21.6
TAS Hospital/Health Service	4 (Metro = 4)	10.8

Metro = metropolitan.

exact test where assumptions violated). The Mann–Whitney test was used to determine differences between groups for Likert-type scales. Multiple-comparison adjustments were not conducted given the exploratory nature of the study. Open-ended responses were analysed by the author FLM who created a coding system to reflect emerging patterns in the data for each question. The authors FLM and AB reviewed the codified data to reach consensus. Emergent patterns are described and summarised using frequency counts and exemplar quotes.

Results

Forty-six participants submitted an online programme evaluation survey (26 Arm 1, 20 Arm 2). After removing those without data on primary/secondary variables for analysis ($n = 9$), 37 participants remained (Fig. 1). At least one respondent from each of the participating rural, remote and metropolitan sites detailed in Table 1 submitted a survey.

Table 2 provides summary data of participant training level and primary service location. 76% considered their current level of neurology knowledge to be adequate, 16% limited, and 8% comprehensive. Respondents had reportedly attended six neurology outreach sessions on average (range 2–20, $sd = 3.16$).

Feedback on neurology outreach sessions

Quantitative data relating to *acceptability* of the programme and self-reported *impact* of the programme is presented in Table 3. A significant difference was observed between metropolitan centres ($med = 5$, $IQR = 0$) and combined rural/remote centres ($med = 5$, $IQR = 1$, $U = 95.500$, $n_1 = 22$, $n_2 = 15$, $p = 0.003$, two tailed), with the metropolitan sites indicating significantly stronger agreement that the outreach programme improved their understanding of topics presented. In relation to impact of the programme on consultations, within the rural/remote centres, a minority (26.7%) indicated a change in their number of consultations impacted compared to a majority of participants (63.6%) from metropolitan centres [χ^2 (1, $N = 37$) = 4.880, $P = 0.027$]. No other significant differences were observed between metropolitan and combined rural/remote centres on acceptability or impact measures.

Table 3 Self-reported Acceptability and Impact of the Neurology Outreach Programme

	n	Frequencies (percentages)
ACCEPTABILITY of programme:		
Format: Liked the format of the programme	37	37 agreed (65% strongly agreed, 35% agreed)
Format: Importance of the Q&A session after each topic	37	35 important (73% very important, 22% somewhat important, 5% neutral)
Relevance: Programme content was relevant to practice	37	37 agreed (84% strongly agreed, 16% agreed)
Appropriateness: Appropriateness of programme for learning needs	37	35 appropriate (94.6% very appropriate, 2.7% somewhat appropriate, 2.7% neutral)
Interest: Interested/engaged in the programme	37	37 yes (100%)
Understanding: Programme improved understanding of topics presented	37	37 agreed (78% strongly-agreed, 22% agreed)
Uptake: Likelihood of joining programme if offered in the future	37	37 likely (97% very likely, 3% somewhat likely)
IMPACT of programme participation on:		
Thinking: Programme altered thinking in relation to clinical neurological problem	37	36 yes (97%); 1 no (3%)
Approach: Programme altered approach in relation to any clinical neurological problem	37	34 yes (92%); 3 no (8%)
Practice: Altered practice in relation to areas taught	37	32 agreed (48% strongly-agreed, 48% agreed, 15% neutral)
Consults: Impacted number of consultations with tertiary referral units (for neurology patients)	37	18 yes (49%); 19 no (51%)
Referrals: Influenced referral patterns to tertiary unit	37	20 yes (54%); 17 no (46%)
Confidence: Improved confidence in managing areas taught	37	35 agreed (57% strongly-agreed, 38% agreed, 5% neutral)
Feeling connected: Helped to feel more connected and less isolated in practice	37	36 yes (97%); 1 no (3%)
Up-to-date: Given confidence of being up-to-date on current neurology best practice	37	36 yes (97%); 1 no (3%)
Self-learning: Lead to further self-learning on neurology topic presented	37	32 yes (86%); 5 no (14%)

Open-ended qualitative responses exploring the impact of the neurology outreach programme including the most and least useful aspects are summarised in Table 4.

Table 4 Qualitative feedback on aspects of neurology outreach programme

	Key content codes	Frequency	Exemplar quotes
Impact on thinking and approach to neurological problems	Better understanding and/or management approach (to a range of cited topics)	35	-'*Provided a clearer structure for approach to child with seizures, migraines, weakness, altered awareness*'. [P17]; -'*Every presentation gives us a broader knowledge of our common presentations and an understanding of how to approach them*'. [P20]; -'*Extremely helpful in expanding my knowledge base because of shared experiences, and not necessarily dependent on specific personal case experience*'. [P04]
	Improved selection/use of treatments	14	-'*Helped me revise anticonvulsants and the best use of each of them*'. [P32]
	Altered understanding and approach to use of investigations	10	-'*Several clinical examples. Eg: HLA tissue typing with the use of Carbamazepine*'. [P13] -'*I was able to do more directed investigations*'. [P18]; '*Genetic investigation for intellectual disability*'. [P35]
	Revised referral pathways	3	-'*Practical approach to presentations, highlighting which ones need further neurologist input*'. [P33]
	Value of literature citations/ guidelines and further reading	2	-'*Provided relevant literature citations*'. [P01]; -'*I read more about many of the topics* (e.g. *encephalitis*)'. [P16]
	Improved confidence in approach; avoidance of pitfalls; improved discussion with/provision of information for families; value of well-chosen cases	$n = 1$ each	-'*Increased my knowledge of neurologic conditions, investigations, treatment options and pitfalls to watch out for*'. [P15]; -'*… information provided to parents (use of seizure monitoring devices, improved discussion of SUDEP) and when to wean medications in relation to adolescence and driving*'. [P12]
Impact on referrals and consultations to tertiary centres	More targeted/appropriate/ differentiated referrals	6	-'*More differentiated towards referrals*'. [P14]; -'*I may do more referrals, and those I do will be more appropriate*'. [P16]; -'*Helped delineate which ones to discuss (practical approach to presentations, highlighting which ones need further neurologist input)*'. [P33];
	Fewer referrals	5	-'*Reduction in referral to tertiary unit as feeling more empowered to manage different neurological presentations and seizures*'. [P21]; -'*Some of patients I did not need to refer*'. [P18]
	More likely to refer if concerned	4	-'*It has likely made me more likely to refer if I have concerns… I think that I'm more likely to ask more questions about why the child has epilepsy and refer for a further work up*'. [P20]
	More confident to manage/ require less support	4	-'*Have perhaps lessened one to two phone consults with on-call neurology service as have felt more confident with the advice I provided to the family*'. [P23]; -'*My confidence has been increased in some areas. Consultations regarding patients seen in outpatients/rooms are about the same however more consultations with neurology are being initiated directly from junior doctors in the ED without first discussing with the general pediatrician on call as time goes by*'. [P12]
	Do more management/ investigations/triaging prior to referring	3	-'*More comfort in self-management of neurological conditions and being aware of the expected red flags or concerning features that would warrant (expected) to be discussed with tertiary services*'. [P13]; -'*Decision to do imaging before referrals or trial of treatment before doing the referrals*'. [P03]
	More likely to conduct phone consult	2	-'*More likely to seek phone advice with change in antiepileptic*'. [P09] -'*Consultation via phone rather than family having to travel to long distances for Paed Neurologist review*'. [P08]

(*Continues*)

Table 4 (Continued)

	Key content codes	Frequency	Exemplar quotes
Impact on feeling connected	Comfort knowing peers grapple with similar challenges	8	-'*Provides understanding that regional colleagues are dealing with similar clinical challenges*'. [P02]; -'*Hearing other peoples' questions is very important as it helps to provide a gauge of your own practice and knowledge sometimes in a reassuring way and sometimes providing the impetus to change or re-evaluate ones own approach*'. [P12]; -'*This is one of the most useful aspects of this program – hearing the shared clinical dilemmas of colleagues, and recognition of the complexity of presentations, in a collegiate and supportive way, but without necessitating a huge time commitment*'. [P09]
	Value of access to a tertiary expert/tertiary centre	7	-'*The neurology outreach sessions improve the relationship between front line clinicians and tertiary services and breaks down the ivory tower mentality. Opens communication and helps understanding on pressures on practice in the periphery and at the tertiary center*'. [P13]
	Value of relevant/practical/tailored approach specifically for paediatricians	6	-'*It is so good to get education tailored for a general paediatrician – not at reg level and not at research level*'. [P37]; -'*Having someone able to tailor a talk and answer questions is excellent*'. [P34]
	General feeling of being supported	3	-'*Having an expert from a tertiary referral hospital taking the time to help and teach us on important topics does reduce the feeling of isolation*'. [P28]
	Feeling more confident/ empowered	2	-'*Helps to empower us as general paediatricians*'. [P19]
	Creates connection within own team	1	-'*I think it provides connection even within our team to think about our presentations and share our experience!*' [P20]
Impact on being up-to-date	Provides recent evidence/ research/citations/best practice	9	-'*…very good at providing recent published evidence for a particular treatment strategy, reassuring to know that common management is supported by evidence (or at least opinion)*'. [P35]
	Improved awareness/knowledge/ skills	4	-'*As a general paediatrician it is not possible to be up-to-date in every aspect of my practice. At least these sessions provide an opportunity to upskill*'. [P04]
	Self-reflection on own practice	2	-'*Reassured me of things I was already doing or reminded about things I may not have seen clinically recently*'. [P32]
	Other	4	-'*I avoid the RACP meeting as it is too general, and don't go to neuro meetings as they are too specialised. This is therefore the best education I have had in neurology for many years… It was reassuring to see what hadn't changed, and great to learn new things*'. [P37]
Most useful aspects of outreach programme	Relevant/practical/up-to-date	11	-'*Topics covered very relevant to practice in remote settings or non tertiary settings*'. [P24]; -'*Practical clinically relevant information with an ability to seek clarification with questions*'. [P13]; -'*Getting an update and highlights of recent advances in neurology and a guide of how to manage neurological conditions in general paediatric practice*'. [P05]
	Approach to management of various/common conditions	10	-'*Structured approach to common neurological presentations eg. epilepsy types, movement disorders, headaches*'. [P16]; -'*Discussion of common topics*'. [P03]
	Quality/expertise of presenter	8	-'*Practical teaching from very experienced neurologist*'. [P25]; -'*An excellent teacher that makes everything easy was another most important thing for me. They were very engaging session (s), up to date knowledge, translated in a simple way*'. [P36]

(*Continues*)

Table 4 (Continued)

	Key content codes	Frequency	Exemplar quotes
	Case discussions/examples	7	-'*The case examples/ history that accompanied the diagnosis*'. [P34]; -'*Interesting cases and succinct clinical approach to them*'. [P26]
	Opportunity for live discussion/ interaction	6	-'*The live nature of the sessions has allowed for more interaction and exchange of knowledge and experience*'. [P24]; -'*Capacity for Q&A with tertiary specialist in relation to topic of discussion*'. [P23]
	Accessibility and session regularity	5	-'*I guess, regular education sessions about neurology topic, teaching and problem solving was the main thing for me. In routine, there is limited opportunity of neurology sessions and hence it was good to hear and discuss common issues*'. [P36]
	Peer connection	2	-'*Knowing that other general paediatricians face similar issues or difficulties across the state helps make us feel that we are not alone!*' [P05]; -'*I think its [sic] the connection and regular meetings with physicians creating a network around presentations*'. [P20]
	Value of summaries/handouts/ references	2	-'*High quality and referenced information provided. Summary at the end to reinforce the points*'. [P07]; -'*Having the excellent handouts*'. [P28]
Least useful aspects of outreach programme	Technology	2	-'*The technology is the biggest obstacle but high quality connections are not essential*'. [P09];
	Timing of sessions	2	-'*The timing. I can only access the live sessions occasionally and would live* (*sic*) *either a recorded session or an alternative time*'. [P11]
	Level of complexity/ appropriateness for Paediatricians	3	-'*Some examples are quite complex and beyond the scope of a junior doctor/medical student*'. [P26]; -'*Some of the rare conditions could be superfluous to the priorities of a general paediatrician*'. [P15]
	Not enough time for Q&A	1	-'*Not enough time for questions at the end*'. [P34]
Feedback comparing the live outreach programme with other teaching modalities	Superior value of outreach programme compared to other modalities	26	-'*Superior to most other options, and format allows for short, frequent sessions*'. [P09]; -'*More engaging than online/self-directed learning. Good opportunity for discussion compared to online/self-directed*'. [P26]
	The interactive Q&A component was again highlighted ($n = 6$)	6	-'*Very useful, as there is the opportunity for discussion of teaching points; clarification of practice concerns, and discussion that allows contextual application of knowledge to setting* (i.e. *resources available regionally vs. in tertiary centre*)'. [P23]; -'*The format and duration of the neurology sessions has been very valuable and topics covered have been very relevant to remote practice. The interactive nature of the sessions has made learning more engaging and enjoyable*'. [P24]
	Practical/relevant nature of the programme ($n = 3$)	3	-'*Highly valuable as they are practical and useful for practice*'. [P21]; -'*Topics are always relevant and presented clearly*'. [P28]
	Promotion of ongoing education with peers; value of slides and clinical videos	$n = 1$ each	-'*Very valuable in promoting a culture of ongoing education with peers and Junior doctors*'. [P08]; -'*Included clinical videos… slides are excellent, and I can refer to them whenever required*'. [P28]

Preferences and suggestions to improve neurology outreach programme

Table 5 summarises learner preferences in relation to future neurology teaching and the option of a pre-recorded video alternative. No significant differences were observed between metropolitan and rural/remote groups on preferences in relation to complexity or their views on the live outreach programme compared to the pre-recorded video alternative.

Table 5 Preferences for future neurology teaching and views on pre-recorded video alternative

	n	Frequencies (percentages)
Preferred complexity of future neurology teaching	37	30 (81%) mix of practical neurology and some more complex applications; 4 (11%) more complex topics/case examples; 3 (8%) more practical/prescriptive instruction on how to manage common neurological presentations.
Pre-recorded video alternative option		
Value of the pre-recorded sample video compared to the live neurology outreach sessions	35†	18 (51%) pre-recorded video was *not as good* as live video-teleconference; 16 (46%) pre-recorded video was *just as good* as live teleconference; 1 (3%) pre-recorded video was *better* than live teleconference.
Usefulness of pre-recorded videos if offered in the future	35†	20 (57%) very useful; 12 (34%) moderately useful; 2 (6%) unsure; 1 (3%) not very useful.
Ideal pre-recorded length for future videos	35†	Mean‡ = 27.86 min (range: 5–60 min).
How pre-recorded videos would likely be viewed in the future	35†	24 (69%) self-learning in own time; 6 (17%) during group teaching sessions; 5 (14%) 'other' (i.e. both group and self-learning $n = 2$; with JMOs $n = 2$; not at all $n = 1$).

† $N = 2$ missing. ‡ Mean ideal video length determined by extracting numerical data from qualitative data. Where a range was provided by participants, the mean was computed and used for calculating overall mean.

Preferences for potential future videos

From a list of given neurology topics, participants were asked to select three that would be most helpful to their practice if pre-recorded videos were offered in the future (Fig. 2).

Participants were also asked to list two topics they would find most useful for each of their three preferred subspecialties (Table 6).

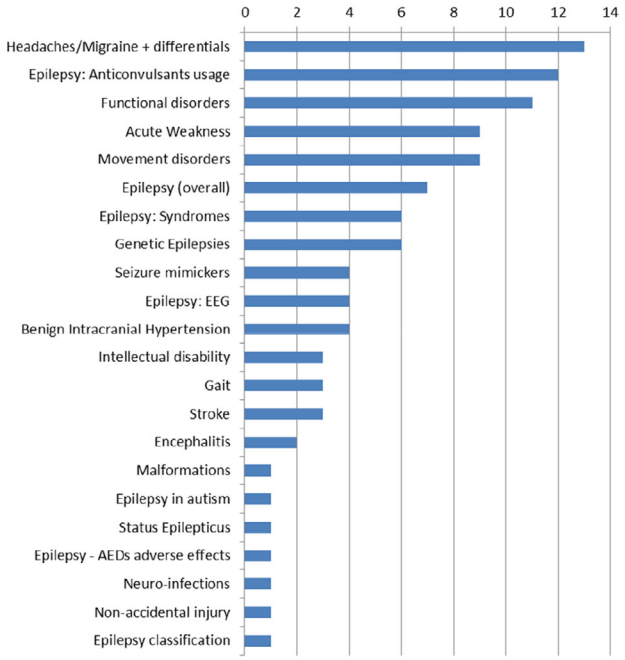

Fig. 2 Participant's preferences for neurology video topics to be offered in the future. Participants were asked to select three helpful topics from the list provided. AED, antiepileptic drug; EEG, electroencephalogram.

Table 6 Participants' preferences for specialty topics to be offered via video education

Specialty area	Frequency count (*n*)	Specific topics requested by ≥2 participants
Gastroenterology	22	Irritable Bowel Syndrome; Abdominal pain/constipation
Developmental/Community Paediatrics	13	Attention-Deficit/Hyperactivity Disorder medications; Autism
Nephrology/renal/urology	12	Nephropathies; renal (broad)
Allergy/immunology	11	Food allergy; Immunodeficiency
Respiratory	9	Asthma; pneumonia
Psychiatry/Mental Health	8	Medications
Cardiology	7	Arrhythmias; Murmurs
Endocrinology	7	Diabetes; Disorders' of sex development
Neonatology	6	
Acute care/Emergency	3	
Dermatology	2	
Genetics	2	Testing
Haematology	2	
Metabolic	2	
Rheumatology	2	
Child protection	1	
ENT	1	
Sleep Medicine	1	

Discussion

This study validates the live video-teleconference outreach model as an acceptable, effective and important means of providing continuing neurology education for Australian paediatricians. The programme was acceptable in format, relevant to practice, appropriate for clinician learning needs, and was engaging. Clinicians

reported improvement in understanding, increased confidence and the programme inspired further self-learning. The study further demonstrated a positive impact on participants' approach to neurological problems covered, ensuing consults, and propensity to undertake more differentiated and appropriate paediatric neurology referrals. Participants felt more connected/less isolated and up-to-date. The programme was similarly acceptable, independent of degree of remoteness. All responders indicated they were likely to join the programme if offered again in the future. Suggestions for improvement, including embedding questions (in the form of polls/quizzes), have since been incorporated.

The format of the programme, which included didactic teaching, cases and regular opportunities for Q&A and peer interaction, was highly valued. Qualitative data further illuminated the importance of peer-to-peer and peer-to-expert interaction as a means to learn from one another, have questions answered immediately, reduce the sense of isolation, and provide reassurance that clinicians are facing similar clinical dilemmas. Responders valued the peer-to-peer exchange of knowledge and hearing the shared clinical experiences and challenges of others. It provides an opportunity to gauge one's own practice and act as an impetus to change or re-evaluate one's approach. These findings are in keeping with McMahon's observation that incorporating substantive time for cases and discussion in education design can make learning more interactive, relevant and meaningful for clinicians.[20]

Sustainability is essential in the assessment of any teaching programme. To cater for complexity and to accommodate local commitments, all neurology outreach sessions were repeated at times suitable for participating sites. Repetition of content is time-intensive, though each subsequent discussion during Q&A was rich and unique. This model may not be sustainable for other educators in the future. Providing handouts of sessions enabled revision of content. Recording the live sessions was suggested and is a means to reduce repetition and facilitate revision. However, patient confidentiality if raised spontaneously during discussion time and clinician consent to be recorded during Q&A, are important and necessary considerations. Furthermore, the richness of sessions may be diluted if clinicians feel discouraged to ask questions, engage or share experiences by virtue of being recorded.

The study included a pre-recorded video-based-lecture option (minus the Q&A/discussion component) to further explore the question of sustainability via an alternative teaching modality. Providing an asynchronous online pre-recording allows self-directed and flexible learning. 51% of clinicians felt the pre-recorded video option was not as good as the live sessions, with 46% considering the video option just as good. The lack of opportunity for discussion and connection with expert and peers was one of the most frequently cited reasons the pre-recorded video option was not considered as helpful. Further work by lead authors FLM and AB has been undertaken to examine the uptake and utility of pre-recorded videos from a variety of paediatric subspecialties, to further explore this modality as a sustainable alternative.

The study has limitations. Our survey response rate was 33%, but is in keeping with the literature for physician responses.[4,15,21] Of those who did not respond, it is unclear how frequently they were able to attend and whether the programme timeslots, content and format met their needs. As this study was exploratory, corrections for multiple between-group comparisons were not made when exploring differences between metropolitan and rural/remote centres, hence significant results may not apply to other populations. Nonetheless, the greater proportion of metropolitan clinicians indicating a change in number of consultations compared to rural/remote clinicians, warrants further exploration. Similarly, the finding that metropolitan clinicians were more likely to report stronger agreement than rural/remote clinicians that their understanding of topics had improved, requires further research to establish meaning.

Conclusion

In an increasingly specialised world, an important question is how to provide appropriate and relevant continuing education for general paediatricians often working in rural or remote centres, and how to maximise the value of this major workforce. In the Australian context, paediatricians are frequently the first point of call for neurological problems. This may differ in other countries. Nevertheless, this model of providing continuing education is equally relevant for neurology trainees, neurologists, and other subspecialties, particularly in early consultancy. This study addresses these issues and has shown the capacity to change practice, lessen feelings of isolation, improve confidence and build peer-to-peer collegiality. In these aspects, it provides a new and significant contribution to the literature, addressing the ongoing neurology learning needs and educational challenges of paediatricians practising in a variety of settings, and capturing their unique insights.

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