Appendix 1

PRISMA 2020 Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	-
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	-
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Ch. 1
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Ch. 2.2
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Ch. 2.4
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Ch. 2.3 Appendix S2
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Appendix S2
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Ch. 2.4
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Ch. 2.4
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Ch. 2.4 Tables S1-S8
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	Ch. 2.5 Tables S1-S8
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Ch. 2.5
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	not applicable (NA)

Section and Topic	Item #	Checklist item	Location where item is reported
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	NA
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	NA
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	NA
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	Ch. 2.5
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	NA
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	NA
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	NA
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome (for example GRADE, describe decision rules)	Ch. 2.6
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	S1A-E
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded. (At a minimum, a list of studies that might appear to meet the inclusion criteria but which were excluded, with citation and a reason for exclusion, should be reported.)	NA
Study characteristics	17	Cite each included study and present its characteristics.	Tables S1-S8
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	Tables S9-S14
Results of individual studies	19	For all outcomes, present, **for each study**: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	Tables S2-6 or NA
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	Ch. 3.1, 3.2, 3.3, 3.4 and 3.5
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	NA
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	NA
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	NA
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	NA

Section and Topic	Item #	Checklist item	Location where item is reported
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	Ch. 3.1.1, 3.2, 3.3.1, 3.4.4and 3.5.4
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Ch. 3.6
	23b	Discuss any limitations of the evidence included in the review.	Ch. 3.6
	23c	Discuss any limitations of the review processes used.	Ch. 3.6
	23d	Discuss implications of the results for practice, policy, and future research.	Ch. 3.6
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	Ch. 2.3
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	Ch. 2.4
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	NA
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	page 23
Competing interests	26	Declare any competing interests of review authors.	page 23
Availability of data, code and other materials	27	**Report which of the following are publicly available and where** they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	Tables S1-S9 data extracted

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71
For more information, visit: http://www.prisma-statement.org/

Appendix 2

Search strategy in Pubmed and Embase

Clinical question 1

(((""routine EEG"") OR (""outpatient EEG"")) OR (""sleep EEG"")) AND (indication OR referral)",,"English, from 1990/1/1 - 2019/10/20","((""routine EEG""[All Fields] OR ""outpatient EEG""[All Fields] OR ""sleep EEG""[All Fields]) AND (""indication""[All Fields] OR ""indications""[All Fields] OR (""referral and consultation""[MeSH Terms] OR (""referral""[All Fields] AND ""consultation""[All Fields]) OR ""referral and consultation""[All Fields] OR ""referral""[All Fields] OR ""referrals""[All Fields] OR ""referrer""[All Fields] OR ""referrers""[All Fields]))) AND ((1990/1/1:2019/10/20[pdat]) AND (english[Filter]))

Clinical question 2

(("electroencephalography"[MeSH Terms] OR "electroencephalography" (All Fields] OR "eeg"[All Fields]) AND (("standards"[All Fields] OR "reference standards"[All Fields) OR "standardization"[All Fields] OR "standard"[All Fields] OR "standard s"[All Fields] OR "standardisation"[All Fields] OR "standardisations"[All Fields] OR "standardise"[All Fields] OR "standardised"[All Fields] OR "standardises"[All Fields] OR "standardising"[All Fields] OR "standardizations"[All Fields] OR "standardize"[All Fields] OR "standardized"[All Fields] OR "standardizes"[All Fields] OR "standardizing" [All Fields] OR "standards"[MeSH Subheading] OR "standards"[All Fields] OR “technical”[All Fields] OR ("minimum"[All Fields] OR "minimums"[All Fields]) OR (“impedance”[All Fields] OR “impedances”[All Fields]) AND ((humans[Filter]) AND (1990:2019/12/31[pdat]) AND (english[Filter]))

Clinical question 3

(("routine"[All Fields] OR "routinely"[All Fields] OR "routines"[All Fields] OR "routinization"[All Fields] OR "routinize"[All Fields] OR "routinized"[All Fields] OR "routinizing"[All Fields] OR ("reference standards"[MeSH Terms] OR ("reference"[All Fields] AND "standards"[All Fields]) OR "reference standards"[All Fields] OR "standardization"[All Fields] OR "standard"[All Fields] OR "standard s"[All Fields] OR "standardisation"[All Fields] OR "standardisations"[All Fields] OR "standardise"[All Fields] OR "standardised"[All Fields] OR "standardises"[All Fields] OR "standardising"[All Fields] OR "standardization s"[All Fields] OR "standardizations"[All Fields] OR "standardize"[All Fields] OR "standardized"[All Fields] OR "standardizes"[All Fields] OR "standardizing"[All Fields] OR "standards"[MeSH Subheading] OR "standards"[All Fields]) OR ("sleep"[MeSH Terms] OR "sleep"[All Fields] OR "sleeping"[All Fields] OR "sleeps"[All Fields] OR "sleep s"[All Fields])) AND ("electroencephalography"[MeSH Terms] OR "electroencephalography"[All Fields] OR "eeg"[All Fields]) AND ("minimum"[All Fields] OR "minimums"[All Fields] OR ("optimal"[All Fields] OR "optimality"[All Fields] OR "optimally"[All Fields] OR "optimization"[All Fields] OR "optimizations"[All Fields] OR "optimize"[All Fields] OR "optimized"[All Fields] OR "optimizer"[All Fields] OR "optimizers"[All Fields] OR "optimizes"[All Fields] OR "optimizing"[All Fields]) OR "best"[All Fields]) AND ("diagnosable"[All Fields] OR "diagnosi"[All Fields] OR "diagnosis"[MeSH Terms] OR "diagnosis"[All Fields] OR "diagnose"[All Fields] OR "diagnosed"[All Fields] OR "diagnoses"[All Fields] OR "diagnosing"[All Fields] OR "diagnosis"[MeSH Subheading] OR ("diagnosis"[MeSH Terms] OR "diagnosis"[All Fields] OR "diagnostic"[All Fields] OR "diagnostical"[All Fields] OR "diagnostically"[All Fields] OR "diagnostics"[All Fields])) AND ("duration"[All Fields] OR "durations"[All Fields])) AND ((humans[Filter]) AND (1990:2019/9/27[pdat]) AND (english[Filter]))

Clinical question 4

(("sleep"[MeSH Terms] OR "sleep"[All Fields] OR "sleeping"[All Fields] OR "sleeps"[All Fields] OR "sleep s"[All Fields]) AND (("electroencephalography"[MeSH Terms] OR "electroencephalography"[All Fields] OR "eeg"[All Fields]) AND ("record s"[All Fields] OR "recordability"[All Fields] OR "recordable"[All Fields] OR "recordables"[All Fields] OR "recorded"[All Fields] OR "recorder"[All Fields] OR "recorders"[All Fields] OR "recording"[All Fields] OR "recordings"[All Fields] OR "records"[MeSH Terms] OR "records"[All Fields] OR "record"[All Fields])) AND ("diagnosable"[All Fields] OR "diagnosi"[All Fields] OR "diagnosis"[MeSH Terms] OR "diagnosis"[All Fields] OR "diagnose"[All Fields] OR "diagnosed"[All Fields] OR "diagnoses"[All Fields] OR "diagnosing"[All Fields] OR "diagnosis"[MeSH Subheading] OR ("diagnosis"[MeSH Terms] OR "diagnosis"[All Fields] OR "diagnostic"[All Fields] OR "diagnostical"[All Fields] OR "diagnostically"[All Fields] OR "diagnostics"[All Fields])) AND ("melatonin"[MeSH Terms] OR "melatonin"[All Fields] OR "melatonin s"[All Fields] OR "melatonine"[All Fields] OR "melatonins"[All Fields] OR ("sleep deprivation"[MeSH Terms] OR ("sleep"[All Fields] AND "deprivation"[All Fields]) OR "sleep deprivation"[All Fields]) OR ("inducted"[All Fields] OR "inducting"[All Fields] OR "induction"[All Fields] OR "inductions"[All Fields]))) AND ((humans[Filter]) AND (1990:2019/10/12[pdat]) AND (english[Filter]))

Clinical question 5

(((((("reference standards"[MeSH Terms] OR ("reference"[All Fields] AND "standards"[All Fields]) OR "reference standards"[All Fields] OR "standardization"[All Fields] OR "standard"[All Fields] OR "standard s"[All Fields] OR "standardisation"[All Fields] OR "standardisations"[All Fields] OR "standardise"[All Fields] OR "standardised"[All Fields] OR "standardises"[All Fields] OR "standardising"[All Fields] OR "standardization s"[All Fields] OR "standardizations"[All Fields] OR "standardize"[All Fields] OR "standardized"[All Fields] OR "standardizes"[All Fields] OR "standardizing"[All Fields] OR "standards"[MeSH Subheading] OR "standards"[All Fields]) AND ("electroencephalography"[MeSH Terms] OR "electroencephalography"[All Fields] OR "eeg"[All Fields])) OR (("routine"[All Fields] OR "routinely"[All Fields] OR "routines"[All Fields] OR "routinization"[All Fields] OR "routinize"[All Fields] OR "routinized"[All Fields] OR "routinizing"[All Fields]) AND ("electroencephalography"[MeSH Terms] OR "electroencephalography"[All Fields] OR "eeg"[All Fields]))) AND ("hyperventilation"[MeSH Terms] OR "hyperventilation"[All Fields] OR "hyperventilate"[All Fields] OR "hyperventilated"[All Fields] OR "hyperventilates"[All Fields] OR "hyperventilating"[All Fields] OR "hyperventilations"[All Fields] OR "hyperventilators"[All Fields])) OR ((((("reference standards"[MeSH Terms] OR ("reference"[All Fields] AND "standards"[All Fields]) OR "reference standards"[All Fields] OR "standardization"[All Fields] OR "standard"[All Fields] OR "standard s"[All Fields] OR "standardisation"[All Fields] OR "standardisations"[All Fields] OR "standardise"[All Fields] OR "standardised"[All Fields] OR "standardises"[All Fields] OR "standardising"[All Fields] OR "standardization s"[All Fields] OR "standardizations"[All Fields] OR "standardize"[All Fields] OR "standardized"[All Fields] OR "standardizes"[All Fields] OR "standardizing"[All Fields] OR "standards"[MeSH Subheading] OR "standards"[All Fields]) AND ("electroencephalography"[MeSH Terms] OR "electroencephalography"[All Fields] OR "eeg"[All Fields])) OR (("routine"[All Fields] OR "routinely"[All Fields] OR "routines"[All Fields] OR "routinization"[All Fields] OR "routinize"[All Fields] OR "routinized"[All Fields] OR "routinizing"[All Fields]) AND ("electroencephalography"[MeSH Terms] OR "electroencephalography"[All Fields] OR "eeg"[All Fields]))) AND ("photic"[All Fields] OR "photically"[All Fields])) OR ((((("reference standards"[MeSH Terms] OR ("reference"[All Fields] AND "standards"[All Fields]) OR "reference standards"[All Fields] OR "standardization"[All Fields] OR "standard"[All Fields] OR "standard s"[All Fields] OR "standardisation"[All Fields] OR "standardisations"[All Fields] OR "standardise"[All Fields] OR "standardised"[All Fields] OR "standardises"[All Fields] OR "standardising"[All Fields] OR "standardization s"[All Fields] OR "standardizations"[All Fields] OR "standardize"[All Fields] OR "standardized"[All Fields] OR "standardizes"[All Fields] OR "standardizing"[All Fields] OR "standards"[MeSH Subheading] OR "standards"[All Fields]) AND ("electroencephalography"[MeSH Terms] OR "electroencephalography"[All Fields] OR "eeg"[All Fields])) OR (("routine"[All Fields] OR "routinely"[All Fields] OR "routines"[All Fields] OR "routinization"[All Fields] OR "routinize"[All Fields] OR "routinized"[All Fields] OR "routinizing"[All Fields]) AND ("electroencephalography"[MeSH Terms] OR "electroencephalography"[All Fields] OR "eeg"[All Fields]))) AND (("eye"[MeSH Terms] OR "eye"[All Fields]) AND ("closure"[All Fields]

OR "closure s"[All Fields] OR "closures"[All Fields]))) OR ((((("reference standards"[MeSH Terms] OR ("reference"[All Fields] AND "standards"[All Fields]) OR "reference standards"[All Fields] OR "standardization"[All Fields] OR "standard"[All Fields] OR "standard s"[All Fields] OR "standardisation"[All Fields] OR "standardisations"[All Fields] OR "standardise"[All Fields] OR "standardised"[All Fields] OR "standardises"[All Fields] OR "standardising"[All Fields] OR "standardization s"[All Fields] OR "standardizations"[All Fields] OR "standardize"[All Fields] OR "standardized"[All Fields] OR "standardizes"[All Fields] OR "standardizing"[All Fields] OR "standards"[MeSH Subheading] OR "standards"[All Fields]) AND ("electroencephalography"[MeSH Terms] OR "electroencephalography"[All Fields] OR "eeg"[All Fields])) OR (("routine"[All Fields] OR "routinely"[All Fields] OR "routines"[All Fields] OR "routinization"[All Fields] OR "routinize"[All Fields] OR "routinized"[All Fields] OR 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AND ("electroencephalography"[MeSH Terms] OR "electroencephalography"[All Fields] OR "eeg"[All Fields]))) AND ("provocated"[All Fields] OR "provocating"[All Fields] OR "provocation"[All Fields] OR "provocational"[All Fields] OR "provocations"[All Fields] OR "provocative"[All Fields]))) AND ((humans[Filter]) AND (1990/1/1:2019/10/31[pdat]) AND (english[Filter]))

Appendix 3

Delphi Questionnaire Part 1.1

Minimum technical requirements for routine and sleep EEG recordings

Unless otherwise stated, please answer these questions based on what you consider to be the optimal technical setup and/or approach, even if this is not something that you can implement at your site due to local restrictions and/or limitations.

1. Routine EEG

1.1. Scalp electrodes for Routine EEG

- Do you use disc electrodes individually applied Yes ☐ / No ☐
- If you use disc electrodes individually applied, what type of electrodes do you use?
    - Gold cup electrodes? Yes ☐ / No ☐
    - Silver silver-chloride electrodes? Yes ☐ / No ☐
- Do you think that these alternative EEG electrode approaches produce signal quality which is adequate for clinical practice?
    - Head caps? Yes ☐ / No ☐
    - Dry electrode recording systems? Yes ☐ / No ☐
- Do you use MRI-compatible silver-chloride-impregnated plastic electrodes for some recordings? Yes ☐ / No ☐
- Do you use needle electrodes for some recordings? Yes ☐ / No ☐

1.2 Number of electrodes used for Routine EEG

- How many electrodes should be used for routine EEG?

- ☐ Standard 10-20 montage (19 electrodes)
- ☐ IFCN extended montage (with subtemporal electrodes as per Seeck et al. 2017; which is 25 electrodes)
- ☐ More electrodes than IFCN extended montage?
    - If so, how many electrodes? _____

- How many electrodes do you use for routine EEG at your site?

- ☐ Standard 10-20 montage (19 electrodes)
- ☐ IFCN extended montage (with subtemporal electrodes as per Seeck et al. 2017; which is 25 electrodes)
- ☐ More electrodes than IFCN extended montage?
    - If so, how many electrodes? _____

1.3 What additional channels should be recorded for Routine EEGs?

- ECG channel – Yes ☐ / No ☐) – if yes, how many ECG channels? _____
- EMG channel – Yes ☐ / No ☐ – if yes, how many EMG channels? _____
  If yes, where are EMG channels located? _____
- Synchronized video -- Yes ☐ / No ☐

What additional channels do you record with Routine EEG at your site?

- ECG channel -- Yes ☐ / No ☐ if yes, how many ECG channels? _____
- EMG channel -- Yes ☐ / No ☐ if yes, how many EMG channels? _____
  If yes, where are EMG channels located? _____
- Do you record synchronized video with all routine EEG recordings? Yes ☐ / No ☐
  - If you only record synchronized video with some of your routine EEG recordings, in what types of studies do you record video? _____

1.4 Maximum recommended input impedance:

- ☐ 5 kOhm
- ☐ 10 kOhm
- ☐ Other maximum impedance? _____

1.5 Minimum sampling rate:

- ☐ 256 Hz
- ☐ 512 Hz
- ☐ Other maximum sampling rate? _____

1.6 Digital filtering for review of EEG – low-pass (high frequency) filter setting
Please enter low-pass filter setting: _____ (70 Hz is typical)

1.7 Digital filtering for review of EEG – high-pass (low frequency) filter setting
Please enter low-pass filter setting: _____ (0.5 or 1.0 Hz is typical)

1.8 Display settings

- Indicate minimum screen resolution for display of waveforms: ____ µV/mm (7 µV/mm is typical)
- Can you change gain of channels? Yes ☐ / No ☐
- Can you change time resolution of display (temporal size of display window, eg. 10 sec versus 20 sec) Yes ☐ / No ☐
- Can you apply a 50 Hz or 60 Hz notch filter? Yes ☐ / No ☐
- Can you display voltage map at a timepoint so that all IFCN criteria for spike definition can be assessed? (Kane et al., 2017) Yes ☐ / No ☐
- Can you add annotations to the EEG recording during EEG review? Yes ☐ / No ☐

1.9 Archiving of Routine EEG

- Do you archive the EEG of the entire Routine EEG recording? Yes ☐ / No ☐

- Do you archive the video in the entire Routine EEG recording Yes ☐ / No ☐

2.0 Data Format

- Have you ever tried to decode and analyze EEG data in the format in which it was originally recorded? Yes ☐ / No ☐
- If you have tried to decode and analyze EEG data in the format in which it was originally recorded, were you successful in reading the EEG data? Yes ☐ / No ☐
- Are you able to export European Data Format (EDF) files from you EEG system?
  Yes ☐ / No ☐

Delphi Questionnaire Part 1.2

Minimum technical requirements for routine and sleep EEG recordings

1. Routine EEG

1.2 Number of electrodes used for Routine EEG

Although most participants responded that they use the standard 10-20 (19 electrode) array for routine EEG, please note that the IFCN released guidelines for a new 25 electrode montage in 2017 (see publication attached to the email).

How many electrodes should be used for routine EEG?

- ☐ Standard 10-20 montage (19 electrodes)
- ☐ IFCN extended montage (with subtemporal electrodes as per Seeck et al. 2017; which is 25 electrodes) unless the patient cannot cooperate with this.

1.3 What additional channels should be recorded for Routine EEGs?

In patients with suspected motor phenomena, how many EMG electrodes should be recorded?

- ☐ Two EMG channel What additional channels do you record with Routine EEG at your site?
- ☐ More than two EMG channels. Please indicate how many: _____

1.5 Minimum sampling rate:

Minimum sampling rate for recording EEG:

- ☐ 256 Hz
- ☐ 512 Hz

1.9 Archiving of Routine EEG

Do you archive the video in the entire Routine EEG recording?

- ☐ Keep the video for all routine EEG recordings
- ☐ Keep the video only for routine EEG recordings which contain relevant clinical events.

2.1 Data Format

- Have you tested whether or not you are able to export European Data Format (EDF) files from you EEG system? Yes ☐ / No ☐
- If you have tested whether or not you are able to export European Data Format (EDF) files, is your EEG system able to do this? Yes ☐ / No ☐

After the Part 1.2 consensus discussion was needed for the suggested electrode array.

Delphi Questionnaire Part 2.1

What should be a minimum duration of a routine and sleep-deprived EEG to be optimally diagnostic?

Should sleep deprivation (partial or all night/24h) used to obtain sleep?

1. What would be an optimal duration of routine EEG for adults?
a) 15 min
b) 20 min
c) 30 min

2. What would be an optimal duration of routine EEG for children?
a) 15 min
b) 20 min
c) 30 min

3. What would be an optimal duration of sleep-deprived EEG for adults?
a) 30 min
b) 40 min
b) >40 min

4. What would be an optimal duration of sleep-deprived EEG for children?
a) 30 min
b) 40 min
b) >40 min

(All recordings include hyperventilation and photic stimulation.)

5. Do you think that we should recommend individualized duration of routine EEG for inpatients and outpatients?
a) yes
b) no

6. Do you think that we should include recommendation for a tailored routine EEG or sleep-deprived EEG for specific indications? Examples: juvenile myoclonus epilepsy (morning EEG), suspicion of infantile spasms (extended sleep-deprived EEG with 15-20 min awake after sleep), CSWS (minimum duration of sleep)?
a) yes
b) no

If you answered yes, please specify the indications where “routine tailoring” would be optimal in your opinion:

Which primary (other methods can be used in addition if that fails) sleep induction method should be used in children?
a) Partial sleep deprivation
b) Melatonin
c) Other sleep-inducing drug than melatonin
d) Partial sleep deprivation combined with melatonin
e) Partial sleep deprivation combined with other sleep-inducing drug than melatonin
f) None

Which primary sleep induction method should be used in adults?
a) Partial sleep deprivation
b) Melatonin
c) Other sleep inducing-drug than melatonin
d) Partial sleep deprivation combined with melatonin
e) Partial sleep deprivation combined with other sleep-inducing drug than melatonin
f) None

Which sleep-inducing method should be used if the primary method fails attain sleep ?
a) Partial sleep deprivation
b) Melatonin
c) Chloral hydrate
d) Hydroxyzine
e) Other
f) None

If the primary sleep-inducing drug is not available, which drug could be used alternatively?
a) Melatonin
b) Chloral hydrate
c) Hydroxyzine
d) Other
e) None

How much is the most appropriate dose of melatonin for children aged 1 – 4 years?
a) 2 mg
a) 3 mg
b) 5-6 mg

How much is the most appropriate dose of melatonin for children aged 5 – 15 years?
a) 3 mg
b) 5-6 mg
c) 10 mg

How much is the most appropriate dose of melatonin for adults and children aged >15 years?
a) 5-6 mg
b) 10 mg
c) Other dose

Should the guideline include a recommendation for a protocol of partial sleep deprivation?
a) Yes
b) No

Delphi Questionnaire Part 2.2

What should be a minimum duration of a routine and sleep-deprived EEG to be optimally diagnostic?

Should sleep deprivation (partial or all night/24h) used to obtain sleep?

Five experts suggested partial sleep deprivation for the primary sleep induction method in children. However, four experts supported the use of melatonin either alone (2 votes) or in a combination with the partial sleep deprivation (2 votes). This indicates that there might be a need for a more flexible recommendation for children than partial sleep deprivation only. There was no consensus of melatonin dosage.
New questions:
The most appropriate dose of melatonin for acute sleep induction is

a) 2-3 mg for children aged 1-4 years, 3-5 mg for children > 4 years and adolescents and 5-6 mg for adults (Wassmer et al. 2001, Gustafsson et al. 2015, Alix et al. 2019, Sander et al. 2012)
b) 3 mg for children < 40 kg and 5 mg for children > 40 kg and adults (Bruni et al. 2015).

Proposals for the protocol of partial sleep deprivation:

	Children aged < 1 year	Children aged 1-5 years	Children aged 6-12 years	Children aged > 12 years	Adults
Instructions Option 1	Stay awake at least 1 hour prior to the EEG.	Go to sleep as habitual. Stay awake after 5 AM.	Go to sleep two hours later than usual. Stay awake after 5 AM.	Go to sleep two hours later than usual but no later than 00 AM. Stay awake after 4 AM.	Go to sleep at 00 AM. Stay awake after 04 AM
Instructions Option 2	Stay awake at least 3 hours prior to the EEG.	Go to sleep as habitual. Wake up two hours earlier than usual and stay awake until the EEG.*	Go to sleep two hours later than usual and wake up two hours earlier than usual. Stay awake until the EEG*.	Go to sleep two hours later than usual, but at the latest at 00 AM. Stay awake from 04 AM*.	Go to sleep sleep at 00 AM. Stay awake after 04 AM.

*Sleep EEG recording before noon.

Do you prefer for a sleep deprivation method

a) Option 1 ?
b) Option 2 ?

Do you want to present a different proposal?

After the Part 2.2 consensus discussion was needed for the primary and secondary sleep induction methods and protocol of partial sleep deprivation.

Delphi Questionnaire Part 3.1

Activation methods for routine EEG recordings

1. Hyperventilation

1.1. Duration, Timing and Preparation

- Is hyperventilation (HV) a standard procedure during standard/ routine EEG in your EEG-lab?
  Yes ☐ / No ☐ / Not enough information ☐
- What is the minimum duration of HV in your EEG-lab?
  - 1 minute Yes ☐ / No ☐
  - 2 minutes Yes ☐ / No ☐
  - 3 minutes Yes ☐ / No ☐
  - 4 minutes Yes ☐ / No ☐
  - 5 minutes Yes ☐ / No ☐
  - Other, please specify…….

- Do you use different times for certain patient groups?
  - Yes ☐ , please specify…..
  - No ☐

- How long is the standard POST-HV surveillance?
  - 1 minute Yes ☐ / No ☐
  - 2 minutes Yes ☐ / No ☐
  - 3 minutes Yes ☐ / No ☐
  - 4 minutes Yes ☐ / No ☐
  - 5 minutes Yes ☐ / No ☐
  - Other, please specify……..
  - Do you use different times for certain patient groups?
    - Yes ☐ , please specify…..
    - No ☐
- Timing of HV procedure:
  - First third of EEG Yes ☐ / No ☐
  - Second third of EEG Yes ☐ / No ☐
  - Third third of EEG Yes ☐ / No ☐
  - Other, please specify……..
  - Do you use different timings for certain patient groups?
    - Yes ☐ , please specify…..
    - No ☐
- Preparation for HV procedure:
  - Do you recommend to titrate down anti-seizure drugs (ASD) before EEG? Yes ☐ / No ☐
  - Do you recommend to skip morning dose of ASD before EEG? Yes ☐ / No ☐
  - Other, please specify……..
  - Do you use different timings for certain patient groups?
    - Yes ☐ , please specify…..
    - No ☐

1.2. Measurement

a. Do you set a certain respiratory rate for HV?
   - 12-15 breaths /min Yes ☐ / No ☐
   - 15-20 breaths /min Yes ☐ / No ☐
   - Other, please specify……..

- Do you use different rates for certain patient groups?
  - Yes ☐ , please specify…..
  - No ☐

b. How do you measure the patient`s respiratory rate?
- Technician counts number of respirations Yes ☐ / No ☐
- Technical device counts number of respirations Yes ☐ / No ☐
- Number of respirations are not counted Yes ☐ / No ☐
- Other, please specify……..
- Do you use different counting methods for certain patient groups?
  - Yes ☐ , please specify…..
  - No ☐

c. Do you use clinical symptoms or signs to titrate HV?
- Numbness/ tingling of perioral regions and fingers
  - HV is adequate with these phenomena Yes ☐ / No ☐
  - HV is too intensive with these phenomena Yes ☐ / No ☐
- Other, please specify……..
- Do you use different clinical parameters for certain patient groups?
  - Yes ☐ , please specify…..
  - No ☐

d. What read-out do you use?
  - Epileptiform discharges Yes ☐ / No ☐
  - Focal slowing Yes ☐ / No ☐
  - Bifrontal delta Yes ☐ / No ☐
- Other, please specify……..
- Do you use different read-out parameters for certain patient groups?
  - Yes ☐ , please specify…..
  - No ☐

1.3. Contraindications

a. Do you apply contraindications?
- No contraindications Yes ☐ / No ☐
- Sickle cell disease Yes ☐ / No ☐
- Recent (3 months) myocardial infarction Yes ☐ / No ☐
- Pregnancy Yes ☐ / No ☐

        i. Only certain periods in pregnancy, please specify:…….
    - Cerebrovascular events Yes ☐ / No ☐
        i. At any time before Yes ☐ / No ☐
        ii. Last month Yes ☐ / No ☐
        iii. Other time since event, please specify:……..
    - Other, please specify……..
    - Do you use specific contraindications for certain patient groups?
        i. Yes ☐ , please specify…..
        ii. No ☐
b. How are contraindications communicated to the EEG-technician?
    - Contraindications are mandatory info boxes (tick-off) in electronic referral: Yes ☐ / No ☐
    - Contraindications are mandatory info boxes (tick-off) on paper referral: Yes ☐ / No ☐
    - Contraindications may be inserted in free entry box on referral: Yes ☐ / No ☐
    - Contraindications need to be asked for systematically by EEG-technicians: Yes ☐ / No ☐
    - Contraindications need to be reported by patient: Yes ☐ / No ☐
    - Other, please specify……..
    - Do you use specific communication forms for certain patient groups?
        - Yes ☐ , please specify…..
        - No ☐

2. Photostimulation

2.1. Technical parameters

a. Is photic stimulation (PS) a standard procedure during standard/ routine EEG in your EEG-lab?
   Yes ☐ / No ☐ / Not enough information ☐
b. What is the minimal stimulation frequency during PS in your EEG-lab?
    - 1 Hz Yes ☐ / No ☐
    - 3 Hz Yes ☐ / No ☐
    - 6 Hz Yes ☐ / No ☐
    - Other, please specify……..
    - Do you use different times for certain patient groups?
        - Yes ☐ , please specify…..
        - No ☐
c. What is the maximal stimulation frequency during PS in your EEG-lab?
    - 18 Hz Yes ☐ / No ☐

- 24 Hz Yes ☐ / No ☐
- 30 Hz Yes ☐ / No ☐
- Other, please specify…….
- Do you use different times for certain patient groups?
  - Yes ☐ , please specify…..
  - No ☐

d. What is the minimal stimulation duration for a certain stimulation rate, e.g. 12 Hz, in your EEG-lab?
- 1 second Yes ☐ / No ☐
- 2 seconds Yes ☐ / No ☐
- 3 seconds Yes ☐ / No ☐
- Other, please specify…….
- Do you use different times for certain patient groups?
  - Yes ☐ , please specify…..
  - No ☐

e. What is the <u>maximal</u> stimulation duration for a certain stimulation rate in your EEG-lab?
- 4 second Yes ☐ / No ☐
- 5 seconds Yes ☐ / No ☐
- 6 seconds Yes ☐ / No ☐
- Other, please specify…….
- Do you use different times for certain patient groups?
  - Yes ☐ , please specify…..
  - No ☐

f. What frequencies do you consider as “absolutely essential” for PS?
- 1 Hz ☐ / 2 Hz ☐ / 3 Hz ☐ / 4 Hz ☐ / 5 Hz ☐ / 6 Hz ☐ / 7 Hz ☐ / 8 Hz ☐ /
- 9 Hz ☐ / 10 Hz ☐ / 11 Hz ☐ / 12 Hz ☐ / 13 Hz ☐ / 14 Hz ☐ / 15 Hz ☐ / 16 Hz ☐ /
- 17 Hz ☐ / 18 Hz ☐ / 19 Hz ☐ / 20 Hz ☐ / 21 Hz ☐ / 22 Hz ☐ / 23 Hz ☐ / 24 Hz ☐ /
- 25 Hz ☐ / 26 Hz ☐ / 27 Hz ☐ / 28 Hz ☐ / 29 Hz ☐ / 30 Hz ☐ / 31 Hz ☐ / 32 Hz ☐ /
- Other, please specify…….

g. Timing of PS procedure:
- First third of EEG Yes ☐ / No ☐
- Second third of EEG Yes ☐ / No ☐
- Third third of EEG Yes ☐ / No ☐
- Other, please specify…….
- Do you use different timings for certain patient groups?

- Yes ☐ , please specify…..
- No ☐

2.2. Practical considerations

a. What is the position of the lamp used for photic stimulation?
   - Lamp directed towards the patient`s eyes: Yes ☐ / No ☐
   - Lamp directed towards the patient`s face, but not eyes: Yes ☐ / No ☐
   - Lamp directed towards the patient`s body, but not face: Yes ☐ / No ☐
   - Other, please specify……..
   - Do you use different orientations for certain patients groups?
     - Yes ☐ , please specify…..
     - No ☐

b. Are the eyes open during photic stimulation in your EEG-lab?
   - Always ☐ / Yes, if tolerated ☐ / Never ☐
   - Other, please specify……..

c. Do you stop PS in case of photomyogenic reaction?
   - Yes ☐ / No ☐
   - Other, please specify……..

d. Do you stop PS in case of photoparoxysmal reaction?
   - Yes ☐ / No ☐
   - Other, please specify……..

e. Do you stop PS in case of photoconvulsive reaction?
   - Yes ☐ / No ☐
   - Other, please specify……..

2.3. Contraindications

c. Do you apply contraindications?
   - No contraindications Yes ☐ / No ☐
   - Pregnancy Yes ☐ / No ☐
     - Only certain periods in pregnancy, please specify:…….
   - Other, please specify……..
   - Do you use specific contraindications for certain patient groups?
     - Yes ☐ , please specify…..
     - No ☐

2. Other stimulation methods

2.1. Technical aspects

a. Do you use stimulation methods other than HV and PS as standardized procedure ?
   - Yes ☐ , please specify…..
   - No ☐

Delphi Questionnaire Part 3.2

Activation methods for routine EEG recordings

New questions based on Delphi round 1:

Hyperventilation:

NEW question as suggested by expert:

1. Patient should also be informed about side effects of HV (paresthesias, headache,..) Yes ☐ / No ☐

NEW question as suggested by expert:

2. HV after PS. Usually early, so that patients have time to fall asleep. However, if the referral diagnosis is IGE /GGE, then it is best to do the provocation at the end of the recording, AFTER they wake up from a short sleep. Yes ☐ / No ☐

NEW questions as suggested by experts:

3. ILAE Europe has a recommendation published in *Epilepsia* on behavioral testing during seizures. Here we should just state that testing should be done and refer to the other guideline on testing. Yes ☐ / No ☐

(Beniczky S, Neufeld M, Diehl B, et al. Testing patients during seizures: A European consensus procedure developed by a joint taskforce of the ILAE - Commission on European Affairs and the European Epilepsy Monitoring Unit Association. Epilepsia. 2016;57(9):1363-8.)

4. I agree with the ILAE Neurophysiology Task Force Yes ☐ / No ☐

(Koutroumanidis M, Arzimanoglou A, Caraballo R, et al. The role of EEG in the diagnosis and classification of the epilepsy syndromes: a tool for clinical practice by the ILAE Neurophysiology Task Force (Part 1). Epileptic Disord. 2017;19(3):233-298.
Koutroumanidis M, Arzimanoglou A, Caraballo R, et al. The role of EEG in the diagnosis and classification of the epilepsy syndromes: a tool for clinical practice by the ILAE Neurophysiology Task Force (Part 2). Epileptic Disord. 2017;19(4):385-437.)

NEW question as suggested by expert:

5. IPS should be performed at least 3 min after HV or before HV. Yes ☐ / No ☐

(Kasteleijn-Nolst Trenité D, Rubboli G, et al. Methodology of photic stimulation revisited: updated European algorithm for visual stimulation in the EEG laboratory. Epilepsia. 2012;53(1):16-24.)

Question derived from missing concordance:

6. Should one set a certain *respiratory RATE* for HV in ADULTS?
    - Normal respiratory rate or mildly elevated up to 20 /min Yes ☐ / No ☐
    - Respiratory rate should be between 15-30 breaths /min Yes ☐ / No ☐

7. Contraindication to HV: myocardial infarction in history, regardless of when it occurred. Yes ☐ / No ☐

8. Contraindication to HV: Moya-Moya. Yes ☐ / No ☐

9. A. Contraindication to HV: Contraindications should be told by the referring physician by electronic or paper tick-off box. If not available, also a free text field on the referral may be used. *If nothing of the above is available*, EEG-technicians have to ask the patient and document the answer. Yes ☐ / No ☐
   B. Contraindication to HV: Contraindications should be told by the referring physician by electronic or paper tick-off box. If not available, also a free text field on the referral may be used. *As a minimum*, EEG-technicians have to ask the patient and document the answer. Yes ☐ / No ☐

Intermittent Photic Stimulation

NEW question as suggested by expert:

10. There is an ILAE guideline (see ILAE homepage) on the technical setup of Photic Stimulation. Unless we have hard-core evidence AGAINST it, we should not come with a new protocol, but use the existing one. Yes ☐ / No ☐

(Kasteleijn-Nolst Trenité D, Rubboli G, et al. Methodology of photic stimulation revisited: updated European algorithm for visual stimulation in the EEG laboratory. Epilepsia. 2012;53(1):16-24.)

11. The recommended (minimum and maximum) duration of IPS is 15 seconds with IPS sensitivity determined in three eye conditions with separate trains of flashes of 5 s duration each during eye closure, eyes closed, and eyes open. Yes ☐ / No ☐

(Kasteleijn-Nolst Trenité D, Rubboli G, et al. Methodology of photic stimulation revisited: updated European algorithm for visual stimulation in the EEG laboratory. Epilepsia. 2012;53(1):16-24.)

12. Other stimulation methods should not be used routinely, but in a “tailored“ standard EEG, simple stimulations (touch, sudden noise, etc.) are encouraged to perform when they are known to provoke seizures. Yes ☐ / No ☐

After the Part 3.2 consensus discussion was needed for contraindications of hyperventilation and photic stimulation.

Delphi Questionnaire Part 4

Indications

Please check Yes/No/Not my expertise (if the specific question pertains to a subject area which you are not familiar with) and comment if necessary.

General Indications	Yes	No	Not my expertise/ other comment
Clinical suspicion of seizure or epilepsy			
Reconsideration of the initial diagnosis of epilepsy			
Syndromic classification of epilepsy			
Changes in seizure pattern			
Etiological evaluation of epilepsy			
Prior to initiation of AED			
Prior to tapering of AED			
During tapering of AED			
In seizure remission after complete withdrawal of AED			
Suspected encephalopathy			
Clinical diagnosis of psychogenic nonepileptic events			
Paroxysmal behavioural changes			
Other psychiatric or behavioural symptoms			
Clinical diagnosis of migraine			
Clinical diagnosis of syncope			
Clinical diagnosis of dementia			
ADHD			
Autistic Spectrum disorders			
Specific genetic syndromes			
Any other (please specify)			

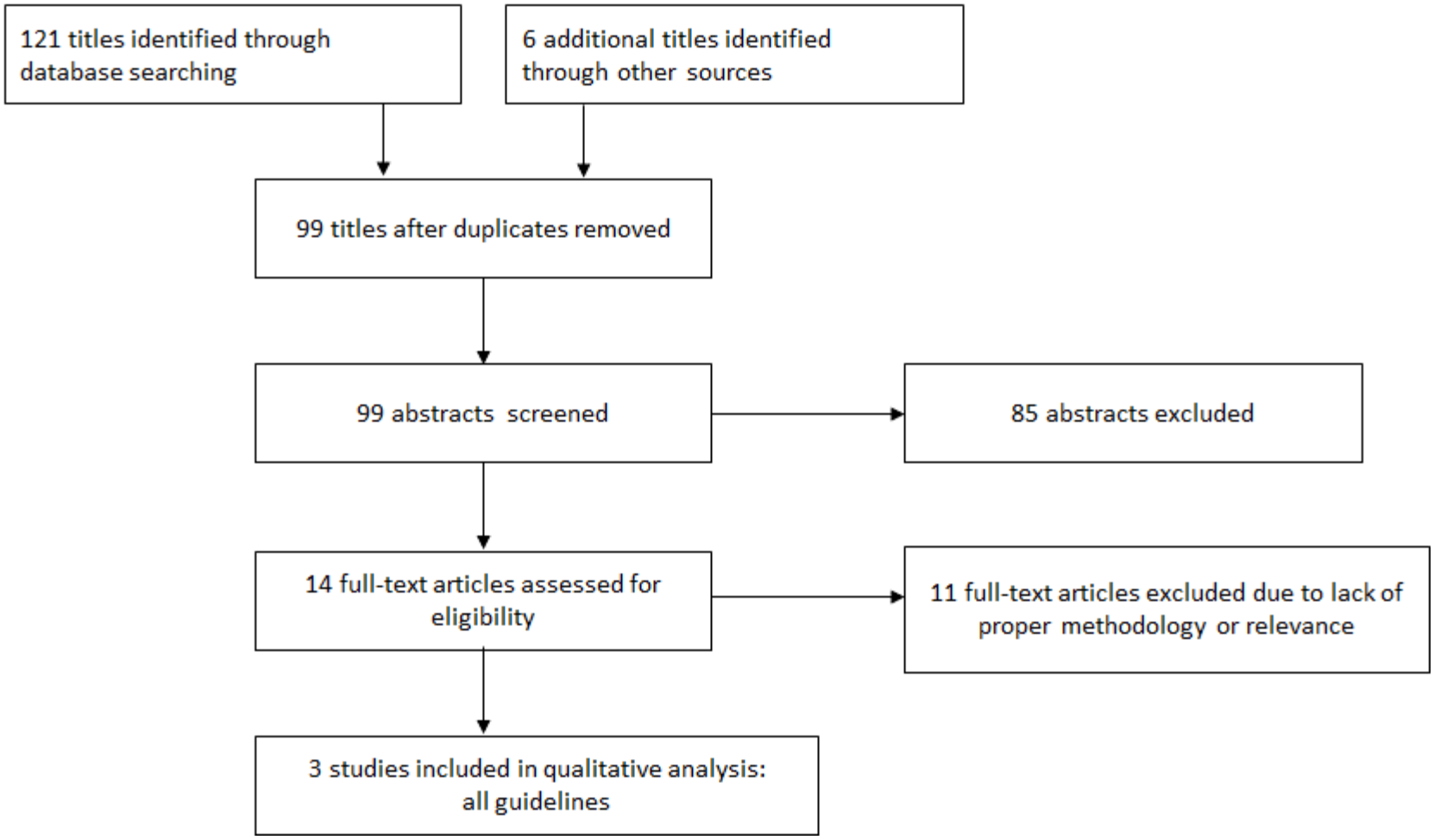
Do you think there are other specific indications in children in addition to those described above If your answer is yes , please proceed further			
Language delay/regression			
Regression/delay in developmental milestones other than language			
Learning Disorders			
Following neonatal brain-affecting events to detect epilepsy (HIE, infarction)			
Tuberosis sclerosis in infancy to detect epilepsy			If yes, for how long/how often
Any other (please specify)			

Consensus was need for the following indications: during tapering of AED, in seizure remission after complete withdrawal of AED, other psychiatric or behavioural symptoms and learning disorders.

Appendix 4A

PRISMA Flow Diagram

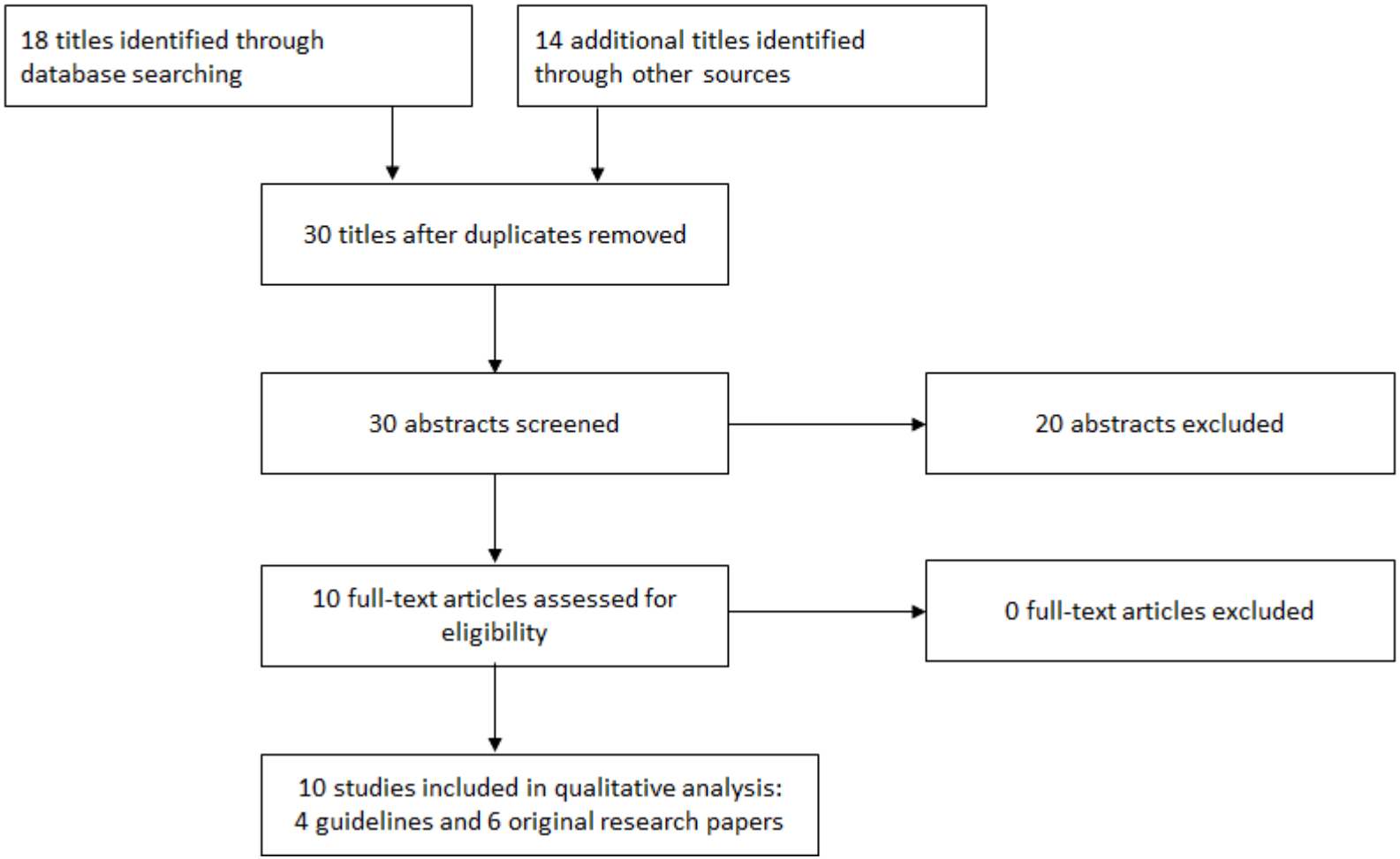
Electronic search in PubMed and EMBASE databases
Search terms: "routine EEG" ,"sleep EEG" ,"outpatient EEG", “indication” and “ referral”



Appendix 4B

PRISMA Flow Diagram

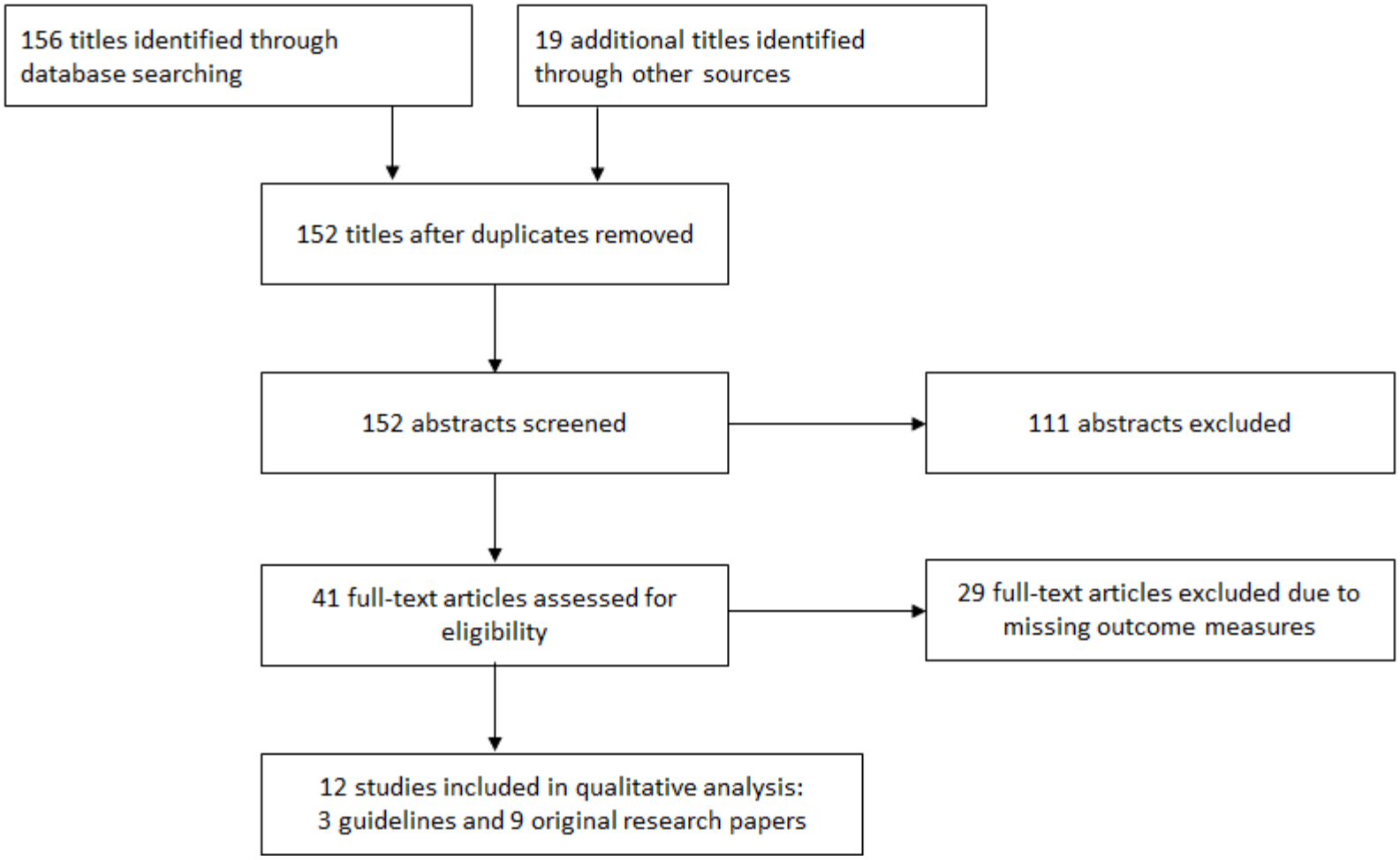
Electronic search in PubMed and EMBASE databases
Search terms: "technical requirements", "technical standards", "minimal standards", "minimum standards", "standard EEG recording" and "routine EEG recording"



Appendix 4C

PRISMA Flow Diagram

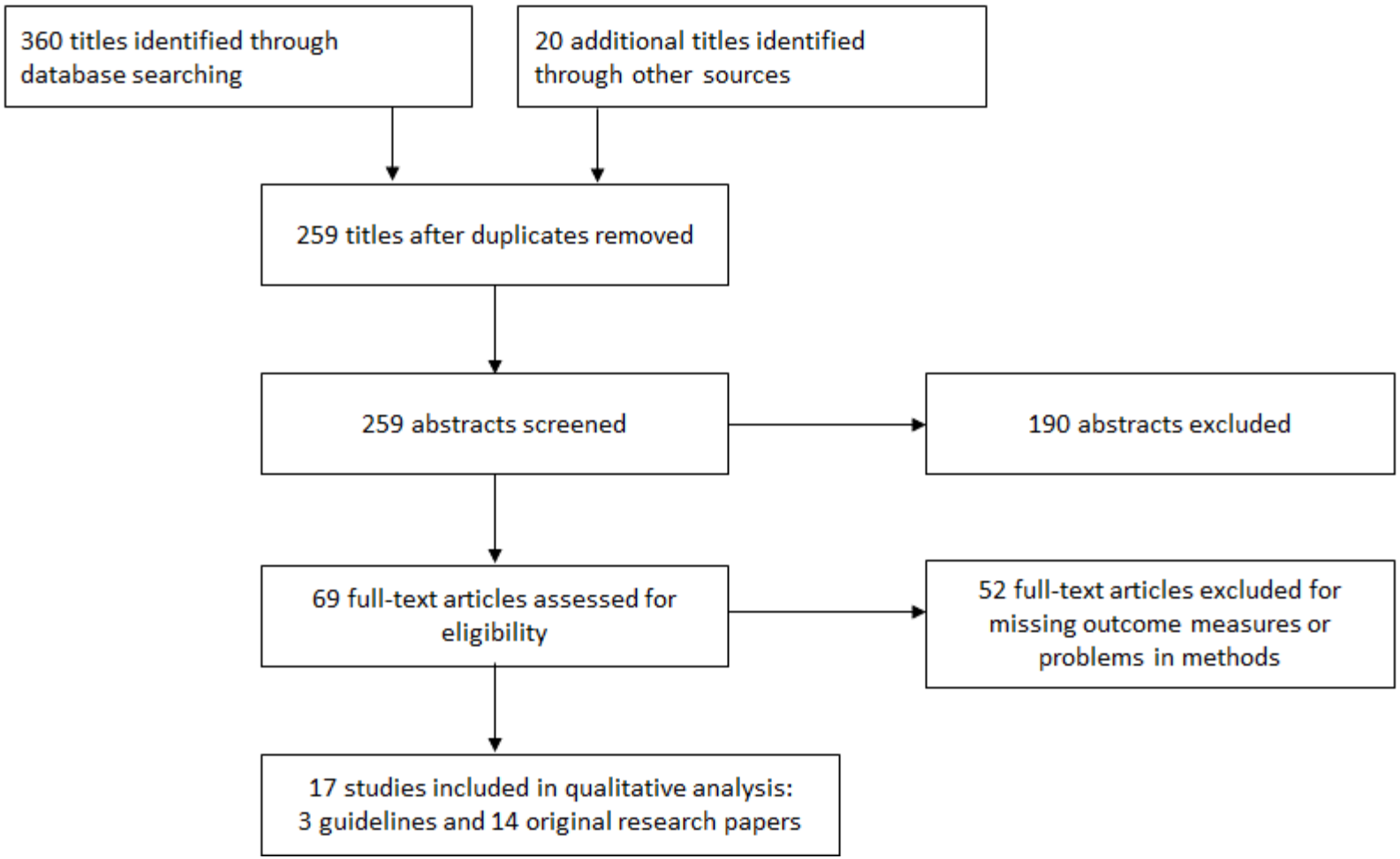
Electronic search in PubMed and EMBASE databases
Search terms: "routine EEG", standard EEG, "sleep EEG", "minimum", "optimal", "best", "diagnosis", "diagnostic" and "duration"



Appendix 4D

PRISMA Flow Diagram

Electronic search in PubMed and EMBASE databases
Search terms: “sleep”, “EEG recording”, “diagnosis”, “ diagnostic”, “melatonin”, “sleep deprivation” and “induction”



Appendix 4E

PRISMA Flow Diagram

Electronic search in PubMed and EMBASE databases
Search terms: "routine EEG", "standard EEG", "hyperventilation", "photic", "eye closure", "tailored", "trigger", "stimulation" and "provocation"