ORIGINAL RESEARCH

Proposed Pathway for the Utilization of Pediatric Ambulatory EEG

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Purpose: The clinical utility of pediatric ambulatory-EEG (A-EEG) has been studied for decades, but limited information exists regarding which variables influence its utility. The authors aimed to evaluate clinical/EEG variables that may influence A-EEG yields and to develop a pathway for A-EEG utilization in children.

Methods: Single-center retrospective review of A-EEGs performed from July 2019 to January 2021 in a tertiary referral center. The primary outcome was whether the A-EEG test successfully answered the referring physician's clinical question or influenced therapy. When it did, the A-EEG test was deemed useful. Clinical and EEG variables were assessed for their ability to predict utility. Further, the literature review generated 10 relevant prior studies whose details were used to generate a pathway for A-EEG utilization in children.

Results: One hundred forty-two A-EEG studies were included (mean age 8.8 years, 48% male patients, mean A-EEG duration 33.5 hours). Overall, A-EEG was considered useful in 106 children (75%) but heavily influenced by A-EEG indication. Specifically, it was deemed useful for 94% of patients evaluated for electrical status epilepticus in slow-wave sleep, 92% of those evaluated for interictal/ictal burden, and 63% of those undergoing spell classification. The test indication ($P < 0.001$), a diagnosis of epilepsy ($P = 0.02$), and an abnormal routine EEG ($P = 0.04$) were associated with A-EEG test utility, although the multivariate analysis confirmed the test indication as the only independent outcome predictor of A-EEG.

Conclusions: Pediatric A-EEG is extremely useful for evaluating electrical status epilepticus in slow-wave sleep and interictal/ictal burden and is often helpful for spell classification. Among all clinical and EEG variables analyzed, the test indication was the only independent outcome predictor of obtaining a helpful A-EEG.

Key Words: Ambulatory EEG, Children, Diagnostic yield, ESES, Interictal ictal burden.

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The clinical utility of ambulatory-EEG (A-EEG) or outpatient prolonged EEG in children has been studied for more than two decades, with an overall diagnostic yield achieved in two thirds of children.[1–3] Recent pediatric and adult data confirm similar diagnostic yields even when A-EEG is combined with video monitoring.[4,5] Furthermore, A-EEG is widely accepted by families and their referring clinicians.[6]

Compared with inpatient long-term video-EEG monitoring, A-EEG advantages include lower costs given there is no need for a hospital bed, and a more comfortable environment for children and families.[7] Technical issues affecting data interpretation from these home-recorded A-EEGs seem to account for the minority of unsuccessful studies.[2,8] The main limitation of A-EEG is the uncertainty whether the suspected events will happen during the recording because this relies on each patient's baseline seizure frequency at the time of the A-EEG request.[8] A-EEG studies that included only patients with at least three suspicious events weekly have obtained higher diagnostic rates.[1,2] Finally, if anti-seizure medication weaning is needed to capture the events, an inpatient long-term video-EEG monitoring admission should be considered to safely treat any prolonged seizures that emerge.[7] Nearly 50% of children undergoing presurgical evaluation with medication wean in long-term video-EEG monitoring may present with seizure clustering, defined at three or more seizures within any 24-hour period.[9] Therefore, an intravenous line in place is more suitable to ensure patient safety.[7]

Most A-EEG studies have reported the percentage of patients in whom events were captured and not whether the reason for testing was successfully addressed or led to a change in therapy. Further, limited information exists regarding which variables influence pediatric A-EEG utility. We investigated the utility of pediatric A-EEG at a large tertiary referral center in Canada including which variables may improve A-EEG utility. We also aimed to develop a practical pathway for pediatric A-EEG utilization based on our center's experience and literature review.

METHODS

This study was a retrospective analysis of pediatric patients aged 1 month to 17 years who underwent A-EEG at Alberta Children's Hospital from July 2019 through January 2021. We initially analyzed all patients who underwent an A-EEG during nine consecutive months. Thereafter, we continued gathering data from the two younger age groups to obtain representative samples from all age groups. Alberta Children's Hospital is a tertiary care pediatric hospital with a comprehensive Epilepsy

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Program. In current practice, all pediatric neurologists can request A-EEG, and neither a minimum baseline seizure frequency nor any particular indication is required for A-EEG. Overall, A-EEG is usually requested to confirm whether suspicious events are epileptic, to assess electrical status epilepticus in slow wave sleep (ESES), or to quantify interictal and ictal burden in epilepsy patients. However, children under investigation for epilepsy surgery undergo inpatient long-term video-EEG monitoring rather than A-EEG.

Our institutional protocol for A-EEG consists of a 16-channel ambulatory EEG system (XLTEK TREX; XLTEK, Oakville, Ontario, Canada) with a sampling rate of 256 Hz, lasting from 24 to 72 hours. In special circumstances, the recording may be extended to 96 hours. Electrodes were attached on the scalp by licensed electroneurophysiology technologists according to the 10 to 20 system using collodion. Children and/or parents were given an event diary to fill out with the timing, duration, and description of any suspicious event. Anti-seizure medications were not changed before or during the recordings.

Through chart reviews, we obtained information on patients' age, gender, A-EEG record duration, frequency of the suspected events, time between the physician request and A-EEG date, previous diagnosis of epilepsy, previous abnormal routine EEG, if events were captured, and whether A-EEG was considered useful. The primary outcome was whether the A-EEG test successfully answered the referring physician's clinical question and/or affected ongoing therapy. When it did, the A-EEG test was deemed useful.

We used the information provided by the referrals and applied the ILAE diagnostic criteria from 2017 to establish a diagnosis of epilepsy.[10] A previous abnormal routine EEG was determined by the presence of interictal or ictal changes, as well as sustained areas of focal slowing. All recordings were read and interpreted by a certified pediatric epileptologist.

The following variables were analyzed for their association with a useful A-EEG: (1) age; (2) duration of A-EEG; (3) previous diagnosis of epilepsy; (4) test indication (spell classification, ESES evaluation, and interictal and ictal burden in epileptic patients); (5) frequency of the reported events; and (6) the presence of a previous abnormal routine EEG.

A literature review was performed on PubMed using the terms "ambulatory EEG," "pediatrics," and "children." Publications in English were included according to the following criteria: minimum of 30 pediatric patients were initially screened. Study duration, number of subjects included as well as their age and frequency of the suspicious events, and outcomes analyzed by previous authors were gathered.

The data were analyzed using IBM SPSS Statistics (version 26). Categorical variables are presented in absolute numbers and percentages and quantitative data as mean, median, and SD. Group comparisons of categorical data were performed through Pearson χ^2 test. Differences on a continuous dependent variable by a categorical independent variable for two or more groups were analyzed using the Kruskal–Wallis test. A binary logistic regression model was used to compare our dependent variable with the independent variables. Because of our limited sample size, only three independent variables could be used in our logistic regression model. P values ≤ 0.05 were regarded as statistically significant. This study was approved by the local Research Ethics Board of the University of Calgary (REB21-0838).

RESULTS

One hundred forty-two A-EEGs (68 male and 74 female patients) were included in our study. The mean age was 8.8 years (SD 4.6, median 8). There were 21 children (14.8%) from 0 to 3 years of age, 33 (23.2%) from 4 to 6 years, 47 (33.1%) from 7 to 12 years, and 41 (28.9%) from 13 to 17 years. The mean duration of A-EEG was 33.5 hours (SD 13, median 23.7). Two patients had A-EEG lasting for more than 48 hours.

The main A-EEG indication was to confirm whether clinical events were epileptic in nature (60.5%, $n = 86$), followed by quantification of interictal or ictal burden in patients with known epilepsy (26.7%) and evaluation of ESES (11.3%). In two children (1.4%), A-EEG was requested for specific reasons such as worsening behavior and sleep evaluation in the context of daytime fatigue.

Patients undergoing spell classification were slightly younger than those evaluated for interictal/ictal burden and ESES events (mean age 7.9 vs. 10.3 and 9.7, $P = 0.01$). There were no statistically significant differences among the three main test indication groups with respect to gender, age group distribution, and A-EEG record duration (Table 1).

The majority of patients were previously diagnosed with epilepsy (76%, $n = 108$), and 71.8% had a previous abnormal routine EEG. One third of families (34.5%, $n = 49$) reported at least daily events, whereas 41.5% ($n = 59$) had rare or no reported events.

Overall, A-EEG was considered useful in 74.6% of patients ($n = 106$), leading to diagnostic confirmation or impacting therapeutic decisions. Events of concern were recorded in 46.4% of patients ($n = 66$). Only one study (0.7%) was deemed as not useful because of technical issues.

Group Characteristics

Differentiation Between Epileptic Versus Nonepileptic Events

Eighty-six children (40 male patients, mean age 7.9 years, SD 4.7, median 7) underwent A-EEG to clarify whether their suspicious events were epileptic or not. The mean test duration was 35.6 hours (SD 14.0, median 36.8); 61.6% ($n = 53$) of children had prior epilepsy, and 60.4% ($n = 52$) had a prior abnormal routine EEG. Of these 86 children, 38 (44.2%) had at least daily reported events before the test, but clinical events were recorded in 48 of them (55.8%). Overall, A-EEG was considered useful in 62.8% ($n = 54$) of patients. Despite of not capturing suspicious events, six A-EEG studies were classified as helpful because their results influenced clinical management: in three children, there were new interictal discharges not previously reported in routine EEGs. One patient had unexpected worsening of interictal activity, whereas two unremarkable studies helped with postsurgical management.

Quantification of Interictal or Ictal Burden in Epilepsy Patients

Thirty-eight patients (19 male patients, mean age 10.3 years, SD 4.4, median 10) had A-EEG to quantify interictal or ictal burden. The mean A-EEG test duration was 31.7 hours (SD 11.4,

TABLE 1. Patient Characteristics According A-EEG Indication, $n = 140$

	Differentiation Between Epileptic Versus Nonepileptic, n = 86	Quantification of Interictal or Ictal Burden in Epileptic Patients, n = 38	Evaluation of ESES, n = 16	P
Mean age (SD, median)	7.9 years (4.7, 7)	10.3 years (4.4, 10)	9.7 years (3.8, 10)	0.01
Age groups				0.061
0–3 years	18 (12.9%)	2 (1.4%)	1 (0.7%)	
4–6 years	23 (16.4%)	8 (5.7%)	2 (1.4%)	
7–12 years	24 (17.1%)	13 (9.3%)	9 (6.4%)	
13–17 years	21 (24.4%)	15 (10.7%)	4 (2.9%)	
Male-to-female ratio	0.87	1.0	1.0	0.92
Mean duration of recording (SD, median)	35.6 hours (14.0, 36.8)	31.7 hours (11.4, 23.5)	28.1 hours (9.6, 23.5)	0.43
A-EEG duration				0.067
24 hours	40 (28.6%)	23 (16.4%)	12 (8.6%)	
>24 hours	46 (32.9%)	15 (10.7%)	4 (2.9%)	
A-EEG helpfulness	54/86 (62.8%)	35/38 (92.1%)	15/16 (93.7%)	<0.001

A-EEG: ambulatory EEG; ESES, encephalopathy with status epilepticus during sleep.

median 23.5), and 33 patients (86.8%) had a previous abnormal routine EEG. Clinical events were recorded in 13 patients (34.2%), even though only 10 families (26.3%) had reported at least daily events. Despite not capturing events in the most patients, A-EEG was considered helpful in 92.1% because it was deemed to have successfully answered the referring clinical question. In three epilepsy patients evaluated for interictal or ictal burden, A-EEG was not considered helpful because their interictal findings were similar to the patients' baseline activity, and ictal events were not captured.

Evaluation of ESES

Sixteen patients underwent A-EEG to evaluate ESES (eight male patients, mean age 9.7 years, SD 3.8, median 10). The mean test duration was 28.1 hours (SD 9.6, median 23.5). All but one child (93.7%) had a history of epilepsy. Ambulatory-EEG was considered useful in 15 of 16 patients (93.7%) by confirming or ruling out ESES. One child had an uninterpretable A-EEG because of lack of cooperating resulting in technical issues.

Variables that May Determine Pediatric A-EEG Utility

Table 2 shows the clinical variables analyzed for association with A-EEG test utility. The test indication was associated with A-EEG usefulness ($P < 0.001$). Specifically, A-EEG was deemed useful among 93.7% of patients undergoing evaluation for ESES, among 92.1% of patients with epilepsy evaluated for interictal/ictal burden, and among 62.8% of patients evaluated for spells.

In addition, only a previous diagnosis of epilepsy ($P = 0.02$) or a prior abnormal routine EEG ($P = 0.04$) were associated with higher A-EEG test utility. Younger age ($P = 0.78$) including multiple age group comparison ($P = 0.52$), a longer test duration (>24 hours) ($P = 0.34$), and presence of daily baseline events ($P = 1.0$), or weekly baseline events ($P = 0.12$), were not associated with increased A-EEG utility.

A binary logistic regression model was used to evaluate the relationship between A-EEG helpfulness and the independent variables with significant association after the univariate analyses. Our model was able to correctly predict 73.5% of cases. The indication of A-EEG was an independent predictor ($P = 0.01$), whereas no independent association between previous diagnosis of epilepsy ($P = 0.34$) or prior abnormal routine EEG ($P = 0.61$) with A-EEG helpfulness was confirmed.

Literature Review

According to our search criteria, 10 previous studies could be included for detailed review (Table 3).[1–6,8,11–13] The number of children included ranged from 30 to 706 (mean 150.2, median 84, SD 192), and most studies recorded A-EEG for at least 24 hours. Half of the studies preselected patients for A-EEG using minimum reported frequency of clinical events.[4–6,8,13] For those who required a minimum baseline frequency of suspected events, it ranged from at least daily events to 3 times per week.[1–3,11,12] The ability to successfully capture clinical events varied largely between studies, ranging from 46% to 89%. Neither longer EEG duration nor preselecting event frequency significantly improved A-EEG yield. Interestingly, three studies

TABLE 2. Variables Analyzed to Determine Pediatric A-EEG Utility in Clinical Practice

Clinical Variables, Number of Patients	A-EEG Helpfulness		*P*
	No	Yes	
Test indication, $n = 140$			**<0.001**
Differentiation between epileptic versus nonepileptic	32 (22.9%)	54 (38.6%)	
Interictal and ictal burden in epileptic patients	03 (2.1%)	35 (25%)	
Evaluation of ESES	01 (0.7%)	15 (10.7%)	
Age groups, $n = 142$			0.78
0–3 years	6 (4.2%)	15 (10.6%)	
4–17 years	30 (21.1%)	91 (64.1%)	
Subset analysis of age groups, $n = 142$			0.52
0–3 years	6 (4.2%)	15 (10.6%)	
4–6 years	7 (4.9%)	26 (18.3%)	
7–12 years	15 (10.6%)	32 (22.5%)	
13–17 years	8 (5.6%)	33 (23.2%)	
Duration of the recording, $n = 142$			0.34
24 hours	17 (12%)	60 (42.3%)	
>24 hours	19 (13.4%)	46 (32.4%)	
Previous diagnosis of epilepsy, $n = 142$			**0.02**
Yes	22 (15.5%)	86 (60.6%)	
No	14 (9.9%)	20 (18.9%)	
Previous routine EEG, $n = 139$			**0.04**
Abnormal	22 (15.5%)	80 (58%)	
Normal	14 (10.1%)	22 (15.9%)	
Baseline frequency of the reported events, $n = 142$			0.12
At least weekly events	22 (15.5%)	48 (33.8%)	
Less than one event per week	14 (9.9%)	58 (40.8%)	
Baseline frequency of the reported events, $n = 142$			1.0
At least daily events	12 (8.5%)	37 (26.1%)	
Less than one event per day	24 (16.9%)	69 (48.6%)	

A-EEG, ambulatory EEG; ESES, encephalopathy with status epilepticus during sleep.

used video telemetry,[4–6] but their outcome was not significantly different from the other studies (events captured in 58% to 64%, answered the posed question in 59% to 77%). Including our findings, overall A-EEG was able to answer the posed question in 59% to 88% of patients (mean 71%, median 73%, SD 8.5). Two studies[8,13] have shown A-EEG success rate from 97.5% to 100% when the test was ordered to assess ESES, or to determine seizure type and localization, frequency of seizures/epileptiform discharges. These data, along with our findings, indicate that A-EEG success is largely determined by the test indication. We therefore propose a practical pathway to guide pediatric A-EEG utility (Fig. 1).

DISCUSSION

In our center, A-EEG is most frequently ordered to elucidate whether reported events are epileptic in nature. However, for this specific test indication, A-EEG has the lowest diagnostic yield although it remains very useful. According to our experience, the referring clinical question will be answered in less than two thirds of children undergoing A-EEG for unclear nature of suspected events. However, when A-EEG is ordered to evaluate ESES or interictal/ictal burden in children with known epilepsy, it will most likely be useful addressing the posed questions.

Despite the lack of synchronous video analysis along with A-EEG in most centers, the possibility of having a high diagnostic yield testing as an outpatient is certainly less disruptive and less costly.[1,14] These advantages are particularly important for epilepsy patients, who sometimes require frequent hospital visits and multiple neurophysiology and imaging tests.

Moreover, the benefits of using A-EEG in epilepsy patients go beyond its spell classification diagnostic role. An interesting study used A-EEG recordings in patients with juvenile myoclonic epilepsy aiming to identify EEG indicators of response to anti-seizure medication.[15] The authors compared A-EEG recording from patients with at least one year seizure freedom versus patients with seizure recurrence within a year. The only valid predictor of seizure recurrence was the maximum length of epileptic discharges, with a cut-off of epileptic discharge duration of 2.68 seconds (93% sensitivity and 100% specificity). It is worthwhile to note that the same analyses using standard EEG (not A-EEG) could not predict seizure recurrence.[15]

Similar to previous studies, the main indication for A-EEG in our study was to differentiate epileptic from nonepileptic spells. Although two studies initially suggested nearly 90% success rate for A-EEG in children with at least three events per week,[1,2] these results have not been replicated. In keeping with our findings, however, most literature from pediatric cohorts suggest an overall usefulness around 60% to 70%.[11,13] Although the presence of synchronized video might improve the successful

TABLE 3. Previous A-EEG Studies in Children

Reference	Study Type	Duration	No. of Children	Age Range, Median	Events Frequency	Outcomes Reported by the Authors
Foley et al. 2000	Outpatient long-term EEG	1–4 days, median 1.5 days	$n = 84$	17 months to 11 years, median 8.4 years	≥ 3 per week	Clinical question was answered in 88% of patients and 86% of suspected epilepsy. In 93% of patients with recorded seizures, information obtained resulted in therapeutic interventions, such as diagnosis reclassification, initiation or reduction of ASM, parental education regarding nonepileptic events, or referral for epilepsy surgery.
Olson 2001	A-EEG	1–4 days, mean 1.9 days	$n = 167$	4 months to 18 years, mean 7.2 years	≥ 3 per week	140 of 157 (89%) had their habitual discrete, seizure-like events recorded. A total of 107 children had nonepileptic events, 32 had epileptic events, and one child had both epileptic and nonepileptic events. The recordings were well tolerated by nearly all children; none terminated recording earlier than planned.
Saravanan et al. 2001	A-EEG	48 hours	$n = 54$	1–16 years, mean 10.2 years	≥ 1 per day	31/54 children (57.4%) experienced one of their typical clinical episodes. After A-EEG, there was no change in management in the majority (37 of 54, or 69%) of patients, but 17 patients (31%) experienced a change in their overall management.
Wirrell et al. 2008	A-EEG	15–120 hours, mean 32.7 hours (1.3 days)	$n = 64$	5 months to 17 years, mean 4.4 years	Variable, but most children had at least one per day	Contribution to the overall diagnosis in 73% of children. Clinical question was answered in 61% (27/44) of patients when A-EEG was requested to differentiate seizures from nonepileptic events, and in 100% of patients when determining seizure/interictal discharge frequency (16/16) or classifying seizure type or localization (4/4).
Hussain et al. 2013	A-EEG	24–72 hours	$n = 100$	11 days to 16 years, mean not given	≥ 1 per day	A-EEG was clinically useful in contributing to a clinical diagnosis in 71% of children. Of note, 65 of 71 patients had their events recorded within 24 hrs.
Alix et al. 2014	A-EEG	24–96 hours	$n = 30$	3–16 years, mean 10.8 years	≥ 1 every 48 hours	A-EEG captured an event of interest in 66% (20/30) and it answered the question posed in 63% (19/30) of children.
Carlson et al. 2018	Video A-EEG	24–72 hours, median 48 hours	$n = 33$	1–15 years, mean 6.7 years	NS	A-EEG (named as home video telemetry) captured an ictal event in 64% of children and answered the clinical question in 59%. There were no significant differences between home video telemetry and inpatient video telemetry in mean number of events captured and answering the question posed.
Nagyova et al. 2019	A-EEG	0.3–48 hours, mean 22.1 hours, median 23 hours	$n = 199$	5 months to 19 years, mean 7.9 years, median 8 years	Variable, from ≥ 1 per day to <one per month	A-EEG was useful in 64.8% cases overall (42.6% when the goal was to capture events, 53.8% to aid syndromic diagnosis, and 97.5% for suspected ESES) and partially useful in 2.5%. Noncapturing suspected events was the most common reason for a failed A-EEG. Technical issues were only responsible for 9.7% of unsuccessful studies.
Syed et al. 2019	Video A-EEG	3 days (IQR 2–3)	$n = 706$	Median 11 (IQR 7–15) years	NS	56.1% of children had at least one patient-activated PB event captured on video; 72.5% of children had interictal epileptiform discharges, electrographic seizures, or at least one PB event captured on video.
DiGiovine et al. 2020	Video A-EEG	~24 hours, but NS	$n = 74$	Median 9 (IQR 6–14) years	NS	58% of children had events, and 60% of those were well seen on video; 77% of studies answered the posed question and 97% of the referring clinicians reported that video A-EEG avoided an admission for inpatient video EEG monitoring; 84% of caregivers reported preferring video A-EEG if EEG data were needed in the future. EEG and video quality were satisfactory in 100% and 92% of patients, respectively.
Present study	A-EEG	24–96 hours, mean 33.5 hours, median 23.7 hours	$n = 142$	1 month to 17 years, mean age 8.8 years, SD 4.6, median 8 years	NS	Events were recorded in 46.4% of patients ($n = 66$) included, which represents 52.3% of the non-ESES sample (66 of 126). A-EEG was considered helpful in 74.6% of patients ($n = 106$) with diagnosis confirmation or exclusion, and/or therapeutic decisions.

A-EEG, ambulatory EEG; ASM, anti-seizure medication; ESES, encephalopathy with status epilepticus during sleep; IQR, interquartile range; NS, not specified; PB, push-button.

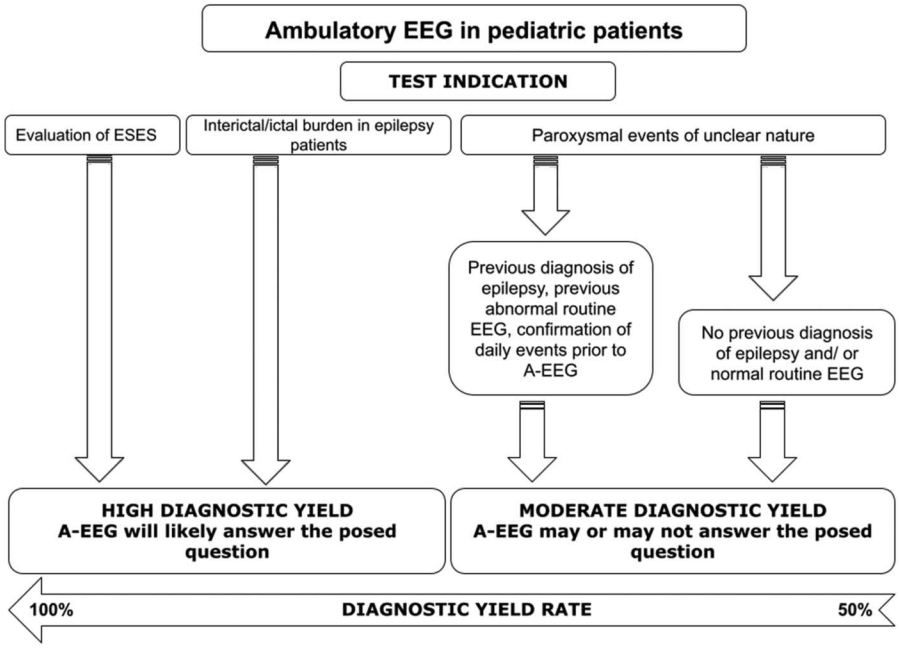

FIG 1. Proposed pathway for guiding pediatric. A-EEG use in clinical practice.

rates of A-EEG, this technology is still not available in most epilepsy centers. A prospective quality improvement study evaluating 74 consecutive A-EEG studies with video in children has shown that 84% of caregivers would prefer this option rather than an admission for video EEG. Most importantly, the quality of the video was rated by the electroencephalographers as excellent or adequate in 92% of the studies. Unfortunately, out of 43 reported events, 17 (39.5%) were poorly or not seen on video.[6] Indeed, one possible explanation for the similar successful rates obtained by A-EEG with and without video is that patients may move out of the camera's range during the suspicious events.[4–6,14] Over time, when A-EEG with synchronized video technology becomes widely available, we may have more robust data regarding its helpfulness in clinical practice.

Some intuitive strategies to potentially increase the diagnostic yield of A-EEG include: (1) preselection of children in whom reported events frequency is high, to ensure that these would be captured while the patient is monitored; (2) setting up a telephone check 1 week before the test, confirming that the concerning events are still happening at the same frequency;[12] (3) given that multiple routine EEGs may ensure high diagnostic yields of interictal activity, maybe extending the duration of A-EEG beyond 24 hours could also be helpful.[7,16]

However, currently, there is no evidence that pediatric A-EEG diagnostic yield is superior with a higher frequency of baseline events. In our study, patients with at least daily events did not have increased A-EEG utility. This was also true when assessed for at least weekly events. As a minor caveat, we were not able to standardize the frequency of events as a continuous variable for this study, given the retrospective data gathering of dichotomized possibilities used in our center. Obtaining the baseline frequency of the events as a continuous variable before A-EEG would be a more appropriate methodology in future studies. Certainly, the frequency of baseline events can change from the time the A-EEG was requested to when it was performed (sometimes months later). Not surprisingly, calling patients 1 week before the test to confirm spell frequency can lead to an increased frequency of actually capturing events (68% to 84%).[12]

Interestingly, a longer A-EEG duration does not necessarily portend increased utility. For instance, one study observed that when events were successfully captured, >90% of these occurred within the first 24 hours.[12] Similarly, we failed to demonstrate that longer A-EEG duration (>24 hours) improved diagnostic yield, although this variable could not be included in the multivariate analysis because of our small sample size. Perhaps in the future, newer technologies such as dry EEG systems could improve A-EEG success. Compared with a traditional wet EEG system, dry EEG is less sensitive to electromagnetic interference from environmental noise and has better acceptance from patients. Moreover, dry EEG wireless connectivity and high-input impedance are additional benefits for long-term recordings obtained from home.[17,18]

Although increasing the recording duration to more than 24 hours does not ensure a successful A-EEG, the diagnostic yield is significantly higher in patients with a prior diagnosis of epilepsy or those with a prior abnormal routine EEG, even though these outcome predictors should not be used independently to predict A-EEG helpfulness because no statistical significance was achieved after a multivariate analysis. However, test indication remains the most relevant indicator of A-EEG utility. Among those evaluated for ESES and among epilepsy patients evaluated for interictal/ictal burden, A-EEG is almost always useful. For patients without epilepsy evaluated for suspicious events, the A-EEG diagnostic yield is moderate. Our proposed pathway for guiding the utilization of pediatric A-EEG reflects these study findings and remains consistent with prior literature (Fig. 1).

However, our study remains single center, retrospective, and contains relatively small numbers when categorized by A-EEG

indication. Ideally, a multicenter prospective study would better evaluate those variables associated with a useful A-EEG.

In conclusion, A-EEG is a useful resource for pediatric patients in clinical practice, particularly for evaluation of interictal and ictal burden in epilepsy patients and to evaluate ESES. The diagnostic yields for these indications surpass 90%. In our experience, A-EEG may elucidate the diagnosis almost two-thirds of children with paroxysmal events of unclear nature. The test indication was an independent outcome predictor of obtaining a helpful A-EEG, whereas a previous diagnosis of epilepsy and an abnormal routine EEG before A-EEG might increase the helpfulness rates in certain patients. Ambulatory-EEG duration longer than 24 hours and a higher frequency of baseline reported events at the time of the requisition were not associated increased chances of obtaining a helpful A-EEG.

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