National Institute for Health and Care Excellence

Final

Epilepsies in children, young people and adults

[A] Magnetic resonance imaging scan to detect relevant abnormalities in people with epilepsy

NICE guideline NG217

Evidence reviews underpinning recommendations 1.3.1-1.3.7 in the NICE guideline

April 2022

Final

These evidence reviews were developed by the National Guideline Alliance which is a part of the Royal College of Obstetricians and Gynaecologists

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Contents

Evidence review for magnetic resonance imaging scan to detect relevant abnormalities in people with epilepsy

Review question

What is the yield of relevant abnormalities detected by MRI in people with epilepsy?

Introduction

Magnetic resonance imaging (MRI) enables detailed images based on the effect of magnetic fields on water molecules in the brain. It enables very detailed pictures to be obtained, and utilising different sequences we can gain information about structural abnormalities that could be a cause of epilepsy. Sequences are optimised to enable maximal contrast between grey and white matter, to obtain accurate pictures of the cerebral cortex, the likely area from where epileptic seizures arise. It is the imaging technique of choice in the investigation of people with epilepsy. The aim of this review is to assess how well MRI performns in detecting brain lesions or other relevant abnormalities in people with epilepsy. Knowing the proportion of epilepsy related (clinically relevant abnormalities) and non-epielpsy related abnormalities detected by MRI helps clinicians to recognise those people who are most at risk of adverse outcomes. Information from MRI is used to optimise therapeutic options, and may help to determine who would benefit of surgery for controlling seizures.

Summary of the protocol

Please see Table 1 for a summary of the Population, Intervention, Comparison and Outcome (PICO) characteristics of this review.

Table 1: Summary of the protocol (PICO table)

Population	People with 1 or more confirmed epileptic seizures
Intervention	Magnetic resonance imaging (MRI)
Comparison	Not relevant
Outcomes	Primary outcomes • Proportion identified with a clinically relevant abnormality Secondary outcomes • Proportion identified with a non-epilepsy related abnormality

For further details see the review protocol in appendix A.

Methods and process

This evidence review was developed using the methods and process described in Developing NICE guidelines: the manual. Methods specific to this review question are described in the review protocol in appendix A and the methods document (supplementary document 1).

Declarations of interest were recorded according to NICE's conflicts of interest policy.

Clinical evidence

Included studies

Thirty-nine observational studies (prospective/retrospective single-arm, cohort and cross-sectional studies) were identified for inclusion in this review (Alam-Eldeen 2015, Ali 2017, Asadi-Pooya 2012, Aslan 2010, Bakhsh 2013, Benson 2019, Berg 2000, Betting 2006, Bruno 2017, Byars 2007, Coryell 2018, Craven 2012, Das 2013, Dirik 2018, Dura-Trave 2012, Ekici 2013, Ferreira 2004, Gaillard 2007, Griffiths 2005, Hakami 2013, Harini 2018, Hesdorffer 2008, Hnojcikova 2010, Hsieh 2010, Jasim 2018, Jeniffer 2015, Koirala 2011, Labate 2006, Lefkopoulos 2005, Ma 2019, Nair 2009, Petrou 2007, Rasool 2012, Santos 2005, Sinha 2012, Solosrungruang 2007, Toledo 2013, Wieshmann 2003, Wongladarom 2004).

MRI abnormalities were categorised into various groups including congenital/developmental abnormalities, tumours and vascular pathology (see appendix M for full list). Although exact causality could not be established from the studies, these abnormalities were divided into 'epilepsy related' (this is, clinically relevant hereafter) and 'non-epilepsy related' based on whether or not the lesions were likely to be associated with or cause epilepsy. Examples of clinically relevant abnormalities include malformations of cortical development, tumours, vascular malformations, metabolic/genetic syndromes and acquired lesions such as infection. Examples of non-epilepsy related abnormalities include arachnoid cysts and hydrocephalus which, although there are rare reports of them causing epilepsy, are for the large part incidental findings.

Analyses were not split by MRI type/technology because no studies were identified reporting data on both MRI and CT, however a separate evidence report was produced assessing the yield of relevant abnormalities detected by CT scans in people with epilepsy (see evidence report B).

The included studies are summarised in Table 2.

See the literature search strategy in appendix B and study selection flow chart in appendix C.

Excluded studies

Studies not included in this review with reasons for their exclusions are provided in appendix K.

Summary of clinical studies included in the evidence review

Summaries of the studies that were included in this review are presented in Table 2.

Table 2: Summary of included studies

Study	Population	Intervention	Outcomes
Alam-Eldeen 2015 Retrospective cohort study Egypt	N=89 children with epilepsy from the general population Age at follow up, years, mean (range): 4.3 (1 month to 17 years)	• MRI 1.5-t	• Proportion identified with a clinically relevant abnormality • Proportion identified with a non-epilepsy related abnormality

Study	Population	Intervention	Outcomes
Ali 2017 Cross-sectional Pakistan	N=209 people with epilepsy from the general population No demographic characteristics were reported	• MRI 1.5-t	• Proportion identified with a clinically relevant abnormality • Proportion identified with a non-epilepsy related abnormality
Asadi-Pooya 2012 Cross-sectional Iran	N=135 children with Lennox-Gastaut syndrome Age at follow-up, years, mean (SD): 3.2 (3.8)	• MRI 1.5-t	• Proportion identified with a clinically relevant abnormality • Proportion identified with a non-epilepsy related abnormality
Aslan 2010 Retrospective cohort Turkey	N=32 young people with genetic (idiopathic) generalised epilepsy Age at follow-up, years, mean (range): 22 (16 to 37)	• MRI 1.5-t	• Proportion identified with a clinically relevant abnormality • Proportion identified with a non-epilepsy related abnormality
Bakhsh 2013 Prospective cohort Pakistan	N=44 young people with genetic (idiopathic) generalised epilepsy Age at follow-up, years, mean (SD): 19.5 (SD not reported)	• MRI 1-t	• Proportion identified with a clinically relevant abnormality • Proportion identified with a non-epilepsy related abnormality
Benson 2019 Retrospective cohort US	N=57 adults with unruptured intracranial arteriovenous malformations associated with seizures[Δ] Age at follow-up, years, mean (SD): 35.9 (SD not reported)	• MRI 1.5 or 3.0-t	• Proportion identified with a clinically relevant abnormality • Proportion identified with a non-epilepsy related abnormality
Berg 2000 Retrospective cohort US	N=388 children with newly diagnosed epilepsy Age at seizure onset, years, median (IQR): 5.7 (IQR not reported)	• MRI (strength of magnet not reported)	• Proportion identified with a clinically relevant abnormality • Proportion identified with a non-epilepsy related abnormality
Betting 2006 Prospective cohort Brazil	N=134 adults with genetic (idiopathic) generalised epilepsy Age at seizure onset, years, mean (SD): 28 (9)	• MRI 2-t	• Proportion identified with a clinically relevant abnormality • Proportion identified with a non-epilepsy related abnormality

Study	Population	Intervention	Outcomes
	Age at follow up, years, mean (SD): 13 (7)		
Bruno 2017 Prospective cohort Bhutan	N=217 people with epilepsy from the general population Age at follow up, years, mean (SD): Children: 11.7 (8 years) Adults: 30.2 (11 years)	• MRI 1.5-t	• Proportion identified with a clinically relevant abnormality¥ • Proportion identified with a non-epilepsy related abnormality
Byars 2007 Prospective cohort US	N=249 children with a first recognised seizure Age at follow-up, years, mean (SD): 9.6 (2.5)	• MRI 0.5 or 1.5-t	• Proportion identified with a clinically relevant abnormality • Proportion identified with a non-epilepsy related abnormality
Coryell 2018 Prospective cohort US	N=714 infants with early life epilepsy Age at seizure onset, months, mean (SD): 11.1 (SD not reported) Age at follow-up, months, mean (SD): 12.7 (SD not reported)	• MRI 1.5 or 3.0-t	• Proportion identified with a clinically relevant abnormality • Proportion identified with a non-epilepsy related abnormality
Craven 2012 Retrospective cohort UK	N=2000 young people with focal epilepsy Age at follow-up, years, median (range): 23 (25 to 48)	• MRI 3.0-t	• Proportion identified with a clinically relevant abnormality • Proportion identified with a non-epilepsy related abnormality
Das 2013 Cross-sectional India	N=144 infants with epilepsy from the general population Age at seizure onset, years, mean (SD): 2.91 (3.30) Age at follow up, years, mean (SD): 5.87 (4.19)	• MRI 1.5 or 3.0-t	• Proportion identified with a clinically relevant abnormality • Proportion identified with a non-epilepsy related abnormality

Study	Population	Intervention	Outcomes
Dirik 2018 Retrospective cohort Cyprus	N=222 infants with newly diagnosed epilepsy Age at seizure onset, months, mean (SD): 48 (SD not reported)	• MRI 1.5 or 3.0-t	• Proportion identified with a clinically relevant abnormality • Proportion identified with a non-epilepsy related abnormality
Dura-Trave 2012 Retrospective cohort Spain	N=457 people with epilepsy from the general population Age range at time of diagnosis: 1 month to 15 years	• MRI (strength of magnet was not reported)	• Proportion identified with a clinically relevant abnormality • Proportion identified with a non-epilepsy related abnormality
Ekici 2013 Retrospective cohort Turkey	N=264 people with epilepsy from the general population Age at follow-up, years, mean (range): 31.3 (18 to 82)	• MRI 3.0-t	• Proportion identified with a clinically relevant abnormality • Proportion identified with a non-epilepsy related abnormality
Ferreira 2004 Retrospective cohort Brazil	N=67 adults with focal epilepsy Age at follow-up, years, mean (range): 35 (8 to 76)	• MRI 2.0-t	• Proportion identified with a clinically relevant abnormality
Gaillard 2007 Retrospective cohort US	N=38 children with focal epilepsy Age at seizure onset, years, mean (range): 5.8 (0.9 to 11.9)	• MRI 1.5-t	• Proportion identified with a clinically relevant abnormality
Griffiths 2005 Retrospective cohort UK	N= 120 young people with focal epilepsy Age at seizure onset, years, median (range): 13 (25 to 38)	• MRI 3.0-t	• Proportion identified with a clinically relevant abnormality

Study	Population	Intervention	Outcomes
Hakami 2013 Prospective cohort Australia	N=764 adults with new-onset epilepsy Age at follow-up, years, mean (SD/range): 42.2 (18.8/14.3 to 94.3)	• MRI 1.5 or 3.0-t	• Proportion identified with a clinically relevant abnormality • Proportion identified with a non-epilepsy related abnormality
Harini 2018 Retrospective cohort US	N=71 children with infantile spasms Age at seizure onset, years, median (IQR): 6 (IQR not reported)	• MRI 1.5 or 3.0-t	• Proportion identified with a clinically relevant abnormality
Hesdorffer 2008 Prospective cohort US	N=159 infants with febrile seizures Age at seizure onset, months (%): <18 months, n=75 (47.2); ≥18 months, n=84 (52.8)	• MRI 1.5-t	• Proportion identified with a clinically relevant abnormality • Proportion identified with a non-epilepsy related abnormality
Hnojcikova 2010 Retrospective cohort US	N=28 children with epilepsy from the general population Age at seizure onset, months, mean years (SD): 9.6 (12.7) Age at follow-up, months, mean (SD): 28.8 (17.7)	• MRI (strength of magnet was not reported)	• Proportion identified with a clinically relevant abnormality
Hsieh 2010 Prospective cohort US	N=182 infants with new onset afebrile seizures At follow-up, all infants were <24 months	• MRI 1.5-t	• Proportion identified with a clinically relevant abnormality • Proportion identified with a non-epilepsy related abnormality
Jasim 2018 Cross-sectional Iraq	N=51 people with epilepsy from the general population Age at follow up, mean years (SD): 21.31 (12.75)	• MRI 1.5-t	• Proportion identified with a clinically relevant abnormality

Study	Population	Intervention	Outcomes
Jeniffer 2015 Prospective cohort India	N=64 people with focal seizures At follow-up, all were <18 years old	• MRI 1.5-t	• Proportion identified with a clinically relevant abnormality
Koirala 2011 Cross-sectional Nepal	N=160 people with epilepsy from the general population Age at follow-up, years: range was 1 to 82 years old; n=36 (22.5) were ≥16 years old; n=124 (77.5) were >16 years old	• MRI 0.2-t	• Proportion identified with a clinically relevant abnormality
Labate 2006 Retrospective cohort Italy	N=101 young people with focal epilepsy Age at seizure onset, years, mean (SD): 22.3 (17.4 years) Age at follow-up, years, mean (SD): 37.3 (17.5)	• MRI 1.5-t	• Proportion identified with a clinically relevant abnormality
Lefkopoulos 2005 Retrospective cohort Greece	N=120 young people with intractable partial seizures Age at follow-up, years, mean (SD): 21 (SD not reported)	• MRI 1.5-t	• Proportion identified with a clinically relevant abnormality
Ma 2019 Retrospective cohort China	N=115 adults with focal epilepsy Age at follow-up, years, mean (SD): 30.8 (12.6)	• MRI (strength of magnet not reported)	• Proportion identified with a clinically relevant abnormality
Nair 2009 Prospective cohort India	N=41 adults with status epilepticus Age at follow-up, years, mean (range): 35 (1 to 78)	• MRI 1.5-t	• Proportion identified with a clinically relevant abnormality

Study	Population	Intervention	Outcomes
Petrou 2007 Retrospective cohort Sweden	N=437 infants with epilepsy from the general population Age at seizure onset, mean months (SD): 14.1 (not reported)	• MRI (strength of magnet not reported)	• Proportion identified with a clinically relevant abnormality
Rasool 2012 Prospective cohort India	N=157 people with first onset afebrile and complex febrile seizures Age at follow-up, range: 6 months to 14 years old	• MRI 1.5-t	• Proportion identified with a clinically relevant abnormality
Santos 2005 Retrospective cohort Brazil	N=100 children with focal epilepsy Age at seizure onset, years, mean (SD): 8.5 (3.1) Age at follow-up, years, mean (SD): 23.9 (9)	• MRI (strength of magnet not reported)	• Proportion identified with a clinically relevant abnormality
Sinha 2012 Prospective cohort India	N=43 older people with epilepsy Age at seizure onset, years, mean (SD): 68 (7.5)	• MRI 1.5-t	• Proportion identified with a clinically relevant abnormality
Solosrungruang 2007 Retrospective cohort Thailand	N=91 adult people with epilepsy from the general population Age at follow-up, years, mean (range): 36.9 (15-85)	• MRI 1.5-t	• Proportion identified with a clinically relevant abnormality
Toledo 2013 Prospective cohort Spain	N=161 adults with focal epilepsy Age at follow-up, years, mean (SD): 41.6 (16.3)	• MRI 3.0-t	• Proportion identified with a clinically relevant abnormality

Study	Population	Intervention	Outcomes
Wieshmann 2003 Cross-sectional UK	N=332 adults with epilepsy from the general population Age at follow-up, years, mean (SD): 39.7 (14.2)	• MRI 1.5-t	• Proportion identified with a clinically relevant abnormality
Wongladarom 2004 Retrospective cohort Thailand	N=100 children with epilepsy from the general population Age at follow-up, years, mean (SD): 7 (5 months)	• MRI 1.5-t	• Proportion identified with a clinically relevant abnormality • Proportion identified with a non-epilepsy related abnormality

IQR: interquartile range; SD: standard deviation
Δ This study included people with arteriovenous malformations (AVM) only, therefore the proportion identified with vascular abnormalities was 100%. This study was excluded from the vascular abnormalities estimates, but the results have been noted in the evidence table
¥ All infections identified in this study were neurocysticercosis, which is a condition endemic to Bhutan, where the study was conducted

See the full evidence tables in appendix D and the forest plots in appendix E.

Summary of the evidence

Epilepsy related abnormalities (clinically relevant abnormalities) detected by MRI

- Very low quality evidence from 24 observational studies assessing N= 6693 people with epilepsy showed that the overall proportion of people identified by MRI with tumour abnormalitites was 3% (95% CI, 2 to 4%). The proportion of tumour abnormalities identified by MRI in subgroup analyses were as follows:
  - By age group:
    - Infants (<3 years old at seizure onset): n= 985, 1% (95% CI, 1 to 2%)
    - Children (between 3 and 11 years old at seizure onset): n= 516, 1% (95% CI, 0 to 2%)
    - Young people (between 11 and 25 years old at seizure onset): n= 120, 3% (95% CI, 1 to 8%)
    - Older people (above 65 years old at seizure onset): n= 43, 12% (95% CI, 4 to 25%)
  - By seizure type:
    - People with focal (partial) epilepsy: n= 2660, 4% (95% CI, 2 to 9%)
    - People with genetic (idiopathic) generalised epilepsy: n= 144, 5% (95% CI, 2 to 14%)
  - By MRI strength of magnet:
    - MRI 1.5-t: n= 1080, 4% (95% CI, 2 to 7%)
    - MRI 3-t: n= 3309, 3% (95% CI, 1 to 6%)
  - By response to treatment:
    - People with a new diagnosis: n= 1556, 1% (95% CI, 0 to 3%)
    - People with existing diagnosis and treatment resistant: n= 454, 5% (95% CI, 2 to 12%)

    - People with existing diagnosis and controlled: n= 170, 0% (95% CI, 0 to 2%)
  - By presence/absence of learning disabilities:
    - People without learning disabilities: n= 64, 2% (95% CI, 0 to 8%)
  - By previous CT scan:
    - People with a previous CT scan: n = 269, 4% (95% CI, 1 to 13%)
- Very low quality evidence from 25 observational studies assessing N= 7544 people with epilepsy showed that the overall proportion of people identified by MRI with vascular abnormalitites was 6% (95% CI, 4 to 8%). The proportion of vascular abnormalities identified by MRI in subgroup analyses were as follows:
  - By age group:
    - Children (between 3 and 11 years old at seizure onset): n= 559, 4% (95% CI, 1 to 18%)
    - Young people (between 11 and 25 years old at seizure onset): n= 240, 7% (95% CI, 4 to 48%)
    - Older people (above 65 years old at seizure onset): n= 43, 30% (95% CI, 17 to 46%)
  - By seizure type:
    - People with focal (partial) epilepsy: n= 2596, 4% (95% CI, 2 to 8%)
    - People with genetic (idiopathic) generalised epilepsy: n= 60, 8% (95% CI, 4 to 19%)
    - People with West syndrome: n= 73, 21% (95% CI, 13 to 31%)
    - People with Lennox-Gastaut syndrome: n= 1, 0% (95% CI, 0 to 2%)
  - By MRI strength of magnet:
    - MRI 1.5-t: n=794, 11% (95% CI, 7 to 17%)
    - MRI 3-t: n= 559, 4% (95% CI, 2 to 7%)
  - By response to treatment:
    - People with a new diagnosis: n=2370, 4% (95% CI, 2 to 9%)
    - People with existing diagnosis and treatment resistant: n= 426, 6% (95% CI, 4 to 9%)
    - People with existing diagnosis and controlled: n= 170, 2% (95% CI, 0 to 5%)

- Very low quality evidence from 37 observational studies assessing N= 8681 people with epilepsy showed that the overall proportion of people identified by MRI with scarring abnormalitites was 10% (95% CI, 6 to 16%). The proportion of scarring abnormalities identified by MRI in subgroup analyses were as follows:
  - By age group:
    - Infants (<3 years old at seizure onset): n= 1858, 4% (95% CI, 2 to 9%)
    - Children (between 3 and 11 years old at seizure onset): n= 625, 17% (95% CI, 4 to 49%)
    - Young people (between 11 and 25 years old at seizure onset): n= 341, 21% (95% CI, 10 to 40%)
    - Adults (between 25 and 65 years old at seizure onset): n= 134, 8% (95% CI, 4 to 14%)
    - Older people (above 65 years old at seizure onset): n= 43, 2% (95% CI, 0 to 12%)
  - By seizure type:
    - People with focal (partial) epilepsy: n= 3023, 17% (95% CI, 8 to 31%)

    - People with genetic (idiopathic) generalised epilepsy: n= 467, 8% (95% CI, 2 to 32%)
    - Those with West syndrome: n= 171, 7% (95% CI, 3 to 15%)
    - Those with Lennox-Gastaut syndrome: n=100, 42% (95% CI, 32 to 52%)
  - By MRI strength:
    - MRI 1.5-t: n = 1687, 12% (95% CI, 6 to 23%)
    - MRI 3-t: n= 3045, 15% (95% CI, 10 to 21%)
  - By response to treatment:
    - People with a new diagnosis: n=2576, 7% (95% CI, 2 to 18%)
    - People with existing diagnosis and treatment resistant: n=574, 20% (95% CI, 6 to 49%)
    - People with existing diagnosis and controlled: n=202, 11% (95% CI, 3 to 35%)
  - By presence/absence of learning disabilities:
    - People without learning disabilities: n= 96, 10% (95% CI, 3 to 26%)
  - By previous CT scan:
    - People with a previous CT scan: n= 426, 4% (95% CI, 1 to 13%)
- Very low quality evidence from 31 observational studies assessing N= 8450 people with epilepsy showed that the overall proportion of people identified by MRI with congenital/developmental abnormalitites was 10% (95% CI, 7 to 15%). The proportion of congenital/developmental abnormalities identified by MRI in subgroup analyses was as follows:
  - By age group:
    - Infants (<3 years old at seizure onset): n=1858, 13% (95% CI, 9 to 19%)
    - Children (between 3 and 11 years old at seizure onset): n= 587, 27% (95% CI, 12 to 48%)
    - Young people (between 11 and 25 years old at seizure onset): n= 240, 9% (95% CI, 2 to 27%)
    - Adults (between 25 and 65 years old at seizure onset): n= 134, 2% (95% CI, 0 to 6%)
  - By seizure type:
    - People with focal (partial) epilepsy: n=2810, 9% (95% CI, 5 to 18%)
    - People with genetic (idiopathic) generalised epilepsy: n=307, 3% (95% CI, 2 to 6%)
  - By syndrome type:
    - Those with West syndrome: n= 73, 41% (95% CI, 30 to 53%)
    - Those with Lennox-Gastaut syndrome: n=137, 15% (95% CI, 10 to 22%)
  - By MRI strength of magnet:
    - MRI 1.5-t: n= 1422, 16% (95% CI, 9 to 26%)
    - MRI 3-t: n=3309, 4% (95% CI, 3 to 7%)
  - By response to treatment:
    - People with a new diagnosis: n=2676, 9% (95% CI, 5 to 15%)
    - People with existing diagnosis and treatment resistant: n=574, 16% (95% CI, 7 to 33%)
    - People with existing diagnosis and controlled: n= 170, 0% (95% CI, 0 to 2%)
  - By presence/absence of learning disabilities:
    - People with learning disabilities: n= 135, 15% (95% CI, 9 to 22%)

    - People without learning disabilities: n= 64, 45% (95% CI, 33 to 58%)
  - By previous CT scan:
    - People with a previous CT scan: n= 339, 14% (95% CI, 4 to 37%)

- Very low quality evidence from 19 observational studies assessing N= 5341 people with epilepsy showed that the overall proportion of people identified by MRI with inflammatory/infective/inmumne abnormalitites was 4% (95% CI, 2 to 9%). The proportion of inflammatory/infective/immune abnormalities identified by MRI in subgroup analyses was as follows:
  - By age group:
    - Infants (<3 years old at seizure onset): n=1477, 1% (95% CI, 1 to 2%)
    - Children (between 3 and 11 years old at seizure onset): n= 559, 2% (95% CI, 1 to 5%)
    - Young people (between 11 and 25 years old at seizure onset): n= 240, 3% (95% CI, 1 to 6%)
    - Older people (above 65 years old at seizure onset): n= 43, 12% (95% CI, 4 to 25%)
  - By seizure type:
    - People with focal (partial) epilepsy: n=2361, 2% (95% CI, 1 to 8%)
    - People with genetic (idiopathic) generalised epilepsy: n=16, 12% (95% CI, 2 to 38%)
  - By syndrome type:
    - Those with West syndrome: n= 73, 4% (95% CI, 1 to 12%)
    - Those with Lennox-Gastaut syndrome: n= 2, 0% (95% CI, 0 to 2%)
  - By MRI strength of magnet:
    - MRI 1.5-t: n= 794, 10% (95% CI, 2 to 31%)
    - MRI 3-t: n= 2120, 1% (95% CI, 0 to 3%)
  - By response to treatment:
    - People with a new diagnosis: n= 1284, 1% (95% CI, 1 to 2%)
    - People with existing diagnosis and treatment resistant: n= 452, 7% (95% CI, 4 to 13%)
  - By previous CT scan:
    - People with a previous CT scan: n= 266, 13% (95% CI, 1 to 82%)

- Very low quality evidence from 9 observational studies assessing N= 4426 people with epilepsy showed that the overall proportion of people identified by MRI with metabolic/genetic abnormalitites was 1% (95% CI, 1 to 3%). The proportion of metabolic/genetic abnormalities identified by MRI in subgroup analyses was as follows:
  - By age group:
    - Infants (<3 years old at seizure onset): n= 1477, 1% (95% CI, 0 to 1%)
    - Children (between 3 and 11 years old at seizure onset): n= 388, 4% (95% CI, 2 to 6%)
  - By seizure type:
    - People with focal (partial) epilepsy: n= 2000, 0% (95% CI, 0 to 1%)
  - By syndrome type:
    - Those with Lennox-Gastaut syndrome: n= 135, 7% (95% CI, 3 to 12%)

- By MRI strenght of magnet:
  - MRI 1.5-t: n=399, 1% (95% CI, 0 to 3%)
  - MRI 3-t: n= 2000, 0% (95% CI, 0 to 1%)
- By response to treatment:
  - People with a new diagnosis: n= 1284, 2% (95% CI, 1 to 4%)
  - People with existing diagnosis and treatment resistant: n= 217, 0% (95% CI, 0 to 3%)
- By presence/absence of learning disabilities:
  - People without learning disabilities: n= 135, 7% (95% CI, 3 to 12%)
- By previous CT scan:
  - People with a previous CT scan: n= 182, 2% (95% CI, 0 to 5%)

Non-epilepsy related abnormalities detected by MRI

- Very low quality evidence from 20 observational studies assessing N= 6628 people with epilepsy showed that the overall proportion of people identified by MRI with non-epilepsy related abnormalitites was 6% (95% CI, 4 to 9%). The proportion of non-epilepsy related abnormalities identified by MRI in subgroup analyses was as follows:
  - By age group:
    - Infants (<3 years old at seizure onset): n= 1421, 8% (95% CI, 3 to 18%)
    - Children (between 3 and 11 years old at seizure onset): n= 388, 4% (95% CI, 2 to 6%)
    - Adults (between 25 and 65 years old at seizure onset): n= 134, 1% (95% CI, 0 to 5%)
  - By seizure type:
    - People with focal (partial) epilepsy: n= 2183, 7% (95% CI, 2 to 22%)
    - People with genetic (idiopathic) generalised epilepsy: n= 383, 4% (95% CI, 2 to 10%)
  - By syndrome type:
    - Those with West syndrome: n = 2, 0% (95% CI, 0 to 84%)
    - Those with Lennox-Gastaut syndrome: n= 137, 1% (95% CI, 0 to 5%)
  - By MRI strength of magnet:
    - MRI 1.5-t: n= 688, 10% (95% CI, 5 to 16%)
    - MRI 3-t: n= 2000, 16% (95% CI, 15 to 18%)
  - By response to treatment:
    - People with a new diagnosis: n= 2733, 6% (95% CI, 3 to 12%)
    - People with existing diagnosis and treatment resistant: n= 311, 1% (95% CI, 0 to 62%)
    - People with existing diagnosis and controlled: n= 202, 5% (95% CI, 1 to 15%)
  - By presence/absence of learning disabilities:
    - People with learning disabilities: n = 135, 1% (95% CI, 0 to 4%)
    - People without learning disabilities: n= 32, 12% (95% CI, 4 to 29%)
  - By previous CT scan:
    - People with a previous CT scan: n= 383, 7% (95% CI, 2 to 19%)

Quality assessment of clinical outcomes included in the evidence review

See the clinical evidence profiles in appendix F.

Economic evidence

Included studies

A single economic search was undertaken for all topics included in the scope of this guideline but no economic studies were identified which were applicable to this review question. See the literature search strategy in appendix B and economic study selection flow chart in appendix G.

Excluded studies

A single economic search was undertaken for all topics included in the scope of this guideline. See supplementary material 2 for details.

Summary of studies included in the economic evidence review

No studies were identified which were applicable to this review question

Economic model

No economic modelling was undertaken for this review because the committee agreed that other topics were higher priorities for economic evaluation.

Summary of the economic evidence

No evidence was identified which was applicable to this review question.

The committee's discussion of the evidence

Interpreting the evidence

The outcomes that matter most

The committee identified two outcomes as relevant for this review question. As part of the critical outcomes, the committee prioritised the proportion identified with a clinically relevant abnormality. Identification of structural brain abnormalities related with epilepsy may inform additional testing, and the need for surgery in people with epilepsy. As part of the important outcomes, the committee prioritised the proportion with a non-epilepsy abnormality. 'Incidental findings' on scans can be a huge source of worry for people. Some of them will have operations or treatment based on these 'incidental' findings because these can be harmful, even when not associated with epilepsy.

The quality of the evidence

The quality of the evidence was assessed with a modified GRADE approach, using the same principles of GRADE for assessing the quality of the evidence, but a different form of presentation as GRADE is not yet available for single-arm prevalence studies.

The quality of the evidence was considered to be very low for most of the outcomes. The domain 'risk of bias' was assessed with the CEBMA checklist, and most studies

were considered to be at very high risk of bias, mainly due to the sampling approaches used and concerns regarding how representative the samples were.

Many of the outcomes were also downgraded due to high levels of imprecision in the estimated proportions.

Other concerns included very high between-study heterogeneity amongst the included studies, for which random effects model was considered. Possible causes for this substantial heterogeneity are believed to be the variability among the included studies characteristics, such as the variety of designs, point along the pathway when MRI was undertaken, or excessive clinical diversity of the individuals included. It was not considered that sensitivity analyses would identify the cause for heterogeneity as excluding a few studies from the analyses on the basis of specific characteristics could add undue emphasis on post-hoc data dependent analysis. Additionally, it was not believed that this will lead to solid results, particularly when it was already established, by committee's informal consensus that the underlying cause of heterogeneity was not due to a single factor.

As a result of the variability between the included studies, some studies appear to be outliers in the meta-analyses conducted; for example Ma 2019, which contributed to the meta-analysis of proportion of tumours abnormalities identified in focal (partial) epilepsy. The lower 95% CI for Ma 2019 is above the upper 95% CI for the pooled estimate. The results reported by Ma 2019 were pre-operative MRI assessments, so it is anticipated that the sample of people included in this study was highly selective.

Outcomes were downgraded for inconsistency, as appropriate, and the committee interpreted the evidence taking these limitations into consideration.

Overall, the committee agreed that the evidence was of insufficient quality as the basis to make recommendations alone and supplemented the information provided by the review with their clinical experience and awareness of the wider literature.

Benefits and harms

Neuroimaging is one of the most common imaging tests in people with 1 or more confirmed seizures. MRI helps identify the cause of epilepsy and provides the information necessary to plan appropriate treatment.

The evidence showed that the yield of clinically relevant abnormalities varied by age. Infants (<3 years old) and children (3 to 11 years old) had higher yield of congenital/developmental abnormalities; children and young people (>11 to 25 years old) had higher yield of scarring abnormalities; and older people (>65 years old) higher yield of inflammatory/infective/immune and vascular abnormalities. These findings are consistent with the clinical experience and expertise of the committee, who emphasised that MRI scanning is particularly important in those who develop epilepsy before the age of 2 or in adulthood. Onset of seizures in these age groups is more frequently associated with an abnormality demonstrable on neuroimaging. However, the committee agreed that an abnormality could be present at any age and agreed to make a recommendation to this effect.

The committee discussed that there are specific conditions in which neuroimaging is not needed routinely because they are not associated with abnormal findings, namely idiopathic generalised epilepsy (IGE) that responds to treatment, or childhood epilepsy with centrotemporal spikes.

Based on their experience and expertise, the committee established that MRI scans should be offered within 6 weeks of referral to avoid undue delays. The committee

could not recommend a specific imaging protocol as this was not formally assessed in the review. However, to avoid ambiguity, the committee decided to recommend that regionally agreed protocols should be followed. From clinical experience and expertise, the committee noted that these should be detailed enough to pick up relevant and subtle abnormalities that may cause epilepsy. The protocol should include 3D imaging datasets, such as suggested in the International League Against Epilepsy (ILAE) recommendations on structural magnetic resonance imaging (https://pubmed.ncbi.nlm.nih.gov/31135062). Where possible, the scan should be performed on a higher magnetic field strength scanner (3T preferred over 1.5T).

There may be some situations where general anaesthetic or sedation may be required in order for the person to undergo neuroimaging. For example, this would be needed in those who find it difficult to lie still for the scan (particularly children aged 3 months to 5 years) or those who are anxious during imaging, so the benefits and risks of the anaesthetic procedure or sedation should be discussed with them. Other alternatives to help people go through the procedure includes various approaches to facilitate the process, such as desensitisation or administration of anxiolytic drugs prior to the procedure. Play therapy may also help children to prepare for and undertake the scan. The committee emphasised that these measures should be tailored to each situation and person.

The use of CT or MRI is associated with possible harm. For example, if a contrast agent is used, there is a risk of allergic reaction to it. For CT, there is the specific risk of radiation exposure, which is related to the dose of radiation and the age of the person (worse at younger age). There is no radiation risk associated with MRI, but this modality may not be suitable for some people the procedure takes longer than a CT scan, and may provoke feelings of claustrophobia in susceptible individuals. Additionally, unlike CT, MRI is also contraindicated in those with some metallic implants, such non-MR conditional pacemakers. The benefits for each procedure have to be balanced against the associated risks.

The committee discussed that in cases where MRI cannot be tolerated, CT should be considered. The main disadvantage of CT as compared to MRI is that CT is less sensitive in detecting subtle abnormalities, especially developmental abnormalities, although it may help identify the cause of an acute symptomatic seizure.

The committee acknowledged that paediatric neuroradiologists within tertiary centres have expertise in reporting children's scans, and their expertise can be sought when there are doubts regarding the relevance of imaging findings on children's or young people's scans or in cases of children or young people with drug resistant epilepsy. The committee explained that interpretation of imaging in children and young people can be challenging due to the complex structural brain changes that take place during child development.

The use of agreed epilepsy protocols should reduce the requirement for repeat scans, saving resources over time. However, the committee noted that there are some situations when a repeat MRI scan may be needed. This includes if the first scan was suboptimal, or was done many years ago (as there has been improvement in neuroimaging with modern scanners and scanning techniques), if new symptoms have appeared, or if surgery is being considered.

Cost effectiveness and resource use

The committee noted that no relevant published economic evaluations had been identified and no additional economic analysis had been undertaken in this area.

In current practice, most people with epilepsy will receive neuroimaging to help identify their cause of epilepsy. Therefore, the committee agreed to make a strong recommendation about offering neuroimaging to people with 1 or more confirmed epileptic seizures, in order to look for an underlying cause and assist in planning appropriate treatment. This reflects current practice, so there will not be substantial impact on use of NHS resources associated with these recommendations. There may be some cost savings from refining the diagnostic pathway and reducing the requirement for repeat investigations.

The committee agreed that there would be minimal impact on resource use in the way the MRI scans are conducted, reported and reviewed, as these recommendations largely reflect current practice.

Finally, the committee discussed the length of time people with epilepsy should be expected to wait for neuroimaging. According to the NHS constitution diagnostic imaging should be undertaken within 6 weeks from the referral. The committee considered this was appropriate.

Recommendations supported by this evidence review

This evidence review supports recommendation section 1.3.1-1.3.7.

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Appendices

Appendix A – Review protocols

Review protocol for review question: What is the yield of relevant abnormalities detected by MRI in people with epilepsy?

Table 3: Review protocol for yield of relevant abnormalities detected by MRI in people with epilepsy

Field	Content
PROSPERO registration number	CRD42019159416
Review title	Magnetic resonance imaging scan to detect relevant abnormalities in people with epilepsy
Review question	What is the yield of relevant abnormalities detected by MRI in people with epilepsy? *Note: The question has changed from that in the scope, as the committee agreed the accuracy of MRI is known; however determining when MRI should be used is not clear*
Objective	The objective of this review is to assess how well magnetic resonance imaging (MRI) performs in detecting brain lesions or other relevant abnormalities in people with epilepsy. Knowing the frequency of these abnormalities, helps clinicians to recognise those people who are most at risk of adverse outcomes, and helps to optimise therapeutic options.
Searches	The following databases will be searched: • CDSR • CENTRAL • DARE • HTA • MEDLINE & MEDLINE In-Process and Other Non-Indexed Citations • Embase

Field	Content
	• EMCare Searches will be restricted by: • Date: year 2000 onwards (because of the MRI Technology advances since that year) • English language studies • Human studies
Condition or domain being studied	• Epilepsy
Population	Inclusion: • People with 1 or more confirmed epileptic seizures Exclusion: • Newborn babies (under 28 days) with acute symptomatic seizures
Interventions	• Magnetic resonance imaging (MRI)
Comparator	• Not relevant
Types of study to be included	• Systematic reviews of observational studies • Prospective/ retrospective cohort studies • Cross-sectional studies Note: For further details, see the algorithm in appendix H, Developing NICE guidelines: the manual.
Other exclusion criteria	• Studies with a mixed population (this is, including children, young people and adults with epilepsy and others with a condition different to epilepsy) will be excluded, unless subgroup analysis for epilepsy has been reported.
Context	Recommendations will apply to those receiving care in any healthcare setting (for example, community, primary, secondary care) Priority in decision making will be given to identified studies which report data on both MRI and CT as determining who should be tested for MRI and/or CT is required when determining the aetiology of epilepsy.
Primary outcomes (critical outcomes)	• Proportion identified with a clinically relevant abnormality

Field	Content
Secondary outcomes (important outcomes)	• Proportion identified with a non-epilepsy related abnormality
Data extraction (selection and coding)	All references identified by the searches and from other sources will be uploaded into STAR and de-duplicated. Titles and abstracts of the retrieved citations will be screened. The full text of potentially eligible studies will be retrieved and will be assessed in line with the inclusion criteria outlined in the review protocol. Studies that fail to meet the inclusion criteria once the full version has been checked will be excluded at this stage. Each study excluded after checking the full version will be listed, along with the reason for its exclusion. A standardised form will be used to extract data from studies (see Developing NICE guideline: the manual section 6.4) and will include: study setting; study design; study aim; study dates; funding; sample size; participant demographics and baseline characteristics; inclusion and exclusion criteria; details of intervention and control groups; study methodology; recruitment and study completion rates; outcomes and times of measurement; and information for assessment of risk of bias. All data extraction will be quality assured by a senior reviewer. Draft included and excluded studies tables will be circulated to the Topic Group for their comments. Resolution of disputes will be by discussion between the senior reviewer, Topic advisor and Chair. Duplicate screening will not be undertaken for this question.
Risk of bias (quality) assessment	Quality assessment of individual studies will be performed using the following checklists: • ROBIS tool for systematic reviews • The CEBMA checklist for prevalence data The quality assessment will be performed by one reviewer and this will be quality assessed by a senior reviewer
Strategy for data synthesis	Depending on the availability of the evidence, the findings will be summarised narratively or quantitatively. <u>Data synthesis</u> Data will be extracted from the studies, and where possible, meta-analyses will be conducted using R, version 3.1.2. A fixed effect meta-analysis will be conducted and data will be presented as absolute rates of yield. <u>Heterogeneity</u>

Field	Content
	Heterogeneity in the effect estimates of the individual studies will be assessed using the I^2 statistic. I^2 values of greater than 50% and 75% will be considered as significant and very significant heterogeneity, respectively. In the presence of heterogeneity, sub-group analysis will be conducted: • according to the risk of bias of individual studies • study location Exact sub-group analysis may vary depending on differences identified within included studies. If heterogeneity cannot be explained using these methods, random effects model will be used. If heterogeneity remains above 75% and cannot be explained by sub-group analysis; reviewers will consider if meta-analysis is appropriate given characteristics of included studies. Validity The confidence in the findings across all available evidence will be evaluated for each outcome using an adaptation of the 'Grading of Recommendations Assessment, Development and Evaluation (GRADE) toolbox' developed by the international GRADE working group: http://www.gradeworkinggroup.org/

Analysis of sub-groups	Stratification
	Results will be presented separately by:
	
	• Age group:
	  ○ Infants (< 3 years old)
	  ○ Children (3 to 11 years old)
	  ○ Young people (> 11 to 25 years old)
	  ○ Adults (> 25 to 65 years old)
	  ○ Older people (> 65 years old)
	
	• Seizure type:
	  ○ Focal (partial)
	  ○ Genetic (idiopathic) generalised

Field	Content	

	• Syndrome type:
	  ○ Rolandic
	  ○ West
	  ○ Dravet
	  ○ Lennox Gastaut
	
	• MRI strength of magnet (1.5 versus 3)
	
	• Response to treatment:
	  ○ New diagnosis
	  ○ Existing diagnosis and treatment resistant
	  ○ Existing diagnosis and controlled
	
	• Learning disability (present/absent)
	• Alcohol related seizures (present/absent)
	• According to those who have or have not had a previous CT scan	

Type and method of review	☐	Intervention
	☐	Diagnostic
	☐	Prognostic
	☐	Qualitative
	☒	Epidemiologic
	☐	Service Delivery
	☐	Other (please specify)
Language	English	

Field	Content		
Country	England		
Anticipated or actual start date	16 January 2020		
Anticipated completion date	21 April 2021		
Stage of review at time of this submission	Review stage	Started	Completed
	Preliminary searches	x	x
	Piloting of the study selection process	x	x
	Formal screening of search results against eligibility criteria	x	x
	Data extraction	x	x
	Risk of bias (quality) assessment	x	x
	Data analysis	x	x
Named contact	5a. Named contact National Guideline Alliance 5b. Named contact e-mail epilepsies@nice.org.uk 5c. Organisational affiliation of the review National Institute for Health and Care Excellence (NICE) and National Guideline Alliance		
Review team members	NGA technical team		
Funding sources/sponsor	This systematic review is being completed by the National Guideline Alliance, which is funded by NICE and hosted by the Royal College of Obstetricians and Gynaecologists. NICE funds the National Guideline Alliance to develop guidelines for those working in the NHS, public health, and social care in England.		
Conflicts of interest	All guideline committee members and anyone who has direct input into NICE guidelines (including the evidence review team and expert witnesses) must declare any potential conflicts of interest in line with NICE's code of practice for declaring and dealing with conflicts of interest. Any relevant interests, or changes to interests, will also be		

Field	Content
	declared publicly at the start of each guideline committee meeting. Before each meeting, any potential conflicts of interest will be considered by the guideline committee Chair and a senior member of the development team. Any decisions to exclude a person from all or part of a meeting will be documented. Any changes to a member's declaration of interests will be recorded in the minutes of the meeting. Declarations of interests will be published with the final guideline.
Collaborators	Development of this systematic review will be overseen by an advisory committee who will use the review to inform the development of evidence-based recommendations in line with section 3 of Developing NICE guidelines: the manual. Members of the guideline committee are available on the NICE website: https://www.nice.org.uk/guidance/indevelopment/gid-ng10112
URL for published protocol	https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42019159416
Dissemination plans	NICE may use a range of different methods to raise awareness of the guideline. These include standard approaches such as: notifying registered stakeholders of publication publicising the guideline through NICE's newsletter and alerts issuing a press release or briefing as appropriate, posting news articles on the NICE website, using social media channels, and publicising the guideline within NICE.
Keywords	Genetic testing, yield, management, epilepsy
Details of existing review of same topic by same authors	Not applicable
Additional information	Not applicable
Details of final publication	www.nice.org.uk

CDSR: Cochrane Database of Systematic Reviews; CEBMA; center for evidence-based management; CENTRAL: Cochrane Central Register of Controlled Trials; GRADE: Grading of Recommendations Assessment, Development and Evaluation; HTA: Health Technology Assessment; MID: minimal important difference; NICE: National Institute for Health and Care Excellence; RCT: Randomised Controlled Trial; RoB: Risk of Bias;; ROBIS: risk of bias in systematic reviews; SD: Standard Deviation

Appendix B – Literature search strategies

Literature search strategies for review question: What is the yield of relevant abnormalities detected by MRI in people with epilepsy?

Clinical

Database(s): EMCare, MEDLINE and Embase (Multifile) – OVID

EMCare 1995 to November 25, 2019; Embase Classic+Embase 1947 to 2019 November 25; Ovid MEDLINE(R) and Epub Ahead of Print, In-Process & Other Non-Indexed Citations and Daily 2019 November 25, 2019
Date of last search: 25 November 2019

Multifile database codes: emcr=EMCare; emczd=Embase Classic+Embase; ppez= MEDLINE(R) and Epub Ahead of Print, In-Process & Other Non-Indexed Citations and Daily

#	searches
1	exp epilepsy/ use ppez, emczd, emcr or epilep*.ti,ab.
2	(((absence or astatic or atonic or tonic or tonic clonic) adj2 (seizure* or spasm*)) or (benign adj2 (childhood or neonatal or pediatric or paediatric) adj2 (convulsion* or seizure* or spasm*)) or (benign adj3 convulsion* adj2 centrotemporal adj2 spike*) or ((centralopathic or centrotemporal or temporal-central focal) adj (convulsion* or seizure*)) or continous spike wave of slow sleep or doose* or dravet or ((early or infantile) adj2 myoclonic adj2 encephalopath*) or ((flexor or infantile or neonatal) adj2 (seizure* or spasm*)) or hypsarrhythmia* or infant* spasm* or ((jacknife or jack nife or lightening or nodding or salaam) adj (attack* or convulsion* or seizure* or spasm*)) or (landau adj2 kleffner) or lennox gastaut or massive myoclonia or (myoclonic adj2 (astatic or atonic)) or (myoclonic adj3 (seizure* or spasm*)) or ((osylvian or postrolandic or roland*) adj2 (convulsion* or seizure* or spasm*)) or propulsive petit mal or spasm in*1 flexion or spasmus nutans or west syndrome*).ti,ab.
3	(bcects or bects or brec or cects or lgs or mae or smei).ti,ab.
4	or/1-3
5	seizure*.ti,ab,hw. or (convulsion* or fits or jerk* or spasm*).ti,ab.
6	4 and 5
7	exp magnetic resonance imaging/ use ppez or exp nuclear magnetic resonance imaging/ use emczd, emcr
8	(magnetic resonance or mri or mrs or nmr* or ((magnet* or mr or nuclear or nm) adj2 (angiogra* or elastogra* or examin* or imag* or scan* or spectroscop* or tomogra* or tomoangiogra*))).ti,ab.
9	or/7-8
10	brain injuries/ use ppez or exp brain injury/ use emczd, emcr or ((brain* or cerebral) adj2 (abnormal* or damage or lesion* or malformation*)).ti,ab.
11	exp encephalomalacia/ use ppez, emczd, emcr or ((brain adj (malacia or softening)) or cerebromalacia* or encephalomalacia* or scarring).ti,ab.
12	exp hemorrhage/ or (bleeding or (blood adj (effusion or loss)) or ha?morrhag* or he?morrhag*).ti,ab.
13	infarction/ use ppez, emczd, emcr or (infarct* or ((thrombo embolic or thromboembolic) adj accident)).ti,ab.
14	calcification*.hw. or calcification.ti,ab.
15	exp vascular malformations/ use ppez or exp congenital blood vessel malformation/ use emczd, emcr or ((vascular adj (abnormal* or malformation*)) or ((arteriovenous or arterio venous) adj malformation) or avm).ti,ab.
16	exp hydrocephalus/ use ppez, emczd, emcr or (aqueductal stenos?s or cerebral ventriculomegal* or hydrocephal*).ti,ab.
17	exp edema/ use ppez, emczd, emcr or (anasarca or dropsy or hydrops or oedema* or edema* or tissue swelling).ti,ab.
18	exp brain neoplasms/ use ppez or meningioma/ use ppez, emczd, emcr or exp brain tumor/ use emczd, emcr
19	(((brain or cerebral or intracranial or meninges or midline) adj2 (cancer* or metastases or neoplasm* or tumor* or tumour*)) or cerebroma* or mening?oma*).ti,ab.
20	posterior leukoencephalopathy syndrome/ use ppez or posterior reversible encephalopathy syndrome/ use emczd, emcr or ((posterio?r adj (leukoencephalopath* or leuko encephalopath*)) or (posterio?r adj2 reversible encephalopath*) or pres or rpls).ti,ab.
21	exp vasculitis/ use ppez, emczd, emcr or (angiitis or vasculiti*).ti,ab.

#	searches
22	exp sinus thrombosis, intracranial/ use ppez or cerebral sinus thrombosis/ use emczd, emcr or (cerebral venous sinus thrombosis or cvst).ti,ab.
23	exp cicatrix/ use ppez or exp scar/ use emczd, emcr or (cicatri?ation or scar*1 or scarring).ti,ab.
24	gliosis/ use ppez, emczd, emcr or (glios?s or gliomatosis or microgliosis).ti,ab.
25	(hippocampus and sclerosis).sh. or ((hippocampal or ammon horn or hippocampus or incisural or mesial temporal or pararhinal) adj sclerosis).ti,ab.
26	ulegyria.ti,ab.
27	exp demyelinating diseases/ use ppez or exp demyelinating disease/ use emczd, emcr or (demyelination or (demyelinating adj2 (disorder* or disease*))).ti,ab.
28	exp "malformations of cortical development"/ use ppez or exp cortical dysplasia/ use emczd, emcr or (((brain cortext or cortical) adj2 (dysplasia* or development malformation*)) or ((abnormal* or malformation*) adj2 cortical development)).ti,ab.
29	exp neurocutaneous syndromes/ use ppez or phakomatosis/ use emczd, emcr or ((neurocutaneous adj (disorder* or syndrome*)) or phakoma* or phacomatos*).ti,ab.
30	exp encephalitis/ use ppez, emczd, emcr or limbic encephalitis/ use ppez or paraneoplastic neuropathy/ use emczd, emcr or ((allergic adj (leukoencephalopath* or leuko encephalopath*)) or encephaliti* or limbic encephalit*).ti,ab.
31	*infection/ use ppez or infection*.ti,ab.
32	exp "congenital disorders of glycosylation"/ use ppez or exp "congenital disorder of glycosylation"/ use emczd, emcr
33	(carbohydrate deficient glycoprotein syndrome* or cdg syndrome* or (congenital disorders adj2 glycosylation) or glycanosis cdg or (carbohydrate deficient adj (glycoprotein disorders or inborn error*))).ti,ab.
34	leukodystrophy*.sh. or ((leucodystroph* or metabolic leucoencephalopa* or very long chain) adj3 deficien*).ti,ab.
35	exp lysosomal storage diseases/ use ppez or exp lysosome storage disease/ use emczd, emcr or (lysosomal adj (enzyme or storage) adj (disease* or disorder*)).ti,ab.
36	exp mitochondrial diseases/ use ppez or exp "disorders of mitochondrial functions"/ use emczd, emcr or ((mitochondrial adj (deficien* or disease* or disorder*)) or mitochondriopath* or ((electron transport chain or oxidative phosphorylation or respiratory chain) adj2 (deficien* or disease* or disorder*))).ti,ab.
37	amino acid metabolism, inborn errors/ use ppez or "disorders of amino acid and protein metabolism"/ use emczd, emcr or (organic adj (acidemia or aciduria*)).ti,ab.
38	molybdenum cofactor deficiency / use emczd, emcr or (molybdenum adj (co factor or cofactor) adj deficiency).ti,ab.
39	(sulfite oxidase and deficiency).hw. or ((sulfite adj2 oxidase adj2 deficiency) or isod).ti,ab.
40	((disorder* adj3 (amino acid* or protein*) adj3 metaboli*) or (phenyl ketonuria* or phenylketonuria* or tyrosinemia* or homocystinuria* or non-ketotic hyperglycinemia* or maple syrup urine disease) or (amino acid metablism adj3 inborn error*)).ti,ab.
41	(glucose transporter*.sh. and deficien*.hw.) or ((glucose transporter adj3 deficien*) or glut1).ti,ab.
42	(or/10-41) or (abnormal* or lesion* or malformation*).ti,ab. or malformation*.hw.
43	exp epilepsy/di or diagnos*.sh. or (diagnos* or detect* or identif* or indicat* or reveal* or ((epilepsy or seizure) adj protocol*) or yield*).ti,ab.
44	6 and 9 and 42 and 43
45	6 and 9 and ((magnetic resonance or mri or mrs or nmr* or angiogra* or tomoangiogra* or imag* or scan* or spectroscop* or tomogra* or elastogra* or examin*) adj3 (abnormal* or lesion* or malformation*)).ti,ab.
46	(6 and 9 and (exp case control studies/ or exp cohort studies/ or cross-sectional studies/ or epidemiologic studies/ or observational study/ or (case control or (cohort adj (analy* or study or studies)) or cross sectional or (follow up adj (study or studies)) or longitudinal or (observational adj (study or studies)) or retrospective).ti,ab.) and ((abnormal* or lesion* or malformation*).ti,ab. or malformation*.hw.)) use ppez or (6 and 9 and (exp case control study/ or cohort analysis/ or cross-sectional study/ or follow up/ or longitudinal study/ or observational study/ or prospective study/ or retrospective study/ or (case control or (cohort adj (analy* or study or studies)) or cross sectional or (follow up adj (study or studies)) or longitudinal or (observational adj (study or studies)) or retrospective).ti,ab.) and ((abnormal* or lesion* or malformation*).ti,ab. or malformation*.hw.)) use emczd, emcr
47	or/44-46
48	limit 47 to yr="2000 - current"
49	limit 48 to english language
50	((letter.pt. or letter/ or note.pt. or editorial.pt. or case report/ or case study/ or (letter or comment*).ti.) not (randomized controlled trial/ or random*.ti,ab.)) or ((animal/ not human/) or nonhuman/ or exp animal experiment/ or exp experimental animal/ or animal model/ or exp rodent/ or (rat or rats or mouse or mice).ti.)
51	50 use emez

#	searches
52	((letter/ or editorial/ or news/ or exp historical article/ or anecdotes as topic/ or comment/ or case report/ or (letter or comment*).ti.) not (randomized controlled trial/ or random*.ti,ab.)) or ((animals not humans).sh. or exp animals, laboratory/ or exp animal experimentation/ or exp models, animal/ or exp rodentia/ or (rat or rats or mouse or mice).ti.)
53	52 use mesz
54	51 or 53
55	49 not 54

Database(s): Cochrane Library

Cochrane Database of Systematic Reviews, Issue 11 of 12, November 2019; Cochrane Central Register of Controlled Trials, Issue 11 of 12, November 2019
Date of last search: 25 November 2019

#	searches
1	mesh descriptor: [epilepsy] explode all trees
2	epilep*:ti,ab
3	(((absence or astatic or atonic or tonic or “tonic clonic”) near/2 (seizure* or spasm*)) or (benign near/2 (childhood or neonatal or pediatric or paediatric) near/2 (convulsion* or seizure* or spasm*)) or (benign near/3 convulsion* near/2 centrotemporal near/2 spike*) or ((centralopathic or centrotemporal or “temporal-central” focal) next (convulsion* or seizure*)) or “continous spike wave of slow sleep” or doose* or dravet or ((early or infantile) near/2 myoclonic near/2 encephalopath*) or ((flexor or infantile or neonatal) near/2 (seizure* or spasm*)) or hypsarrhythmia* or “infant* spasm*” or ((jacknife or “jack nife” or lightening or nodding or salaam) next (attack* or convulsion* or seizure* or spasm*)) or (landau near/2 kleffner) or “lennox gastaut” or “massive myoclonia” or (myoclonic near/2 (astatic or atonic)) or (myoclonic near/3 (seizure* or spasm*)) or ((osylvian or postrolandic or roland*) near/2 (convulsion* or seizure* or spasm*)) or “propulsive petit mal” or “spasm in* flexion” or “spasmus nutans” or “west syndrome*”):ti,ab
4	(bcects or bects or brec or cects or lgs or mae or smei) :ti,ab
5	{ or #1-#4}
6	(convulsion* or fits or jerk* or seizure* or spasm*):ti,ab,kw
7	#5 and #6
8	mesh descriptor: [magnetic resonance imaging] explode all trees
9	(“magnetic resonance” or mri or mrs or nmr* or ((magnet* or mr or nuclear or nm) near/2 (angiogra* or elastogra* or examin* or imag* or scan* or spectroscop* or tomogra* or tomoangiogra*))):ti,ab
11	{or #8-#9}
12	mesh descriptor: [brain injuries] this term only
13	mesh descriptor: [encephalomalacia] explode all trees
14	mesh descriptor: [hemorrhage] explode all trees
15	mesh descriptor: [infarction] this term only
16	calcification*:kw
17	mesh descriptor: [vascular malformations] explode all trees
18	mesh descriptor: [hydrocephalus] explode all trees
19	mesh descriptor: [edema] explode all trees
20	mesh descriptor: [brain neoplasms] explode all trees
21	mesh descriptor: [meningioma] this term only

#	searches
22	mesh descriptor: [posterior leukoencephalopathy syndrome] this term only
23	mesh descriptor: [vasculitis] explode all trees
24	mesh descriptor: [sinus thrombosis, intracranial] explode all trees
25	mesh descriptor: [cicatrix] explode all trees
26	mesh descriptor: [gliosis] this term only
27	(hippocampus and sclerosis):kw
28	mesh descriptor: [demyelinating diseases] explode all trees
29	mesh descriptor: ["malformations of cortical development"] explode all trees
30	mesh descriptor: [neurocutaneous syndromes] explode all trees
31	mesh descriptor: [encephalitis] explode all trees
32	mesh descriptor: [limbic encephalitis] this term only
33	mesh descriptor: [infection] this term only
34	mesh descriptor: ["congenital disorders of glycosylation"] this term only
35	leukodystrophy*:kw.
36	mesh descriptor: [lysosomal storage diseases] explode all trees
37	mesh descriptor: [mitochondrial diseases] explode all trees
38	mesh descriptor: [amino acid metabolism, inborn errors] this term only
39	(sulfite oxidase and deficiency):kw
40	(“glucose transporter*” and deficien*):kw
41	((brain* or cerebral) near/2 (abnormal* or damage or lesion* or malformation*)):ti,ab
42	((brain next (malacia or softening)) or cerebromalacia* or encephalomalacia* or scarring) :ti,ab
43	(bleeding or (blood next (effusion or loss)) or ha?morrhag* or he?morrhag*):ti,ab
44	(infarct* or ((“thrombo embolic” or thromboembolic) next accident*)):ti,ab
45	calcification:ti,ab
46	((vascular next (abnormal* or malformation*)) or ((arteriovenous or “arterio venous”) next malformation*) or avm) :ti,ab
47	(“aqueductal stenos?s” or “cerebral ventriculomegal*” or hydrocephal*):ti,ab
48	(anasarca or dropsy or hydrops or oedema* or edema* or “tissue swelling”) :ti,ab
49	(((brain or cerebral or intracranial or meninges or midline) near/2 (cancer* or metastases or neoplasm* or tumor* or tumour*)) or cerebroma* or mening?oma*):ti,ab
50	((posterio?r next (leukoencephalopath* or “leuko encephalopath*”)) or (posterio?r near/2 reversible encephalopath*) or pres or rpls) :ti,ab
51	(angiitis or vasculiti*):ti,ab
52	(!cerebral venous sinus thrombosis! or cvst) :ti,ab
53	(cicatri?ation or scar* or scarring) :ti,ab

#	searches
54	(glios?s or gliomatosis or microgliosis) :ti,ab
55	((hippocampal or “ammon horn” or hippocampus or incisural or “mesial temporal” or pararhinal) next sclerosis) :ti,ab
56	ulegyria:ti,ab
57	(demyelination or (demyelinating near/2 (disorder* or disease*))):ti,ab
58	(((“brain cortext” or cortical) near/2 (dysplasia* or “development malformation*”)) or ((abnormal* or malformation*) near/2 “cortical development”)) :ti,ab
59	((neurocutaneous next (disorder* or syndrome*)) or phakoma* or phacomatos*):ti,ab
60	((allergic next (leukoencephalopath* or “leuko encephalopath*”)) or encephaliti* or “limbic encephalit*”):ti,ab
61	infection*:ti,ab
62	(“carbohydrate deficient glycoprotein syndrome*” or “cdg syndrome*” or (“congenital disorders” near/2 glycosylation) or “glycanosis cdg” or (“carbohydrate deficient” next (“glycoprotein disorders” or “inborn error*”))):ti,ab
63	((leucodystroph* or “metabolic leucoencephalopa*” or “very long chain”) near/3 deficien*):ti,ab
64	(lysosomal next (enzyme or storage) next (disease* or disorder*)):ti,ab
65	((mitochondrial next (deficien* or disease* or disorder*)) or mitochondriopath* or ((“electron transport chain” or “oxidative phosphorylation” or “respiratory chain”) near/2 (deficien* or disease* or disorder*))):ti,ab
66	(organic next (acidemia or aciduria*)):ti,ab
67	(molybdenum next (“co factor” or cofactor) next deficiency) :ti,ab
68	((sulfite near/2 oxidase near/2 deficiency) or isod) :ti,ab
69	((disorder* near/3 (“amino acid*” or protein*) near/3 metaboli*) or (“phenyl ketonuria*” or phenylketonuria* or tyrosinemia* or homocystinuria* or “non-ketotic hyperglycinemia*” or “maple syrup urine disease”) or (“amino acid metabolism” near/3 inborn error*)):ti,ab
70	((“glucose transporter” near/3 deficien*) or glut1) :ti,ab
71	(abnormal* or lesion* or malformation*) :ti,ab
72	malformation*:kw.
73	{or #12-#72}
74	MeSH descriptor: [epilepsy] explode all trees and with qualifier(s): [diagnosis - DI]
75	diagnos*:kw
76	(diagnos* or detect* or identif* or indicat* or reveal* or ((epilepsy or seizure) next protocol*) or yield*):ti,ab
77	{or #74-#76}
78	#7 and #11 and #73 and #77
79	((“magnetic resonance“ or mri or mrs or nmr* or angiogra* or tomoangiogra* or imag* or scan* or spectroscop* or tomogra* or elastogra* or examin*) near/3 (abnormal* or lesion* or malformation*)):ti,ab
80	#7 and #11 and #79
81	mesh descriptor: [case control studies] explode all trees

#	searches
82	mesh descriptor: [cohort studies] explode all trees
83	mesh descriptor: [cross-sectional studies] this term only
84	mesh descriptor: [epidemiologic studies] this term only
85	mesh descriptor: [observational study] this term only
86	("case control" or (cohort next (analy* or study or studies)) or "cross sectional" or ("follow up" next (study or studies)) or longitudinal or (observational next (study or studies)) or retrospective)):ti,ab
87	((abnormal* or lesion* or malformation* or malformation*):ti,ab,kw
88	{or #81-86}
89	#88 and #87
90	#7 and #11 and #89
91	#78 or #80 or #90 with Cochrane Library publication date from Jan 2000 to November 2019

Database(s): DARE; HTA database - CRD
Date of last search: 25 November 2019

#	searches
1	mesh descriptor epilepsy explode all trees
2	epilep*
3	(((absence or astatic or atonic or tonic or "tonic clonic") near2 (seizure* or spasm*)) or (benign near2 (childhood or neonatal or pediatric or paediatric) near2 (convulsion* or seizure* or spasm*)) or (benign near3 convulsion* near2 centrotemporal near2 spike*) or ((centralopathic or centrotemporal or "temporal-central" focal) next (convulsion* or seizure*)) or "continous spike wave of slow sleep" or doose* or dravet or ((early or infantile) near2 myoclonic near2 encephalopath*) or ((flexor or infantile or neonatal) near2 (seizure* or spasm*)) or hypsarrhythmia* or "infant* spasm*" or ((jacknife or "jack nife" or lightening or nodding or salaam) next (attack* or convulsion* or seizure* or spasm*)) or (landau near2 kleffner) or "lennox gastaut" or "massive myoclonia" or (myoclonic near2 (astatic or atonic)) or (myoclonic near3 (seizure* or spasm*)) or ((osylvian or postrolandic or roland*) near2 (convulsion* or seizure* or spasm*)) or "propulsive petit mal" or "spasm in* flexion" or "spasmus nutans" or "west syndrome*")
4	(bcects or bects or brec or cects or lgs or mae or smei)
5	#1 or #2 or #3 or #4

Economic

Database(s): MEDLINE & Embase (Multifile) - OVID
Embase Classic+Embase 1947 to 2021 March 31; Ovid MEDLINE(R) and Epub Ahead of Print, In-Process & Other Non-Indexed Citations and Daily 1946 to March 31, 2021
Date of last search: 31 March 2021

Multifile database codes: emczd=Embase Classic+Embase; ppez= MEDLINE(R) and Epub Ahead of Print, In-Process & Other Non-Indexed Citations and Daily

#	searches
1	exp epilepsy/ or exp seizure/ or "seizure, epilepsy and convulsion"/
2	1 use emczd
3	exp epilepsy/ or seizures/ or seizures, febrile/ or exp status epilepticus/

#	searches
4	3 use ppez
5	(epilep* or seizure* or convuls*).ti,ab. or (continous spike wave of slow sleep or infant* spasm*).ti,ab.
6	(seizure and absence).sh. use emczd, emcr or seizures/ use ppez or ((absence adj2 (convulsion* or seizure*)) or ((typical or atypical) adj absenc*) or petit mal* or pyknolepsy or typical absence*).ti,ab.
7	(atonic seizure or tonic seizure).sh. use emczd, emcr or exp seizures/ use ppez or ((drop or akinetic or atonic or tonic) adj2 (attack* or epileps* or seizure* or convulsion*)).ti,ab. or brief seizure.ti,ab. or (tonic adj3 atonic adj3 (attack* or epileps* or seizure* or convulsion*)).ti,ab.
8	exp benign childhood epilepsy/ use emczd, emcr or epilepsy, rolandic/ use ppez or (bcects or bects or brec or benign epilepsy or (benign adj2 (childhood or neonatal or pediatric or paediatric) adj2 epileps*) or (benign adj2 (childhood or neonatal or pediatric or paediatric) adj2 (convulsion* or epileps* or seizure* or spasm*)) or (benign adj3 (convulsion* or epileps*) adj2 centrotemporal adj2 spike*) or cects or ((centralopathic or centrotemporal or temporal-central focal) adj (convulsion* or epileps* or seizure*)) or ((osylvian or postrolandic or roland*) adj2 (convulsion* or epileps* or seizure* or spasm*))).ti,ab.
9	exp generalized epilepsy/ use emczd, emcr or exp epilepsy, generalized/ use ppez
10	(((akinetic or atonic or central or diffuse or general or generali?ed or idiopathic or tonic) adj3 (epilep* or seizure*)) or ((childhood absence or juvenile absence or myoclonic or myoclonia or myoclonic astatic or myoclonus or gtcs) adj2 epilep*) or (epilepsy adj2 eyelid myoclonia) or (ige adj2 phantom absenc*) or impulsive petit mal or (janz adj3 (epilep* or petit mal)) or jeavons syndrome* or ((janz or lafora or lafora body or lundborg or unverricht) adj2 (disease or syndrome)) or ((jme or jmes) and epilep*) or perioral myoclon*).ti,ab.
11	infantile spasm/ use emczd, emcr or spasms, infantile/ use ppez or (((early or infantile) adj2 myoclonic adj2 encephalopath*) or ((early or infantile) adj2 epileptic adj2 encephalopath*) or epileptic spasm* or ((flexor or infantile or neonatal) adj2 (seizure* or spasm*)) or generali?ed flexion epileps* or hypsarrhythmia* or ((jacknife or jack nife or lightening or nodding or salaam) adj (attack* or convulsion* or seizure* or spasm*)) or massive myoclonia or minor motor epilepsy or propulsive petit mal or spasm in*1 flexion or spasmus nutans or west syndrome*).ti,ab.
12	landau kleffner syndrome/ use emczd, emcr, ppez or (dravet or lennox gastaut or lgs or (landau adj2 kleffner) or smei).ti,ab.
13	lennox gastaut syndrome/ use emczd, emcr or lennox gastaut syndrome/ use ppez or generalized epilepsy/ use emczd, emcr or epileptic syndromes/ use ppez
14	(child* epileptic encephalopath* or gastaut or lennox or lgs).ti,ab.
15	myoclonus seizure/ use emczd, emcr or seizures/ use ppez or ((myoclon* adj2 (absence* or epileps* or seizure* or jerk* or progressive familial epilep* or spasm* or convulsion*)) or ((lafora or unverricht) adj2 disease) or muscle jerk).ti,ab.
16	myoclonic astatic epilepsy/ use emczd, emcr or exp epilepsies, myoclonic/ use ppez or ((myoclonic adj2 (astatic or atonic)) or (myoclonic adj3 (seizure* or spasm*)) or doose* syndrome or mae or generali?ed idiopathic epilepsy).ti,ab. or ((absence or astatic or atonic or tonic or tonic clonic) adj2 (seizure* or spasm*)).ti,ab.
17	exp epilepsies, partial/ use ppez or exp focal epilepsy/ use emczd, emcr or ((focal or focal onset or local or partial or simple partial) adj3 (epileps* or seizure*)).ti,ab.
18	severe myoclonic epilepsy in infancy/ use emczd, emcr or exp epilepsies, myoclonic/ use ppez
19	(dravet*1 or (intractable childhood epilepsy adj2 (generalised tonic clonic or gtc)) or icegtc* or (severe adj2 (myoclonic or polymorphic) adj2 epilepsy adj2 infancy) or smeb or smei).ti,ab.
20	epilepsy, tonic-clonic/ use ppez or epilepsy, generalized/ use ppez or generalized epilepsy/ use emczd, emcr or grand mal epilepsy/ use emczd, emcr or (((clonic or grand mal or tonic or (tonic adj3 clonic)) adj2 (attack* or contraction* or convuls* or seizure*)) or gtcs or (generali* adj (contraction* or convuls* or insult or seizure*))).ti,ab.
21	or/2,4-20
22	exp budgets/ or exp "costs and cost analysis"/ or exp economics, hospital/ or exp economics, medical/ or economics, nursing/ or economics, pharmaceutical/ or economics/ or exp "fees and charges"/ or value of life/
23	22 use ppez
24	budget/ or exp economic evaluation/ or exp fee/ or funding/ or health economics/ or exp health care cost/
25	24 use emczd
26	budget*.ti,ab.
27	cost*.ti.
28	(economic* or pharmaco economic* or pharmacoeconomic*).ti.
29	(price* or pricing*).ti,ab.
30	(cost* adj2 (effective* or utilit* or benefit* or minimi* or unit* or estimat* or variable*)).ab.
31	(financ* or fee or fees).ti,ab.
32	(value adj2 (money or monetary)).ti,ab.
33	or/23,25-32

#	searches
34	21 and 33
25	limit 34 to engish language

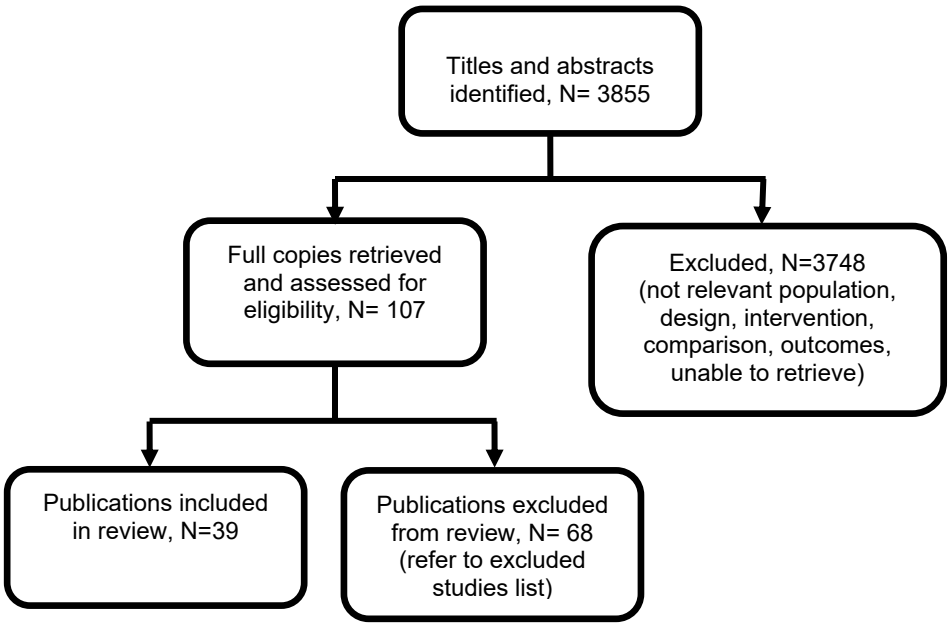
Database(s): NHS Economic Evaluation Database (NHS EED), HTA database – CRD
Date of last search: 31 March 2021

#	searches
1	mesh descriptor epilepsy explode all trees
2	mesh descriptor seizures this term only
3	mesh descriptor seizures, febrile this term only
4	mesh descriptor status epilepticus explode all trees
5	(epilep* or seizure* or convuls*) or (“continous spike wave of slow sleep” or “infant* spasm*”)
6	((absence near2 (convulsion* or seizure*)) or ((typical or atypical) next absenc*) or “petit mal*” or pyknolepsy or “typical absence*”)
7	mesh descriptor seizures explode all trees
8	((drop or akinetic or atonic or tonic) near2 (attack* or epileps* or seizure* or convulsion*)) or “brief seizure” or (tonic near3 atonic near3 (attack* or epileps* or seizure* or convulsion*))
9	mesh descriptor epilepsy, rolandic this term only
10	(bcects or bects or brec or “benign epilepsy” or (benign near2 (childhood or neonatal or pediatric or paediatric) near2 epileps*) or (benign near2 (childhood or neonatal or pediatric or paediatric) near2 (convulsion* or epileps* or seizure* or spasm*)) or (benign near3 (convulsion* or epileps*) near2 centrotemporal near2 spike*) or cects or ((centralopathic or centrotemporal or “temporal-central focal”) near (convulsion* or epileps* or seizure*)) or ((osylvian or postrolandic or roland*) near2 (convulsion* or epileps* or seizure* or spasm*)))
11	mesh descriptor epilepsy, generalized this term only
12	(((akinetic or atonic or central or diffuse or general or generali?ed or idiopathic or tonic) near3 (epilep* or seizure*)) or ((“childhood absence” or “juvenile absence” or myoclonic or myoclonia or “myoclonic astatic” or myoclonus or gtcs) near2 epilep*) or (epilepsy near2 “eyelid myoclonia”) or (ige near2 phantom absenc*) or “impulsive petit mal” or (janz near3 (epilep* or “petit mal”)) or “jeavons syndrome*” or ((janz or lafora or “lafora body” or lundborg or unverricht) near2 (disease or syndrome)) or ((jme or jmes) and epilep*) or “perioral myoclon*”)
13	mesh descriptor spasms, infantile this term only
14	(((early or infantile) near2 myoclonic near2 encephalopath*) or ((early or infantile) near2 epileptic near2 encephalopath*) or “epileptic spasm*” or ((flexor or infantile or neonatal) near2 (seizure* or spasm*)) or “generali?ed flexion epileps*” or hypsarrhythmia* or ((jacknife or “jack nife” or lightening or nodding or salaam) next (attack* or convulsion* or seizure* or spasm*)) or “massive myoclonia” or “minor motor epilepsy” or “propulsive petit mal“or “spasm in* flexion” or “spasmus nutans” or “west syndrome*”)
15	mesh descriptor landau kleffner syndrome this term only
16	(dravet or “lennox gastaut” or lgs or (landau near2 kleffner) or smei)
17	mesh descriptor lennox gastaut syndrome this term only
18	mesh descriptor epileptic syndromes this term only
19	(“child* epileptic encephalopath*” or gastaut or lennox or lgs)
20	((myoclon* near2 (absence* or epileps* or seizure* or jerk* or “progressive familial epilep*” or spasm* or convulsion*)) or ((lafora or unverricht) near2 disease) or “muscle jerk”)
21	mesh descriptor epilepsies, myoclonic explode all trees
22	((myoclonic near2 (astatic or atonic)) or (myoclonic near3 (seizure* or spasm*)) or “doose* syndrome” or mae or “generali?ed idiopathic epilepsy”) or ((absence or astatic or atonic or tonic or “tonic clonic”) near2 (seizure* or spasm*))
23	mesh descriptor epilepsies, partial explode all trees
24	((focal or “focal onset” or local or partial or “simple partial”) near3 (epileps* or seizure*))
25	mesh descriptor epilepsies, myoclonic this term only
26	(dravet*1 or (“intractable childhood epilepsy” near2 (“generalised tonic clonic” or gtc)) or icegtc* or (severe near2 (myoclonic or polymorphic) near2 epilepsy near2 infancy) or smeb or smei)
27	mesh descriptor epilepsy, tonic-clonic this term only
28	mesh descriptor epilepsy, generalized this term only
29	(((clonic or “grand mal” or tonic or (tonic near3 clonic)) near2 (attack* or contraction* or convuls* or seizure*)) or gtcs or (generali* next (contraction* or convuls* or insult or seizure*)))
30	#1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19 or #20 or #21 or #22 or #23 or #24 or #25 or #26 or #27 or #28 or #29

Appendix C – Clinical evidence study selection

Clinical study selection for: What is the yield of relevant abnormalities detected by MRI in people with epilepsy?

Figure 1: Study selection flow chart



Appendix D – Clinical evidence tables

Clinical evidence tables for review question: What is the yield of relevant abnormalities detected by MRI in people with epilepsy?

Table 4: Clinical evidence tables

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Full citation Alam-Eldeen, M. H., Hasan, N. M. A., Assessment of the diagnostic reliability of brain CT and MRI in pediatric epilepsy patients, Egyptian Journal of Radiology and Nuclear Medicine., 27, 2015 **Ref Id** 1156238 **Country/ies where the study was carried out** Egypt **Study type** Retrospective cohort Aim of the study To assess the role of CT and MRI in paediatric epilepsy children	**Sample size** N=181 (74 received CT, 89 received MRI, and 18 received both) **Characteristics** Age of follow up, years, mean (SD): 4.3 years (range 1 month to 17 years); SD was not reported) **Inclusion criteria** • Not reported **Exclusion criteria** • Those with intracranial tumors and CNS postoperative cases were due to absence of operative and histopathological data	**Interventions** MRI 1.5-t	**Details** Children were clinically diagnosed as having epilepsy and were referred to the Department of Diagnostic Radiology. MR images were reviewed by 2 radiologists for interpretation.	**Results** Proportion identified with a clinically relevant abnormality: Vascular: 10/89 Scarring: 3/89 Congenital/ developmental: 33/89 Inflammatory/infective/ immune: 7/89 Proportion identified with a non-epilepsy related abnormality: 8/89	**Limitations** The quality of this study was assessed using the CEBMA checklist Did the study address a clearly focused question / issue? Yes Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described? yes Could the way the sample was obtained introduce (selection)bias? potentially yes as all children were referred to the same hospital

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Study dates April 2012 to April 2014 **Source of funding** Not reported					Was the sample of subjects representative with regard to the population to which the findings will be referred? unclear Was the sample size based on pre-study considerations of statistical power? no Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to be valid and reliable? yes Was the statistical significance assessed? not applicable Are confidence intervals given for the main results? no Could there be confounding factors that haven't been accounted for? no Can the results be applied to your organization? yes
Full citation	**Sample size**	**Interventions**	**Details**	**Results**	**Limitations**

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Ali, A., Akram, F., Khan, G., Hussain, S., Paediatrics Brain Imaging In Epilepsy: Common Presenting Symptoms And Spectrum Of Abnormalities Detected On MRI, Journal of Ayub Medical College, Abbottabad : JAMC, 29, 215-218, 2017 **Ref Id** 1156894 **Country/ies where the study was carried out** Pakistan **Study type** Cross-sectional **Aim of the study** To assess the yield of MRI abnormalities in people with epilepsy **Study dates** March 2015 to March 2016 **Source of funding** Not reported	N=209 **Characteristics** No demographic characteristics were reported **Inclusion criteria** • Those between 28 days and 14 years old with epilepsy **Exclusion criteria** • Not reported	MRI scan 1.5-t	Not reported	Proportion identified with a clinically relevant abnormality: Tumours: 14/209 Vascular: 4/209 Scarring: 3/209 Congenital/ developmental: 16/209 Inflammatory/infective/ immune: 10/209 Metabolic/genetic: 10/209 Proportion identified with a non-epilepsy related abnormality: 8/209	The quality of this study was assessed using the CEBMA checklist Did the study address a clearly focused question / issue? yes Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described? no Could the way the sample was obtained introduce (selection)bias? yes Was the sample of subjects representative with regard to the population to which the findings will be referred? unclear Was the sample size based on pre-study considerations of statistical power? no Was a satisfactory response rate achieved? yes

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
					Are the measurements (questionnaires) likely to be valid and reliable? yes Was the statistical significance assessed? not relevant Are confidence intervals given for the main results? no Could there be confounding factors that haven't been accounted for? yes Can the results be applied to your organization? yes
Full citation Asadi-Pooya, A. A., Sharifzade, M., Lennox-Gastaut syndrome in south Iran: Electro-clinical manifestations, Seizure, 21, 760-763, 2012 **Ref Id** 1160033 **Country/ies where the study was carried out**	**Sample size** N=135 **Characteristics** Age of follow up, years, mean (SD): 3.2 (3.8) Males, n (%): 83 (61.5) Syndrome type, n (%): Lennox-Gastaut syndrome, 135 (100) Learning disability, n (%): 132 (97) **Inclusion criteria**	**Interventions** MRI scan 1.5-t	**Details** EEG was performed on all patients at the time of referral. No further relevant methods were reported	**Results** Proportion identified with a clinically relevant abnormality: Congenital/ developmental: 20/135 Metabolic/genetic: 9/135 Proportion identified with a non-epilepsy related abnormality:1/135	**Limitations** The quality of this study was assessed using the CEBMA checklist Did the study address a clearly focused question / issue? yes Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Iran **Study type** Cross-sectional **Aim of the study** To assess the prevalence of brain abnormalities in children with Lennox-Gastaut syndrome **Study dates** September 2008 to May 2012 **Source of funding** Not reported	• Those diagnosed with Lennox-Gastaut syndrome under the care of an epileptologist **Exclusion criteria** • Not reported				(employees, teams, divisions, organizations) clearly described? yes Could the way the sample was obtained introduce (selection)bias? yes Was the sample of subjects representative with regard to the population to which the findings will be referred? unclear Was the sample size based on pre-study considerations of statistical power? no Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to be valid and reliable? yes Was the statistical significance assessed? not relevant Are confidence intervals given for the main results? no

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
					Could there be confounding factors that haven't been accounted for? yes Can the results be applied to your organization? yes
Full citation Aslan, K., Bozdemir, H., Yapar, Z., Burgut, R., The effect of electrophysiological and neuroimaging findings on the prognosis of juvenile myoclonic epilepsy proband, Neurological Research, 32, 620-624, 2010 **Ref Id** 1153393 **Country/ies where the study was carried out** Turkey **Study type** Retrospective cohort **Aim of the study** To report on the clinical, electrophysiological and neuroimaging findings of people with	**Sample size** N= 32 people with juvenile myoclonic epilepsy **Characteristics** Age of follow up, years, mean (range): 22 (16 to 37) Males, n (%): 9 (28.12%) Seizure type, n (%): myoclonic + absence + generalised tonic clonic, 22 (68.8); myoclonic + generalised tonic clonic, 8 (25); myoclonic + absence, 2 (6.2) Syndrome type, n (%): 32 (100) juvenile myoclonic epilepsy Response to treatment, n (%): existing diagnosis and controlled, 32 (100) Learning disability, n (%): 3 (9.4) Inclusion criteria • Those in whom seizure onset and seizure types were related to juvenile myoclonic epilepsy	**Interventions** MRI scan 1.5-t	**Details** People were classified with juvenile myoclonic epilepsy according to ILAE criteria. Diagnosis was based on clinical presentation, history, EEG reports and biochemical analysis. The Porteus Kest was used to evaluate the intelligence quotient. Patients were assessed according to a pre-specified protocol.	**Results** Proportion identified with a clinically relevant abnormality: Scarring: 1/32 Proportion identified with a non-epilepsy related abnormality: 4/32	**Limitations** The quality of this study was assessed using the CEBMA checklist Did the study address a clearly focused question / issue? yes Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described? no Could the way the sample was obtained introduce (selection)bias? unclear as the way the sample was obtained was not reported

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
juvenile myoclonic epilepsy **Study dates** Not reported **Source of funding** Not reported	• Those taking entiepileptic medication >1 year • Those without CNS developmental abnormality (with or without progressive learning disability) Exclusion criteria • Not rerported				Was the sample of subjects representative with regard to the population to which the findings will be referred? unlcear Was the sample size based on pre-study considerations of statistical power? no Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to be valid and reliable? yes Was the statistical significance assessed? not relevant Are confidence intervals given for the main results? no Could there be confounding factors that haven't been accounted for? no Can the results be applied to your organization? yes

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Full citation Bakhsh, A., Value of neuroimaging in epilepsy: An experience from Pakistan, Journal of Neurosciences in Rural Practice, 4, S35-S39, 2013 **Ref Id** 1153420 **Country/ies where the study was carried out** Pakistan **Study type** Prospective cohort **Aim of the study** To evaluate structural brain lesions in patients with epilepsy **Study dates** Not reported **Source of funding** Not reported	**Sample size** N=366, n=339 received CT scans and n=44 received MRI scans **Characteristics** Age of follow up, years, mean (SD): 19.5 (SD not reported) Males, n (%): 240 (65.5) Seizure type, n (%): generalised tonic clonic, n=282 (77.04); complex partial seizure leading to generalised tonic clonic, n=70 (19.12); partial motor fits leading to generalised tonic clonic, n=10 (2.7); juvenile myoclonic epilepsy, n=2 (0.5); complex partial seizures, n=2 (0.5) Learning disability, n (%): 19 (5.1) **Inclusion criteria** • Patients with epilepsy, regardless of cause, type or neurological status **Exclusion criteria** • Those <1 year old • Those with a first seizure, pseudoseizures, pregnancy, seizures secondary to any metabolic disorders, seizures with a frequency of only 1 per annum	**Interventions** MRI scan 1-t	**Details** Diagnosis of epilepsy was made based on clinical history. MRI scans were done without contrast due to budget constraints. No protocols of hipocampus volumetry was done in any MRI scans. Scans were interpreted by general radiologists	**Results** Proportion identified with a clinically relevant abnormality: Tumours: 3/44 Vascular: 4/44 Scarring: 9/44 Proportion identified with a non-epilepsy related abnormality: 3/44	**Limitations** The quality of this study was assessed using the CEBMA checklist Did the study address a clearly focused question / issue? yes Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described? no Could the way the sample was obtained introduce (selection)bias? yes Was the sample of subjects representative with regard to the population to which the findings will be referred? unclear Was the sample size based on pre-study considerations of statistical power? no

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
					Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to be valid and reliable? yes Was the statistical significance assessed? not relevant Are confidence intervals given for the main results? no Could there be confounding factors that haven't been accounted for? yes Can the results be applied to your organization? yes
Full citation Benson, J. C., Chiu, S., Flemming, K., Nasr, D. M., Lanzino, G., Brinjikji, W., MR characteristics of unruptured intracranial arteriovenous malformations associated with seizure as initial clinical presentation, Journal of	**Sample size** N=57 with a seizure at initial clinical presentation **Characteristics** Age of follow up, years, mean (SD): 35.9 (SD not reported) Males, n (%): 30 (52.6) Syndrome type, n (%): 57 (100) arteriovenous malformation with 1 seizure at first clinical presentaition	**Interventions** MRI scans 1.5-t and 3-t	**Details** Two blinded reviewers assessed the patients's characteristics, including imaging, lesion locality, and characteristics of AVMs. People were assessed	**Results** Proportion identified with a clinically relevant abnormality: Vascular: 57/57 Scarring: 38/57 Proportion identified with a non-epilepsy related abnormality: 12/57	**Limitations** The quality of this study was assessed using the CEBMA checklist Did the study address a clearly focused question / issue? yes Is the research method (study design) appropriate for answering the research question? yes

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
neurointerventional surgery., 18, 2019 **Ref Id** 1157597 **Country/ies where the study was carried out** US **Study type** Retrospective cohort **Aim of the study** To assess MRI characteristics in people with intracranial arteriovenous malformations associated with seizures at initial clinical presentation **Study dates** 1 January 2000 to 31 December 2016 **Source of funding** No specific source of funding was reported	**Inclusion criteria** • Those diagnosed with AVM at the study's institution within the provided timeframe • Those with peri-AVM on T2 imaging were also included provided they had no previous history of AVM and they had never had any imaging evidence of acure or subacute haemorrhage **Exclusion criteria** • Those with extracranial AVM • Those with AVM with history of acute rupture • People who had undergone treatment for AVM • AVM not identified on MRI		according to a pre-specified protocol, although 25 different scanners were used within the institution.		Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described? yes Could the way the sample was obtained introduce (selection)bias? yes Was the sample of subjects representative with regard to the population to which the findings will be referred? unclear Was the sample size based on pre-study considerations of statistical power? no Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to be valid and reliable? yes Was the statistical significance assessed? not relevant

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
					Are confidence intervals given for the main results? no Could there be confounding factors that haven't been accounted for? yes (different MRI scans with different strenght of magnet were used) Can the results be applied to your organization? yes **Other information** Note: presence of AVM part of the inclusion criteria, which may overstimate the yield of vascular abnormalities
Full citation Berg, A. T., Testa, F. M., Levy, S. R., Shinnar, S., Neuroimaging in children with newly diagnosed epilepsy: A community-based study, Pediatrics, 106, 527-532, 2000 **Ref Id** 1153473	**Sample size** N= 388 children with newly diagnosed epilepsy **Characteristics** Age at seizure onset, years, median: 5.7 (range/IQR was not reported) **Inclusion criteria** • Those between 1 month and 15 years **Exclusion criteria**	**Interventions** MRI, strength of magnet was not reported	**Details** Children were entered in the study when they were first diagnosed with epilepsy. Etiology was based on medical records and information obtained from parents. MRI was considered if it was ordered as	**Results** Proportion identified with a clinically relevant abnormality: Tumours: 2/388 Vascular: 11/388 Scarring: 5/388 Congenital/ developmental: 41/388 Inflammatory/infective/ immune: 3/388 Metabolic/genetic: 15/388 Proportion identified with a non-epilepsy related abnormality: 15/388	**Limitations** The quality of this study was assessed using the CEBMA checklist Did the study address a clearly focused question / issue? yes Is the research method (study design) appropriate for answering the research question? yes

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Country/ies where the study was carried out US **Study type** Retrospective cohort **Aim of the study** To assess the yield of neuroimaging in people with epilepsy **Study dates** 1993 to 1997 **Source of funding** National Institutes of Health	• Not reported		part of the initial assessment or if these have been done before the onset of epilepsy.		Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described? unclear - resons for inclusion/ exclusion are not provided in detail Could the way the sample was obtained introduce (selection)bias? yes Was the sample of subjects representative with regard to the population to which the findings will be referred? unclear Was the sample size based on pre-study considerations of statistical power? no Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to be valid and reliable? yes Was the statistical significance assessed? not applicable

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
					Are confidence intervals given for the main results? no Could there be confounding factors that haven't been accounted for? yes Can the results be applied to your organization? yes
Full citation Betting, L. E., Mory, S. B., Lopes-Cendes, I., Li, L. M., Guerreiro, M. M., Guerreiro, C. A. M., Cendes, F., MRI reveals structural abnormalities in patients with idiopathic generalized epilepsy, Neurology, 67, 848-852, 2006 **Ref Id** 1158776 **Country/ies where the study was carried out** Brazil **Study type** Prospective cohort study **Aim of the study**	**Sample size** N=134 **Characteristics** Age at seizure onset, years, mean (SD): 28 (9) Age of follow up, years, mean (SD): 13 (7) Males, n (%): 51 (38.05) Seizure type n (%): idiopathic generalised epilepsy, 134 (100) Syndrome type, n (%): juvenile myoclonic epilepsy, 71 (52.9); absence epilepsy, 22 (16.4); generalised tonic clonic, 41 (30.5) **Inclusion criteria** • Those with a clinical history of generalised seizures **Exclusion criteria**	**Interventions** MRI scan 2.0-t	**Details** A pre-specified MRI protocol was used in all patients.	**Results** Proportion identified with a clinically relevant abnormality: Scarring: 11/134 Congenital/developmental: 3/134 Proportion identified with a non-epilepsy related abnormality: 2/134	**Limitations** The quality of this study was assessed using the CEBMA checklist Did the study address a clearly focused question / issue? yes Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described? yes Could the way the sample was obtained introduce (selection)bias? yes

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
To assess MRI findings in people with idiopathic generalised epilepsy Study dates 2000 to 2005 **Source of funding** Amparo a Pesquisa do Estado de Sao Paulo (FAPESP) and Coordenacao de Aperfeicoamento de Pessoal de Nıvel Superior (CAPES)	• Those above 50 years old • Those with suspected focal seizure				Was the sample of subjects representative with regard to the population to which the findings will be referred? unclear Was the sample size based on pre-study considerations of statistical power? no Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to be valid and reliable? yes Was the statistical significance assessed? not relevant Are confidence intervals given for the main results? no Could there be confounding factors that haven't been accounted for? yes Can the results be applied to your organization? yes
Full citation	**Sample size**	**Interventions**	**Details**	**Results**	**Limitations**

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Bruno, V., Klein, J. P., Nidup, D., Nirola, D. K., Tshering, L., Deki, S., Clark, S. J., Linn, K. A., Shinohara, R. T., Dorji, C., Pokhrel, D. R., Dema, U., Mateen, F. J., Yield of Brain MRI in Clinically Diagnosed Epilepsy in the Kingdom of Bhutan: A Prospective Study, Annals of Global Health, 83, 415-422, 2017 **Ref Id** 1156928 **Country/ies where the study was carried out** Bhutan **Study type** Prospective cohort **Aim of the study** To assess the yield of brain MRI in people with epilepsy **Study dates** July 2014 to December 2015 **Source of funding** Government of Canada; Thrasher	N=217 **Characteristics** Age of follow up, years, mean (SD): Children: 11.7 (8) Adults: 30.2 (11) Males, n (%): Children: 26 (48.14) Adults: 67 (41.10) Response to treatment, n (%): 217 (100) existing diagnosis and resistant to treatment **Inclusion criteria** • Bhutan residents • Diagnosis of epilepsy **Exclusion criteria** • Those with non-epileptic epilepsy events • Those with febrile seizures • Those with alcohol or metabolic-related seizures • Those under 5 not needing an MRI for clinical reasons	MRI scan 1.5-t	People were recruited from an existing epilepsy registry and referred through healthcare profesionals. A neurologist or psyshiatrist evaluated each participant and confirmed the clinical diagnosis.	Proportion identified with a clinically relevant abnormality: **Tumours** Children: 0/54 Adults: 4/163 Overall: 4/217 **Vascular** Children: 6/54 Adults: 9/163 Overall: 13/217 **Scarring** Children: 0/54 Adults: 2/163 Overall: 2/217 **Congenital/ developmental** Children: 14/54 Adults: 15/163 Overall: 29/217 **Inflammatory/infective/ immune** Children: 1/54 Adults: 25/163 Overall: 26/217 **Metabolic/genetic** Children: 0/54 Adults: 1/163 Overall: 1/217 Proportion identified with a non-epilepsy related abnormality: Children: 5/54	The quality of this study was assessed using the CEBMA checklist Did the study address a clearly focused question / issue? yes Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described? yes Could the way the sample was obtained introduce (selection)bias? yes Was the sample of subjects representative with regard to the population to which the findings will be referred? unclear Was the sample size based on pre-study considerations of statistical power? no Was a satisfactory response rate achieved? yes

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Foundation; Charles Hood Foundation. Two authors were partially funded by a grant				Adults: 23/163 Overall: 28/217	Are the measurements (questionnaires) likely to be valid and reliable? yes Was the statistical significance assessed? not relevant Are confidence intervals given for the main results? no Could there be confounding factors that haven't been accounted for? yes Can the results be applied to your organization? yes **Other information** Note: neurocysticercosis is endemic to Bhutan, the infections detected in MRI were all neurocysticercosis, which may overestimate the yield of MRI for infections in this group
Full citation Byars, A. W., deGrauw, T. J., Johnson, C. S., Fastenau, P. S.,	**Sample size** N= 249 **Characteristics**	**Interventions** MRI scans. Strenght magnet varied	**Details** Participants had their MRI within 6 months of the first	**Results** Proportion identified with a clinically relevant abnormality: Scarring: 29/249	**Limitations** The quality of this study was assessed using the CEBMA checklist

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Perkins, S. M., Egelhoff, J. C., Kalnin, A., Dunn, D. W., Austin, J. K., The association of MRI findings and neuropsychological functioning after the first recognized seizure, Epilepsia, 48, 1067-74, 2007 **Ref Id** 1158973 **Country/ies where the study was carried out** US **Study type** Prospective cohort **Aim of the study** To assess the prevalence of MRI abnormalities in people with epilepsy after their first seizure **Study dates** July 2000 to June 2004 **Source of funding** National Institute of Neurological Disorders and Stroke	Age of follow up, years, mean (SD): 9.6 (2.5) Males, n (%): 198 (79.5) Seizure type: mixed Syndrome type: mixed **Inclusion criteria** • Those aged 6 to 14 years old • Those with a first recognised seizure within the past 3 months **Exclusion criteria** • Those whose seizure provoked from an acute situational etiology such as infection, toxin, trauma or a mass lesion • Those with chronic co-occurring conditions	between 0.5 and 1.5-t	seizure (median 1.3 months). Blinded neuroradiologists to EEG findings reviewed the data. Scanners were done according to a standardised seizure protocol.	Congenital/developmental: 6/249 Proportion identified with a non-epilepsy related abnormality: 5/249	Did the study address a clearly focused question / issue? yes Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described? yes Could the way the sample was obtained introduce (selection)bias? yes Was the sample of subjects representative with regard to the population to which the findings will be referred? unclear Was the sample size based on pre-study considerations of statistical power? no Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
					be valid and reliable? yes Was the statistical significance assessed? no Are confidence intervals given for the main results? no Could there be confounding factors that haven't been accounted for? yes Can the results be applied to your organization? yes **Other information** Scans were done within 3 months from the onset of the first seizure, therefore the age at follow-up and onset were very close in time
Full citation Coryell, J., Gaillard, W. D., Shellhaas, R. A., Grinspan, Z. M., Wirrell, E. C., Knupp, K. G., Wusthoff, C. J., Keator, C., Sullivan, J. E., Loddenkemper, T., Patel, A., Chu, C. J., Massey, S., Novotny, E. J., Saneto, R. P.,	**Sample size** N=714 infants with early life epilepsy **Characteristics** Age at seizure onset, months, mean (SD): 11.1 (SD not reported) Age of follow up, months, mean (SD): 12.7 (SD not reported)	**Interventions** MRI scan 1.5 or 3-t, results have not been reported separately	**Details** For each of the participating centres, paediatric epileptologists, identified the children relevant for inclusion.	**Results** Proportion identified with a clinically relevant abnormality: Vascular: 55/ 714 Scarring: 9/714 Congenital/ developmental: 109/714 Inflammatory/infective/ immune: 8/714 Metabolic/genetic: 5/714	**Limitations** The quality of this study was assessed using the CEBMA checklist Did the study address a clearly focused question / issue? yes Is the research method (study design)

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Berg, A. T., Neuroimaging of early life epilepsy, Pediatrics, 142 (3) (no pagination), 2018 **Ref Id** 1098077 **Country/ies where the study was carried out** US **Study type** Prospective cohort **Aim of the study** To assess the yield of MRI abnormalities in infant with early life epilepsy **Study dates** 2012-2015 **Source of funding** Pediatric Epilepsy Research Foundation in Dallas, Texas.	**Inclusion criteria** • Infants with a first seizure before their 3rd birthday and with a diagnosis of epilepsy established before 42 months of age **Exclusion criteria** • Not reported		Researchers obtained relevant data from medical records. Scans done within 1 year of first seizure, were reviewed by a lead study coordinator and the principal study investigator.	<u>Proportion identified with a non-epilepsy related abnormality:</u> 20/714	appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described? yes Could the way the sample was obtained introduce (selection)bias? yes Was the sample of subjects representative with regard to the population to which the findings will be referred? unclear as subjects were referred from tertiary centers and this may overestimate the severity of some cases Was the sample size based on pre-study considerations of statistical power? No Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to be valid and reliable? yes

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
					Was the statistical significance assessed? not relevant Are confidence intervals given for the main results? no Could there be confounding factors that haven't been accounted for? yes Can the results be applied to your organization? yes
Full citation Craven, I., Griffiths, P. D., Bhattacharyya, D., Grunewald, R. A., Hodgson, T., Connolly, D. J. A., Coley, S. C., Batty, R., Romanowski, C. A. J., Hoggard, N., 3.0 T MRI of 2000 consecutive patients with localisation-related epilepsy, British Journal of Radiology, 85, 1236-1242, 2012 **Ref Id** 1160064	**Sample size** N=2000 **Characteristics** Age of follow up, years, median (range): 23 (25 to 48 years) Males, n (%): 922 (46.1) **Inclusion criteria** • Not reported **Exclusion criteria** • Those with generalised epilepsy and those with first seizures	**Interventions** MRI scan 3.0-t	**Details** Patients were referred to the neuroscience facility from a catchment area of 2.3 million people. People were scanned with a protocol only used for people with epilepsy. Examinations were reviewed by experienced neuroradiologists and whether findings were related or not to	**Results** Proportion identified with a clinically relevant abnormality: Tumours: 20/2000 Vascular: 33/2000 Scarring: 248/2000 Congenital/ developmental: 73/2000 Inflammatory/infective/ immune: 4/2000 Metabolic/genetic: 6/2000 Proportion identified with a non-epilepsy related abnormality: 326/2000	**Limitations** The quality of this study was assessed using the CEBMA checklist Did the study address a clearly focused question / issue? yes Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described? yes

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Country/ies where the study was carried out UK **Study type** Retrospective cohort **Aim of the study** To evaluate the yield of radiological abnormalities in people with localised seizures **Study dates** January 2005 to February 2011 **Source of funding** Not reported			epilepsy, was discussed in a "multidisciplinaty epilepsy meeting"		Could the way the sample was obtained introduce (selection)bias? no Was the sample of subjects representative with regard to the population to which the findings will be referred? yes Was the sample size based on pre-study considerations of statistical power? no Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to be valid and reliable? yes Was the statistical significance assessed? not relevant Are confidence intervals given for the main results? no Could there be confounding factors that haven't been accounted for? no

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
					Can the results be applied to your organization? yes
Full citation Das, P., Bindu, P. S., Bharath, R. D., Saini, J. S., Prasad, C., Sinha, S., MRI observations in children with epilepsy: Experience from a large cohort, Journal of Pediatric Epilepsy, 2, 223-228, 2013 **Ref Id** 1153713 **Country/ies where the study was carried out** India **Study type** Cross-sectional **Aim of the study** To assess the yield of MRI abnormalities in people with epilepsy **Study dates** August 2009 to January 2011 **Source of funding**	**Sample size** N=144 **Characteristics** Age at seizure onset, years, mean (SD): 2.91 (3.30 years) Age of follow up, years, mean (SD): 5.87 (4.19 years) Males, n (%): 73 (50.69) Seizure type, n (%): partial in n=67 (46.5); generalised in n=72 (50); and unclassified in n=5 (3.4) Syndrome type n (%): structural/metabolic (symptomatic), n=95 (65.9); unknown (cryptogenic), n= 45 (31.25); genetic (idiopathic), n=6 (4.1) Learning disability, n (%): 71 (49.3) **Inclusion criteria** • Not reported **Exclusion criteria** • Those with neonatal or febrile seizures	**Interventions** MRI scan 1.5 or 3-t	**Details** The study was conducted in the departments of nerorology and neuroradiology in a teaching hospital. Seizure type was classified according to ILAE criteria/ revised classification of epilepsy and epilepsy syndromes. Patients underwent EEG and MRI according to a standardised protocol.	**Results** Proportion identified with a clinically relevant abnormality: Tumours: 4/144 Vascular: 10/144 Scarring: 17/144 Congenital/ developmental: 20/144 Inflammatory/infective/immune: 5/144 Metabolic/genetic: 1/144 Proportion identified with a non-epilepsy related abnormality: 29/144	**Limitations** The quality of this study was assessed using the CEBMA checklist Did the study address a clearly focused question / issue? yes Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described? yes Could the way the sample was obtained introduce (selection)bias? yes Was the sample of subjects representative with regard to the population to which the findings will be referred? unclear

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Not reported					Was the sample size based on pre-study considerations of statistical power? no Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to be valid and reliable? yes Was the statistical significance assessed? not relevant Are confidence intervals given for the main results? no Could there be confounding factors that haven't been accounted for? yes Can the results be applied to your organization? yes
Full citation Dirik, M. A., Sanlidag, B., Magnetic resonance imaging and interictal electroencephalography findings in newly diagnosed epileptic children, Journal of	**Sample size** N=222 **Characteristics** Age at seizure onset, months, mean (SD): 48 (SD not reported) Males, n (%): 147 (66.2)	**Interventions** MRI scan 1.5-t or 3-t	**Details** Children were recruited from the department of paediatric neurology. MRI protocol was standardised	**Results** Proportion identified with a clinically relevant abnormality: Tumours: 1/222 Vascular: 3/222 Scarring: 23/222 Congenital/developmental: 25/222	**Limitations** The quality of this study was assessed using the CEBMA checklist Did the study address a clearly focused question / issue? yes

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Clinical Medicine, 7 (6) (no pagination), 2018 **Ref Id** 1157305 **Country/ies where the study was carried out** Cyprus **Study type** Retrospective cohort **Aim of the study** To assess the prevalence of MRI lesions in children with newly diagnosed epilepsy **Study dates** Not reported **Source of funding** Not reported	**Inclusion criteria** • Those aged between 3 months and 18 years of age **Exclusion criteria** • Not reported			Proportion identified with a non-epilepsy related abnormality: 9/222	Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described? yes Could the way the sample was obtained introduce (selection)bias? yes Was the sample of subjects representative with regard to the population to which the findings will be referred? yes Was the sample size based on pre-study considerations of statistical power? no Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to be valid and reliable? yes

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
					Was the statistical significance assessed? no Are confidence intervals given for the main results? no Could there be confounding factors that haven't been accounted for? yes Can the results be applied to your organization? yes
Full citation Dura-Trave, T., Yoldi-Petri, M. E., Esparza-Estaun, J., Gallinas-Victoriano, F., Aguilera-Albesa, S., Sagastibelza-Zabaleta, A., Magnetic resonance imaging abnormalities in children with epilepsy, European Journal of Neurology, 19, 1053-1059, 2012 **Ref Id** 1160077 **Country/ies where the study was carried out** Spain	**Sample size** N=457 **Characteristics** Age, years, at the time of diagnosis: 1 month to 15 years old Males. n (%): 233 (51) Syndrome type: mixed (West Syndrome, myoclonic epilepsy in infancy, Dravet syndrome..) **Inclusion criteria** • Those between 1 month and 15 years of age at the time of diagnosis **Exclusion criteria**	**Interventions** MRI scan (strength of magnet was not reported)	**Details** Medical records from children referred to the neuropaediatric department of reference within the region where the study was conducted were included. Children were scanned according to a standardised protocol	**Results** Proportion identified with a clinically relevant abnormality: Tumours: 2/457 Vascular: 12/457 Scarring: 76/457 Congenital/developmental: 33/457 Proportion identified with a non-epilepsy related abnormality: 47/457	**Limitations** The quality of this study was assessed using the CEBMA checklist Did the study address a clearly focused question / issue? yes Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described? yes

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Study type Retrospective cohort **Aim of the study** To assess the proportion of MRI abnormalities in children with epilepsy **Study dates** Not reported **Source of funding** No specific grant was received	• Those with neonatal seizures only, febrile seizures, and other acute symptomatic seizures				Could the way the sample was obtained introduce (selection) bias? yes Was the sample of subjects representative with regard to the population to which the findings will be referred? yes Was the sample size based on pre-study considerations of statistical power? No Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to be valid and reliable? yes Was the statistical significance assessed? not relevant Are confidence intervals given for the main results? no Could there be confounding factors that haven't been accounted for? yes

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
					Can the results be applied to your organization? yes
Full citation Ekici, F., Tekbas, G., Onder, H., Gumus, H., Cetincakmak, M. G., Balik, S. K., Acar, A., Hamidi, C., Bilici, A., Comparison of 3.0-T MRI findings in drug resistant and non-resistant adult epileptic patients, Neurology Psychiatry and Brain Research, 19, 42-47, 2013 **Ref Id** 1155672 **Country/ies where the study was carried out** Turkey **Study type** Retrospective cohort **Aim of the study** To assess the prevalence of MRI abnormalities in a sample of people with epilepsy **Study dates** December 2009 - October 2011	**Sample size** N=264 **Characteristics** Age of follow up: range 18 to 82; mean 31.3 Males, n (%): 150 (56.8) Response to treatment, n (%): existing diagnosis and resistant to medical treatment, n=94 (35); existing diagnosis (non-resistant to medical treatment), n= 170 (64.3%) (unclear if patients had an existing diagnosis) **Inclusion criteria** • Not reported **Exclusion criteria** • Not reported	**Interventions** MRI scan 3-t	**Details** Diagnosis was established based on the clinical and EEG findings by one neurologist. Those who received a single antiepileptic drug to control seizures were considered non-resistant to treatment and those who had 2 or more seizures per month for a period of more than 2 years with 2 or more antiepileptic drugs attending the intractable epilepsy outpatient clinic. All patients underwent MRI sequences according to a standardised protocol.	**Results** **Resistant to medical treatment** Proportion identified with a clinically relevant abnormality: Tumours: 4/94 Vascular: 7/94 Scarring: 39/94 Congenital/developmental: 10/94 Proportion identified with a non-epilepsy related abnormality: 0/94 Non-resistant to medical treatment Proportion identified with a clinically relevant abnormality: Tumours: 0/170 Vascular: 3/170 Scarring: 35/170 Congenital/developmental: 0/170 Proportion identified with a non-epilepsy related abnormality:4/170	**Limitations** The quality of this study was assessed using the CEBMA checklist Did the study address a clearly focused question / issue? yes Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described? yes Could the way the sample was obtained introduce (selection)bias? yes Was the sample of subjects representative with regard to the population to which the findings will be referred? unclear Was the sample size based on pre-study

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Source of funding Not reported					considerations of statistical power? no Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to be valid and reliable? yes Was the statistical significance assessed? not relevant Are confidence intervals given for the main results? no Could there be confounding factors that haven't been accounted for? yes Can the results be applied to your organization? yes
Full citation Ferreira, F. T., Kobayashi, E., Lopes-Cendes, I., Cendes, F., Structural abnormalities are similar in familial and nonfamilial mesial temporal lobe epilepsy, Canadian Journal of	**Sample size** N=67 **Characteristics** Age of follow up, years, mean (range): 35 (8 to 76) Syndrome type, n (%): temporal lobe epilepsy, n=67 (100)	**Interventions** MRI scan 2.0-t	**Details** Patients were recruited from the author's epilepsy clinic and all underwent the same MRI protocol	**Results** Proportion identified with a clinically relevant abnormality: Scarring: 2/67 Congenital/developmental: 6/67	**Limitations** The quality of this study was assessed using the CEBMA checklist Did the study address a clearly focused question / issue? yes Is the research method (study design)

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Neurological Sciences, 31, 368-372, 2004 **Ref Id** 1158443 **Country/ies where the study was carried out** Brazil **Study type** Retrospective cohort **Aim of the study** To assess temporal lobe structures in patients with familial temporal lobe epilepsy **Study dates** Not reported **Source of funding** Two of the authors received scholarship grants from Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP)	**Inclusion criteria** • Not reported **Exclusion criteria** • Lateral temporal lobe epilepsy				appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described? no Could the way the sample was obtained introduce (selection) bias? yes Was the sample of subjects representative with regard to the population to which the findings will be referred? unclear Was the sample size based on pre-study considerations of statistical power? no Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to be valid and reliable? yes Was the statistical significance assessed? not relevant

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
					Are confidence intervals given for the main results? no Could there be confounding factors that haven't been accounted for? yes Can the results be applied to your organization? yes **Other information** All patients had temporal lobe epilepsy (familial and non familial)
Full citation Gaillard, W. D., Weinstein, S., Conry, J., Pearl, P. L., Fazilat, S., Vezina, L. G., Reeves-Tyer, P., Theodore, W. H., Prognosis of children with partial epilepsy: MRI and serial 18FDG-PET, Neurology, 68, 655-659, 2007 **Ref Id** 1158995	**Sample size** N= 38 **Characteristics** Age at seizure onset, years, mean (range): 5.8 (0.9 to 11.9) Seizure type, n (%): partial epilepsy, 8 (100) **Inclusion criteria** • Those with more than 3 partial seizures before their first FDG-PET **Exclusion criteria**	**Interventions** MRI scan 1.5-t	**Details** Children were referred to the epilepsy clinical and scanned using a standardised protocol. MRI imaging was interpreted by a neuroradiologist blinded to the child's identity.	**Results** Proportion identified with a clinically relevant abnormality: Scarring: 12/38	**Limitations** The quality of this study was assessed using the CEBMA checklist Did the study address a clearly focused question / issue? yes Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams,

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Country/ies where the study was carried out US **Study type** Retrospective cohort **Aim of the study** To assess the prevance of brain abnormalities in children with partial epilepsy **Study dates** Not reported **Source of funding** Not reproted	• Children with a history of head trauma, meningitis, or encephalitis, and focal neurologic examinations, or benign partial epilepsy syndromes (for example, rolandic epilepsy) • Those with a mass or other structural lesion (such a tumour)				divisions, organizations) clearly described? no Could the way the sample was obtained introduce (selection)bias? yes Was the sample of subjects representative with regard to the population to which the findings will be referred? unclear Was the sample size based on pre-study considerations of statistical power? no Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to be valid and reliable? yes Was the statistical significance assessed? not relevant Are confidence intervals given for the main results? no Could there be confounding factors that

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
					haven't been accounted for? yes Can the results be applied to your organization? Yes
Full citation Griffiths, P. D., Coley, S. C., Connolly, D. J. A., Hodgson, T., Romanowski, C. A. J., Widjaja, E., Darwent, G., Wilkinson, I. D., MR imaging of patients with localisation-related seizures: Initial experience at 3.0T and relevance to the NICE guidelines, Clinical Radiology, 60, 1090-1099, 2005 **Ref Id** 1086050 **Country/ies where the study was carried out** UK **Study type** Retrospective cohort **Aim of the study** To describe the initial experience of imaging	**Sample size** N=120 people with localisation related epilespsy **Characteristics** Age at seizure onset, years, median (range): 13 (range 25-38 years) Males, n (%): 48 (40) Seizure type, n (%): localisation related epilepsy, 120 (100) **Inclusion criteria** • Those above 16 years-old with localisation-related epilepsy **Exclusion criteria** • Not reported	**Interventions** MRI scan 3.0-t	**Details** Patients were referred to the MRI facility from a regional neuroscience centre with a new diagnosis of localisation-related epilepsy. Diagnosis was based clinically and/or electrophysiologically and scans were reviewed by experienced neuroradiologists.	**Results** Proportion identified with a clinically relevant abnormality: Tumours: 4/120 Vascular: 7/120 Scarring: 10/120 Congenital/developmental: 4/120 Inflammatory/infective/immune: 3/120	**Limitations** The quality of this study was assessed using the CEBMA checklist Did the study address a clearly focused question / issue? yes Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described? yes Could the way the sample was obtained introduce (selection)bias? yes Was the sample of subjects representative with regard to the population to which the

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
in adults with localisation-related epilepsy **Study dates** Not reported **Source of funding** Not reported					findings will be referred? unclear Was the sample size based on pre-study considerations of statistical power? no Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to be valid and reliable? yes Was the statistical significance assessed? not relevant Are confidence intervals given for the main results? no Could there be confounding factors that haven't been accounted for? yes Can the results be applied to your organization? yes
Full citation Hakami, T., McIntosh, A., Todaro, M., Lui, E., Yerra, R., Tan, K. M., French, C., Li, S.,	**Sample size** N= 993 adults with new-onset seizures; MRI was available in n=764	**Interventions** Before October 2007, MRI scans were performed	**Details** The first presentation to the clinic was within a median of	**Results** Proportion identified with a clinically relevant abnormality: 177/764 Tumours: 26/764	**Limitations** The quality of this study was assessed using the CEBMA checklist

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Desmond, P., Matkovic, Z., O'Brien, T. J., MRI-identified pathology in adults with new-onset seizures, Neurology, 81, 920-927, 2013 **Ref Id** 1155699 **Country/ies where the study was carried out** Australia **Study type** Prospective cohort **Aim of the study** To assess the frequency of epileptogenic lesions on MRI in adults with new-onset seizures **Study dates** January 2000 to December 2009 **Source of funding** The Royal Melbourne Hospital Neuroscience Foundation and by the NHMRC Centre for Research Excellence in	**Characteristics** Age of follow up, years, mean (SD): 42.2 (18.8), range 14.3–94.3 Males, n (%): 597 (61) Seizure type, n (%): 713 (72) epileptic seizure [focal convulsive in 184 patients (26), focal nonconvulsive in 85 (12), primarily generalized convulsive in 69 (10), and generalized nonconvulsive in 10 (1)], 180 (18) nonepileptic event [included syncope in 114 patients (63) and psychogenic in 66 (37)], and 100 (10) uncertain. Seizures were unclassified in 365 patients (51) Syndrome type, n (%): focal in 343 (48), idiopathic generalized epilepsy (IGE) in 77 (11), and unclassified in 293 patients (41) Previous CT: some patients did have previous CT at the request of their referring doctor. % of patients was not reported **Inclusion criteria** • Not reported **Exclusion criteria** • Prior diagnosis of epilepsy • Those with acute symptomatic seizures	on 1.5-tesla. From October 2007, scans were performed on 3-tesla	24 days (IQR 14 to 44 days) from the suspected seizure. Patients presented to the clinic referred by their general practitioner after their first suspected seizure. EEG and MRI were routinely requested, unless MRI was contraindicated. If several MRI scans were available, the closest to the time of the last seizure was chosen. Initially, 1 neuroradiologist assessed the scans and a second one assessed a random sample of scans. Disagreements were resolved by a third neuroradiologist.	Vascular: 26/764 Scarring: 99/764 Congenital/developmental: 26/764 Proportion identified with a non-epilepsy related abnormality: 165/764	Did the study address a clearly focused question / issue? yes Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described? yes Could the way the sample was obtained introduce (selection)bias? yes Was the sample of subjects representative with regard to the population to which the findings will be referred? yes Was the sample size based on pre-study considerations of statistical power? no Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Translational Neuroscience					be valid and reliable? yes Was the statistical significance assessed? not relevant Are confidence intervals given for the main results? no Could there be confounding factors that haven't been accounted for? no Can the results be applied to your organization? yes
Full citation Harini, C., Sharda, S., Bergin, A. M., Poduri, A., Yuskaitis, C. J., Peters, J. M., Rakesh, K., Kapur, K., Pearl, P. L., Prabhu, S. P., Detailed Magnetic Resonance Imaging (MRI) Analysis in Infantile Spasms, Journal of Child Neurology, 33, 405-412, 2018 **Ref Id** 1157355	**Sample size** N=71 children with infantile spasms **Characteristics** Age at seizure onset, years, median: 6 Males, n (%): 31 (43.66) Syndrome type, n (%): infantile spasms, 71 (100) **Inclusion criteria** • Infants between 2 months and 2 years of age with new diagnosis of infantile spasms	**Interventions** MRI scan 1.5 or 3-t	**Details** Patients were identified by searching key terms on institutional billing databases, inpatient and outpatient databases. Scans were interpreted by a neuroradiologist	**Results** Proportion identified with a clinically relevant abnormality: Vascular: 15/71 Scarring: 4/71 Congenital/developmental: 29/71 Inflammatory/infective/immune: 3/71	**Limitations** The quality of this study was assessed using the CEBMA checklist Did the study address a clearly focused question / issue? yes Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described? yes

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Country/ies where the study was carried out US **Study type** Retrospective cohort **Aim of the study** To describe MRI findings in children with infantile spasms **Study dates** January 2012 to December 2014 **Source of funding** No financial support for the research, authorship, and/or publication	• Electroencephalographic features compatible with this diagnosis (hypsarrhythmia, modified hypsarrhythmia, or other) **Exclusion criteria** • Those without MRI data or a single visit to the hospital where the study was conducted for a second opinion (hence lacking follow-up data) • Those with infantile spasms and tuberous sclerosis complex				Could the way the sample was obtained introduce (selection)bias? yes Was the sample of subjects representative with regard to the population to which the findings will be referred? unclear Was the sample size based on pre-study considerations of statistical power? no Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to be valid and reliable? yes Was the statistical significance assessed? not relevant Are confidence intervals given for the main results? no Could there be confounding factors that haven't been accounted for? yes

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
					Can the results be applied to your organization? yes
Full citation Hesdorffer, D. C., Chan, S., Tian, H., Allen Hauser, W., Dayan, P., Leary, L. D., Hinton, V. J., Are MRI-detected brain abnormalities associated with febrile seizure type?, Epilepsia, 49, 765-771, 2008 **Ref Id** 1159207 **Country/ies where the study was carried out** US **Study type** Prospective cohort **Aim of the study** To determine the yield of MRI-detected brain abnormalities in children with first febrile seizures **Study dates** March 1999 to April 2004	**Sample size** N=159 **Characteristics** Age at seizure onset, months (%): <18 months, n=75 (47.2); ≥18 months, n=84 (52.8) Males, n (%): 87 (54.7) **Inclusion criteria** • Those with first febrile seizures aged between 6 months and 5 years **Exclusion criteria** • Not reported	**Interventions** MRI scan 1.5-t	**Details** Children were selected by reviewing cases from the emergency department or hospital records with the ICD-9 code of 780.3 Children were classified as having febrile seizures by an epileptologist blind to the child's MRI findings and prior clinical history. MRI readings were done by a single neuroradiologist with epilwpsy expertise.	**Results** Proportion identified with a clinically relevant abnormality: Scarring: 9/159 Congenital/developmental: 9/159 Proportion identified with a non-epilepsy related abnormality: 2/159	**Limitations** The quality of this study was assessed using the CEBMA checklist Did the study address a clearly focused question / issue? yes Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described? yes Could the way the sample was obtained introduce (selection)bias? yes Was the sample of subjects representative with regard to the population to which the findings will be referred? unclear

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Source of funding National Institute of Child Health and Human Development					Was the sample size based on pre-study considerations of statistical power? no Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to be valid and reliable? yes Was the statistical significance assessed? not relevant Are confidence intervals given for the main results? no Could there be confounding factors that haven't been accounted for? yes Can the results be applied to your organization? yes
Full citation Hnojcikova, M., Nickels, K. C., Wetjen, N. M., Buchhalter, J. R., Raffel, C., Wirrell, E. C., EEG and neuroimaging studies	**Sample size** N=28 **Characteristics** Age at seizure onset, months, mean (SD): 9.6 (12.7)	**Interventions** MRI scan (magnet strenght was not reported)	**Details** The charts of all children who had epilepsy surgery before 60 months of age at the study's clinic were reviewed. The	**Results** Proportion identified with a clinically relevant abnormality: Tumours: 1/28 Scarring: 9/28 Congenital/developmental: 16/28	**Limitations** The quality of this study was assessed using the CEBMA checklist Did the study address a clearly focused question / issue? yes

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
in young children having epilepsy surgery, Pediatric Neurology, 43, 335-340, 2010 **Ref Id** 1159643 **Country/ies where the study was carried out** US **Study type** Retrospective cohort **Aim of the study** To evaluate the yield of MRI in children having resective epilepsy surgery before the age of 5 **Study dates** January 2002 to June 2009 **Source of funding** Not reported	Age of follow up, months, mean (SD): 28.8 (17.7) Males, n (%): 15 (54) Seizure type, n (%): partial only, n=15 (50); partial and secondarily generalised, n=2 (7); spasms only, n=4 (14); spasms + secondarily generalised, n=8 (29) Learning disability, n (%): normal, n=8 (29); mild-moderate delay, n=10 (36); severe delay, n=10 (36) **Inclusion criteria** • Medical intractable epilepsy before 5 years old **Exclusion criteria** • Children who presented with acute symptomatic seizures • Those who had corpus callosotomy without resection (those who had lesionectomy, lobectomy or multilobar resection were included)		MRI findings reported were conducted preoperatively		Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described? yes Could the way the sample was obtained introduce (selection)bias? yes Was the sample of subjects representative with regard to the population to which the findings will be referred? unclear Was the sample size based on pre-study considerations of statistical power? no Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to be valid and reliable? yes

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
					Was the statistical significance assessed? not relevant Are confidence intervals given for the main results? no Could there be confounding factors that haven't been accounted for? yes Can the results be applied to your organization? yes
Full citation Hsieh, D. T., Chang, T., Tsuchida, T. N., Vezina, L. G., Vanderver, A., Siedel, J., Brown, K., Berl, M. M., Stephens, S., Zeitchick, A., Gaillard, W. D., New-onset afebrile seizures in infants: Role of neuroimaging, Neurology, 74, 150-156, 2010 **Ref Id** 1154172 **Country/ies where the study was carried out** US	**Sample size** N=317 in total, of which n=182 infants had MRI **Characteristics** Age of follow up: all <24 months Males, n (%): 165 (52) Seizure type, n (%): partial n=154 (48.5); no clear partial features n=163 (151.5) Learning disability, n (%): 15 (4.7) Previous CT, n (%): 298 (94) **Inclusion criteria** • Those between 1 and 24 months • Those presenting in the emergency department or as	**Interventions** MRI scan 1.5-t	**Details** MRI scans were interpreted by a paediatric neurologist. MRI sequence was the same for all the infants included. MRI was performed when focal findings were present, when CT was ambiguous or to define abnormal findings on CT	**Results** Proportion identified with a clinically relevant abnormality: Tumours: 2/182 Vascular: 24/182 Scarring: 9/182 Congenital/developmental: 51/182 Inflammatory/infective/immune: 1/182 Metabolic/genetic: 3/182 Proportion identified with a non-epilepsy related abnormality: 33/182	**Limitations** The quality of this study was assessed using the CEBMA checklist Did the study address a clearly focused question / issue? yes Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described? yes

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Study type Prospective cohort **Aim of the study** To assess the yield of neuroimaging in infants with new-onset afebrile seizures **Study dates** January 2001 to February 2007 **Source of funding** No specific funding was reported	inpatients in the hospital where the study was conducted with new onset afebrile seizures **Exclusion criteria** • Those with a febrile illness • Those with an infection of the CNS • Those admitted for a suspicion of seizures, but discharged with a diagnosis of a "spell"				Could the way the sample was obtained introduce (selection)bias? yes Was the sample of subjects representative with regard to the population to which the findings will be referred? unclear Was the sample size based on pre-study considerations of statistical power? no Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to be valid and reliable? yes Was the statistical significance assessed? not relevant Are confidence intervals given for the main results? no Could there be confounding factors that haven't been accounted for? yes

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
					Can the results be applied to your organization? yes
Full citation Jasim, H. A., Abdulsattar, O. A., MRI findings in iraqi patients with epilepsy: A cross sectional study, Indian Journal of Public Health Research and Development, 9, 810-814, 2018 **Ref Id** 1157380 **Country/ies where the study was carried out** Iraq **Study type** Cross-sectional **Aim of the study** To evaluate MRI findings in patients with epilepsy **Study dates** 1 January 2017 to 4 June 2018 **Source of funding** No funding was received	**Sample size** N=51 **Characteristics** Age, years, mean (SD): 21.31 (12.75) Males, n (%): 26 (50.9) Seizure type, n (%): focal: 36 (70.6); generalised: 15 (29.4) **Inclusion criteria** • Not reported **Exclusion criteria** • Children with a history of acute cerebral insult, such as infection, trauma, metabolic abnormalities or vascular pathology. Those with neonatal seizures were also excluded	**Interventions** MRI 1.5 t	**Details** Patients were referred to the neurology department of the hospital where the study took place. MRI protocol was the same for all patients.	**Results** Clinically relevant abnormalities: Tumours: 6/51 Scarring: 11/51	**Limitations** The quality of this study was assessed using the CEBMA checklist Did the study address a clearly focused question / issue? yes Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described? no Could the way the sample was obtained introduce (selection)bias? yes Was the sample of subjects representative with regard to the population to which the findings will be referred? unclear Was the sample size based on pre-study

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
					considerations of statistical power? no Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to be valid and reliable? yes Was the statistical significance assessed? not relevant Are confidence intervals given for the main results? no Could there be confounding factors that haven't been accounted for? yes Can the results be applied to your organization? yes
Full citation Jeniffer, V. N., Udayakumar, S., Pushpalatha, K., A clinical study to identify the possible etiology of complex partial seizures using magnetic resonance imaging brain findings	**Sample size** N=64 **Characteristics** Age of follow up, years: all <18 years old; results have not been reported separately by age Males, n (%): 42 (65.6)	**Interventions** MRI scan 1.5-t	**Details** A detailed clinical evaluation was carried out in all children, which included blood tests and MRI scan. MRI protocol was the	**Results** Proportion identified with a clinically relevant abnormality: Tumours: 1/64 Scarring: 10/64 Congenital/developmental: 29/64	**Limitations** The quality of this study was assessed using the CEBMA checklist Did the study address a clearly focused question / issue? yes

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
and its implications on treatment, Journal of Pediatric Neurosciences, 10, 350-354, 2015 **Ref Id** 1156379 **Country/ies where the study was carried out** India **Study type** Prospective cohort **Aim of the study** To assess MRI findings in children aged 1 to 12 years old with complex partial seizures **Study dates** October 2011 to March 2013 **Source of funding** No funding was received	Learning disability, n (%): 0 (0) **Inclusion criteria** • Those aged between 1 and 18 years old • Those diagnosed with complex partial seizures • Those attending the department of paediatrics where the sutudy was conducted • Those who gave consent to participate Exclusion criteria • Those with developmental delay, learning disabilities or cerebral palsy • Those with seizures following head injury		same for all children.		Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described? no Could the way the sample was obtained introduce (selection)bias? yes Was the sample of subjects representative with regard to the population to which the findings will be referred? unclear Was the sample size based on pre-study considerations of statistical power? no Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to be valid and reliable? yes

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
					Was the statistical significance assessed? not relevant Are confidence intervals given for the main results? no Could there be confounding factors that haven't been accounted for? yes Can the results be applied to your organization? yes
Full citation Koirala, K., Magnetic resonance neuroimaging in patient with complain of seizure, Journal of Nepal Health Research Council, 9, 56-60, 2011 **Ref Id** 1159895 **Country/ies where the study was carried out** Nepal **Study type** Cross-sectional **Aim of the study**	**Sample size** N=160 **Characteristics** Age of follow up, years, n (%): 1 to 82 years old; n=36 (22.5) were ≥16 years old; n=124 (77.5) were >16 years old **Inclusion criteria** • Those diagnosed with epilepsy and referred to a private epilepsy clinic to perform a MRI within 1 year **Exclusion criteria** • Not reported	**Interventions** MRI scan 0.2-t	**Details** All patients underwent the same MRI protocol. No further details were provided	**Results** Proportion identified with a clinically relevant abnormality: Tumours: 21/160 Vascular: 11/160 Scarring: 6/160 Congenital/developmental: 1/160 Inflammatory/infective/immune: 12/160	**Limitations** The quality of this study was assessed using the CEBMA checklist Did the study address a clearly focused question / issue? yes Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described? no

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
To assess the yield of MRI abnormalities in patients with epilepsy **Study dates** July 2008 to June 2009 **Source of funding** Not reported					Could the way the sample was obtained introduce (selection)bias? yes Was the sample of subjects representative with regard to the population to which the findings will be referred? unclear Was the sample size based on pre-study considerations of statistical power? no Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to be valid and reliable? yes Was the statistical significance assessed? not relevant Are confidence intervals given for the main results? no Could there be confounding factors that haven't been accounted for? yes

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
					Can the results be applied to your organization? yes
Full citation Labate, A., Ventura, P., Gambardella, A., Le Piane, E., Colosimo, E., Leggio, U., Ambrosio, R., Condino, F., Messina, D., Lanza, P., Aguglia, U., Quattrone, A., MRI evidence of mesial temporal sclerosis in sporadic "benign" temporal lobe epilepsy, Neurology, 66, 562-565, 2006 **Ref Id** 1158857 **Country/ies where the study was carried out** Italy **Study type** Retrospective cohort **Aim of the study** To assess whether there is MRI-detectable mesial temporal sclerosis in people with sporadic	**Sample size** N=101 people with sporadic benign temporal lobe epilepsy **Characteristics** Age at seizure onset, years, mean (SD): 22.3 (17.4) Age of follow up, years, mean (SD): 37.3 (17.5) Males, n (%): 50 (49.5) Seizure type: people were either seizure free, had auras, or not more than 2 disabling seizures per year for at least 2 years (with or without appropriate antiepileptic medication) Syndrome type: sporadic benign temporal lobe epilepsy **Inclusion criteria** • Not reported **Exclusion criteria** • Any suggestion of seizure onset outside the mesial temporal structures by semiology or EEG findings	**Interventions** MRI scans performed on a 1.5-tesla	**Details** In each person, the diagnosis of temporal lobe epilepsy was made on the basis of clinical, EEG and MRI criteria. All patients had MRI evaluations based on a protocol routinely used for those with temporal lobe epilepsy.	**Results** Proportion identified with a clinically relevant abnormality: 39/101 Scarring: 39/101	**Limitations** The quality of this study was assessed using the CEBMA checklist Did the study address a clearly focused question / issue? yes Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described? yes Could the way the sample was obtained introduce (selection)bias? yes Was the sample of subjects representative with regard to the population to which the findings will be referred? unclear Was the sample size based on pre-study

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
benign temporal lobe epilepsy **Study dates** Not reported **Source of funding** Not reported					considerations of statistical power? no Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to be valid and reliable? yes Was the statistical significance assessed? not relevant Are confidence intervals given for the main results? no Could there be confounding factors that haven't been accounted for? no Can the results be applied to your organization? yes
Full citation Lefkopoulos, A., Haritanti, A., Papadopoulou, E., Karanikolas, D., Fotiadis, N., Dimitriadis, A. S., Magnetic resonance imaging in 120 patients with	**Sample size** N=120 people with intractable partial seizures **Characteristics** Age of follow up, years, mean (SD): 21 (SD not reported) Males, n (%): 40 (33.3)	**Interventions** MRI scan 1.5-t	**Details** Not reported	**Results** Proportion identified with a clinically relevant abnormality: Vascular: 9/120 Scarring: 30/120 Congenital/developmental: 23/120 Inflammatory/infective/immune: 4/120	**Limitations** The quality of this study was assessed using the CEBMA checklist Did the study address a clearly focused question / issue? yes

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
intractable partial seizures: A preoperative assessment, Neuroradiology, 47, 352-361, 2005 **Ref Id** 1158669 **Country/ies where the study was carried out** Greece **Study type** Retrospective cohort **Aim of the study** To assess MRI findings in people with intractable partial seizures **Study dates** January 2000 to June 2003 **Source of funding** Not reported	Seizure type, n(%): intractable partial, 120 (100) Response to treatment: existing diagnosis and treatment resistant, 120 (100) **Inclusion criteria** • Those with intractable partial seizures **Exclusion criteria** • Not reported				Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described? no Could the way the sample was obtained introduce (selection)bias? unclear (how the sample was obtained was not reported) Was the sample of subjects representative with regard to the population to which the findings will be referred? unclear (as above) Was the sample size based on pre-study considerations of statistical power? no information was provided Was a satisfactory response rate achieved? yes

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
					Are the measurements (questionnaires) likely to be valid and reliable? yes Was the statistical significance assessed? not applicable Are confidence intervals given for the main results? no Could there be confounding factors that haven't been accounted for? no Can the results be applied to your organization? yes
Full citation Ma, W., Li, C., Liu, L., Li, S., Liu, Y., Pre-Operative Interictal Discharge Patterns and Magnetic Resonance Imaging Findings Affect Prognosis of Temporal Lobe Epilepsy Surgery, European Neurology, 81, 152-162, 2019 **Ref Id** 1157748	**Sample size** N=115 **Characteristics** Age of follow up, years, mean (SD): 30.8 (12.6) Males, n (%): 59 (51.3) Seizure type, n (%): 115 (100) temporal lobe epilepsy Response to treatment, n (%): 115 (100) existing diagnosis and treatment resistant **Inclusion criteria**	**Interventions** MRI scan (strength of magnet was not reported)	**Details** Participants were attending the neurosurgery department of the hospital where the study was conducted. Diagnosis was made on the basis of clinical presentation and EEG monitoring	**Results** Proportion identified with a clinically relevant abnormality: Tumours: 18/115 Vascular: 7/115 Scarring: 42/115 Congenital/developmental: 5/115 Inflammatory/infective/immune: 8/115	**Limitations** The quality of this study was assessed using the CEBMA checklist Did the study address a clearly focused question / issue? yes Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Country/ies where the study was carried out China **Study type** Retrospective cohort **Aim of the study** To assess MRI findings in people with temporal lobe epilepsy **Study dates** October 2010 to October 2014 **Source of funding** No specific grant or funding was received to conduct this study	• Patients attending the neurosurgery department of the hospital where the study was conducted and presenting with temporal lobe epilepsy **Exclusion criteria** • Not reported				(employees, teams, divisions, organizations) clearly described? no Could the way the sample was obtained introduce (selection) bias? yes Was the sample of subjects representative with regard to the population to which the findings will be referred? unclear Was the sample size based on pre-study considerations of statistical power? no Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to be valid and reliable? yes Was the statistical significance assessed? not applicable Are confidence intervals given for the main results? no

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
					Could there be confounding factors that haven't been accounted for? yes Can the results be applied to your organization? yes
Full citation Nair, P. P., Kalita, J., Misra, U. K., Role of cranial imaging in epileptic status, European Journal of Radiology, 70, 475-80, 2009 **Ref Id** 1154726 **Country/ies where the study was carried out** India **Study type** Prospective cohort **Aim of the study** To assess the role of imaging in predicting the outcome of status epilepticus **Study dates** January 2002 to March 2007	**Sample size** N=99 people with status epilepticus of which n=41 underwent MRI **Characteristics** Age of follow up, years, mean (range): 35 (1 to 78) Males, n (%): 59 (59) Seizure type, n (%): 99 (100) status epilepticus Previous CT, n (%): MRI and CT was carried out in n=14 (14) **Inclusion criteria** • Those diagnosed with status epilepticus and attending the emergency department of the hospital where the study was carried out • Those developing status epilepticus during their hospital stay in the neurology department of the hospital where the study was carried out **Exclusion criteria** • Those with pseudoseizures	**Interventions** MRI scan 1.5-t	**Details** A detailed clinical examination was conducted for all patients. Status epilepticus was defined as the occurrence of 2 or more seizures without full recovery of consciousness between the seizures, or continuous convulsive activity for >10 minutes.	**Results** Proportion identified with a clinically relevant abnormality: Vascular: 4/41 Inflammatory/infective/immune: 35/41	**Limitations** The quality of this study was assessed using the CEBMA checklist Did the study address a clearly focused question / issue? yes Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described? no Could the way the sample was obtained introduce (selection)bias? yes Was the sample of subjects representative with regard to the population to which the

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Source of funding Not reported					findings will be referred? unclear Was the sample size based on pre-study considerations of statistical power? no Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to be valid and reliable? yes Was the statistical significance assessed? not relevant Are confidence intervals given for the main results? no Could there be confounding factors that haven't been accounted for? yes Can the results be applied to your organization? yes
Full citation Petrou, M., Foerster, B., Maly, P. V., Eldevik, O. P., Leber, S., Sundgren, P. C.,	**Sample size** N=437 **Characteristics**	**Interventions** MRI scan (strength of magnet was not reported)	**Details** MRI imaging was performed as part of an initial seizure workup.	**Results** Proportion identified with a clinically relevant abnormality: Tumours: 4/437	**Limitations** The quality of this study was assessed using the CEBMA checklist

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Added utility of gadolinium in the magnetic resonance imaging (MRI) workup of seizures in children younger than 2 years, Journal of Child Neurology, 22, 200-203, 2007 **Ref Id** 1159064 **Country/ies where the study was carried out** Sweden **Study type** Retrospective cohort **Aim of the study** To assess the prevalence of MRI abnormalities in children with initial seizure presentation under 2 years old **Study dates** 1995 to 2002 **Source of funding** Not reported	Age at seizure onset, mean months (SD): 14.1 (SD not reported) Males, n (%): 230 (52.6) **Inclusion criteria** • Those <2 years old • Those who presented at the hospital where the study was conducted for an initial seizure workup **Exclusion criteria** • Not reported		No further details regarding study methodology was provided	Vascular: 83/437 Scarring: 6/437 Congenital/developmental: 42/437 Inflammatory/infective/immune: 8/437 Metabolic/genetic: 3/437	Did the study address a clearly focused question / issue? yes Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described? no Could the way the sample was obtained introduce (selection) bias? yes Was the sample of subjects representative with regard to the population to which the findings will be referred? unclear Was the sample size based on pre-study considerations of statistical power? no Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
					be valid and reliable? yes Was the statistical significance assessed? not applicable Are confidence intervals given for the main results? no Could there be confounding factors that haven't been accounted for? yes Can the results be applied to your organization? yes
Full citation Rasool, A., Choh, S. A., Wani, N. A., Mushtaq Ahmad, S., Iqbal, Q., Role of electroencephalogram and neuroimaging in first onset afebrile and complex febrile seizures in children from Kashmir, Journal of Pediatric Neurosciences, 7, 9-15, 2012 **Ref Id** 1154932	**Sample size** N=276, of which n=157 received MRI **Characteristics** Age of follow up, range: 6 months to 14 years old Males, n (%): 162 (58.7) Seizure type, n (%): partial, n= 86 (31.1); generalised, n=116 (42); complex febrile seizures, n= 64 (23); undetermined, n=10 (3.6) Learning disability, n (%): 0 (0) **Inclusion criteria** • Not reported	**Interventions** MRI scan 1.5-t	**Details** Participants were patients attending the emergency, inpatients, or outpatient departments of advanced paediatrics. The International League Against Epilepsy classification was used to define seizure types.	**Results** Proportion identified with a clinically relevant abnormality: Scarring: 2/157 Congenital/developmental: 9/157 Proportion identified with a non-epilepsy related abnormality: 4/157	**Limitations** The quality of this study was assessed using the CEBMA checklist Did the study address a clearly focused question / issue? yes Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams,

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Country/ies where the study was carried out India **Study type** Prospective cohort **Aim of the study** To assess the frequency of abnormal neuroimaging in children with new-onset afebrile and febrile seizures **Study dates** November 2006 to November 2008 **Source of funding** No funding was received	**Exclusion criteria** • Those with seizures resulting from an acute situational etiology (for example, toxin infection, trauma) • Those with a chronic neurologic illness (for example, cerebral palsy, learning disabilities, pervasive developmental disorders) • Those with other abnormalities on neurologic examination or with simple febrile seizures				divisions, organizations) clearly described? yes Could the way the sample was obtained introduce (selection)bias? yes Was the sample of subjects representative with regard to the population to which the findings will be referred? unclear Was the sample size based on pre-study considerations of statistical power? no Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to be valid and reliable? yes Was the statistical significance assessed? not relevant Are confidence intervals given for the main results? no Could there be confounding factors that

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
					haven't been accounted for? yes Can the results be applied to your organization? yes
Full citation Santos, S. L. M., Ghizoni, E., Li, L. M., Cendes, F., Dynamic assessment of high-resolution MRI with multi-planar reconstruction increases the yield of lesion detection in patients with partial epilepsy, Journal of Epilepsy and Clinical Neurophysiology, 11, 111-116, 2005 **Ref Id** 1158708 **Country/ies where the study was carried out** Brazil **Study type** Retrospective cohort **Aim of the study** To evaluate the presence and type of lesions associated with partial epilepsy	**Sample size** N=100 **Characteristics** Age at seizure onset, years, mean (SD): 8.5 (3.1) Age of follow up, years, mean (SD): 23.9 (9) Seizure type, n (%): partial epilepsy, 100 (100) **Inclusion criteria** • Not reported **Exclusion criteria** • Not reported	**Interventions** MRI scan (strength magnet not reported)	**Details** Patients were recruited consecutively. Partial epilepsy diagnosis was based on previous EEG examinations and were established according to ILAE criteria.	**Results** Proportion identified with a clinically relevant abnormality: Tumours: 1/100 Vascular: 1/100 Scarring: 66/100 Congenital/developmental: 16/100 Inflammatory/infective/immune: 3/100	**Limitations** The quality of this study was assessed using the CEBMA checklist Did the study address a clearly focused question / issue? yes Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described? no Could the way the sample was obtained introduce (selection) bias? yes Was the sample of subjects representative with regard to the population to which the findings will be referred? unclear

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Study dates April to September 2008 **Source of funding** Not reported					Was the sample size based on pre-study considerations of statistical power? no Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to be valid and reliable? yes Was the statistical significance assessed? not applicable Are confidence intervals given for the main results? no Could there be confounding factors that haven't been accounted for? yes Can the results be applied to your organization? yes
Full citation Sinha, S., Satishchandra, P., Kalband, B. R., Bharath, R. D., Thennarasu, K., Neuroimaging	**Sample size** N=201; n=43 patients underwent MRI **Characteristics** Age at seizure onset, years, mean (SD): 68 (7.5)	**Interventions** MRI scan 1.5-t	**Details** All patients underwent a detailed clinical evaluation. All patients underwent CT,	**Results** Proportion identified with a clinically relevant abnormality: Tumours: 5/43 Vascular: 13/43 Scarring: 1/43	**Limitations** The quality of this study was assessed using the CEBMA checklist

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
observations in a cohort of elderly manifesting with new onset seizures: Experience from a university hospital, Annals of Indian Academy of Neurology, 15, 273-280, 2012 **Ref Id** 1155182 **Country/ies where the study was carried out** India **Study type** Prospective study **Aim of the study** To assess the MRI observations in elderly people manifesting with new onset seizures **Study dates** January 2007 to January 2009 **Source of funding** No funding was received to conduct this study	Males, n (%): 131 (65.2) Seizure type, n (%): simple partial seizure, n= 84 (42); generalised tonic clonic seizure, n=61 (30.3); complex partial seizure, n=55 (27.4) Syndrome type, n (%): acute symptomatic, n=86 (42.3); remote symptomatic, n=37 (18.4); cryptogenic, n=75 (37.8); idiopathic, n=3 (1.5) Previous CT, n (%): 201 (100) **Inclusion criteria** • Those who manifested with new onset seizures in the neurology department of the hospital where the study was conducted • who manifested with new onset seizures **Exclusion criteria** • Those with epilepsy and onset before 60 years old		and only those in whom it was clinically indicated had a MRI scan	Inflammatory/infective/immune: 5/43	Did the study address a clearly focused question / issue? yes Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described? yes Could the way the sample was obtained introduce (selection)bias? yes Was the sample of subjects representative with regard to the population to which the findings will be referred? unclear Was the sample size based on pre-study considerations of statistical power? no Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
					be valid and reliable? yes Was the statistical significance assessed? not relevant Are confidence intervals given for the main results? no Could there be confounding factors that haven't been accounted for? yes Can the results be applied to your organization? yes
Full citation Solosrungruang, A., Laothamatas, J., Chinwarun, Y., Magnetic resonance imaging of the brain in epileptic adult patients: experience in Ramathibodi Hospital, Journal of the Medical Association of Thailand = Chotmaihet thangphaet, 90, 762-773, 2007 **Ref Id** 1159098	**Sample size** N=91 adult patients with epilepsy **Characteristics** Age of follow up, years, mean (range): 36.9 (15-85) Males, n (%): 37 (40.6) Syndrome type, n (%): generalised seizure, n=50 (41.67); partial seizure, n=70 (58.33) (*n=25 had their symptoms classified as more than 1 seizure type) **Inclusion criteria** • Those ≥15 years old with epilepsy or seizure who had an	**Interventions** MRI scan 1.5-t	**Details** MRI scans were reviewer by a neuroradiologist or radiologist. The same MRI protocol was applied to all patients.	**Results** Proportion identified with a clinically relevant abnormality: Tumours: 7/91 Vascular: 17/91 Scarring: 31/91 Congenital/developmental: 19/91 Inflammatory/infective/immune: 9/91	**Limitations** The quality of this study was assessed using the CEBMA checklist Did the study address a clearly focused question / issue? yes Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams,

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Country/ies where the study was carried out Thailand **Study type** Retrospective cohort **Aim of the study** To classify the imaging of structural abnormalities of epileptic adult patients referred for MRI **Study dates** January 2001 to December 2002 **Source of funding** Not reported	MRI scan in the hospital where the study was carried out **Exclusion criteria** • Those with incomplete MRI study and clinical data				divisions, organizations) clearly described? yes Could the way the sample was obtained introduce (selection)bias? yes Was the sample of subjects representative with regard to the population to which the findings will be referred? unclear Was the sample size based on pre-study considerations of statistical power? no Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to be valid and reliable? yes Was the statistical significance assessed? not relevant Are confidence intervals given for the main results? no Could there be confounding factors that

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
					haven't been accounted for? yes Can the results be applied to your organization? yes
Full citation Toledo, M., Sarria-Estrada, S., Quintana, M., Auger, C., Salas-Puig, X., Santamarina, E., Vert, C., Rovira, A., 3 TESLA MR imaging in adults with focal onset epilepsy, Clinical Neurology and Neurosurgery, 115, 2111-2116, 2013 **Ref Id** 1155884 **Country/ies where the study was carried out** Spain **Study type** Prospective cohort **Aim of the study** To evaluate the yield of MRI for detecting epileptogenic cerebral lesions **Study dates**	**Sample size** N=161 **Characteristics** Age of follow up, years, mean (SD): 41.6 (16.3) Males, n (%): 78 (64.4) Seizure type, n (%): focal, n=161 (100) Response to treatment, n (%): drug resistant, n=90 (56) **Inclusion criteria** • Those ≥16 years old diagnosed with focal epilepsy **Exclusion criteria** • Those with multifocal, generalized, non-classifiable, or non-epileptic seizures • Those with lack of diagnostic consensus • Those with multifocal or generalised epilepsy and the presence of non-epileptic seizures	**Interventions** MRI scan 3-t	**Details** Diagnosis was based on the results of clinical, MR imaging and video-EEG findings. Patients meeting inclusion criteria from the epilepsy unit of the tertiary hospital where the study was conducted where included. The diagnosis of focal epilepsy was independently established by 3 expert epileptologists	**Results** Proportion identified with a clinically relevant abnormality: Tumours: 17/161 Vascular: 15/161 Scarring: 27/161 Congenital/developmental: 18/161	**Limitations** The quality of this study was assessed using the CEBMA checklist Did the study address a clearly focused question / issue? yes Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described? yes Could the way the sample was obtained introduce (selection)bias? yes Was the sample of subjects representative with regard to the population to which the findings will be referred? unclear

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Not reported **Source of funding** Not reported					Was the sample size based on pre-study considerations of statistical power? no Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to be valid and reliable? yes Was the statistical significance assessed? not relevant Are confidence intervals given for the main results? no Could there be confounding factors that haven't been accounted for? yes Can the results be applied to your organization? yes
Full citation Wieshmann, U. C., Clinical application of neuroimaging in epilepsy, Journal of Neurology Neurosurgery and	**Sample size** N=528 people had a scan, n=495 scans were reviewed, n=332 had a MRI scan **Characteristics**	**Interventions** MRI scan (standard MRI and high resolution MRI)	**Details** MRI scans were reviewed and imaging modality identified. The neuroradiological findings were	**Results** Proportion identified with a clinically relevant abnormality: Tumours: 21/332 Vascular: 14/332 Scarring: 134/332	**Limitations** The quality of this study was assessed using the CEBMA checklist

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Psychiatry, 74, 466-470, 2003 **Ref Id** 1155495 **Country/ies where the study was carried out** UK **Study type** Cross-sectional **Aim of the study** To evaluate the prevalence of detected structural abnormalities in patients with epilepsy **Study dates** Not reported **Source of funding** Not reported	Age of follow up, years, mean (SD): 39.7 (14.2) **Inclusion criteria** • Those with chronic active epilepsy, a single epileptic seizure, epilepsy in remission (no seizures for two years or longer) or nonepileptic seizures. **Exclusion criteria** • Not reported		defined as normal, consistent with hippocampal sclerosis, vascular abnormality, tumour, malformation of cortical developlopment, brain damage, or non-specific abnormality	Congenital/developmental: 13/332	Did the study address a clearly focused question / issue? yes Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described? yes Could the way the sample was obtained introduce (selection) bias? yes Was the sample of subjects representative with regard to the population to which the findings will be referred? yes Was the sample size based on pre-study considerations of statistical power? no Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
					be valid and reliable? yes Was the statistical significance assessed? not relevant Are confidence intervals given for the main results? no Could there be confounding factors that haven't been accounted for? no Can the results be applied to your organization? yes
Full citation Wongladarom, S., Laothamatas, J., Visudtibhan, A., Sawatsut, P., Magnetic resonance imaging of the brain in epileptic pediatric patients: Review of the experience in Ramathibodi Hospital, Journal of the Medical Association of Thailand, 87, 1092-1099, 2004 **Ref Id** 1158559	**Sample size** N=100 children **Characteristics** Age of follow up, years, mean (SD): 7 (5 months) Males, n (%): 43 (43) Seizure type, n (%): 16 (16) children with primary generalized seizure, 79 (79) children with partial or complex partial seizures with or without secondary generalization. The remaining 5 (5) children had a specific syndrome Syndrome type, n (%): 2 (2) infantile spasms, 2 (2) Lennox-	**Interventions** Scans were performed with MRI 1.5-t	**Details** Diagnosis was established according to clinical presentation and EEG MRI was performed according to a pre-specified protocol	**Results** Proportion identified with a clinically relevant abnormality: 741/100 Tumours: 3/100 Primarily generalised: 0/16 Partial: 3/26 Complex partial seizures: 0/9 Focal with secondarily: 0/44 Infantile spasms: 0/2 Lennox-Gastaut syndrome: 0/2 Londau-Kleffner syndrome: 0/1 Vascular: 5/100 Primarily generalised: 1/16 Partial: 3/26	**Limitations** The quality of this study was assessed using the CEBMA checklist Did the study address a clearly focused question / issue? yes Is the research method (study design) appropriate for answering the research question? yes Is the method of selection of the subjects (employees, teams, divisions, organizations) clearly described? yes

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
Country/ies where the study was carried out Thailand **Study type** Retrospective cohort **Aim of the study** To assess the MRI findings in a group of children referred with epilepsy **Study dates** January 1999 to December 2002 **Source of funding** Not reported	Gastaut Syndrome, 5 (5) Londau-Kleffner syndrome **Inclusion criteria** • Those <15 years old • Those with epilepsy or seizure and had MRI studies at the study Hospital between 1st January 1999 and 31st December 2002 **Exclusion criteria** • Those with unavailable MRI studies and incomplete clinical data • Those without evidence of seizure or epilepsy from the clinical review			Complex partial seizures: 0/9 Focal with secondarily: 1/44 Infantile spasms: 0/2 Lennox-Gastaut syndrome: 0/1 Londau-Kleffner syndrome: 0/1 <u>Scarring:</u> 42/100 Primarily generalised: 9/16 Partial: 6/26 Complex partial seizures: 5/9 Focal with secondarily: 19/44 Infantile spasms: 1/2 Lennox-Gastaut syndrome: 2/2 Londau-Kleffner syndrome: 0/1 <u>Congenital/developmental:</u> 34/100 Primarily generalised: 2/16 Partial: 8/26 Complex partial seizures: 4/26 Focal with secondarily: 18/44 Infantile spasms: 1/2 Lennox-Gastaut syndrome: 0/2 Londau-Kleffner syndrome: 1/1 <u>Inflammatory/infective/ immune:</u> 7/100 Primarily generalised: 2/16	Could the way the sample was obtained introduce (selection)bias? potentially, all MRI examinations were done in the same hospital Was the sample of subjects representative with regard to the population to which the findings will be referred? unclear Was the sample size based on pre-study considerations of statistical power? no Was a satisfactory response rate achieved? yes Are the measurements (questionnaires) likely to be valid and reliable? yes Was the statistical significance assessed? not applicable Are confidence intervals given for the main results? no Could there be confounding factors that

Study details	Participants	Interventions	Methods	Outcomes and Results	Comments
				Partial: 3/26 Complex partial seizures: 0/9 Focal with secondarily: 2/44 Infantile spasms: 0/2 Lennox-Gastaut syndrome: 0/2 Londau-Kleffner syndrome: 0/1 *17/100 had more than MTS in combination with other abnormality, which has been included in the scarring group Proportion identified with a non-epilepsy related abnormality: 9/100 Primarily generalised: 2/16 Partial: 3/26 Complex partial seizures: 0/9 Focal with secondarily: 4/44 Infantile spasms: 0/2 Lennox-Gastaut syndrome: 0/2 Londau-Kleffner syndrome: 0/1	haven't been accounted for? no Can the results be applied to your organization? yes

Appendix E – Forest plots

Forest plots for review question: What is the yield of relevant abnormalities detected by MRI in people with epilepsy?

This section includes forest plots only for outcomes that are meta-analysed. Outcomes from single studies are not presented here, but the quality assessment for these outcomes is provided in the GRADE profiles in appendix F.

Critical outcomes: proportion identified with tumour abnormalites

Figure 2: Proportion identified with tumour abnormalities: overall estimate

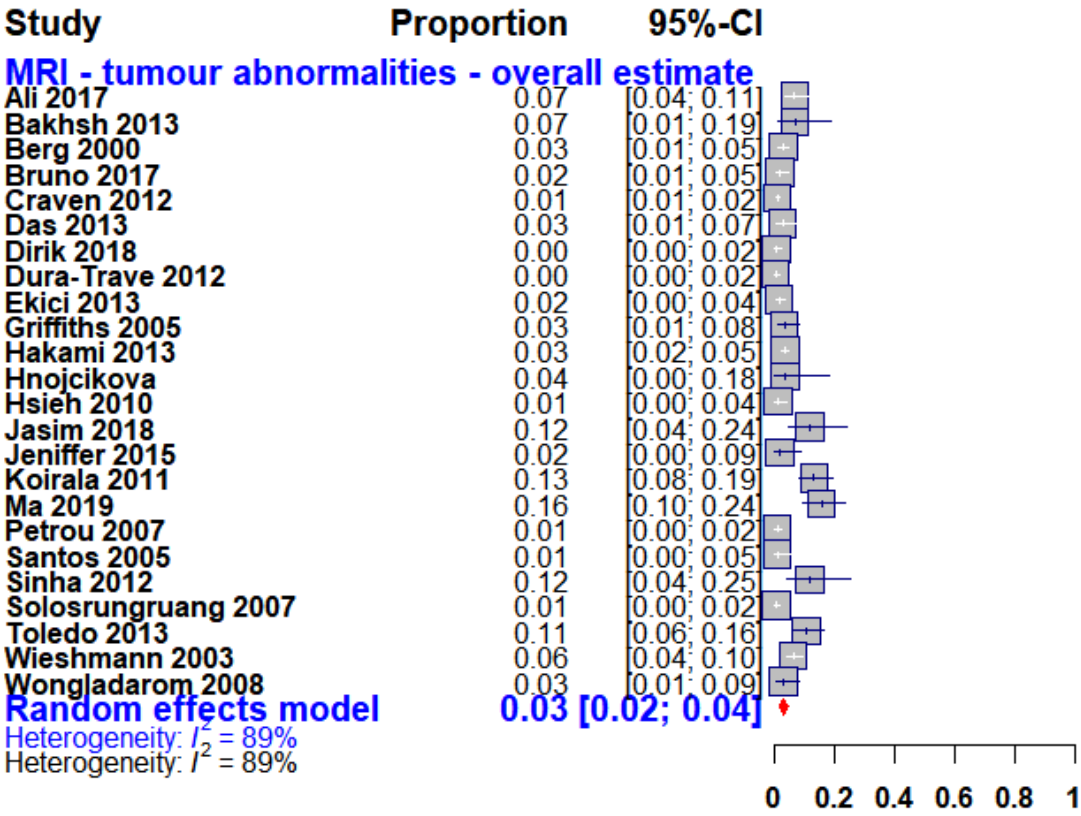


Figure 3: Proportion of tumour abnormalities identified in infants (<3 years old at seizure onset)

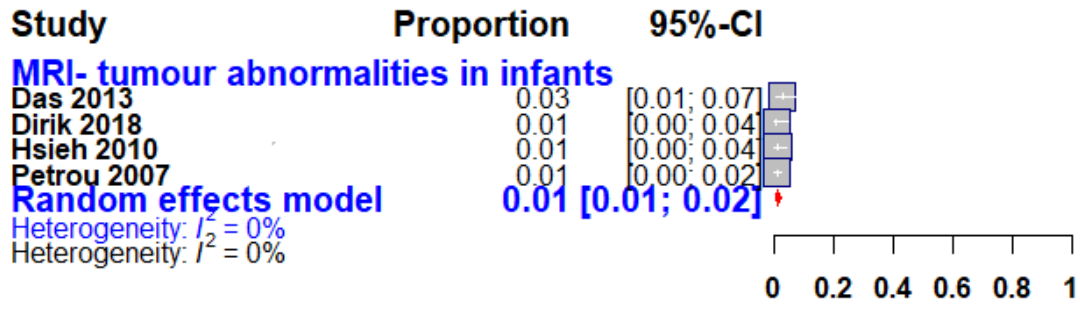


Figure 4: Proportion of tumour abnormalities identified in children (3 to 11 years old at seizure onset)

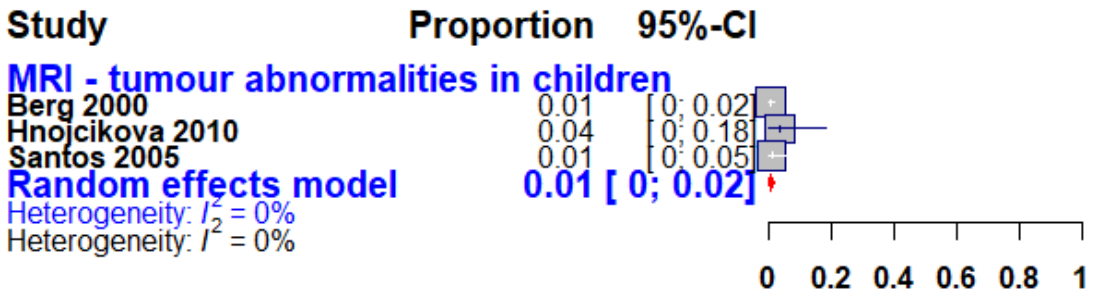


Figure 5: Proportion of tumour abnormalities identified in focal (partial) epilepsy

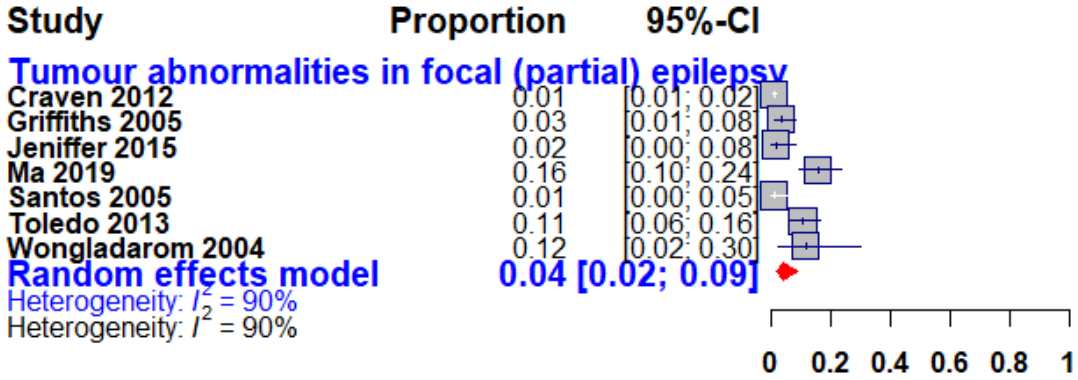


Figure 6: Proportion of tumour abnormalities identified in genetic (idiopathic) generalised epilepsy

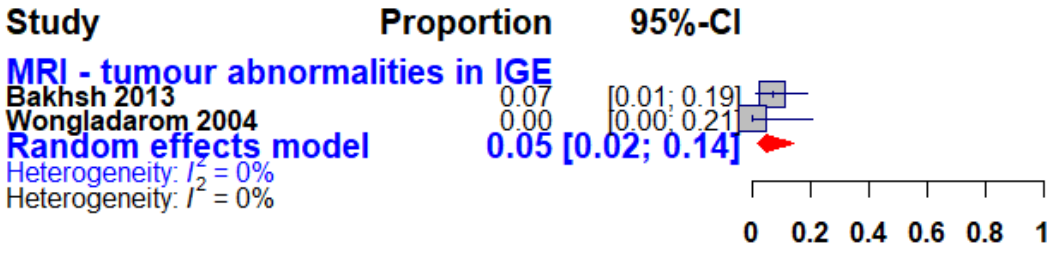


Figure 7: Proportion of tumour abnormalities identified on 1.5-t

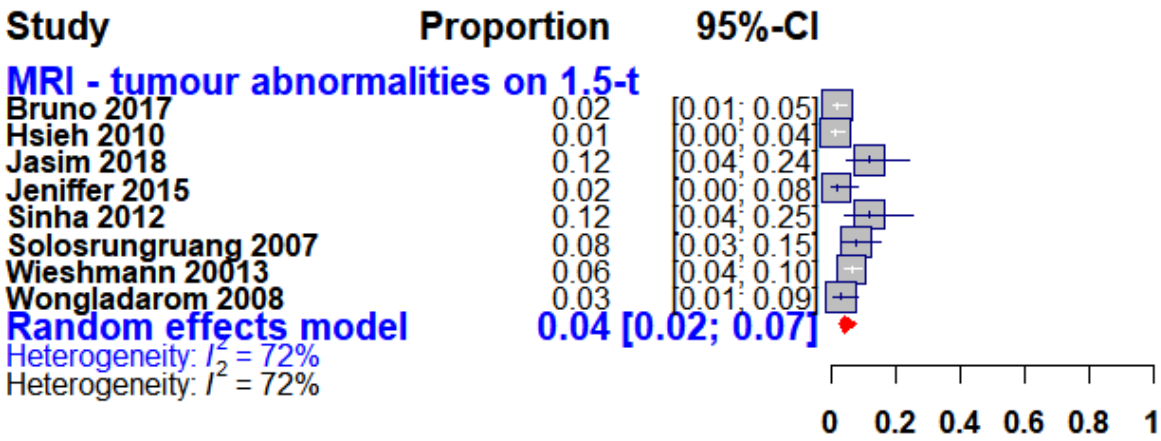


Figure 8: Proportion of tumour abnormalities identified on 3.0-t

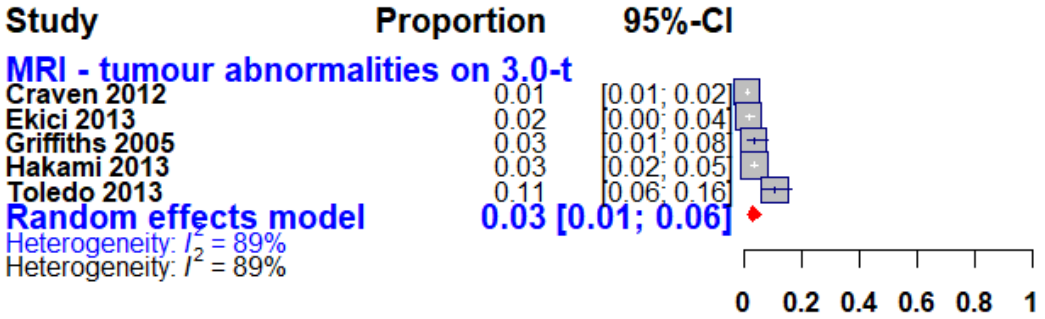


Figure 9: Proportion of tumour abnormalities identified in those with a new diagnosis

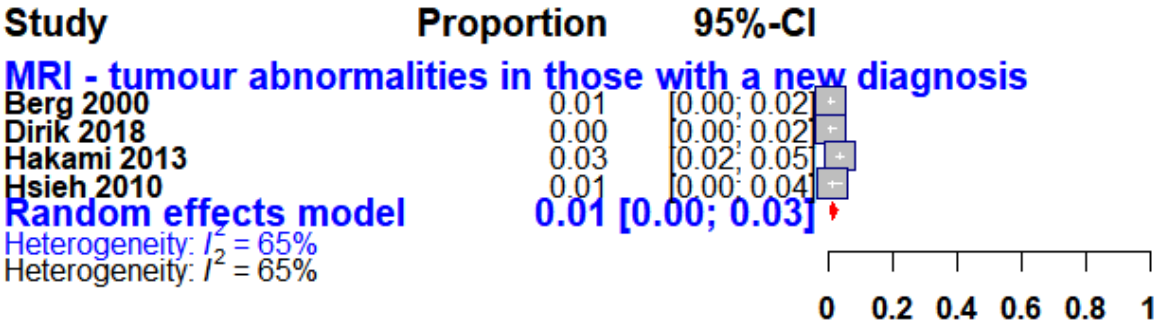


Figure 10: Proportion of tumour abnormalities identified in those with existing diagnosis and treatment resistant

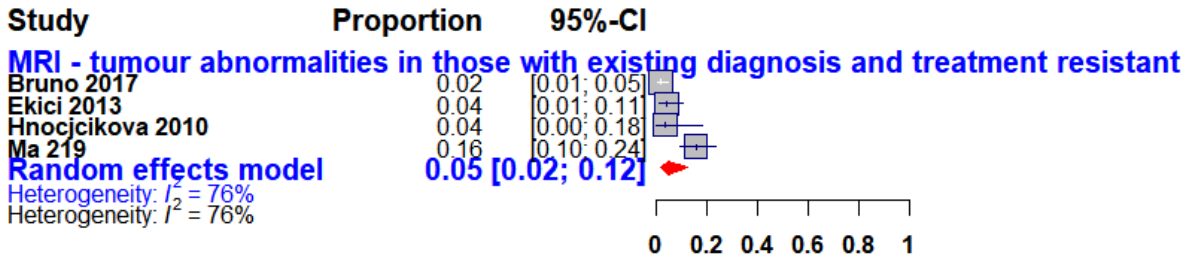
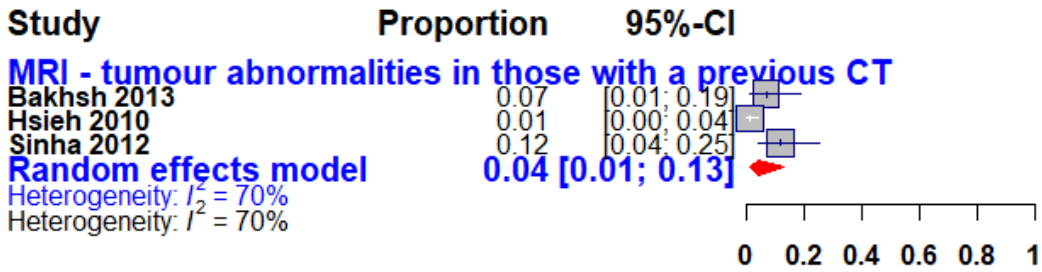


Figure 11: Proportion of tumour abnormalities identified in those with a previous CT scan



Critical outcomes: proportion identified with vascular abnormalities

Figure 12: Proportion identified with vascular abnormalities: overall estimate

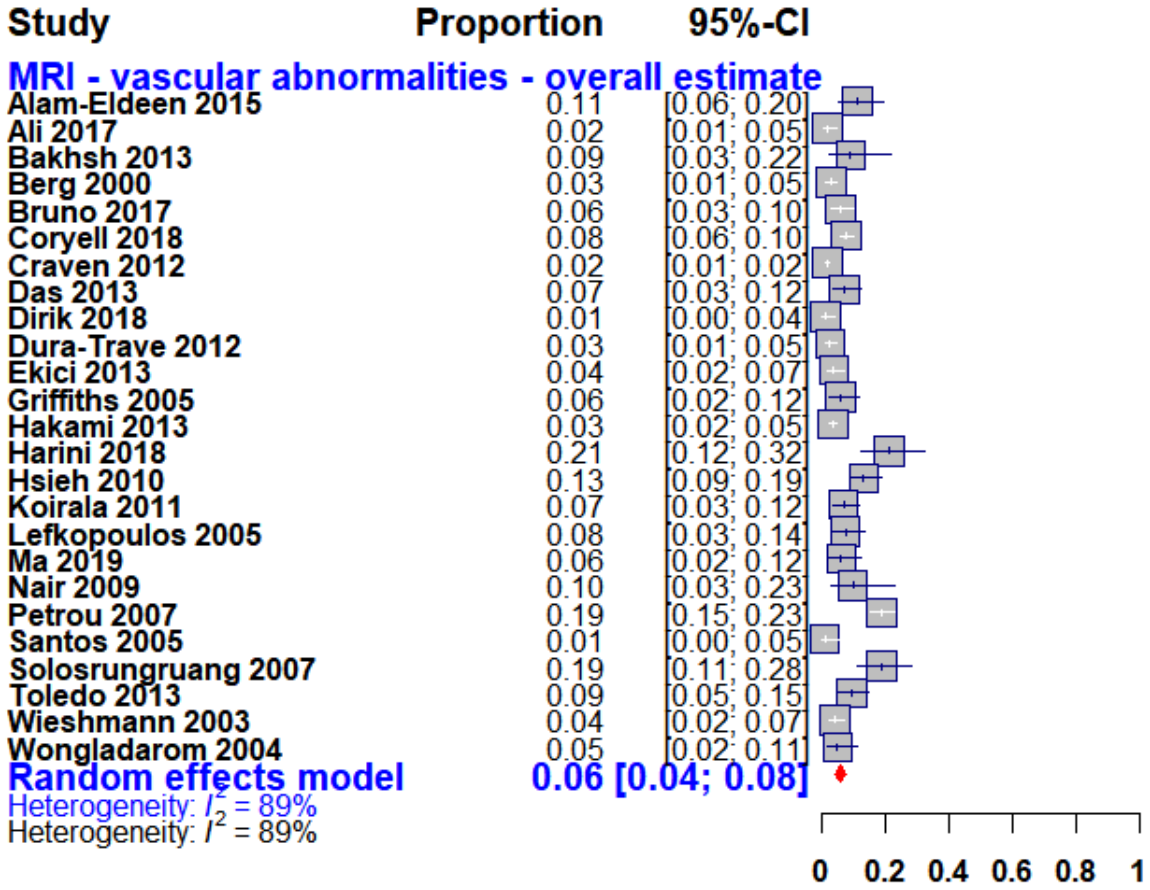


Figure 13: Proportion of vascular abnormalities identified in children (3 to 11 years old at seizure onset)

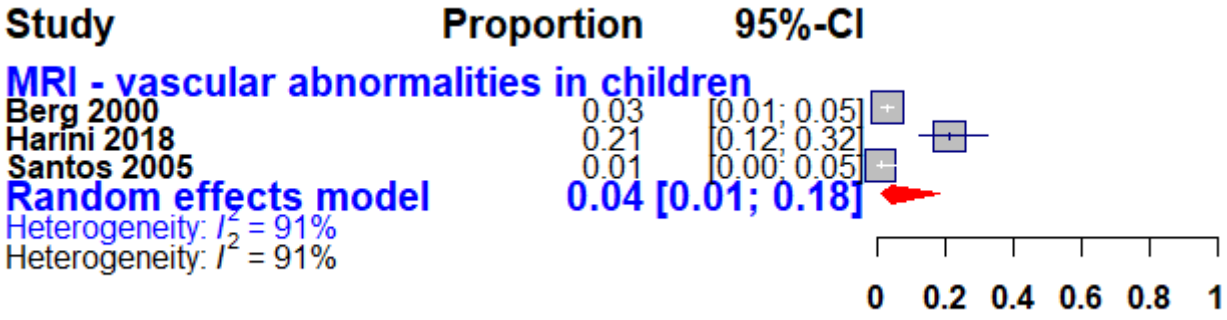


Figure 14: Proportion of vascular abnormalities identified in young people (11 to 25 years old at seizure onset)

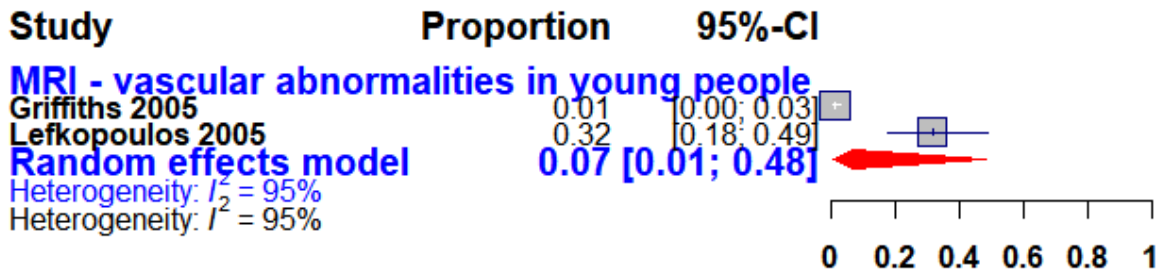


Figure 15: Proportion of vascular abnormalities identified in focal (partial) epilepsy

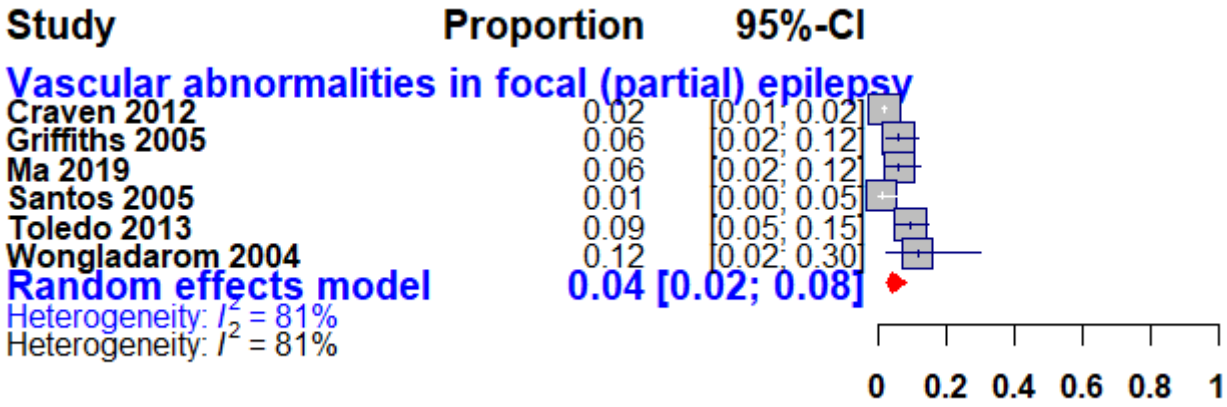


Figure 16: Proportion of vascular abnormalities identified in genetic (idiopathic) generalised epilepsy

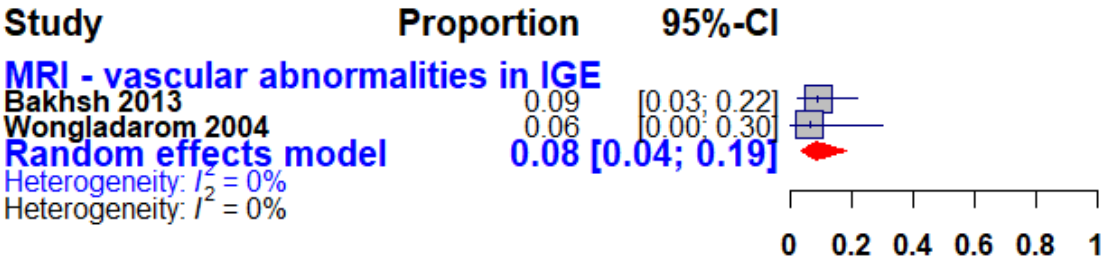


Figure 17: Proportion of vascular abnormalities identified in West syndrome

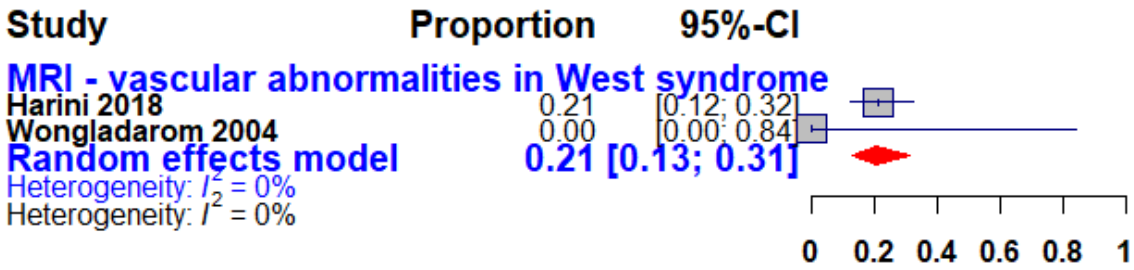


Figure 18: Proportion of vascular abnormalities identified on 1.5-t

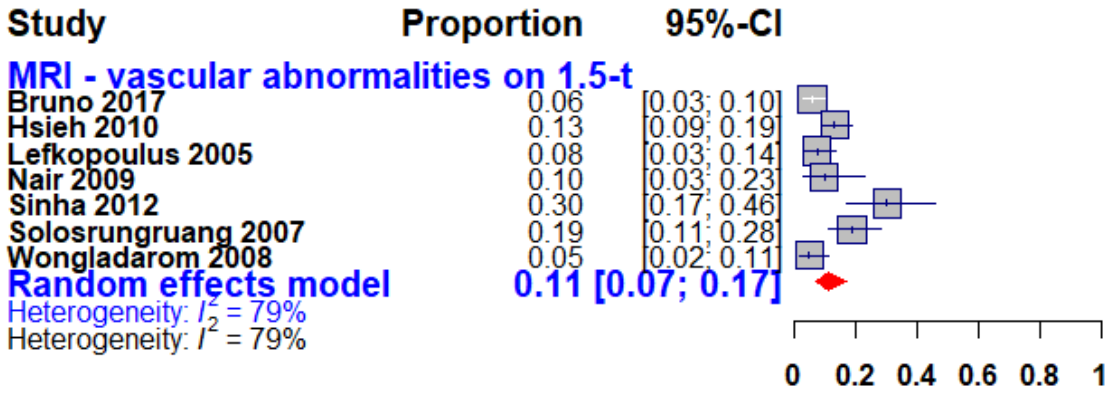


Figure 19: Proportion of vascular abnormalities identified on 3.0-t

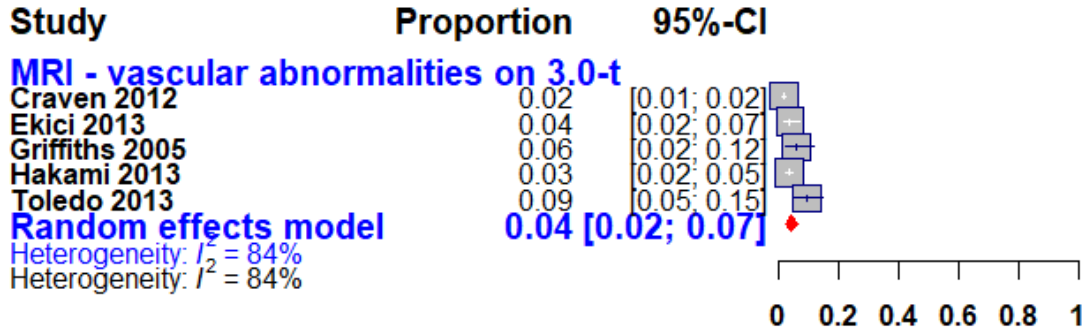


Figure 20: Proportion of vascular abnormalities identified in those with a new diagnosis

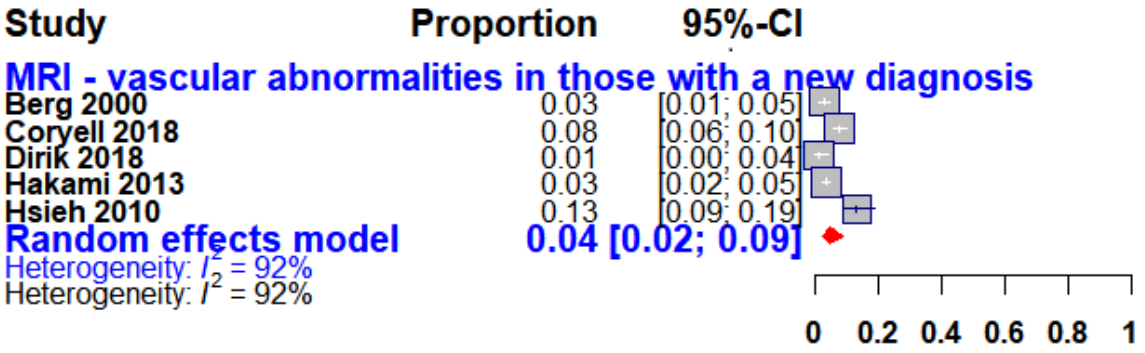
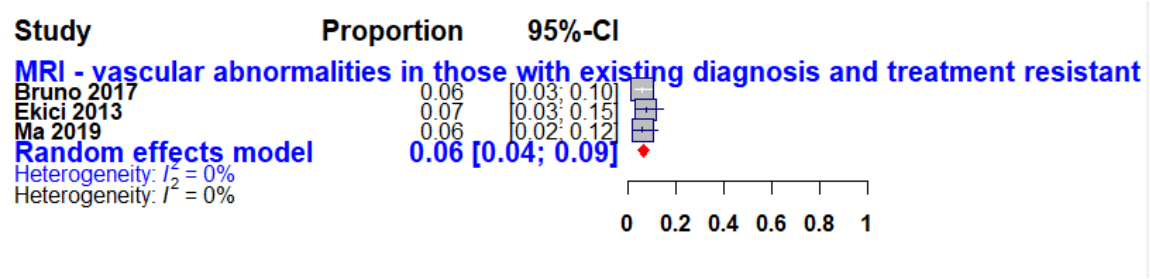


Figure 21: Proportion of vascular abnormalities identified in those with existing diagnosis and treatment resistant



Critical outcomes: proportion identified with scarring abnormalities

Figure 22: Proportion identified with scarring abnormalities: overall estimate

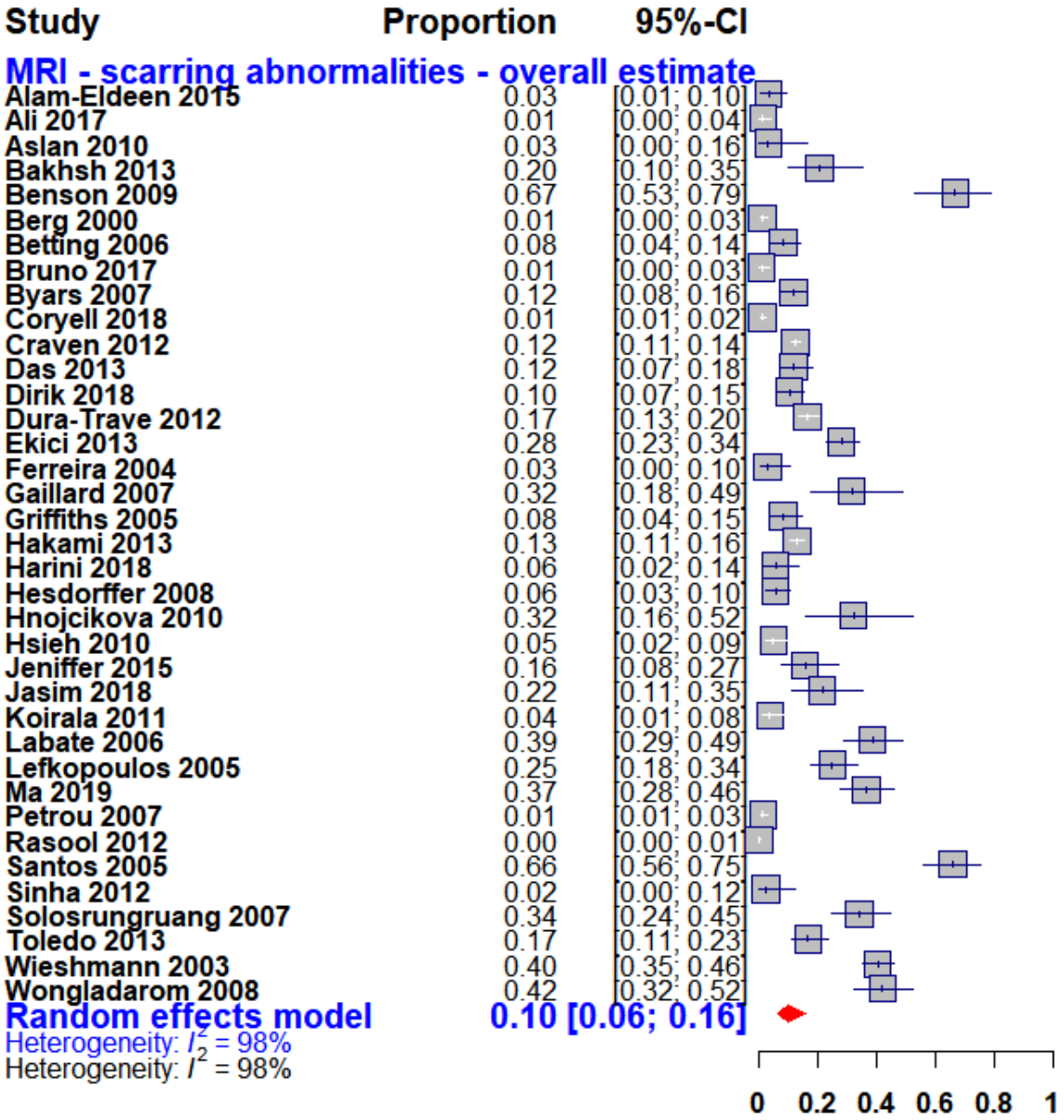


Figure 23: Proportion of scarring abnormalities identified in infants (<3 years old at seizure onset)

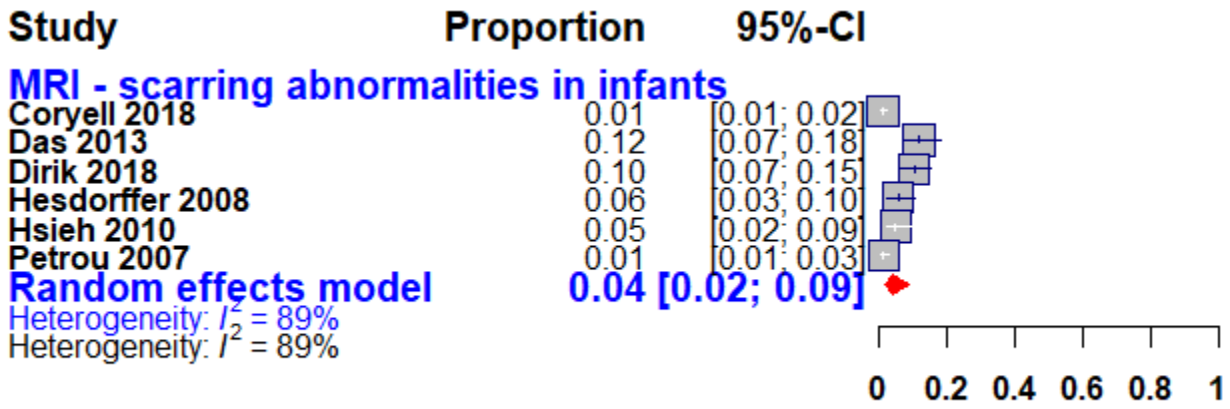


Figure 24: Proportion of scarring abnormalities identified in children (3 to 11 years old at seizure onset)

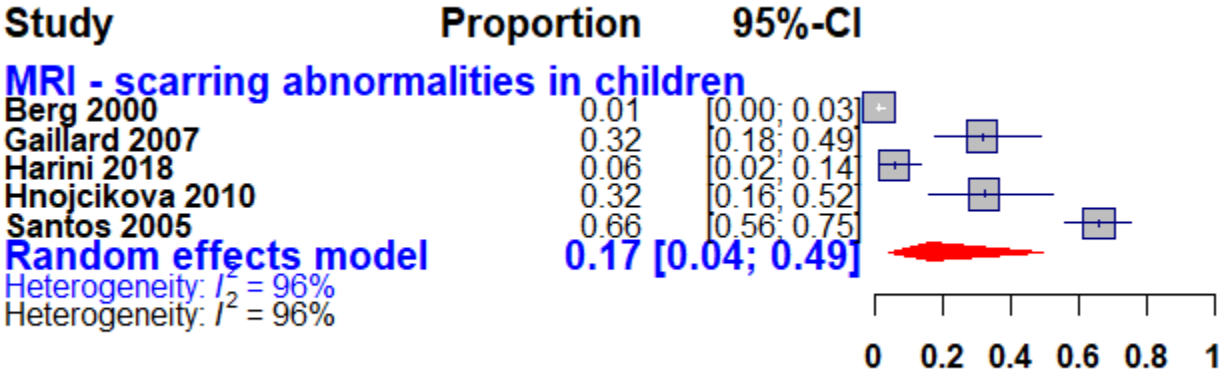


Figure 25: Proportion of scarring abnormalities identified in young people (11 to 25 years old at seizure onset)

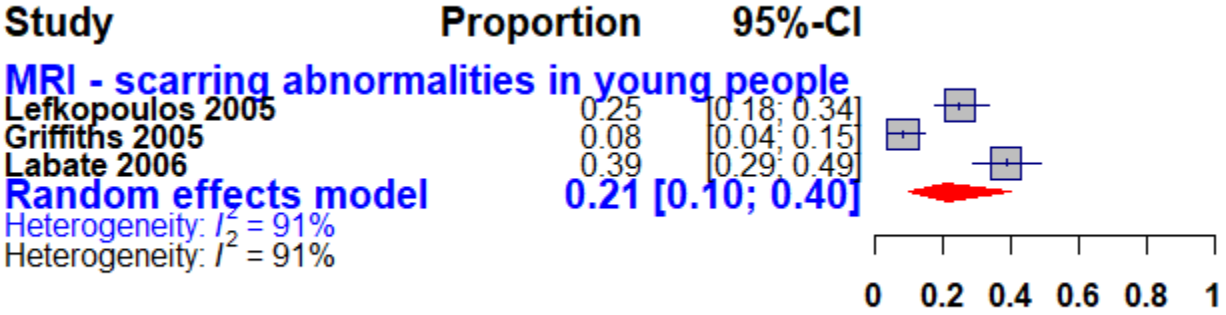


Figure 26: Proportion of scarring abnormalities identified in focal (partial) epilepsy

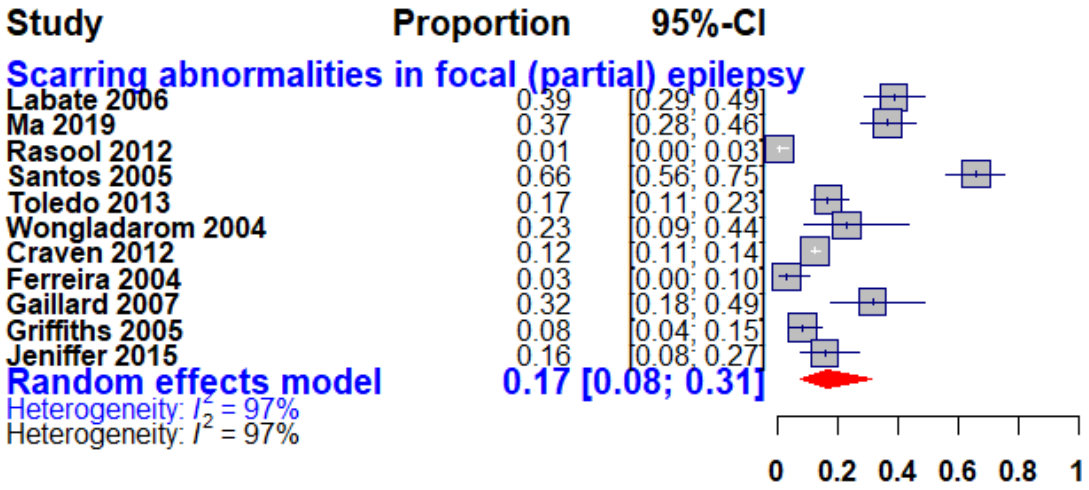


Figure 27: Proportion of scarring abnormalities identified in genetic (idiopathic) generalised epilepsy

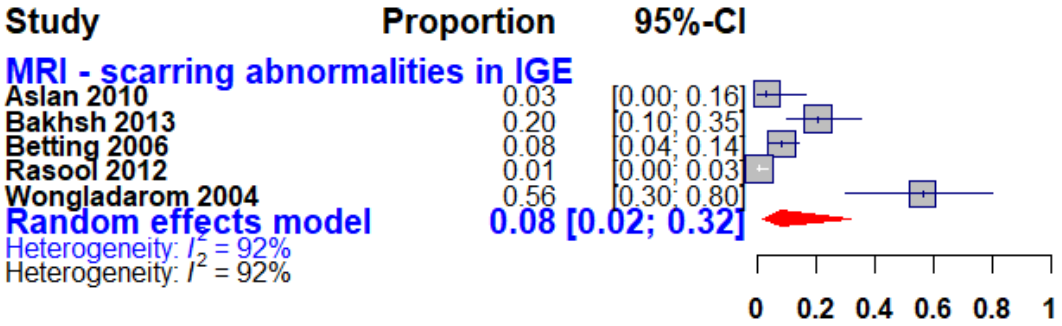


Figure 28: Proportion of scarring abnormalities identified in West syndrome

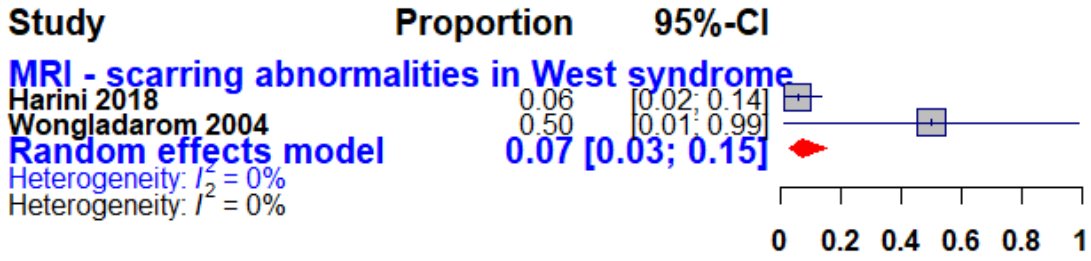


Figure 29: Proportion of scarring abnormalities identified on 1.5-t

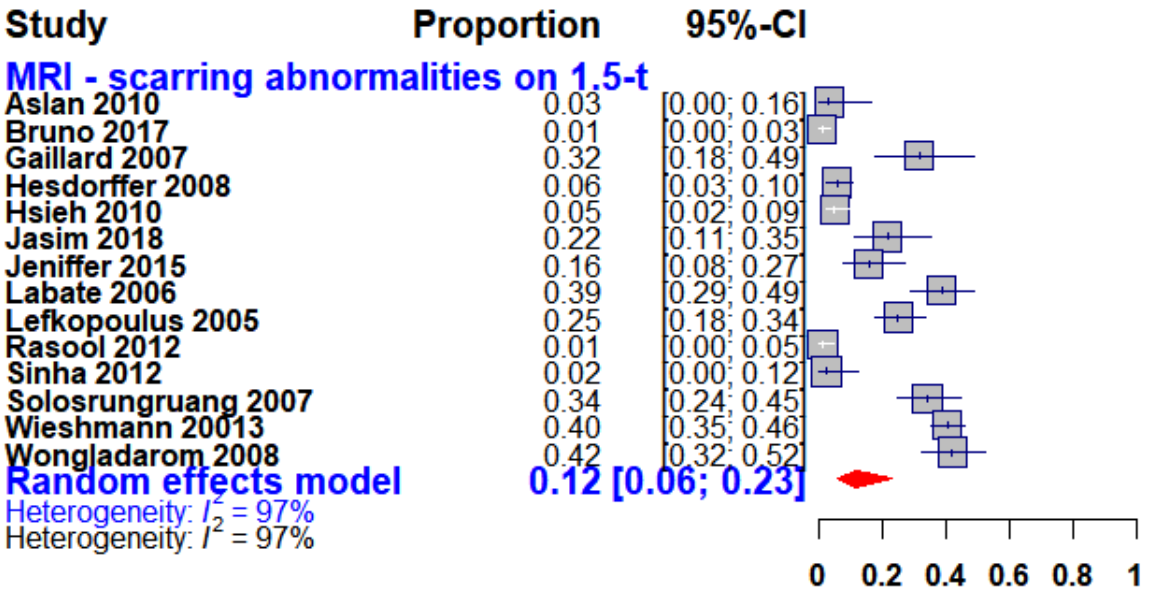


Figure 30: Proportion of scarring abnormalities identified on 3.0-t

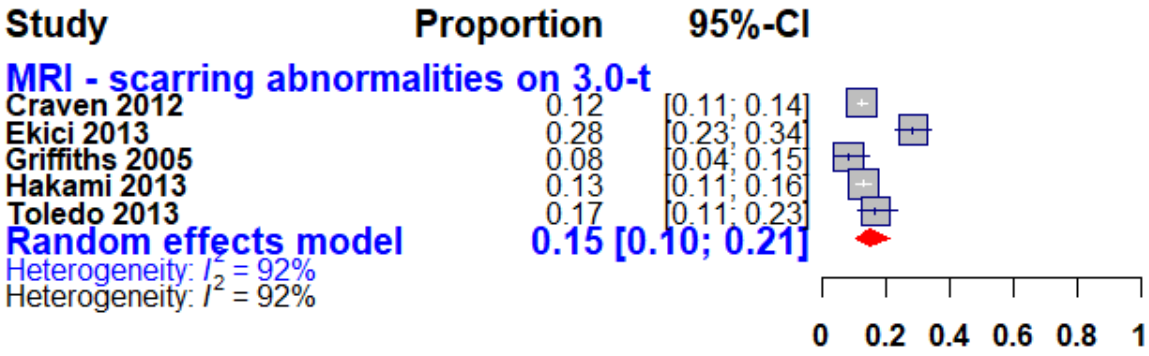


Figure 31: Proportion of scarring abnormalities in those with a new diagnosis

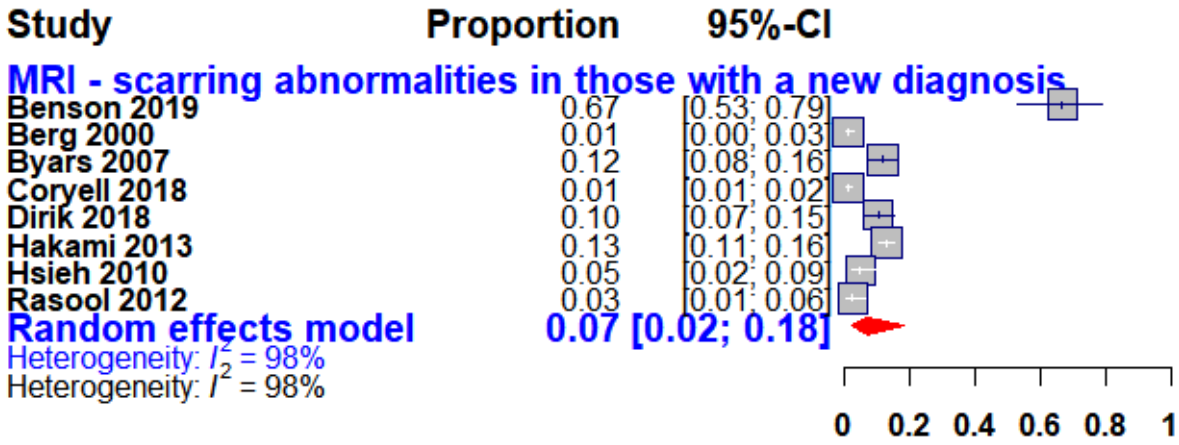


Figure 32: Proportion of scarring abnormalities identified in those with existing diagnosis and treatment resistant

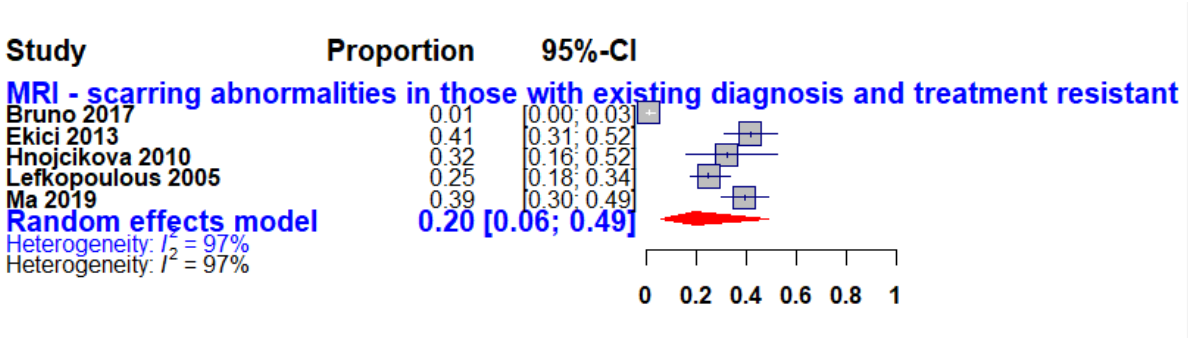


Figure 33: Proportion of scarring abnormalities identified in those with existing diagnosis and controlled epilepsy

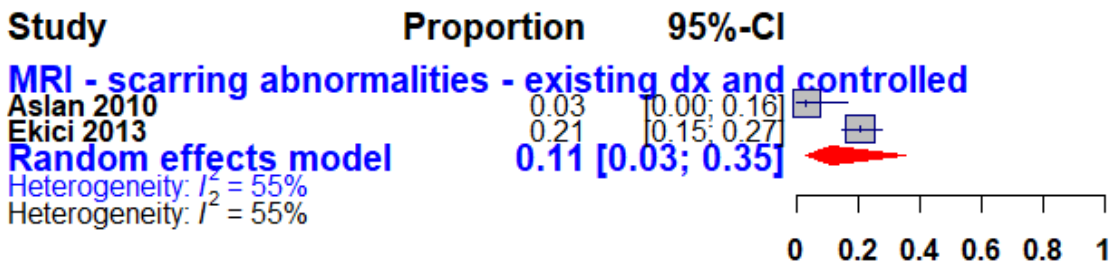


Figure 34: Proportion of scarring abnormalities identified in those without learning disabilities

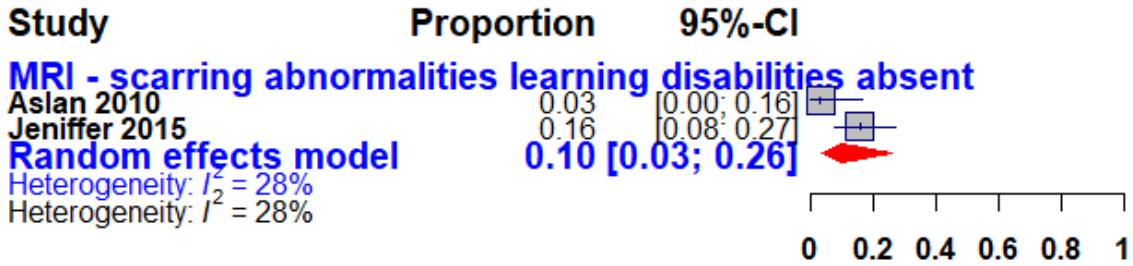
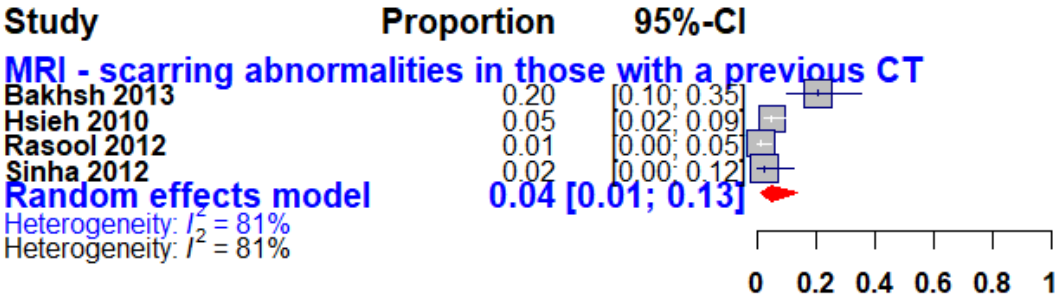


Figure 35: Proportion of scarring abnormalities identified in those with a previous CT scan



Critical outcomes: proportion identified with congenital/developmental abnormalities

Figure 36: Proportion identified with congenital/developmental abnormalities: overall estimate

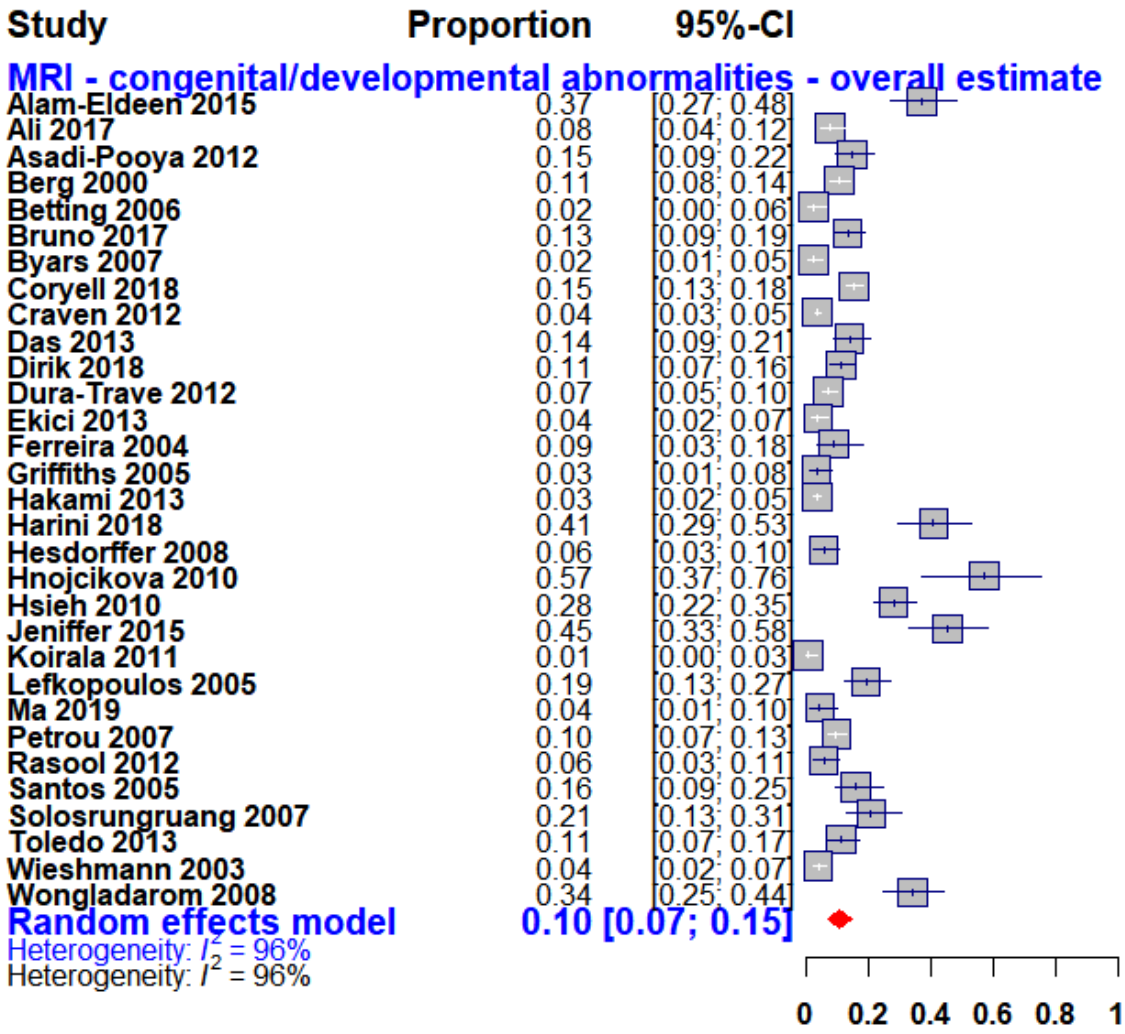


Figure 37: Proportion of congenital/developmental abnormalities indentified in infants (<3 years old at seizure onset)

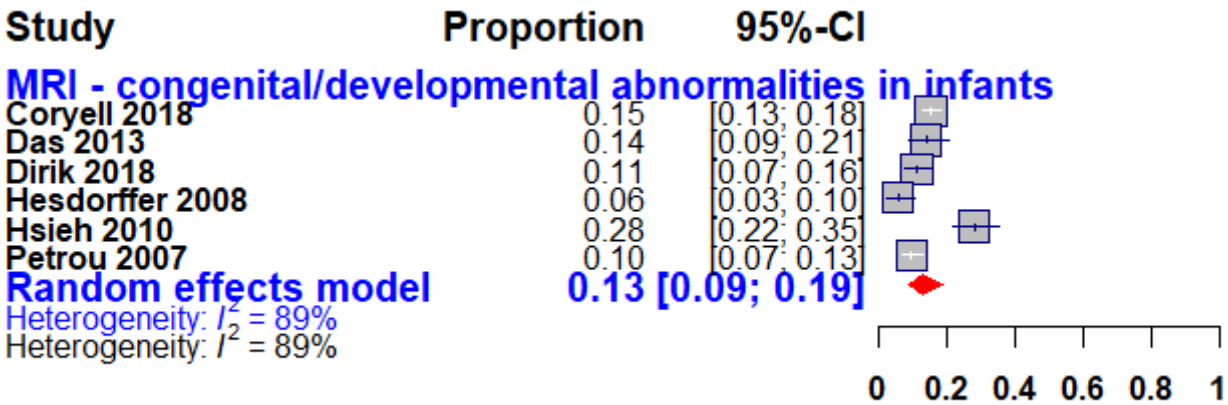


Figure 38: Proportion of congenital/developmental abnormalities identified in children (3 to 11 years old at seizure onset)

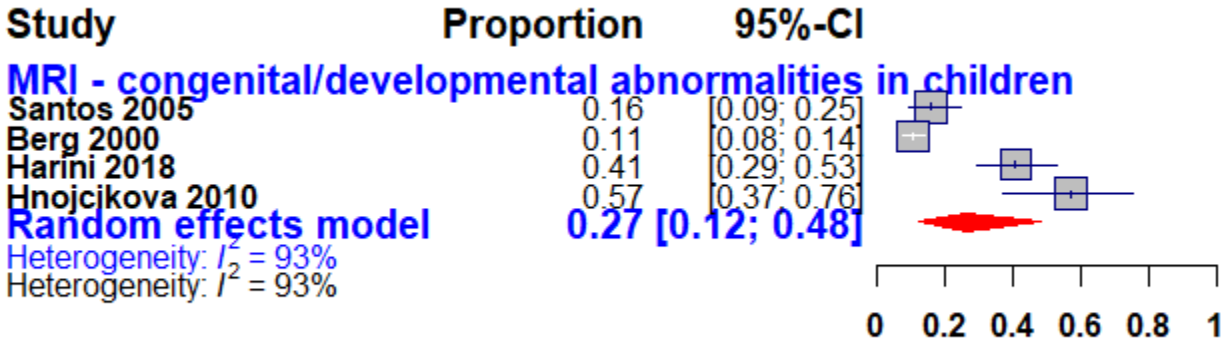


Figure 39: Proportion of congenital/developmental abnormalities identified in young people (11 to 25 years old at seizure onset)

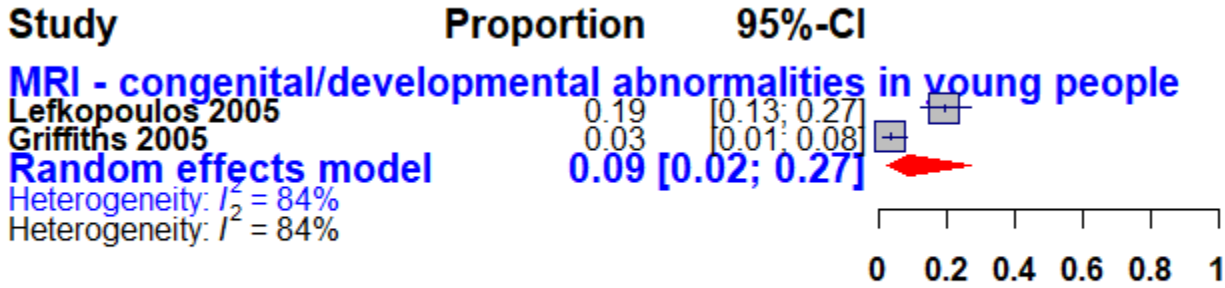


Figure 40: Proportion of congenital/developmental abnormalities identified in focal (partial) epilepsy

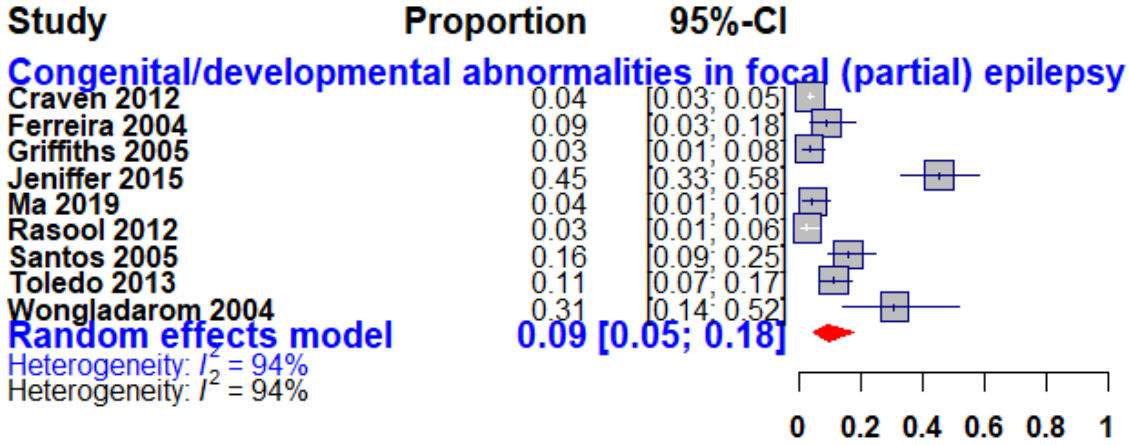


Figure 41: Proportion of congenital/developmental abnormalities identified in genetic (idiopathic) generalised epilepsy

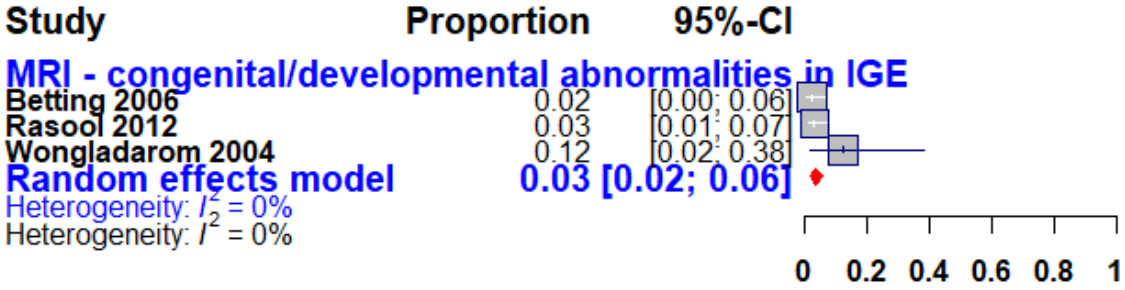


Figure 42: Proportion of congenital/developmental abnormalities identified in West syndrome

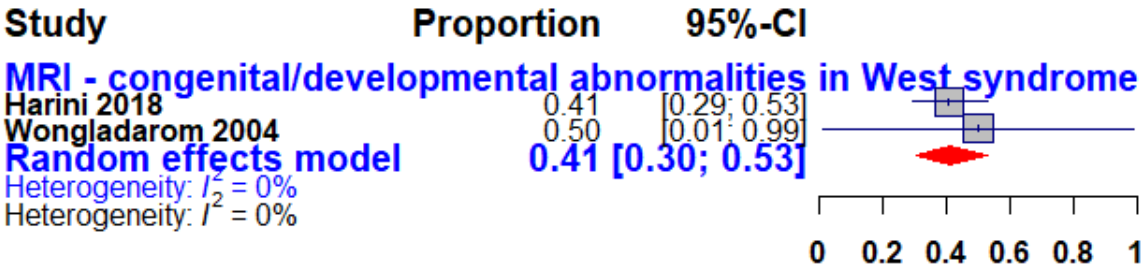


Figure 43: Proportion of congenital/developmental abnormalities identified in Lennox-Gastaut syndrome

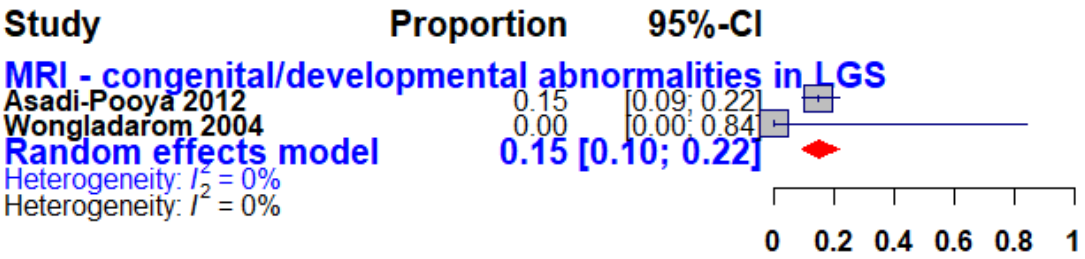


Figure 44: Proportion of congenital/developmental abnormalities identified on 1.5-t

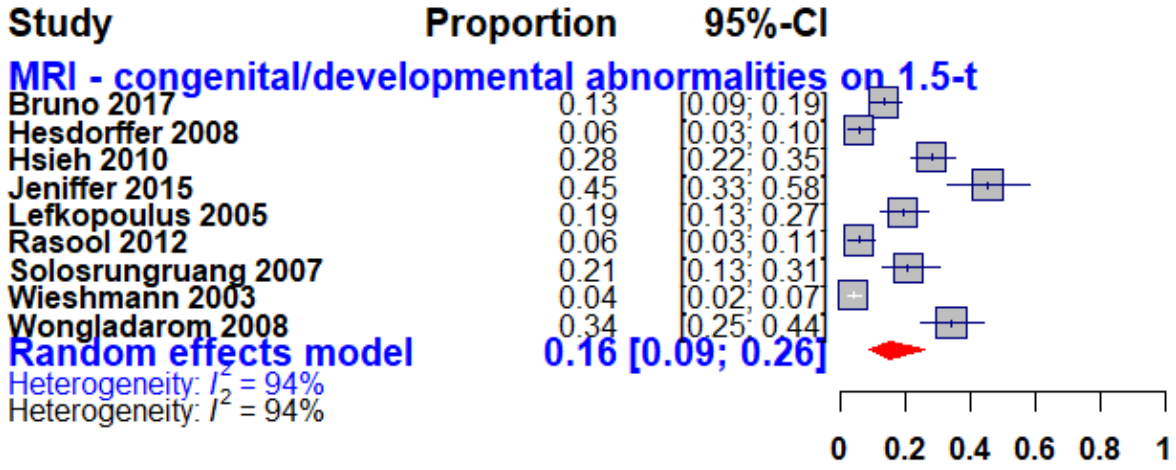


Figure 45: Proportion of congenital/developmental abnormalities identified on 3.0-t

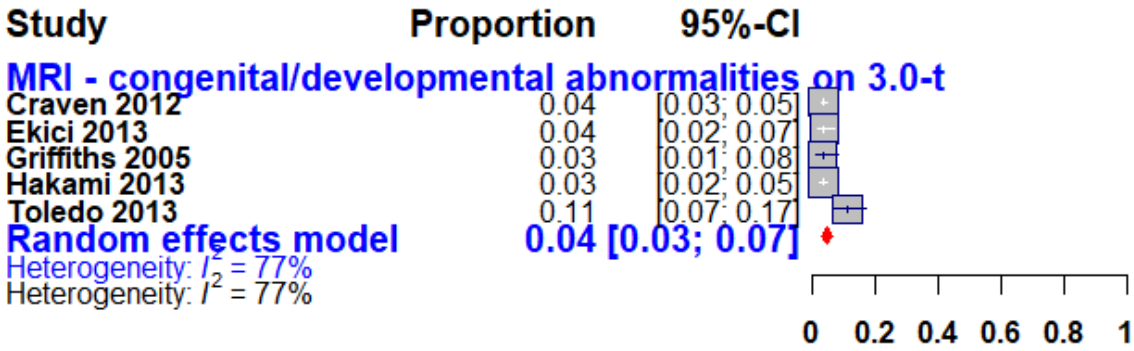


Figure 46: Proportion of congenital/developmental abnormalities identified in those with a new diagnosis

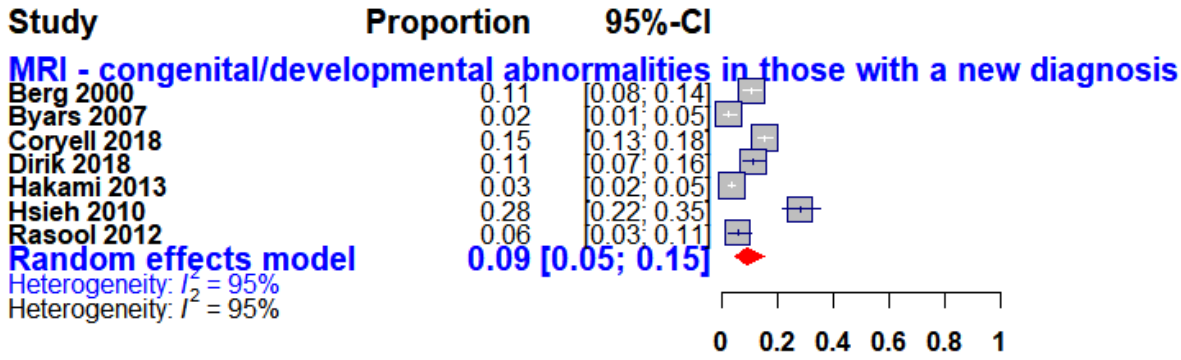


Figure 47: Proportion of congenital/developmental abnormalities identified in those with existing diagnosis and treatment resistant

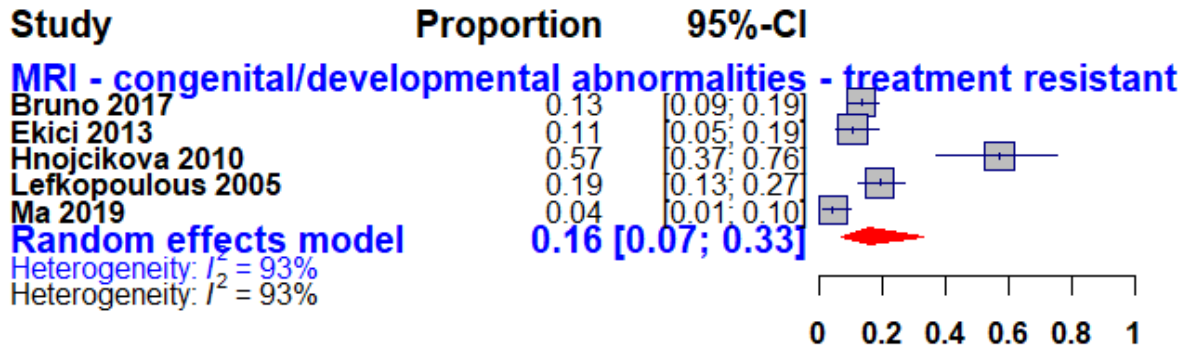
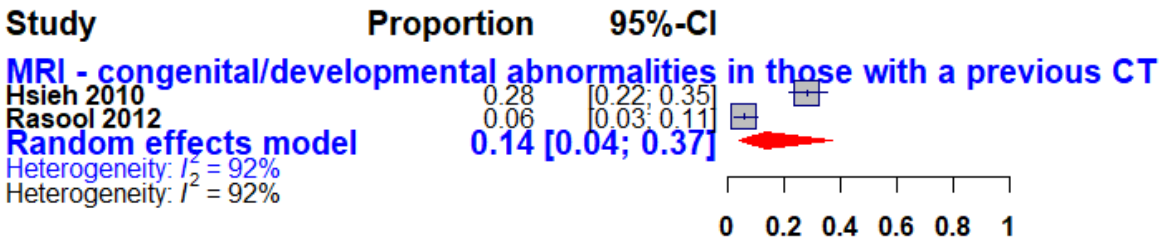


Figure 48: Proportion of congenital/developmental abnormalities identified in those with a previous CT scan



Critical outcomes: proportion identified with inflammatory/infective/immune abnormalities

Figure 49: Proportion identified with inflammatory/infective/immune abnormalities: overall estimate

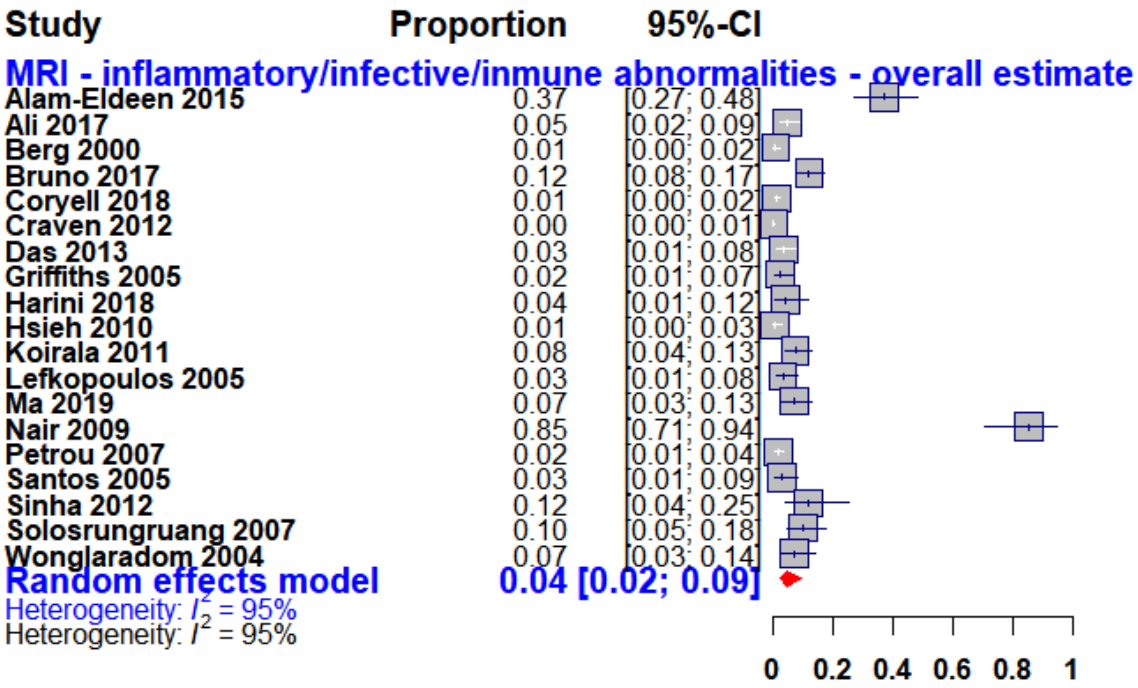


Figure 50: Proportion of inflammatory/infective/inmune abnormalities identified in infants (<3 years old at seizure onset)

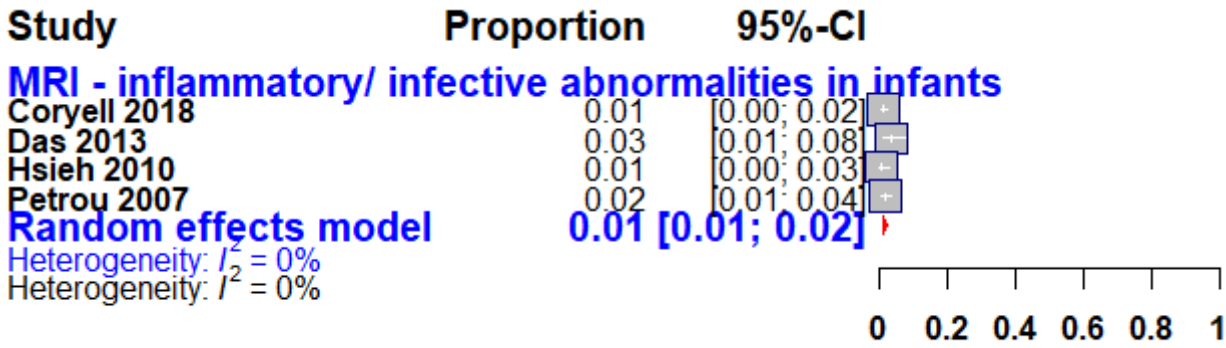


Figure 51: Proportion of inflammatory/infective/inmune abnormalities identified in children (3 to 11 years old at seizure onset)

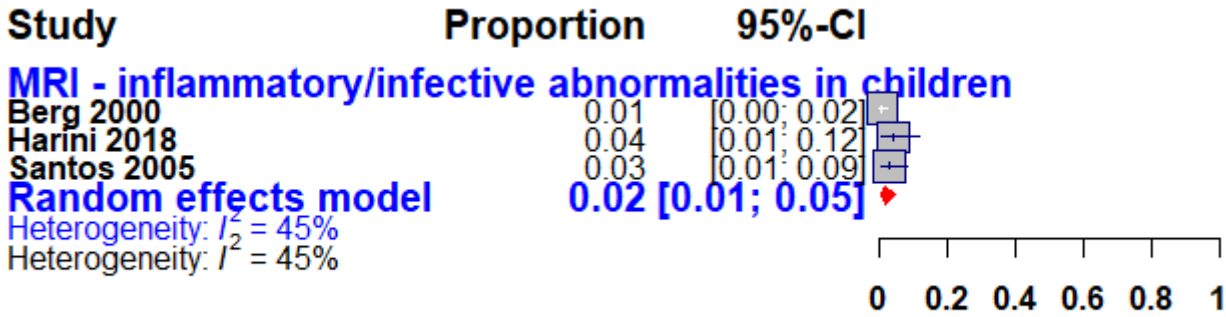


Figure 52: Proportion of inflammatory/infective/inmune abnormalities identified in young people (11 to 25 years old at seizure onset)

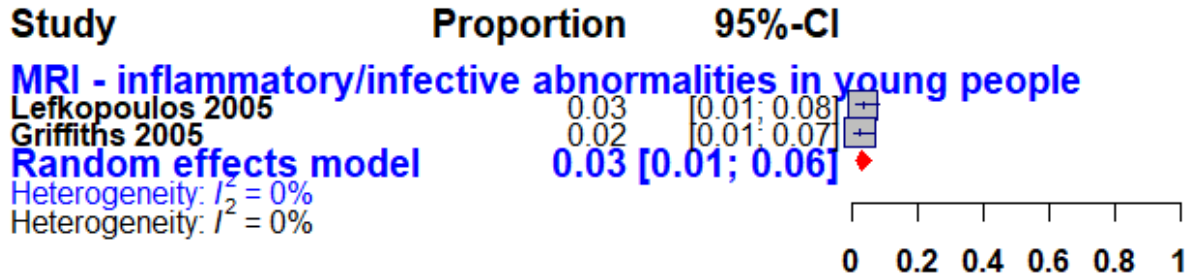


Figure 53: Proportion of inflammatory/infective/inmune abnormalities identified in focal (partial) epilepsy

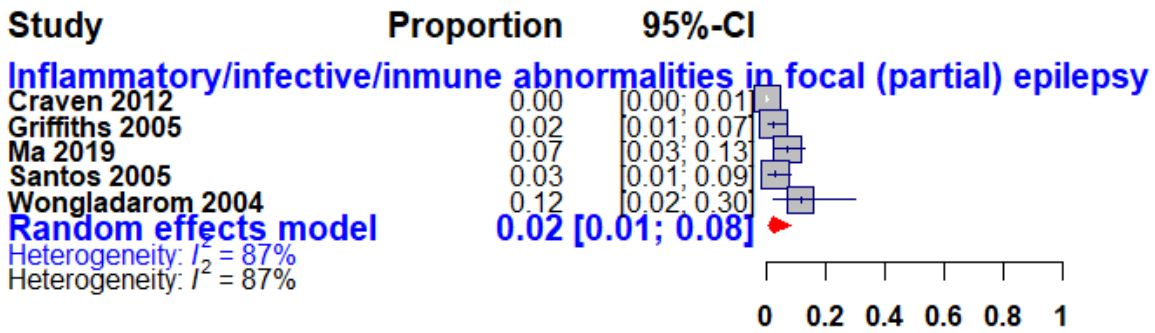


Figure 54: Proportion of inflammatory/infective/inmune abnormalities identified in West syndrome

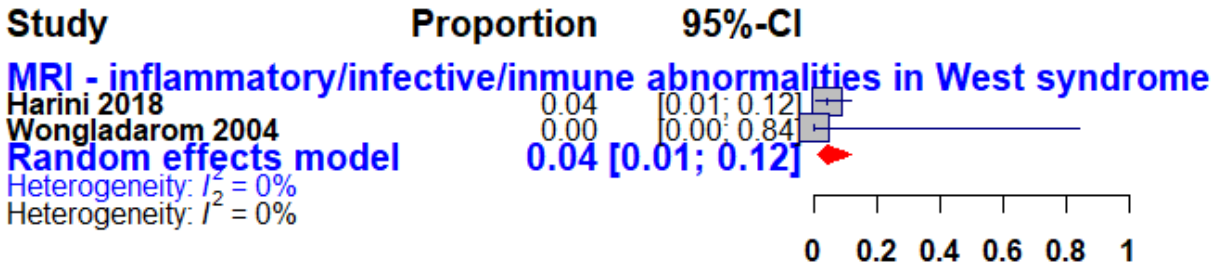


Figure 55: Proportion of inflammatory/infective/inmune abnormalities identified on 1.5-t

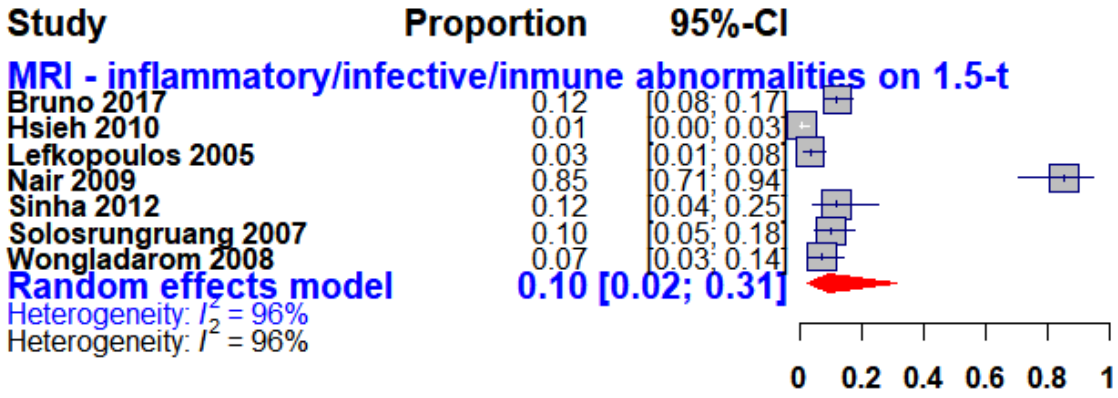


Figure 56: Proportion of inflammatory/infective/inmune abnormalities identified on 3.0-t

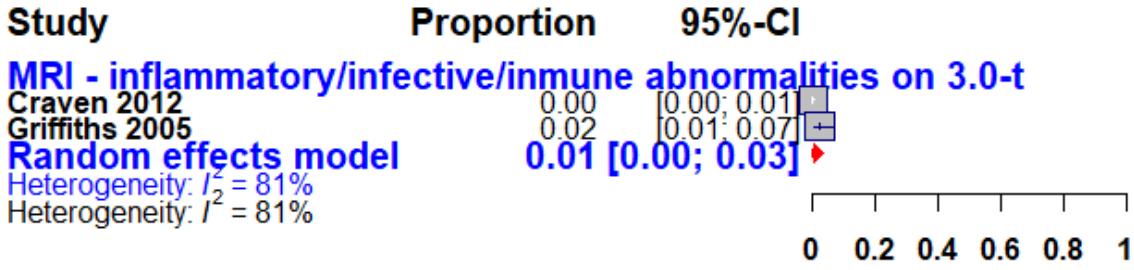


Figure 57:Proportion of inflammatory/infective/inmune abnormalities identified in those with a new diagnosis

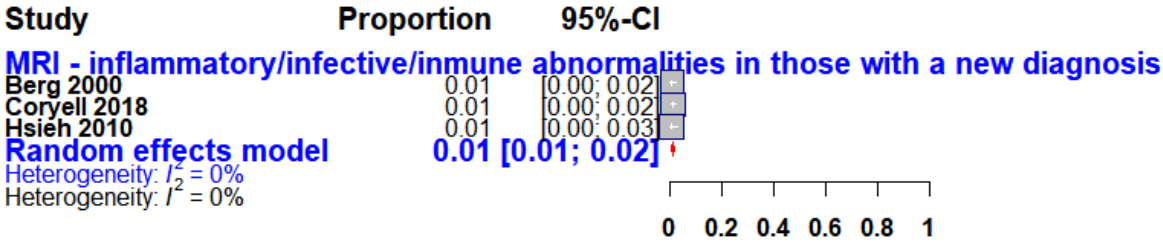


Figure 58: Proportion of inflammatory/infective/inmune abnormalities identified in those with existing diagnosis and treatment resistant

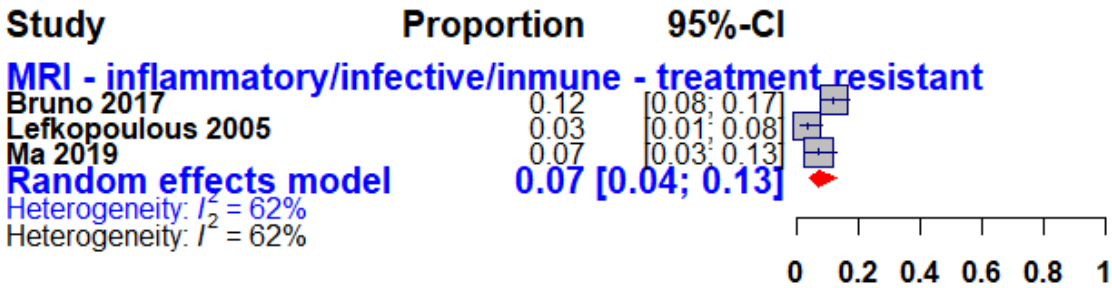
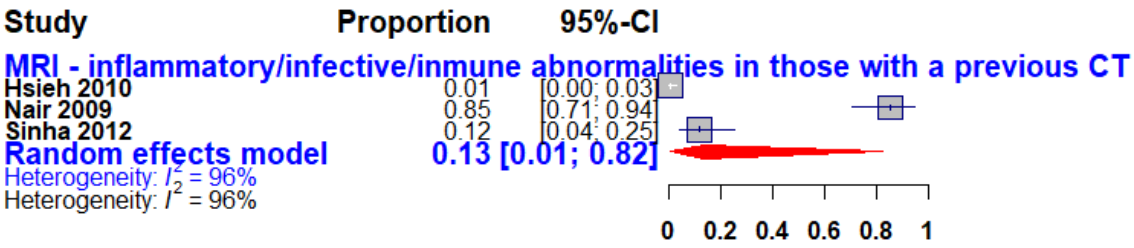


Figure 59: Proportion of inflammatory/infective/inmune abnormalities identified in those with a previous CT scan



Critical outcomes: proportion identified with metabolic/genetic abnormalities

Figure 60: Proportion identified with metabolic/genetic abnormalities: overall estimate

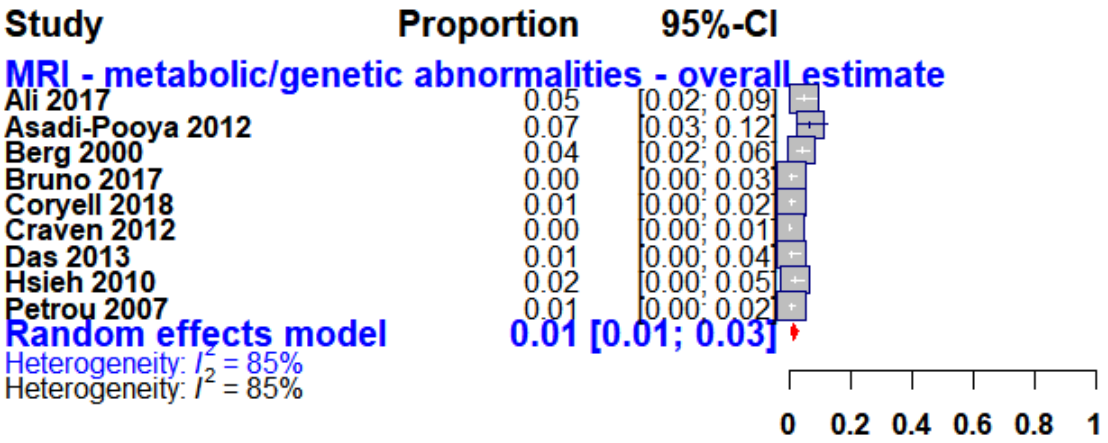


Figure 61: Proportion of metabolic/genetic abnormalities identified in infants (<3 years old at seizure onset)

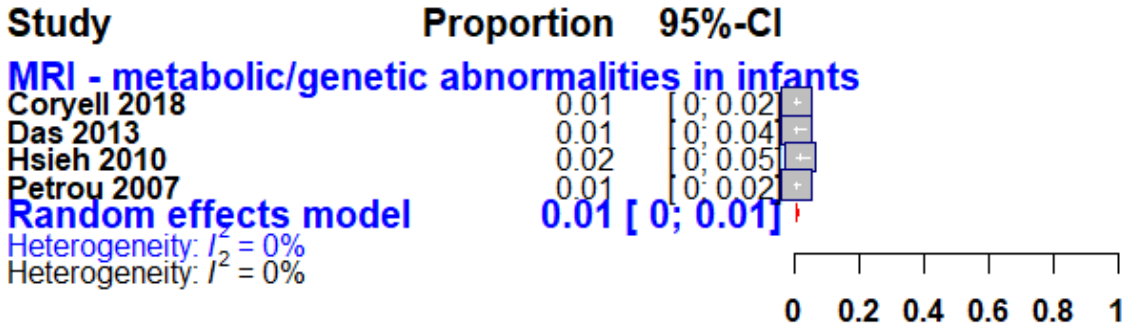


Figure 62: Proportion of metabolic/genetic abnormalities identified on 1.5-t

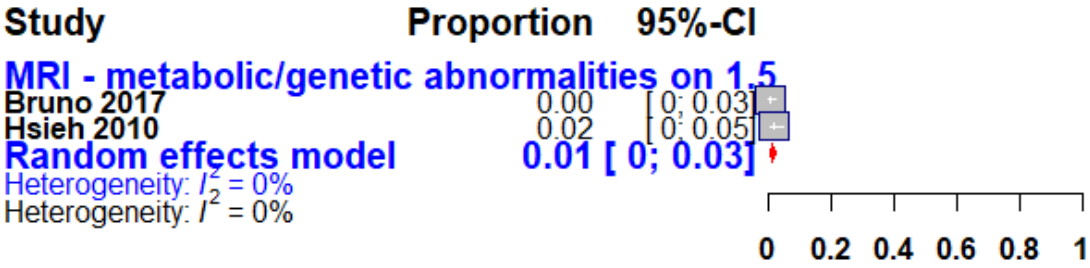
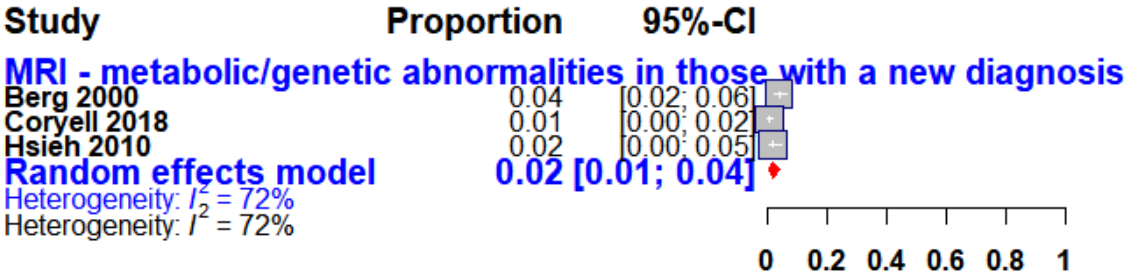


Figure 63: Proportion of metabolic/genetic abnormalities in those with a new diagnosis



Important outcomes: proportion identified with a non-epilepsy related abnormality

Figure 64: Proportion identified with non-epilepsy abnormalities: overall estimate

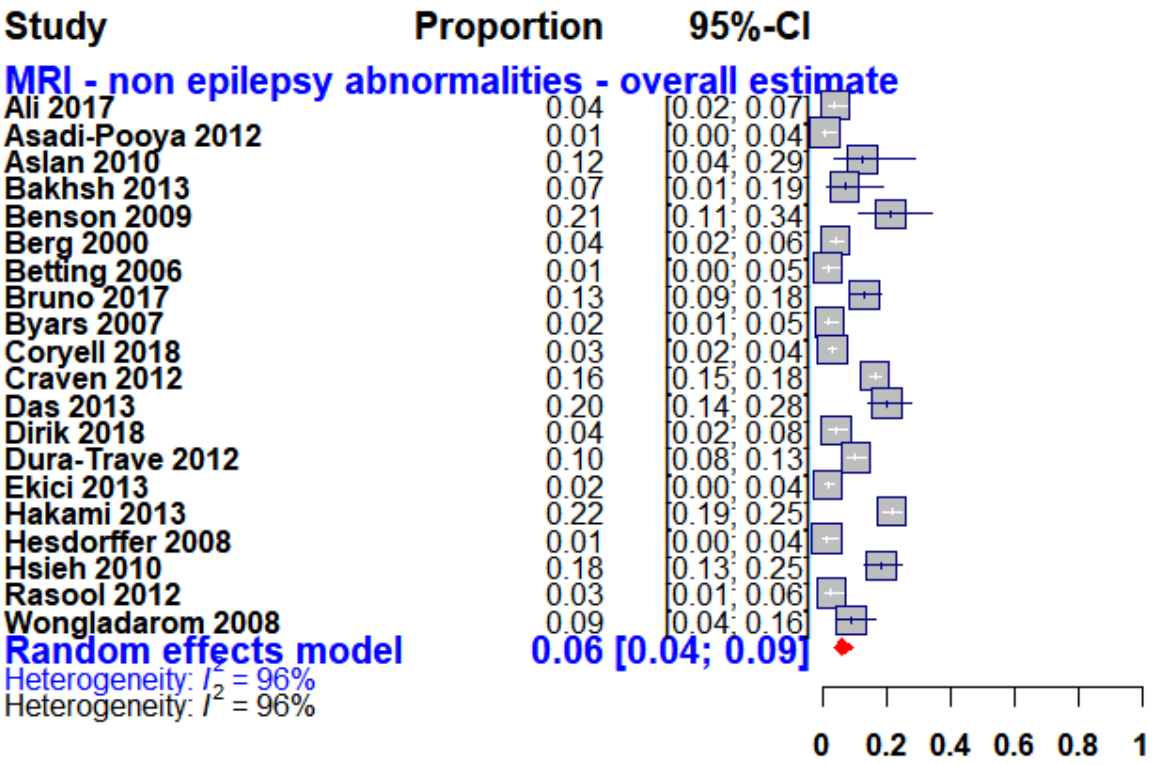


Figure 65: Proportion of non-epilepsy related abnormalities identified in infants (<3 years old at seizure onset)

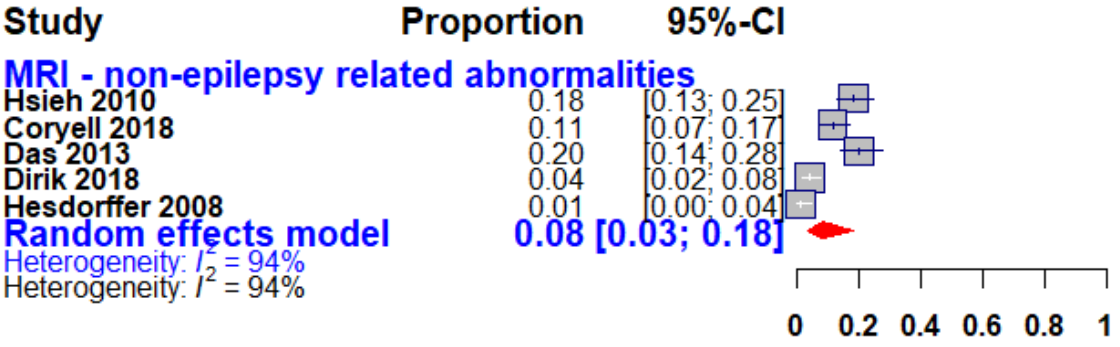


Figure 66: Proportion of non-epilepsy related abnormalities identified in focal (partial) epilepsy

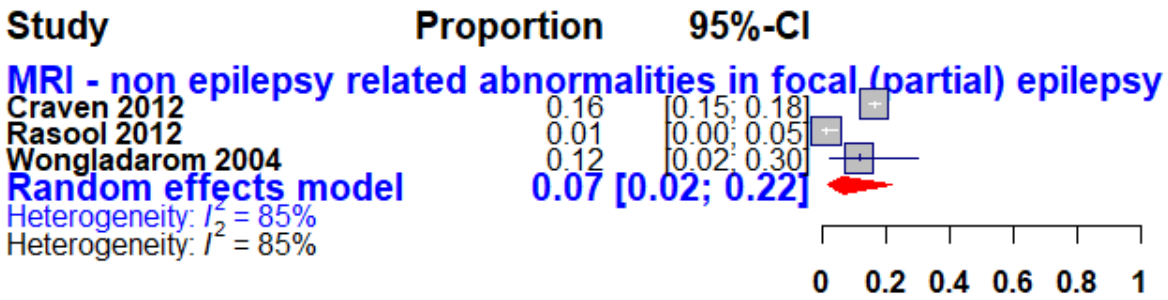


Figure 67: Proportion of non-epilepsy related abnormalities identified in genetic (idiopathic) generalised epilepsy

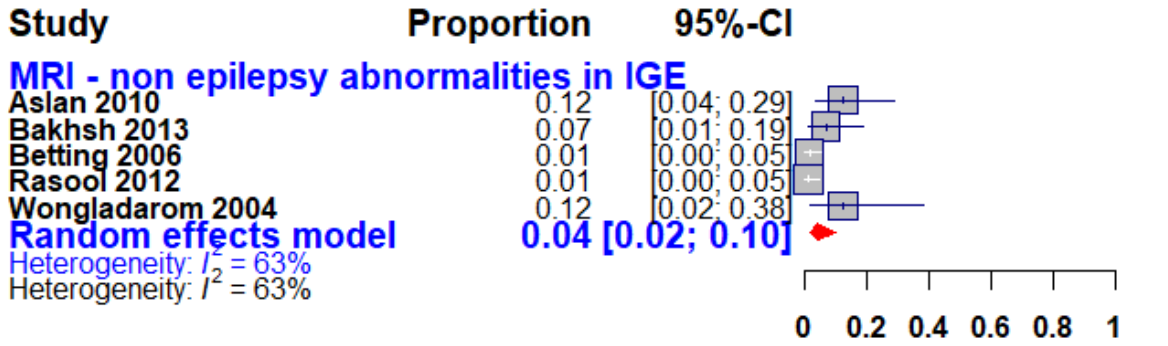


Figure 68: Proportion of non-epilepsy related abnormalities identified in Lennox-Gastaut syndrome

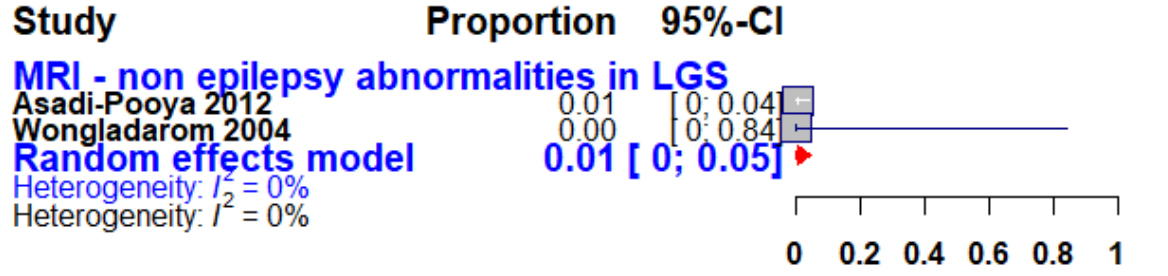


Figure 69: Proportion of non-epilepsy related abnormalities identified on 1.5-t

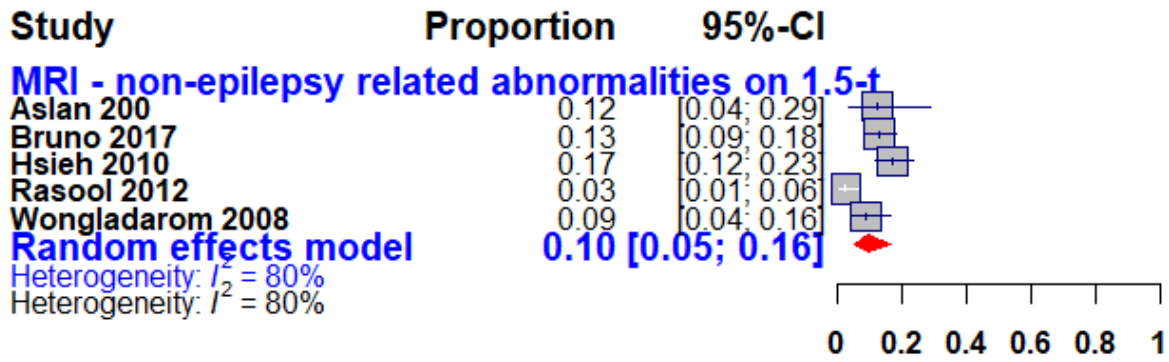


Figure 70: Proportion of non-epilepsy related abnormalities in those with a new diagnosis

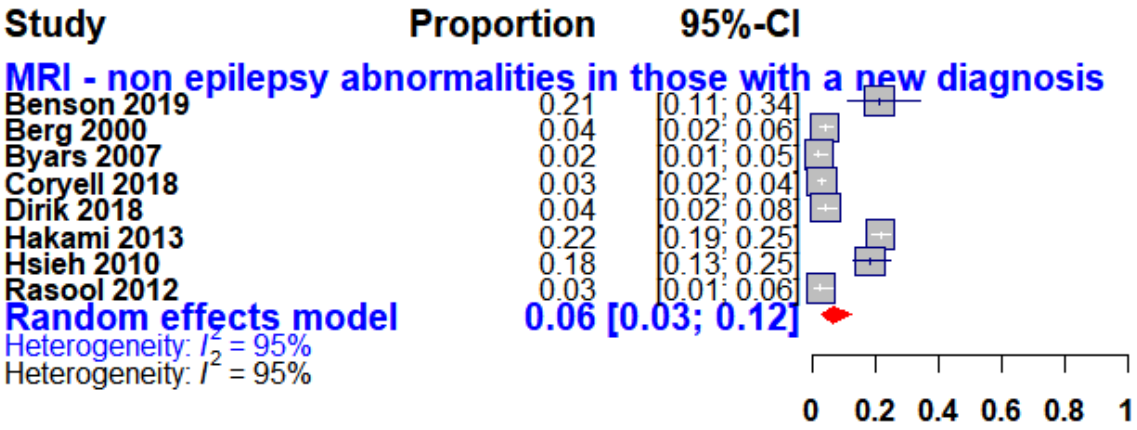


Figure 71: Proportion of non-epilepsy related abnormalities identified in those with an existing diagnosis and treatment resistant

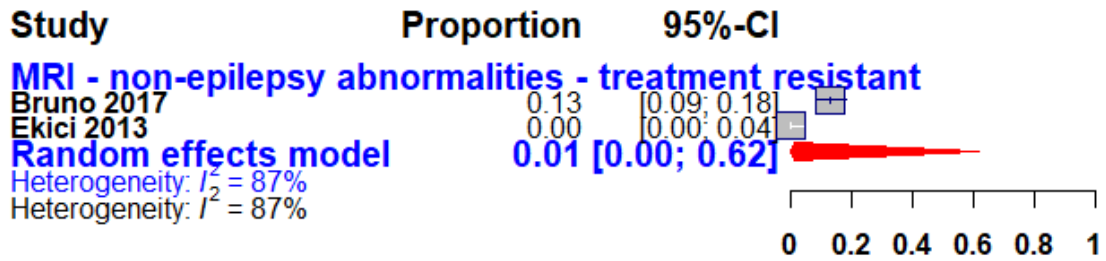


Figure 72: Proportion of non-epilepsy related abnormalities identified in those with an existing diagnosis and controlled

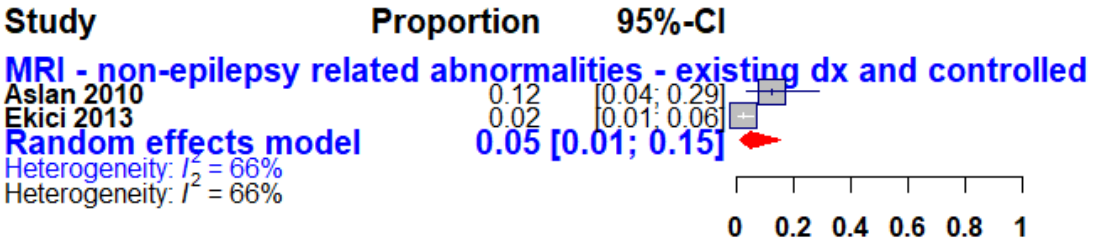
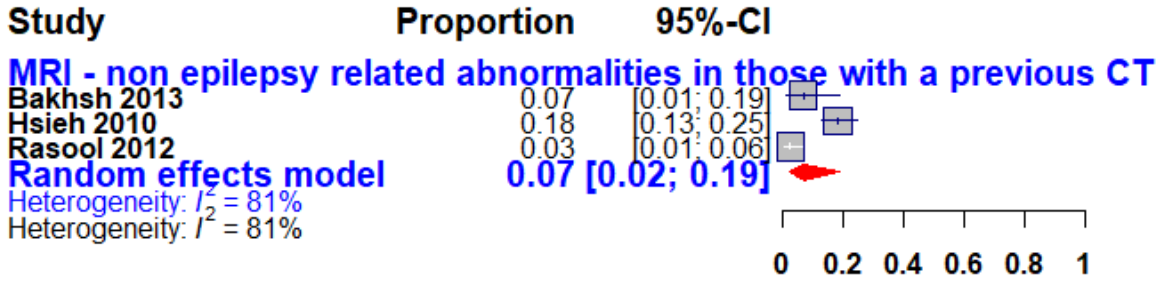


Figure 73: Proportion of non-epilepsy related abnormalities identified in those with a previous CT scan



Appendix F – Adapted GRADE tables

Clinical evidence profile tables for review question: What is the yield of relevant abnormalities detected by MRI in people with epilepsy?

Table 5: Clinical evidence profile for proportion identified with tumour abnormalities

Quality assessment						Number of patients		Effect		
Number of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Number with a clinically relevant abnormality	Number assessed	Proportion (95% CI)	Quality	Importance
Proportion identified with tumour abnormalities: overall estimate¥										
24[1]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	Serious[4]	191	6693	0.03 (0.02 to 0.04)	⊕OOO VERY LOW	CRITICAL
Proportion of tumour abnormalities identified in infants (<3 years old at seizure onset)										
4[5]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[6]	11	985	0.01 (0.01 to 0.02)	⊕OOO VERY LOW	CRITICAL
Proportion of tumour abnormalities identified in children (3 to 11 years old at seizure onset)										
3[7]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[6]	4	516	0.01 (0 to 0.02)	⊕OOO VERY LOW	CRITICAL
Proportion of tumour abnormalities identified in young people (11 to 25 years old at seizure onset)										
1[8]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[6]	4	120	0.03 (0.01 to 0.08)	⊕OOO VERY LOW	CRITICAL

Quality assessment						Number of patients		Effect		
Number of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Number with a clinically relevant abnormality	Number assessed	Proportion (95% CI)	Quality	Importance
Proportion of tumour abnormalities identified in older people (> 65 years old at seizure onset)										
1[9]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[6]	5	43	0.12 (0.04 to 0.25)	⊕OOO VERY LOW	CRITICAL
Proportion of tumour abnormalities identified in those with focal (partial) epilepsy										
7[10]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[6]	64	2660	0.04 (0.02 to 0.09)	⊕OOO VERY LOW	CRITICAL
Proportion of tumour abnormalities identified in those with genetic (idiopathic) generalised epilepsy										
2[11]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[6]	6	144	0.05 (0.02 to 0.14)	⊕OOO VERY LOW	CRITICAL
Proportion of tumour abnormalities identified on 1.5-t										
8[12]	Observational studies	Very serious[2]	Serious[13]	No serious indirectness	Very serious[6]	49	1080	0.04 (0.02 to 0.07)	⊕OOO VERY LOW	CRITICAL
Proportion of tumour abnormalities identified on 3.0-t										
5[14]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	Very serious[6]	71	3309	0.03 (0.01 to 0.06)	⊕OOO VERY LOW	CRITICAL
Proportion of tumour abnormalities identified in those with a new diagnosis										
4[15]	Observational studies	Very serious[2]	Serious[13]	No serious indirectness	Very serious[6]	31	1556	0.01 (0.00 to 0.03)	⊕OOO VERY LOW	CRITICAL

Quality assessment						Number of patients		Effect		
Number of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Number with a clinically relevant abnormality	Number assessed	Proportion (95% CI)	Quality	Importance
Proportion of tumour abnormalities identified in those with existing diagnosis and treatment resistant										
4[16]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	Very serious[6]	27	454	0.05 (0.02 to 0.12)	⊕OOO VERY LOW	CRITICAL
Proportion of tumour abnormalities identified in those with existing diagnosis and controlled										
1[17]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[6]	0	170	0.00 (0 to 0.02)	⊕OOO VERY LOW	CRITICAL
Proportion of tumour abnormalities identified in those without learning disabilities										
1[18]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[6]	1	64	0.02 (0 to 0.08)	⊕OOO VERY LOW	CRITICAL
Proportion of tumour abnormalities identified in those who had a previous CT scan										
3[19]	Observational studies	Very serious[2]	Serious[13]	No serious indirectness	Very serious[6]	10	269	0.04 (0.01 to 0.13)	⊕OOO VERY LOW	CRITICAL

1 Ali 2017, Bakhsh 2013, Berg 2000, Bruno 2017, Craven 2012, Das 2013, Dirik 2018, Dura-Trave 2012, Ekici 2013, Griffiths 2005, Hakami 2013, Hnojcikova 2010, Hsieh 2010, Jasim 2018, Jeniffer 2015, Koirala 2011, Ma 2019, Petrou 2007, Santos 2005, Sinha 2012, Solosrungrouang 2007, Toledo 2013, Wieshmann 2003, Wongladarom 2004
2 Very serious risk of bias in the evidence contributing to the outcomes as per CEBMA checklist
3 Very serious heterogeneity (I^2>75%)
4 Number of events >150 but <300
5 Das 2013, Diriki 2018, Hsieh 2010, Petrou 2007
6 Number of events <150
7 Berg 2000, Hnojcikova 2010, Santos 2005
8 Griffiths 2005
9 Sinha 2012

10 Craven 2012, Griffiths 2005, Jeniffer 2015, Ma 2019, Santos 2005, Toledo 2013, Wongladarom 2004
11 Bakhsh 2012, Wongladarom 2004
12 Bruno 2017, Hsieh 2010, Jasim 2018, Jeniffer 2015, Sinha 2012, Solosrungruang 2007, Wieshmann 2013, Wongladarom 2004
13 Serious heterogeneity (I^2 >50% but <75%)
14 Craven 2012, Ekici 2013, Griffiths 2005, Hakami 2013, Toledo 2013
15 Berg 2000, Dirik 2018, Hakami 2013, Hsieh 2010
16 Bruno 2017, Ekici 2013, Hnojcikova 2010, Ma 2019
17 Ekici 2013
18 Jenniffer 2015
19 Bakhsh 2013, Hsieh 2010, Sinha 2012

Table 6: Clinical evidence profile for proportion identified with vascular abnormalities

Quality assessment						Number of patients		Effect		
Number of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Number with a clinically relevant abnormality	Number assessed	Proportion (95% CI)	Quality	Importance
Proportion identified with vascular abnormalities: overall estimate[Δ]										
25[1]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	No serious imprecision	412	7544	0.06 (0.04 to 0.8)	⊕OOO VERY LOW	CRITICAL
Proportion of vascular abnormalities identified in children (3 to 11 years old at seizure onset)										
3[4]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	Very serious[5]	27	559	0.04 (0.01 to 0.18)	⊕OOO VERY LOW	CRITICAL
Proportion of vascular abnormalities identified in young people (11 to 25 years old at seizure onset)										
2[6]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[5]	16	240	0.07 (0.04 to 0.48)	⊕OOO VERY LOW	CRITICAL
Proportion of vascular abnormalities identified in older people (> 65 years old at seizure onset)										

Quality assessment						Number of patients		Effect		
Number of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Number with a clinically relevant abnormality	Number assessed	Proportion (95% CI)	Quality	Importance
1[7]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[5]	13	43	0.30 (0.17 to 0.46)	⊕OOO VERY LOW	CRITICAL
Proportion of vascular abnormalities identified in those with focal (partial) epilepsy										
6[8]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	Very serious[5]	68	2596	0.04 (0.02 to 0.08)	⊕OOO VERY LOW	CRITICAL
Proportion of vascular abnormalities identified in those with genetic (idiopathic) generalised epilepsy										
2[9]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[5]	5	60	0.08 (0.04 to 0.19)	⊕OOO VERY LOW	CRITICAL
Proportion of vascular abnormalities identified in those with West syndrome										
2[10]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[5]	15	73	0.21 (0.13 to 0.31)	⊕OOO VERY LOW	CRITICAL
Proportion of vascular abnormalities identified in those with Lennox-Gastaut syndrome										
1[11]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[5]	0	1	0.00 (0 to 0.02)	⊕OOO VERY LOW	CRITICAL
Proportion of vascular abnormalities identified on 1.5-t										
7[12]	Observational studies	Very serious[2]	Serious[13]	No serious indirectness	Very serious[5]	85	794	0.11 (0.07 to 0.17)	⊕OOO VERY LOW	CRITICAL
Proportion of vascular abnormalities identified on 3.0-t										

Quality assessment						Number of patients		Effect		
Number of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Number with a clinically relevant abnormality	Number assessed	Proportion (95% CI)	Quality	Importance
5[14]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	Very serious[5]	27	559	0.04 (0.02 to 0.07)	⊕OOO VERY LOW	CRITICAL
Proportion of vascular abnormalities identified in those with a new diagnosis[4]										
6[15]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	Serious[16]	119	2370	0.04 (0.02 to 0.09)	⊕OOO VERY LOW	CRITICAL
Proportion of vascular abnormalities identified in those with existing diagnosis and treatment resistant										
3[17]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[5]	27	426	0.06 (0.04 to 0.09)	⊕OOO VERY LOW	CRITICAL
Proportion of vascular abnormalities identified in those with existing diagnosis and controlled										
1[18]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[5]	3	170	0.02 (0 to 0.05)	⊕OOO VERY LOW	CRITICAL

Δ One of the included studies (Benson 2019) included people with arteriovenous malformations (AVM) only, which may overestimate the yield of identified vascular abnormalities
1 Alam-Eldeen 2015, Ali 2017, Bakhsh 2013, Berg 2000, Bruno 2017, Coryell 2018, Craven 2012, Das 2013, Dirik 2018, Dura-Trave 2012, Ekici 2013, Griffiths 2005, Hakami 2013, Harini 2018, Hsieh 2010, Koirala 2011, Lefkopoulos 2005, Ma 2019, Nair 2009, Petrou 2007, Santos 2005, Solosrungrouang 2007, Toledo 2013, Wieshmann 2003, Wongladarom 2004
2 Very serious risk of bias in the evidence contributing to the outcomes as per CEBMA checklist
3 Very serious heterogeneity (I^2>75%)
4 Berg 2000, Harini 2018, Santos 2005
5 Number of events <150
6 Griffiths 2005, Lefkopoulos 2005
7 Sinha 2012
8 Craven 2012, Griffiths 2005, Ma 2019, Santos 2005, Toledo 2013, Wongladarom 2004
9 Bakhsh 2013, Wongladarom 2004

10 Harini 2018, Wongladarom 2004
11 Wongladarom 2004
12 Bruno 2017, Hsieh 2010, Lefkopoukus 2005, Nair 2009, Sinha 2012, Solosrungruang 2007, Wongladarom 2004
13 Serious heterogeneity (I^2 >50% but <75%)
14 Craven 2012, Ekici 2013, Griffiths 2005, Hakami 2013, Toledo 2013
15 Berg 2000, Coryell 2008, Dirik 2018, Hakami 2013, Hsieh 2010
16 Number of events >150 but <300
17 Bruno 2017, Ekici 2013, Ma 2019
18 Ekici 2013

Table 7: Clinical evidence profile for proportion identified with scarring abnormalities

Quality assessment						Number of patients		Effect		
Number of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Number with a clinically relevant abnormality	Number assessed	Proportion (95% CI)	Quality	Importance
Proportion identified with scarring abnormalities: overall estimate										
37[1]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	No serious imprecision	1146	8681	0.10 (0.06 to 0.16)	⊕OOO VERY LOW	CRITICAL
Proportion of scarring abnormalities identified in infants (<3 years old at seizure onset)										
6[4]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	Very serious[5]	73	1858	0.04 (0.02 to 0.09)	⊕OOO VERY LOW	CRITICAL
Proportion of scarring abnormalities identified in children (3 to 11 years old at seizure onset)										

Quality assessment						Number of patients		Effect		
Number of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Number with a clinically relevant abnormality	Number assessed	Proportion (95% CI)	Quality	Importance
5[6]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	Very serious[5]	96	625	0.17 (0.04 to 0.49)	⊕OOO VERY LOW	CRITICAL
Proportion of scarring abnormalities identified in young people (11 to 25 years old at seizure onset)										
3[7]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	Very serious[5]	79	341	0.21 (0.10 to 0.40)	⊕OOO VERY LOW	CRITICAL
Proportion of scarring abnormalities identified in adults (25 to 65 years old sat seizure onset)										
1[8]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[5]	11	134	0.08 (0.04 to 0.14)	⊕OOO VERY LOW	CRITICAL
Proportion of scarring abnormalities identified in older people (> 65 years old at seizure onset)										
1[9]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[5]	1	43	0.02 (0 to 0.12)	⊕OOO VERY LOW	CRITICAL
Proportion of scarring abnormalities identified in those with focal (partial) epilepsy										
11[10]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	No serious imprecision	500	3023	0.17 (0.08 to 0.31)	⊕OOO VERY LOW	CRITICAL

Quality assessment						Number of patients		Effect		
Number of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Number with a clinically relevant abnormality	Number assessed	Proportion (95% CI)	Quality	Importance
Proportion of scarring abnormalities identified in those with genetic (idiopathic) generalised epilepsy										
5[11]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	Very serious[5]	65	467	0.08 (0.02 to 0.32)	⊕OOO VERY LOW	CRITICAL
Proportion of scarring abnormalities in those with West syndrome										
2[12]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[5]	46	171	0.07 (0.03 to 0.15)	⊕OOO VERY LOW	CRITICAL
Proportion of scarring abnormalities identified in those with Lennox-Gastaut syndrome										
1[13]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[5]	42	100	0.42 (0.32 to 0.52)	⊕OOO VERY LOW	CRITICAL
Proportion of scarring abnormalities identified on 1.5-t										
14[14]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	No serious imprecision	331	1687	0.12 (0.06 to 0.23)	⊕OOO VERY LOW	CRITICAL
Proportion of scarring abnormalities identified on 3.0-t										

Quality assessment						Number of patients		Effect		
Number of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Number with a clinically relevant abnormality	Number assessed	Proportion (95% CI)	Quality	Importance
5[15]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	No serious imprecision	458	3045	0.15 (0.10 to 0.21)	⊕OOO VERY LOW	CRITICAL
Proportion of scarring abnormalities identified in those with a new diagnosis										
8[16]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	Serious[17]	212	2576	0.07 (0.02 to 0.18)	⊕OOO VERY LOW	CRITICAL
Proportion of scarring abnormalities identified in those with existing diagnosis and treatment resistant										
5[18]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	Very serious[5]	122	574	0.20 (0.06 to 0.49)	⊕OOO VERY LOW	CRITICAL
Proportion of scarring abnormalities identified in those with existing diagnosis and controlled										
2[19]	Observational studies	Very serious[2]	Serious[20]	No serious indirectness	Very serious[5]	36	202	0.11 (0.03 to 0.35)	⊕OOO VERY LOW	CRITICAL
Proportion of scarring abnormalities identified in those without learning disabilities										
2[21]	Observational studies	Very serious[2]	No serious inconsistency	Serious[22]	Very serious[5]	11	96	0.10 (0.03 to 0.26)	⊕OOO VERY LOW	CRITICAL

Quality assessment						Number of patients		Effect		
Number of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Number with a clinically relevant abnormality	Number assessed	Proportion (95% CI)	Quality	Importance
Proportion of scarring abnormalities identified in those who had a previous CT scan										
4[23]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	Very serious[5]	21	426	0.04 (0.01 to 0.13)	⊕OOO VERY LOW	CRITICAL

1 Alam-Eldeen 2015, Ali 2017, Aslan 2010, Bakhsh 2013, Benson 2009, Berg 2000, Betting 2006, Bruno 2017, Byars 2007, Coryell 2018, Craven 2012, Das 2013, Dirik 2018, Dura-Trave 2012, Ekici 2013, Ferreira 2004, Gaillard 2007, Griffiths 2005, Hakami 2013, Harini 2018, Hersdorffer 2008, Hnojcikova 2010, Hsieh 2010, Jeniffer 2015, Jasim 2018, Koirala 2011, Labate 2006, Lefkopoulos 2005, Ma 2019, Petrou 2007, Rasool 2012, Santos 2005, Sinha 2012, Solosrungruang 2007, Toledo 2013, Wieshmann 2003, Wongladarom 2004
2 Very serious risk of bias in the evidence contributing to the outcomes as per CEBMA checklist
3 Very serious heterogeneity (I^2>75%)
4 Coryell 2018, Das 2013, Dirik 2018, Hesdorffer 2008, Hsieh 2010, Petrou 2007
5 Number of events <150
6 Berg 2000, Gaillard 2007, Harini 2018, Hnojcikova 2010, Santos 2005
7 Lefkopoulos 2005, Griffiths 2005, Labate 2006
8 Betting 2006
9 Sinha 2012
10 Craven 2012, Ferreira 2004, Gaillard 2007, Griffiths 2005, Jeniffer 2015, Labate 2006, Ma 2019, Rasool 2012, Santos 2005, Toledo 2013, Wongladarom 2004
11 Aslan 2010, Bakhsh 2013, Betting 2006, Rasool 2012, Wongladarom 2004
12 Harini 2018, Wongladarom 2004
13 Wongladarom 2004
14 Aslan 2010, Bruno 2017, Gaillard 2007, Hesdorffer 2008, Hsieh 2010, Jasim 2018, Jeniffer 2015, Labate 2006, Lefkopoulos 2005, Rasool 2012, Sinha 2012, Solosgruang 2007, Wieshmann 2013, Wongladarom 2004
15 Craven 2012, Ekici 2013, Griffiths 2005, Hakami 2013, Toledo 2013
16 Benson 2019, Berg 2000, Byars 2007, Coryell 2018, Dirik 2018, Hakami 2013, Hsieh 2010, Rasool 2012
17 Number of events >150 but <300
18 Bruno 2017, Ekici 2013, Hnojcikova 2010, Lefkopoulos 2005, Ma 2019

19 Aslan 2010, Ekici 2013
20 Serious heterogeneity (I^2 >50% but <75%)
21 Aslan 2010, Jenifer 2015
22 Population is indirect in 1 study (3% of participants did have learning disabilities)
23 Bakhsh 2013, Hsieh 2010, Rasool 2012, Sinha 2012

Table 8: Clinical evidence profile for proportion identified with congenital/developmental abnormalities

Quality assessment						Number of patients		Effect		
Number of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Number with a clinically relevant abnormality	Number assessed	Proportion (95% CI)	Quality	Importance
Proportion identidied with congenital/developmental abnormalities: overall estimate										
31[1]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	No serious imprecision	768	8450	0.10 (0.07 to 0.15)	⊕OOO VERY LOW	CRITICAL
Proportion of congenital/developmental abnormalities identified in infants (<3 years old at seizure onset)										
6[4]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	Serious[5]	256	1858	0.13 (0.09 to 0.19)	⊕OOO VERY LOW	CRITICAL
Proportion of congenital/developmental abnormalities identified in children (3 to 11 years old at seizure onset)										
4[6]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	Very serious[7]	102	587	0.27 (0.12 to 0.48)	⊕OOO VERY LOW	CRITICAL

Quality assessment						Number of patients		Effect		
Number of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Number with a clinically relevant abnormality	Number assessed	Proportion (95% CI)	Quality	Importance
Proportion of congenital/developmental abnormalities identified in young people (11 to 25 years old at seizure onset)										
2[8]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	Very serious[7]	27	240	0.09 (0.02 to 0.27)	⊕OOO VERY LOW	CRITICAL
Proportion of congenital/developmental abnormalities identified in adults (25 to 65 years old at seizure onset)										
1[9]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[7]	3	134	0.02 (0 to 0.06)	⊕OOO VERY LOW	CRITICAL
Proportion of congenital/developmental abnormalities identified in those with focal (partial) epilepsy										
9[10]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	Serious[5]	168	2810	0.09 (0.05 to 0.18)	⊕OOO VERY LOW	CRITICAL
Proportion of congenital/developmental abnormalities identified in those with genetic (idiopathic) generalised epilepsy										
3[11]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[7]	14	307	0.03 (0.02 to 0.06)	⊕OOO VERY LOW	CRITICAL
Proportion of congenital/developmental abnormalities identified in those with West syndrome										

Quality assessment						Number of patients		Effect		
Number of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Number with a clinically relevant abnormality	Number assessed	Proportion (95% CI)	Quality	Importance
2[12]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[7]	30	73	0.41 (0.30 to 0.53)	⊕OOO VERY LOW	CRITICAL
Proportion of congenital/developmental abnormalities identified in those with Lennox-Gastaut syndrome										
2[13]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[7]	20	137	0.15 (0.10 to 0.22)	⊕OOO VERY LOW	CRITICAL
Proportion of congenital/developmental abnormalities identified on 1.5-t										
9[14]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	Serious[5]	216	1422	0.16 (0.09 to 0.26)	⊕OOO VERY LOW	CRITICAL
Proportion of congenital/developmental abnormalities identified on 3.0-t										
5[15]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	Very serious[7]	131	3309	0.04 (0.03 to 0.07)	⊕OOO VERY LOW	CRITICAL
Proportion of congenital/developmental abnormalities identified in those with a new diagnosis										

Quality assessment						Number of patients		Effect		
Number of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Number with a clinically relevant abnormality	Number assessed	Proportion (95% CI)	Quality	Importance
7[16]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	Serious[5]	267	2676	0.09 (0.05 to 0.15)	⊕OOO VERY LOW	CRITICAL
Proportion of congenital/developmental abnormalities identified in those with existing diagnosis and treatment resistant										
5[17]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	Very serious[7]	83	574	0.16 (0.07 to 0.33)	⊕OOO VERY LOW	CRITICAL
Proportion of congenital/developmental abnormalities identified in those with existing diagnosis and controlled										
1[18]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[7]	0	170	0.00 (0 to 0.02)	⊕OOO VERY LOW	CRITICAL
Proportion of congenital/developmental abnormalities identified in those with learning disabilities										
1[19]	Observational studies	Very serious[2]	No serious inconsistency	Serious[20]	Very serious[7]	20	135	0.15 (0.09 to 0.22)	⊕OOO VERY LOW	CRITICAL
Proportion of congenital/developmental abnormalities identified in those without learning disabilities										

Quality assessment						Number of patients		Effect		
Number of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Number with a clinically relevant abnormality	Number assessed	Proportion (95% CI)	Quality	Importance
1[21]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[7]	29	64	0.45 (0.33 to 0.58)	⊕OOO VERY LOW	CRITICAL
Proportion of congenital/developmental abnormalities identified in those who had a previous CT scan										
2[22]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	Very serious[7]	60	339	0.14 (0.04 to 0.37)	⊕OOO VERY LOW	CRITICAL

1 Alam-Eldeen 2015, Ali 2017, Asadi-Pooya 2012, Berg 2000, Betting 2006, Bruno 2017, Byars 2007, Coryell 2018, Craven 2012, Das 2013, Dirik 2018, Dura-Trave 2012, Ekici 2013, Ferreira 2004, Griffiths 2005, Hakami 2013, Harini 2018, Hersdorffer 2008, Hnojcikova 2010, Hsieh 2010, Jeniffer 2015, Koirala 2011, Lefkopoulos 2005, Ma 2019, Petrou 2007, Rasool 2012, Santos 2005, Solosrungruang 2007, Toledo 2013, Wieshmann 2003, Wongladarom 2004
2 Very serious risk of bias in the evidence contributing to the outcomes as per CEBMA checklist
3 Very serious heterogeneity (I^2>75%)
4 Coryell 2018, Das 2013, Dirik 2018, Hesdorffer 2008, Hsieh 2010, Petrou 2007
5 Number of events >150 but <300
6 Santos 2005, Berg 2000, Harini 2018, Hnojcikova 2010
7 Number of events <150
8 Lefkopoulos 2005, Griffiths 2005
9 Betting 2006
10 Craven 2012, Ferreira 2004, Griffiths 2005, Jeniffer 2015, Ma 2019, Rasool 2012, Santos 2005, Toledo 2013, Wongladarom 2004
11 Betting 2006, Rasool 2012, Wongladarom 2004
12 Harini 2018, Wongladarom 2004
13 Asadi-Pooya 2012, Wongladarom 2004
14 Bruno 2017, Hesdorffer 2008, Hsieh 2010, Jeniffer 2015, Lefkopoulos 2005, Rasool 2012, Solosgruang 2007, Wieshmann 2013, Wongladarom 2004

15 Craven 2012, Ekici 2013, Griffiths 2005, Hakami 2013, Toledo 2013
16 Berg 2000, Byars 2007, Coryell 2018, Dirik 2018, Hakami 2013, Hsieh 2010, Rasool 2012
17 Bruno 2017, Ekici 2013, Hnojcikova 2010, Lefkopoulos 2005, Ma 2019
18 Ekici 2013
19 Asadi-Pooya 2012
20 Population is indirect in 1 study (3% of participants did not have learning disabilities)
21 Jeniffer 2015
22 Hsieh 2010, Rasool 2012

Table 9: Clinical evidence profile for proportion identified with inflammatory/infective/immune abnormalities

Quality assessment						Number of patients		Effect		
Number of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Number with a clinically relevant abnormality	Number assessed	Proportion (95% CI)	Quality	Importance
Proportion identified with inflammatory/infective/immune abnormalities: overall estimate¥										
19[1]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	Serious[4]	187	5341	0.04 (0.02 to 0.09)	⊕OOO VERY LOW	CRITICAL
Proportion of inflammatory/infective/immune abnormalities identified in infants (<3 years old at seizure onset)										
4[5]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[6]	22	1477	0.01 (0.01 to 0.02)	⊕OOO VERY LOW	CRITICAL
Proportion of inflammatory/infective/immune abnormalities identified in children (3 to 11 years old at seizure onset)										

Quality assessment						Number of patients		Effect		
Number of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Number with a clinically relevant abnormality	Number assessed	Proportion (95% CI)	Quality	Importance
3[7]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[6]	9	559	0.02 (0.01 to 0.05)	⊕OOO VERY LOW	CRITICAL
Proportion of inflammatory/infective/immune abnormalities identified in young people (11 to 25 years old at seizure onset)										
2[8]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[6]	7	240	0.03 (0.01 to 0.06)	⊕OOO VERY LOW	CRITICAL
Proportion of inflammatory/infective/immune abnormalities identified in older people (> 65 years old at seizure onset)										
1[9]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[6]	5	43	0.12 (0.04 to 0.25)	⊕OOO VERY LOW	CRITICAL
Proportion of inflammatory/infective/immune abnormalities identified in those with focal (partial) epilepsy										
5[10]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	Very serious[6]	21	2361	0.02 (0.01 to 0.08)	⊕OOO VERY LOW	CRITICAL
Proportion of inflammatory/infective/immune abnormalities identified in those with genetic (idiopathic) generalised epilepsy										
1[11]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[6]	2	16	0.12 (0.02 to 0.38)	⊕OOO VERY LOW	CRITICAL

Quality assessment						Number of patients		Effect		
Number of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Number with a clinically relevant abnormality	Number assessed	Proportion (95% CI)	Quality	Importance
Proportion of inflammatory/infective/immune abnormalities identified in those with West syndrome										
2[12]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[6]	3	73	0.04 (0.01 to 0.12)	⊕OOO VERY LOW	CRITICAL
Proportion of inflammatory/infective/immune abnormalities identified in those with Lennox-Gastaut syndrome										
1[11]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[6]	0	2	0.00 (0 to 0.02)	⊕OOO VERY LOW	CRITICAL
Proportion of inflammatory/infective/immune abnormalities identified on 1.5-t¥										
7[13]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	Very serious[6]	87	794	0.10 (0.02 to 0.31)	⊕OOO VERY LOW	CRITICAL
Proportion of inflammatory/infective/immune abnormalities identified on 3.0-t										
2[14]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	Very serious[6]	7	2120	0.01 (0.00 to 0.03)	⊕OOO VERY LOW	CRITICAL
Proportion of inflammatory/infective/immune abnormalities in those with a new diagnosis										

Quality assessment						Number of patients		Effect		
Number of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Number with a clinically relevant abnormality	Number assessed	Proportion (95% CI)	Quality	Importance
3[15]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[6]	12	1284	0.01 (0.01 to 0.02)	⊕OOO VERY LOW	CRITICAL
Proportion of inflammatory/infective/immune abnormalities identified in those with existing diagnosis and treatment resistant¥										
3[16]	Observational studies	Very serious[2]	Serious[17]	No serious indirectness	Very serious[6]	38	452	0.07 (0.04 to 0.13)	⊕OOO VERY LOW	CRITICAL
Proportion of inflammatory/infective/immune abnormalities identified in those who had a previous CT scan										
3[18]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	Very serious[6]	41	266	0.13 (0.01 to 0.82)	⊕OOO VERY LOW	CRITICAL

¥ In 1 of the included studies (Bruno 2017), all infections identified were neurocysticercosis, which is a condition endemic to Bhutan, where the study was conducted

1 Alam-Eldeen 2015, Ali 2017, Berg 2000, Bruno 2017, Coryell 2018, Craven 2012, Das 2013, Griffiths 2005, Harini 2018, Hsieh 2010, Koirala 2011, Lefkopoulos 2005, Ma 2019, Nair 2009, Petrou 2007, Santos 2005, Sinha 2012, Solosrungruang 2007, Wongladarom 2004

2 Very serious risk of bias in the evidence contributing to the outcomes as per CEBMA checklist

3 Very serious heterogeneity (I^2>75%)

4 Number of events >150 but <300

5 Coryell 2018, Das 2013, Hsieh 2010, Petrou 2007

6 Number of events <150

7 Berg 2000, Harini 2018, Santos 2005

8 Lefkopoulos 2005, Griffiths 2005

9 Sinha 2012

10 Craven 2012, Griffiths 2005, Ma 2019, Santos 2005, Wongladarom 2004
11 Wongladarom 2004
12 Harini 2018, Wongladarom 2004
13 Bruno 2017, Hsieh 2010, Lefkopoulos 2005, Nair 2009, Sinha 2012, Solosrungruang 2007, Wongladarom 2004
14 Craven 2012, Griffiths 2005
15 Berg 2000, Coryell 2018, Hsieh 2010
16 Bruno 2017, Lefkopoulos 2005, Ma 2019
17 Serious heterogeneity (I^2 >50% but <75%)
18 Hsieh 2010, Nair 2009, Sinha 2012

Table 10: Clinical evidence profile for proportion identified with metabolic/genetic abnormalities

Quality assessment						Number of patients		Effect		
Number of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Number with a clinically relevant abnormality	Number assessed	Proportion (95% CI)	Quality	Importance
Proportion identified with metabolic/genetic abnormalities: overall estimate										
9[1]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	Very serious[4]	54	4426	0.01 (0.01 to 0.03)	⊕OOO VERY LOW	CRITICAL
Proportion of metabolic/genetic abnormalities identified in infants (<3 years old at seizure onset)										
4[5]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[4]	10	1477	0.01 (0 to 0.01)	⊕OOO VERY LOW	CRITICAL
Proportion of metabolic/genetic abnormalities identified in children (3 to 11 years old at seizure onset)										

Quality assessment						Number of patients		Effect		
Number of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Number with a clinically relevant abnormality	Number assessed	Proportion (95% CI)	Quality	Importance
1[6]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[4]	15	388	0.04 (0.02 to 0.06)	⊕OOO VERY LOW	CRITICAL
Proportion of metabolic/genetic abnormalities identified in those with focal (partial) epilepsy										
1[7]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[4]	6	2000	0.00 (0 to 0.01)	⊕OOO VERY LOW	CRITICAL
Proportion of metabolic/genetic abnormalities identified in those with Lennox-Gastaut syndrome										
1[8]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[4]	9	135	0.07 (0.03 to 0.12)	⊕OOO VERY LOW	CRITICAL
Proportion of metabolic/genetic abnormalities identified on 1.5-t										
2[9]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[4]	4	399	0.01 (0 to 0.03)	⊕OOO VERY LOW	CRITICAL
Proportion of metabolic/genetic abnormalities identified on 3.0-t										

Quality assessment						Number of patients		Effect		
Number of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Number with a clinically relevant abnormality	Number assessed	Proportion (95% CI)	Quality	Importance
1[10]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[4]	6	2000	0.00 (0 to 0.01)	⊕OOO VERY LOW	CRITICAL
Proportion of metabolic/genetic abnormalities in those with a new diagnosis										
3[11]	Observational studies	Very serious[2]	Serious[15]	No serious indirectness	Very serious[4]	23	1284	0.02 (0.01 to 0.04)	⊕OOO VERY LOW	CRITICAL
Proportion of metabolic/genetic abnormalities identified in those with existing diagnosis and treatment resistant										
1[13]	Observational studies	Very serious[2]	No serious incosistency	No serious indirectness	Very serious[4]	1	217	0.00 (0 to 0.03)	⊕OOO VERY LOW	CRITICAL
Proportion of metabolic/genetic abnormalities identified in those without learning disabilities										
1[8]	Observational studies	Very serious[2]	No serious incosistency	Serious[14]	Very serious[4]	9	135	0.07 (0.03 to 0.12)	⊕OOO VERY LOW	CRITICAL
Proportion of metabolic/genetic abnormalities identified in those who had a previous CT scan										

Quality assessment						Number of patients		Effect		
Number of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Number with a clinically relevant abnormality	Number assessed	Proportion (95% CI)	Quality	Importance
1[15]	Observational studies	Very serious[2]	No serious incosistency	No serious indirectness	Very serious[4]	3	182	0.02 (0 to 0.05)	⊕OOO VERY LOW	CRITICAL

1 Ali 2017, Asadi-Pooya 2012, Berg 2000, Bruno 2017, Coryell 2018, Craven 2012, Das 2013, Hsieh 2010, Petrou 2007
2 Very serious risk of bias in the evidence contributing to the outcomes as per CEBMA checklist
3 Very serious heterogeneity (I^2>75%)
4 Number of events <150
5 Coryell 2018, Das 2013, Hsieh 2010, Petrou 2007
6 Berg 2000
7 Craven 2012
8 Asadi-Pooya 2012
9 Bruno 2017, Hsieh 2010
10 Craven 2012
11 Berg 200, Coryell 2018, Hsieh 2010
12 I2>50% <75%
13 Bruno 2017
14 Population is indirect (3% of the participants did not have learning disabilities)
15 Hsieh 2010

Table 11: Clinical evidence profile for proportion identified with non-epilepsy related abnormalities

Quality assessment						Number of patients		Effect		
Number of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Number with a clinically relevant abnormality	Number assessed	Proportion (95% CI)	Quality	Importance
Proportion identified with non-epilepsy related abnormalities: overall estimate										
20[1]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	No serious imprecision	700	6628	0.06 (0.04 to 0.09)	⊕OOO VERY LOW	IMPORTANT
Proportion of non-epilepsy related abnormalities identified in infants (<3 years old at seizure onset)										
5[4]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	Very serious[5]	93	1421	0.08 (0.03 to 0.18)	⊕OOO VERY LOW	IMPORTANT
Proportion of non-epilepsy related abnormalities identified in children (3 to 11 years old at seizure onset)										
1[6]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[5]	15	388	0.04 (0.02 to 0.06)	⊕OOO VERY LOW	IMPORTANT
Proportion of non-epilepsy related abnormalities identified in adults (25 to 65 years old sat seizure onset)										
1[7]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[5]	2	134	0.01 (0 to 0.05)	⊕OOO VERY LOW	IMPORTANT

Quality assessment						Number of patients		Effect		
Number of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Number with a clinically relevant abnormality	Number assessed	Proportion (95% CI)	Quality	Importance
Proportion of non-epilepsy related abnormalities identified in those with focal (partial) epilepsy										
3[8]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	No serious imprecision	333	2183	0.07 (0.02 to 0.22)	⊕OOO VERY LOW	IMPORTANT
Proportion of non-epilepsy related abnormalities identified in those with genetic (idiopathic) generalised epilepsy										
5[9]	Observational studies	Very serious[2]	Serious[10]	No serious indirectness	Very serious[5]	15	383	0.04 (0.02 to 0.10)	⊕OOO VERY LOW	IMPORTANT
Proportion of non-epilepsy related abnormalities identified in those with West syndrome										
1[11]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[5]	0	2	0.00 (0 to 0.84)	⊕OOO VERY LOW	IMPORTANT
Proportion of non-epilepsy related abnormalities identified in those with Lennox-Gastaut syndrome										
2[12]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	Very serious[5]	1	137	0.01 (0 to 0.05)	⊕OOO VERY LOW	IMPORTANT
Proportion of non-epilepsy related abnormalities identified on 1.5-t										

Quality assessment						Number of patients		Effect		
Number of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Number with a clinically relevant abnormality	Number assessed	Proportion (95% CI)	Quality	Importance
5[13]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	Very serious[5]	78	688	0.10 (0.05 to 0.16)	⊕OOO VERY LOW	IMPORTANT
Proportion of non-epilepsy related abnormalities identified on 3.0-t										
1[14]	Observational studies	Very serious[2]	No serious inconsistency	No serious indirectness	No serious imprecision	326	2000	0.16 (0.15 to 0.18)	⊕OOO VERY LOW	IMPORTANT
Proportion of non-epilepsy related abnormalities in those with a new diagnosis										
8[15]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	Serious[16]	263	2733	0.06 (0.03 to 0.12)	⊕OOO VERY LOW	IMPORTANT
Proportion of non-epilepsy related abnormalities identified in those with existing diagnosis and treatment resistant										
2[17]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	Very serious[5]	28	311	0.01 (0.00 to 0.62)	⊕OOO VERY LOW	IMPORTANT
Proportion of non-epilepsy related abnormalities identified in those with existing diagnosis and controlled										

Quality assessment						Number of patients		Effect		
Number of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Number with a clinically relevant abnormality	Number assessed	Proportion (95% CI)	Quality	Importance
2[18]	Observational studies	Very serious[2]	Serious[10]	No serious indirectness	Very serious[5]	8	202	0.05 (0.01 to 0.15)	⊕OOO VERY LOW	IMPORTANT
Proportion of non-epilepsy related abnormalities identified in those with learning disabilities										
1[19]	Observational studies	Very serious[2]	No serious inconsistency	Serious[20]	Very serious[5]	1	135	0.01 (0 to 0.04)	⊕OOO VERY LOW	IMPORTANT
Proportion of non-epilepsy related abnormalities identified in those without learning disabilities										
1[21]	Observational studies	Very serious[2]	No serious inconsistency	Serious[22]	Very serious[5]	4	32	0.12 (0.04 to 0.29)	⊕OOO VERY LOW	IMPORTANT
Proportion of non-epilepsy related abnormalities identified in those who had a previous CT scan										
3[23]	Observational studies	Very serious[2]	Very serious[3]	No serious indirectness	Very serious[5]	40	383	0.07 (0.02 to 0.19)	⊕OOO VERY LOW	IMPORTANT

1 Ali 2017, Asadi-Pooya 2012, Aslan 2010, Bakhsh 2013, Benson 2009, Berg 2000, Betting 2006, Bruno 2017, Byars 2007, Coryell 2018, Craven 2012, Das 2013, Dirik 2018, Dura-Trave 2012, Ekici 2013, Hakami 2013, Hersdorffer 2008, Hsieh 2010, Rasool 2012, Wongladarom 2004

2 Very serious risk of bias in the evidence contributing to the outcomes as per CEBMA checklist
3 Very serious heterogeneity (I^2>75%)
4 Hsieh 2010, Coryell 2018, Das 2013, Dirik 2018, Hesdorffer 2008
5 Number of events <150
6 Berg 2000
7 Betting 2006
8 Craven 2012, Rasool 2012, Wongladarom 2004
9 Aslan 2010, Bakhsh 2013, Betting 2006, Rasool 2012, Wongladarom 2004
10 Serious heterogeneity (I^2 >50% but <75%)
11 Wongladarom 2004
12 Asadi-Pooya 2012, Wongladarom 2004
13 Asaln 2010, Bruno 2017, Hsieh 2010, Rasool 2012, Wongladarom 2004
14 Craven 2012,
15 Benson 2019, Berg 2000, Byars 2007, Coryell 2018, Dirik 2018, Rasool 2012, Hakami 2013, Hsieh 2010
16 Number of events >150 but <300
17 Bruno 2017, Ekici 2013
18 Aslan 2010, Ekici 2013
19 Asadi-Pooya 2012
20 Population is indirect in 1 study (3% of participants did not have learning disabilities)
21 Aslan 2010
22 Population is indirect in 1 study (3% of participants did have learning disabilities)
23 Bakshsh 2013, Hsieh 2010, Rasool 2012

Appendix G – Economic evidence study selection

Economic evidence study selection for review question: What is the effectiveness of genetic testing in determining the aetiology of epilepsy?

A global search of economic evidence was undertaken for all review questions in this guideline. See Supplement 2 for further information

Appendix H – Economic evidence tables

Economic evidence tables for review question: What is the effectiveness of genetic testing in determining the aetiology of epilepsy?

No evidence was identified which was applicable to this review question

Appendix I – Economic evidence profiles

Economic evidence profiles for review question: What is the effectiveness of genetic testing in determining the aetiology of epilepsy?

No evidence was identified which was applicable to this review question

Appendix J – Economic analysis

Economic evidence analysis for review question: What is the yield of relevant abnormalities detected by MRI in people with epilepsy?

No economic analysis was conducted for this review question.

Appendix K – Excluded studies

Excluded clinical and economic studies for review question: What is the yield of relevant abnormalities detected by MRI in people with epilepsy?

Clinical studies

Table 12: Excluded studies and reasons for their exclusion

Excluded studies - Yield of MRI	
Study	**Reason for Exclusion**
Aamir, I., Arooj, S., Mansoor, M., Niazi, T., Neuroimaging in epilepsy: Magnetic resonance imaging (MRI) evaluation in refractory complex partial seizures, Pakistan Journal of Medical and Health Sciences, 8, 1105-1108, 2014	No relevant study design; case series
Adachi, Y., Yagishita, A., Arai, N., White matter abnormalities in the anterior temporal lobe suggest the side of the seizure foci in temporal lobe epilepsy, Neuroradiology, 48, 460-464, 2006	Yield of MRI abnormalities was not reported
Adams, M. E., Aylett, S. E., Squier, W., Chong, W., A Spectrum of unusual neuroimaging findings in patients with suspected Sturge-Weber syndrome, American Journal of Neuroradiology, 30, 276-281, 2009	Incorrect population
Agarwal, A., Raghav, S., Husain, M., Kumar, R., Gupta, R. K., Epilepsy with focal cerebral calcification: Role of magnetization transfer MR imaging, Neurology India, 52, 197-199, 2004	No relevant study design; case control study
Alhusaini, S., Doherty, C. P., Scanlon, C., Ronan, L., Maguire, S., Borgulya, G., Brennan, P., Delanty, N., Fitzsimons, M., Cavalleri, G. L., A cross-sectional MRI study of brain regional atrophy and clinical characteristics of temporal lobe epilepsy with hippocampal sclerosis, Epilepsy Research, 99, 156-166, 2012	No relevant outcomes were reported; the study described MRI-based volumetric analysis
Alhusaini, S., Scanlon, C., Ronan, L., Maguire, S., Meaney, J. F., Fagan, A. J., Boyle, G., Borgulya, G., Iyer, P. M., Brennan, P., Costello, D., Chaila, E., Fitzsimons, M., Doherty, C. P., Delanty, N., Cavalleri, G. L., Heritability of Subcortical Volumetric Traits in Mesial Temporal Lobe Epilepsy, PLoS ONE, 8 (4) (no pagination), 2013	No relevant outcomes were reported
Alizadeh, M., Kozlowski, L., Muller, J., Ashraf, N., Shahrampour, S., Mohamed, F. B., Wu, C., Sharan, A., Hemispheric Regional Based Analysis of Diffusion Tensor Imaging and Diffusion Tensor Tractography in Patients with Temporal Lobe Epilepsy and Correlation with Patient outcomes, Scientific reports, 9, 215, 2019	Incorrect imaging modality
Andres, M., Andre, V. M., Nguyen, S., Salamon, N., Cepeda, C., Levine, M. S., Leite, J. P., Neder, L., Vinters, H. V., Mathern, G. W., Human cortical dysplasia and epilepsy: An ontogenetic hypothesis based on volumetric MRI and NeuN neuronal density and size	Incorrect diagnostic test

Excluded studies - Yield of MRI	
measurements, Cerebral Cortex, 15, 194-210, 2005	
Angus-Leppan, H., Diagnosing epilepsy in neurology clinics: a prospective study, Seizure, 17, 431-6, 2008	Incorrect population
Aprahamian, N., Harper, M. B., Prabhu, S. P., Monuteaux, M. C., Sadiq, Z., Torres, A., Kimia, A. A., Pediatric first time non-febrile seizure with focal manifestations: Is emergent imaging indicated?, Seizure, 23, 740-745, 2014	CT and MRI were performed, but results have not been reported separately
Arhan, E., Serdaroglu, A., Aydin, K., Hirfanoglu, T., Soysal, A. S., Epileptic encephalopathy with electrical status epilepticus: an electroclinical study of 59 patients, Seizure, 26, 86-93, 2015	No relevant results were reported
Arya, R., Mangano, F. T., Horn, P. S., Kaul, S. K., Roth, C., Leach, J. L., Turner, M., Holland, K. D., Greiner, H. M., Long-term seizure outcomes after pediatric temporal lobectomy: Does brain MRI lesion matter?, Journal of Neurosurgery: Pediatrics, 24, 200-208, 2019	Yield of MRI abnormalities was not reported
Barba, C., Jacques, T., Kahane, P., Polster, T., Isnard, J., Leijten, F. S. S., Ozkara, C., Tassi, L., Giordano, F., Castagna, M., John, A., Oz, B., Salon, C., Streichenberger, N., Cross, J. H., Guerrini, R., Epilepsy surgery in Neurofibromatosis Type 1, Epilepsy Research, 105, 384-395, 2013	Yield of MRI was not reported
Barcia, G., Desguerre, I., Carmona, O., Barnerias, C., Chemaly, N., Gitiaux, C., Brunelle, F., Dulac, O., Boddaert, N., Nabbout, R., Hemiconvulsion-hemiplegia syndrome revisited: longitudinal MRI findings in 10 children, Developmental Medicine & Child Neurology, 55, 1150-8, 2013	No relevant study design; case series
Basiri, R., Shariatzadeh, A., Wiebe, S., Aghakhani, Y., Focal epilepsy without interictal spikes on scalp EEG: A common finding of uncertain significance, Epilepsy Research, 150, 1-6, 2019	Yield of MRI abnormalities was not reported
Bayram, E., Topcu, Y., Yis, U., Cakmaci, H., Kurul, S. H., Comparison of cranial magnetic resonance imaging findings and clinical features in patients with corpus callosum abnormalities, Neuropediatrics, 45, 30-35, 2014	Not all patients presented with epilepsy and the results could not be extracted for the target population
Bekelis, K., Desai, A., Kotlyar, A., Thadani, V., Jobst, B. C., Bujarski, K., Darcey, T. M., Roberts, D. W., Occipitotemporal hippocampal depth electrodes in intracranial epilepsy monitoring: Safety and utility ; Clinical article, Journal of Neurosurgery, 118, 345-352, 2013	Proportion of specific abnormalities was not reported
Berger, J., Plotkin, M., Demin, K., Holtkamp, M., Bengner, T., The relationship between structural MRI, FDG-PET, and memory in temporal lobe epilepsy: Preliminary results, Epilepsy and Behavior, 80, 61-67, 2018	No relevant outcomes were reported
Bernasconi, N., Bernasconi, A., Caramanos, Z., Dubeau, F., Richardson, J., Andermann, F., Arnold, D. L., Entorhinal cortex atrophy in epilepsy patients exhibiting normal hippocampal volumes, Neurology, 56, 1335-1339, 2001	No relevant outcomes were reported

Excluded studies - Yield of MRI	
Bernhardt, B. C., Hong, S. J., Bernasconi, A., Bernasconi, N., Magnetic resonance imaging pattern learning in temporal lobe epilepsy: Classification and prognostics, Annals of Neurology, 77, 436-446, 2015	Yield of MRI was not reported
Bersani, G., Iannitelli, A., Quartini, A., Di Biasi, C., Gualdi, G., Pancheri, P., Patients with epilepsy associated with schizophrenia: A descriptive study of patients investigated with magnetic resonance imaging (MRI) and standard electroencephalography (EEG), Italian Journal of Psychopathology, 14, 10-15, 2008	Not an investigation of a standardised MRI programme
Bhoopathy, R. M., Arthy, B., Vignesh, S. S., Srinivasan, A. V., Prevalence and clinical characteristics of malformations of cortical development and incomplete hippocampal inversion with medically intractable seizures in Chennai - A prospective study, Neurology India, 67, 442-447, 2019	Patients underwent EEG, CT and MRI, but results have not been reported separately
Bindu, P. S., Sonam, K., Govindaraj, P., Govindaraju, C., Chiplunkar, S., Nagappa, M., Kumar, R., Vekhande, C. C., Arvinda, H. R., Gayathri, N., Srinivas Bharath, M. M., Ponmalar, J. N. J., Philip, M., Vandana, V. P., Khan, N. A., Nunia, V., Paramasivam, A., Sinha, S., Thangaraj, K., Taly, A. B., Outcome of epilepsy in patients with mitochondrial disorders: Phenotype genotype and magnetic resonance imaging correlations, Clinical Neurology and Neurosurgery, 164, 182-189, 2018	Not all patients presented with epilepsy and the results could not be extracted for the target population
Blackmon, K., Structural MRI biomarkers of shared pathogenesis in autism spectrum disorder and epilepsy, Epilepsy and Behavior, 47, 172-182, 2015	Narrative review
Blauwblomme, T., Boddaert, N., Chemaly, N., Chiron, C., Pages, M., Varlet, P., Bourgeois, M., Bahi-Buisson, N., Kaminska, A., Grevent, D., Brunelle, F., Sainte-Rose, C., Archambaud, F., Nabbout, R., Arterial Spin Labeling MRI: a step forward in non-invasive delineation of focal cortical dysplasia in children, Epilepsy Research, 108, 1932-9, 2014	Irrelevant study design; case series
Bleich, S., Sperling, W., Degner, D., Graesel, E., Bleich, K., Wilhelm, J., Havemann-Reinecke, U., Javaheripour, K., Kornhuber, J., Lack of association between hippocampal volume reduction and first-onset alcohol withdrawal seizure. A volumetric MRI study, Alcohol and Alcoholism, 38, 40-44, 2003	No relevant outcomes were reported
Bohm, L. A., Zhou, T. C., Mingo, T. J., Dugan, S. L., Patterson, R. J., Sidman, J. D., Roby, B. B., Neuroradiographic findings in 22q11.2 deletion syndrome, American Journal of Medical Genetics, Part A, 173, 2158-2165, 2017	Incorrect population
Bolen, R. D., Koontz, E. H., Pritchard, P. B., Prevalence and distribution of MRI abnormalities in patients with psychogenic nonepileptic events, Epilepsy and Behavior, 59, 73-76, 2016	This study does not report the type of MRI abnormality, only its location
Boxerman, J. L., Hawash, K., Bali, B., Clarke, T., Rogg, J., Pal, D. K., Is Rolandic epilepsy	Irrelevant study design; case-control study

Excluded studies - Yield of MRI	
associated with abnormal findings on cranial MRI?, Epilepsy Research, 75, 180-5, 2007	
Briellmann, R. S., Wellard, R. M., Jackson, G. D., Seizure-associated abnormalities in epilepsy: evidence from MR imaging, Epilepsia, 46, 760-6, 2005	Narrative review
Brizzi, K., Pelden, S., Tshokey, T., Nirola, D. K., Diamond, M. B., Klein, J. P., Tshering, L., Deki, S., Nidup, D., Bruno, V., Dorny, P., Garcia, H. H., Mateen, F. J., Neurocysticercosis in Bhutan: A cross-sectional study in people with epilepsy, Transactions of the Royal Society of Tropical Medicine and Hygiene, 110, 517-526, 2016	All participants presented with neurocysticercosis
Bronen, R. A., Spencer, D. D., Fulbright, R. K., Cerebrospinal fluid cleft with cortical dimple: MR imaging marker for focal cortical dysgenesis, Radiology, 214, 657-663, 2000	No relevant outcomes were reported
Canas, N., Breia, P., Soares, P., Saraiva, P., Calado, S., Jordao, C., Vale, J., The electroclinical-imagiological spectrum and long-term outcome of transient periictal MRI abnormalities, Epilepsy Research, 91, 240-252, 2010	Study design not relevant; case series
Cantor-Rivera, D., Khan, A. R., Goubran, M., Mirsattari, S. M., Peters, T. M., Detection of temporal lobe epilepsy using support vector machines in multi-parametric quantitative MR imaging, Computerized Medical Imaging and Graphics, 41, 14-28, 2015	No relevant outcomes were reported
Capizzano, A. A., Vermathen, P., Laxer, K. D., Matson, G. B., Maudsley, A. A., Soher, B. J., Schuff, N. W., Weiner, M. W., Multisection proton MR spectroscopy for mesial temporal lobe epilepsy, American Journal of Neuroradiology, 23, 1359-1368, 2002	No relevant study design; case-control
Cardinale, F., Francione, S., Gennari, L., Citterio, A., Sberna, M., Tassi, L., Mai, R., Sartori, I., Nobili, L., Cossu, M., Castana, L., Lo Russo, G., Colombo, N., SUrface-PRojected FLuid-Attenuation-Inversion-Recovery Analysis: A Novel Tool for Advanced Imaging of Epilepsy, World Neurosurgery, 98, 715-726.e1, 2017	No relevant outcomes were reported
Cendes, F., Neuroimaging in investigation of patients with epilepsy, CONTINUUM Lifelong Learning in Neurology, 19, 623-642, 2013	Narrative review
Cendes, F., Theodore, W. H., Brinkmann, B. H., Sulc, V., Cascino, G. D., Neuroimaging of epilepsy, Handbook of Clinical Neurology, 136, 985-1014, 2016	Narrative review
Cianfoni, A., Caulo, M., Cerase, A., Della Marca, G., Falcone, C., Di Lella, G. M., Gaudino, S., Edwards, J., Colosimo, C., Seizure-induced brain lesions: A wide spectrum of variably reversible MRI abnormalities, European Journal of Radiology, 82, 1964-1972, 2013	No relevant study design; case series
Clusmann, H., Kral, T., Fackeldey, E., Blumcke, I., Helmstaedter, C., von Oertzen, J., Urbach, H., Schramm, J., Lesional mesial temporal lobe epilepsy and limited resections: prognostic	No relevant study design; case series

Excluded studies - Yield of MRI	
factors and outcome, Journal of Neurology, Neurosurgery & Psychiatry, 75, 1589-96, 2004	
Clusmann, H., Schramm, J., Kral, T., Helmstaedter, C., Ostertun, B., Fimmers, R., Haun, D., Elger, C. E., Prognostic factors and outcome after different types of resection for temporal lobe epilepsy, Journal of Neurosurgery, 97, 1131-1141, 2002	No relevant outcomes were reported
Coste, S., Ryvlin, P., Hermier, M., Ostrowsky, K., Adeleine, P., Froment, J. C., Mauguiere, F., Temporopolar changes in temporal lobe epilepsy: A quantitative MRI-based study, Neurology, 59, 855-861, 2002	Yield of abnormalities was not reported
Craven, I., Griffiths, P. D., Hoggard, N., Magnetic resonance imaging of epilepsy at 3 Tesla, Clinical Radiology, 66, 278-86, 2011	Narrative review
Dakaj, N., Kruja, J., Jashari, F., Boshnjaku, D., Shatri, N., Zeqiraj, K., Accuracy of conventional diagnostic methods for identifying structural changes in patients with focal epilepsy, Acta Informatica Medica, 24, 351-353, 2016	Study does not report the yield of MRI abnormalities
De Ciantis, A., Barba, C., Tassi, L., Cosottini, M., Tosetti, M., Costagli, M., Bramerio, M., Bartolini, E., Biagi, L., Cossu, M., Pelliccia, V., Symms, M. R., Guerrini, R., 7T MRI in focal epilepsy with unrevealing conventional field strength imaging, Epilepsia, 57, 445-454, 2016	No relevant study design; case series
Degerliyurt, A., Yalnizoglu, D., Bakar, E. E., Topcu, M., Turanli, G., Electrical status epilepticus during sleep: A study of 22 patients, Brain and Development, 37, 250-264, 2015	No relevant outcomes were reported
Desarnaud, S., Mellerio, C., Semah, F., Laurent, A., Landre, E., Devaux, B., Chiron, C., Lebon, V., Chassoux, F., ¹⁸F-FDG PET in drug-resistant epilepsy due to focal cortical dysplasia type 2: additional value of electroclinical data and coregistration with MRI, European Journal of Nuclear Medicine and Molecular Imaging, 45, 1449-1460, 2018	No relevant outcomes were reported
Diehl, B., Prayson, R., Najm, I., Ruggieri, P., Hamartomas and epilepsy: Clinical and imaging characteristics, Seizure, 12, 307-311, 2003	Not relevant study design; case series
Ding, Y. S., Chen, B. B., Glielmi, C., Friedman, K., Devinsky, O., A pilot study in epilepsy patients using simultaneous PET/MR, American Journal of Nuclear Medicine and Molecular Imaging, 4, 459-470, 2014	Not relevant study design; case series
Doescher, J. S., deGrauw, T. J., Musick, B. S., Dunn, D. W., Kalnin, A. J., Egelhoff, J. C., Bryars, A. W., Mathews, V. P., Austin, J. K., Magnetic resonance imaging (MRI) and electroencephalographic (EEG) findings in a cohort of normal children with newly diagnosed seizures, Journal of Child Neurology, 21, 490-495, 2006	Yield of MRI abnormalities was not reported
Donmez, F. Y., Guleryuz, P., Agildere, M., MRI Findings in Childhood PRES: What is Different than the Adults?, Clinical Neuroradiology, 26, 209-213, 2016	Not relevant study design; case series

Excluded studies - Yield of MRI	
Eeg-Olofsson, O., Lundberg, S., Raininko, R., MRI in rolandic epilepsy, Epileptic Disorders, 2 Suppl 1, S51-3, 2000	Conference abstract
El Ameen, N. F., Amin, M. F., kotb, A., MRI of the brain in postpartum convulsions; pose diagnostic dilemmas, Egyptian Journal of Radiology and Nuclear Medicine, 48, 999-1004, 2017	Patients did not present with epilepsy
Farrow, T. F. D., Dickson, J. M., Grunewald, R. A., A Six-Year Follow-Up MRI Study of Complicated Early Childhood Convulsion, Pediatric Neurology, 35, 257-260, 2006	No relevant study design; case series
Fredriksen, J. R., Carr, C. M., Koeller, K. K., Verdoorn, J. T., Gadoth, A., Pittock, S. J., Kotsenas, A. L., MRI findings in glutamic acid decarboxylase associated autoimmune epilepsy, Neuroradiology, 60, 239-245, 2018	Irrelevant study design; case series
Gaily, E., Anttonen, A. K., Valanne, L., Liukkonen, E., Traskelin, A. L., Polvi, A., Lommi, M., Muona, M., Eriksson, K., Lehesjoki, A. E., Dravet syndrome: New potential genetic modifiers, imaging abnormalities, and ictal findings, Epilepsia, 54, 1577-1585, 2013	No relevant study design; case series
Gilliam, F., Faught, E., Martin, R., Bowling, S., Bilir, E., Thomas, J., Morawetz, R., Kuzniecky, R., Predictive value of MRI-identified mesial temporal sclerosis for surgical outcome in temporal lobe epilepsy: An intent-to-treat analysis, Epilepsia, 41, 963-966, 2000	No relevant outcomes were reported
Glass, H. C., Bonifacio, S. L., Sullivan, J., Rogers, E., Ferriero, D. M., Goldstein, R., Barkovich, J. A., Magnetic resonance imaging and ultrasound injury in preterm infants with seizures, Journal of Child Neurology, 24, 1105-1111, 2009	Population were newborn babies
Goyal, M., Bangert, B. A., Lewin, J. S., Cohen, M. L., Robinson, S., High-resolution MRI enhances identification of lesions amenable to surgical therapy in children with intractable epilepsy, Epilepsia, 45, 954-959, 2004	No relevant study design; case series
Grillo, E., Postictal MRI abnormalities and seizure-induced brain injury: Notions to be challenged, Epilepsy and Behavior, 44, 195-199, 2015	No relevant outcomes were reported
Grunewald, R. A., Farrow, T., Vaughan, P., Rittey, C. D. C., Mundy, J., A magnetic resonance study of complicated early childhood convulsion, Journal of Neurology Neurosurgery and Psychiatry, 71, 638-642, 2001	No relevant outcomes were reported
Gunawan, P. I., Saharso, D., Purnama Sari, D., Correlation of serum S100B levels with brain magnetic resonance imaging abnormalities in children with status epilepticus, Korean Journal of Pediatrics, 62, 281-285, 2019	No relevant outcomes were reported
Gupta, S. N., Belay, B., Intracranial incidental findings on brain MR images in a pediatric neurology practice: A retrospective study, Journal of the Neurological SciencesJ Neurol Sci, 264, 34-37, 2008	The study does not specify whether all included patients had epilepsy

Excluded studies - Yield of MRI	
Halac, G., Delil, S., Zafer, D., Isler, C., Uzan, M., Comunoglu, N., Oz, B., Yeni, S. N., Vatankulu, B., Halac, M., Ozkara, C., Compatibility of MRI and FDG-PET findings with histopathological results in patients with focal cortical dysplasia, Seizure, 45, 80-86, 2017	No relevant outcomes were reported
Hallbook, T., Ruggieri, P., Adina, C., Lachhwani, D. K., Gupta, A., Kotagal, P., Bingaman, W. E., Wyllie, E., Contralateral MRI abnormalities in candidates for hemispherectomy for refractory epilepsy, Epilepsia, 51, 556-563, 2010	No relevant outcomes were reported
Heers, M., Rampp, S., Stefan, H., Urbach, H., Elger, C. E., von Lehe, M., Wellmer, J., MEG-based identification of the epileptogenic zone in occult peri-insular epilepsy, Seizure, 21, 128-33, 2012	No relevant outcomes were reported
Ho, K., Lawn, N., Bynevelt, M., Lee, J., Dunne, J., Neuroimaging of first-ever seizure Contribution of MRI if CT is normal, Neurology: Clinical Practice, 3, 398-403, 2013	CT and MRI were performed, but results have not been reported separately
Izuora, G. I., Ayadi, K. M., Okoroma, E., Neuroimaging findings in children with infantile spasms, Neurosciences, 9, 30-33, 2004	No relevant study design; case series
Jahodova, A., Krsek, P., Kyncl, M., Jezdik, P., Kudr, M., Komarek, V., Jayakar, P., Miller, I., Resnick, T., Duchowny, M., Distinctive MRI features of the epileptogenic zone in children with tuberous sclerosis, European Journal of Radiology, 83, 703-709, 2014	No relevant outcomes were reported
Jansen, J. F. A., Vlooswijk, M. C. G., Majoie, H. M., De Krom, M. C. T. F. M., Aldenkamp, A. P., Hofman, P. A. M., Backes, W. H., White matter lesions in patients with localization-related epilepsy, Investigative Radiology, 43, 552-558, 2008	No relevant outcomes were reported
Kalnin, A. J., Fastenau, P. S., deGrauw, T. J., Musick, B. S., Perkins, S. M., Johnson, C. S., Mathews, V. P., Egelhoff, J. C., Dunn, D. W., Austin, J. K., Magnetic Resonance Imaging Findings in Children With a First Recognized Seizure, Pediatric Neurology, 39, 404-414, 2008	Unable to read the contents of the Appendix where the results were reported as these were distorted. Author was contacted, but no response received
Kasasbeh, A., Hwang, E. C., Steger-May, K., Bandt, S. K., Oberhelman, A., Limbrick, D., Miller-Thomas, M. M., Shimony, J. S., Smyth, M. D., Association of magnetic resonance imaging identification of mesial temporal sclerosis with pathological diagnosis and surgical outcomes in children following epilepsy surgery: Clinical article, Journal of Neurosurgery: Pediatrics, 9, 552-561, 2012	Irrelevant study design; case series
Katramados, A. M., Burdette, D., Patel, S. C., Schultz, L. R., Gaddam, S., Mitsias, P. D., Periictal diffusion abnormalities of the thalamus in partial status epilepticus, Epilepsia, 50, 265-75, 2009	Irrelevant study design; case series
Kim, D. W., Lee, S. K., Yun, C. H., Kim, K. K., Lee, D. S., Chung, C. K., Chang, K. H., Parietal lobe epilepsy: The semiology, yield of diagnostic workup, and surgical outcome, Epilepsia, 45, 641-649, 2004	Irrelevant study design; case series

Excluded studies - Yield of MRI	
Lascano, A. M., Perneger, T., Vulliemoz, S., Spinelli, L., Garibotto, V., Korff, C. M., Vargas, M. I., Michel, C. M., Seeck, M., Yield of MRI, high-density electric source imaging (HD-ESI), SPECT and PET in epilepsy surgery candidates, Clinical Neurophysiology, 127, 150-155, 2016	Yield of MRI was not reported
Lefkopoulos, A., Tzinas, A., Papadopoulou, E., Haritanti, A., Karanikolas, D., Tsifountoudis, I., Dimitriadis, A. S., MRI assessment of hippocampal sclerosis, Rivista di Neuroradiologia, 18, 357-363, 2005	Irrelevant study design; case series
Liu, R. S. N., Lemieux, L., Bell, G. S., Bartlett, P. A., Sander, J. W. A. S., Sisodiya, S. M., Shorvon, S. D., Duncan, J. S., A longitudinal quantitative MRI study of community-based patients with chronic epilepsy and newly diagnosed seizures: Methodology and preliminary findings, NeuroImage, 14, 231-243, 2001	Conference abstract
Liu, R. S. N., Lemieux, L., Bell, G. S., Sisodiya, S. M., Bartlett, P. A., Shorvon, S. D., Sander, J. W. A. S., Duncan, J. S., Cerebral damage in epilepsy: A population-based longitudinal quantitative MRI study, Epilepsia, 46, 1482-1494, 2005	No relevant outcomes were reported
Lizcano, A., Carrico, L., Barbosa, P., Carvalho, M. I., Yasuda, C., Montenegro, M. A., Guerreiro, M., Guerreiro, C., Cendes, F., EEG and magnetic resonance imaging abnormalities in patients with acute limbic encephalitis, Journal of Epilepsy and Clinical Neurophysiology, 17, 133-139, 2011	Not relevant study design; case series
Lyons, T. W., Johnson, K. B., Michelson, K. A., Nigrovic, L. E., Loddenkemper, T., Prabhu, S. P., Kimia, A. A., Yield of emergent neuroimaging in children with new-onset seizure and status epilepticus, Seizure, 35, 4-10, 2016	Not relevant study design; case series
Malik, M. A., Tarar, M. A., Hamid, H., Ur Rehhman, M., Qureshi, A., Ossaid, M., Sultan, T., Ahmad, N., Ali, Q., Malik, S., Diagnostic importance of interictal electroencephalogram and neuroimaging of brain in new-onset idiopathic generalized epilepsy of childhood (IGEC), Pakistan Paediatric Journal, 34, 15-22, 2010	Unavailable. Last checked 29/03/21
Marsh, L., Sullivan, E. V., Morrell, M., Lim, K. O., Pfefferbaum, A., Structural brain abnormalities in patients with schizophrenia, epilepsy, and epilepsy with chronic interictal psychosis, Psychiatry Research, 108, 1-15, 2001	Mixed population of people with epilepsy and schizophrenia. Results were not reported separately
Matsuura, K., Maeda, M., Okamoto, K., Araki, T., Miura, Y., Hamada, K., Kanamaru, K., Tomimoto, H., Usefulness of arterial spin-labeling images in periictal state diagnosis of epilepsy, Journal of the Neurological Sciences, 359, 424-429, 2015	No relevant outcomes were reported
McGill, M. L., Devinsky, O., Wang, X., Quinn, B. T., Pardoe, H., Carlson, C., Butler, T., Kuzniecky, R., Thesen, T., Functional neuroimaging abnormalities in idiopathic	No relevant outcomes were reported

Excluded studies - Yield of MRI	
generalized epilepsy, NeuroImage: Clinical, 6, 455-462, 2014	
Mendes, A., Sampaio, L., Brain magnetic resonance in status epilepticus: A focused review, Seizure, 38, 63-7, 2016	Narrative review
Middlebrooks, E. H., Ver Hoef, L., Szaflarski, J. P., Neuroimaging in Epilepsy, Current Neurology and Neuroscience Reports, 17 (4) (no pagination), 2017	Narrative review
Milligan, T. A., Zamani, A., Bromfield, E., Frequency and patterns of MRI abnormalities due to status epilepticus, Seizure, 18, 104-108, 2009	No relevant study design; case series
Mitsueda-Ono, T., Ikeda, A., Sawamoto, N., Aso, T., Hanakawa, T., Kinoshita, M., Matsumoto, R., Mikuni, N., Amano, S., Fukuyama, H., Takahashi, R., Internal structural changes in the hippocampus observed on 3-tesla MRI in patients with mesial temporal lobe epilepsy, Internal Medicine, 52, 877-85, 2013	No relevant study design; case series
Morimoto, E., Kanagaki, M., Okada, T., Yamamoto, A., Mori, N., Matsumoto, R., Ikeda, A., Mikuni, N., Kunieda, T., Paul, D., Miyamoto, S., Takahashi, R., Togashi, K., Anterior temporal lobe white matter abnormal signal (ATLAS) as an indicator of seizure focus laterality in temporal lobe epilepsy: Comparison of double inversion recovery, FLAIR and T2W MR imaging, European Radiology, 23, 3-11, 2013	Participants did not have epilepsy
Ndubuisi, C. A., Mezue, W. C., Ohaegbulam, S. C., Chikani, M. C., Ekuma, M., Onyia, E., Neuroimaging findings in pediatric patients with seizure from an institution in Enugu, Nigerian journal of clinical practice, 19, 121-127, 2016	CT and MRI results were reported combined
Nikodijevic, D., Baneva-Dolnenec, N., Petrovska-Cvetkovska, D., Caparoska, D., Refractory epilepsy-MRI, EEG and CT scan, a correlative clinical study, Open Access Macedonian Journal of Medical Sciences, 4, 98-101, 2016	CT and MRI results were reported combined
Ozturk, M., Akdulum, I., Dag, N., Sigirci, A., Gungor, S., Yilmaz, S., Analysis of magnetic resonance imaging findings of children with neurologic complications after liver transplantation, La Radiologia medica, 122, 617-622, 2017	Population did not have epilepsy
Parihar, R. K., Gupta, A. K., Saini, G., Dev, G., Role of magnectic resonance imaging of brain in paediatric patients with partial seizures, JK Science, 14, 60-64, 2011	This study does not report the type of MRI abnormality, only its location
Patil, T. B., Paithankar, M. M., Clinico-radiological profile and treatment outcomes in neurocysticercosis: A study of 40 patients, Annals of Tropical Medicine and Public Health, 5, 63-68, 2012	No relevant outcomes were reported
Pinto, A. L., Chen, L., Friedman, R., Grant, P. E., Poduri, A., Takeoka, M., Prabhu, S. P., Sahin, M., Sturge-Weber Syndrome: Brain Magnetic Resonance Imaging and	No relevant study design; case series

Excluded studies - Yield of MRI	
Neuropathology Findings, Pediatric Neurology, 58, 25-30, 2016	
Ranji-Burachaloo, S., Sarraf, P., Rahimian, E., Shakiba, S., Javadian, N., Faraji, P., Tafakhori, A., The role of susceptibility-weighted imaging and dedicated MRI protocols in the diagnostic evaluation of patients with drug-resistant epilepsy, Archives of Neuroscience, 6 (Special Issue) (no pagination), 2019	Not relevant study design; case series
Rennebaum, F., Kassubek, J., Pinkhardt, E., Hubers, A., Ludolph, A. C., Schocke, M., Fauser, S., Status epilepticus: Clinical characteristics and EEG patterns associated with and without MRI diffusion restriction in 69 patients, Epilepsy Research, 120, 55-64, 2016	No relevant outcomes were reported
Sadeq, H., Karim, J., Marwan, Y., Alsaleem, T., Neuroimaging Evaluation for First Attack of Unprovoked Nonfebrile Seizure in Pediatrics: When to Order?, Medical Principles and Practice, 25, 56-60, 2016	No relevant study design; case series
Saini, J., Kesavadas, C., Thomas, B., Kapilamoorthy, T. R., Gupta, A. K., Radhakrishnan, A., Radhakrishnan, K., Susceptibility weighted imaging in the diagnostic evaluation of patients with intractable epilepsy, Epilepsia, 50, 1462-1473, 2009	No relevant study design; case series
Salamon, N., Kung, J., Shaw, S. J., Koo, J., Koh, S., Wu, J. Y., Lerner, J. T., Sankar, R., Shields, W. D., Engel, J., Fried, I., Miyata, H., Yong, W. H., Vinters, H. V., Mathern, G. W., FDG-PET/MRI coregistration improves detection of cortical dysplasia in patients with epilepsy, Neurology, 71, 1594-1601, 2008	Yield of MRI abnormalities was not reported
Scott, R. C., Gadian, D. G., King, M. D., Chong, W. K., Cox, T. C., Neville, B. G., Connelly, A., Magnetic resonance imaging findings within 5 days of status epilepticus in childhood, Brain, 125, 1951-9, 2002	No relevant study design; case series
Sharma, S., Riviello, J. J., Harper, M. B., Baskin, M. N., The role of emergent neuroimaging in children with new-onset afebrile seizures, Pediatrics, 111, 1-5, 2003	Article in Spanish
Shinnar, S., Bello, J. A., Chan, S., Hesdorffer, D. C., Lewis, D. V., Macfall, J., Pellock, J. M., Nordli, D. R., Frank, L. M., Moshe, S. L., Gomes, W., Shinnar, R. C., Sun, S., Febstat Study Team, MRI abnormalities following febrile status epilepticus in children: the FEBSTAT study, Neurology, 79, 871-7, 2012	Conference abstract
Shinnar, S., Hesdorffer, D. C., Nordli, D. R., Pellock, J. M., O'Dell, C., Lewis, D. V., Frank, L. M., Moshe, S. L., Epstein, L. G., Marmarou, A., Bagiella, E., Phenomenology of prolonged febrile seizures: Results of the FEBSTAT study, Neurology, 71, 170-176, 2008	No relevant outcomes were reported
Shinnar, S., O'Dell, C., Mitnick, R., Berg, A. T., Moshe, S. L., Neuroimaging abnormalities in children with an apparent first unprovoked seizure, Epilepsy ResearchEpilepsy Res, 43, 261-9, 2001	CT and MRI were performed, but results have not been reported separately

Excluded studies - Yield of MRI	
Si, Y., Liu, L., Fang, J. J., Mu, J., Hu, J., Zhao, L. L., Tian, L. Y., Zhou, D., Evaluation of the efficiency of inpatient 24-hour VEEG combined with MRI in consecutive patients with newly diagnosed epilepsies, Epilepsy and Behavior, 20, 633-637, 2011	No relevant outcomes were reported
Sinclair, D. B., Wheatley, M., Aronyk, K., Hao, C., Snyder, T., Colmers, W., McKean, J. D. S., Pathology and neuroimaging in pediatric temporal lobectomy for intractable epilepsy, Pediatric Neurosurgery, 35, 239-246, 2001	Not relevant study design; case series
Striano, P., Mancardi, M. M., Biancheri, R., Madia, F., Gennaro, E., Paravidino, R., Beccaria, F., Capovilla, G., Bernardina, B. D., Darra, F., Elia, M., Giordano, L., Gobbi, G., Granata, T., Ragona, F., Guerrini, R., Marini, C., Mei, D., Longaretti, F., Romeo, A., Siri, L., Specchio, N., Vigevano, F., Striano, S., Tortora, F., Rossi, A., Minetti, C., Dravet, C., Gaggero, R., Zara, F., Brain MRI findings in severe myoclonic epilepsy in infancy and genotype-phenotype correlations, Epilepsia, 48, 1092-1096, 2007	No relevant study design; case series
Strohm, T., Steriade, C., Wu, G., Hantus, S., Rae-Grant, A., Larvie, M., FDG-PET and MRI in the evolution of new-onset refractory status epilepticus, American Journal of Neuroradiology, 40, 238-244, 2019	No relevant outcomes were reported
Terra-Bustamante, V. C., Fernandes, R. M. F., Inuzuka, L. M., Velasco, T. R., Alexandre Jr, V., Wichert-Ana, L., Funayama, S., Garzon, E., Santos, A. C., Araujo, D., Walz, R., Assirati, J. A., Machado, H. R., Sakamoto, A. C., Surgically amenable epilepsies in children and adolescents: Clinical, imaging, electrophysiological, and post-surgical outcome data, Child's Nervous System, 21, 546-551, 2005	Yield of MRI abnormalities was not reported
Toledo, M., Munuera, J., Sueiras, M., Rovira, R., Alvarez-Sabin, J., Rovira, A., MRI findings in aphasic status epilepticus, Epilepsia, 49, 1465-1469, 2008	No relevant study design; case series
Urbach, H., Binder, D., von Lehe, M., Podlogar, M., Bien, C. G., Becker, A., Schramm, J., Kral, T., Clusmann, H., Correlation of MRI and histopathology in epileptogenic parietal and occipital lobe lesions, SeizureSeizure, 16, 608-14, 2007	No relevant outcomes were reported
Wang, R., Li, S. Y., Chen, M., Zhou, C., Diagnostic value of interictal diffusion-weighted imaging in evaluation of intractable temporal lobe epilepsy, Chinese Medical Sciences Journal, 23, 68-72, 2008	No relevant outcomes were reported
Weng, H. H., Tsai, Y. t, Huang, Y. C., Hsiao, M. C., Wu, C. Y., Lin, Y. H., Hsu, H. L., Lee, J. D., Periictal magnetic resonance imaging in status epilepticus, Epilepsy Research, 86, 72-81, 2009	Not relevant study design; case series
Wheless, J. W., Carmant, L., Bebin, M., Conry, J. A., Chiron, C., Elterman, R. D., Frost, M., Paolicchi, J. M., Donald Shields, W., Thiele, E.	Yield of specific MRI abnormalities was not reported

Excluded studies - Yield of MRI	
A., Zupanc, M. L., Collins, S. D., Magnetic resonance imaging abnormalities associated with vigabatrin in patients with epilepsy, Epilepsia, 50, 195-205, 2009	
Whiting, P., Gupta, R., Burch, J., Mota, R. E., Wright, K., Marson, A., Weishmann, U., Haycox, A., Kleijnen, J., Forbes, C., A systematic review of the effectiveness and cost-effectiveness of neuroimaging assessments used to visualise the seizure focus in people with refractory epilepsy being considered for surgery, Health technology assessment (Winchester, England), 10, 1-250, iii-iv, 2006	No relevant outcomes were reported
Widjaja, E., Nilsson, D., Blaser, S., Raybaud, C., White matter abnormalities in children with idiopathic developmental delay, Acta Radiologica, 49, 589-95, 2008	Not all patients presented with epilepsy and the results could not be extracted for the target population
Widjaja, E., Otsubo, H., Raybaud, C., Ochi, A., Chan, D., Rutka, J. T., Snead, Iii O. C., Halliday, W., Sakuta, R., Galicia, E., Shelef, I., Chuang, S. H., Characteristics of MEG and MRI between Taylor's focal cortical dysplasia (type II) and other cortical dysplasia: Surgical outcome after complete resection of MEG spike source and MR lesion in pediatric cortical dysplasia, Epilepsy Research, 82, 147-155, 2008	Study does not report the yield of MRI abnormalities, only its location
Wychowski, T., Hussain, A., Tivarus, M. E., Birbeck, G. L., Berg, M. J., Potchen, M., Qualitative analysis of double inversion recovery MRI in drug-resistant epilepsy, Epilepsy Research, 127, 195-199, 2016	No relevant outcomes were reported
Xiang, T., Li, G., Liang, Y., Zhou, J., A wide spectrum of variably periictal MRI abnormalities induced by a single or a cluster of seizures, Journal of the Neurological Sciences, 343, 167-172, 2014	No relevant outcomes were reported

Economic studies

A global search of economic evidence was undertaken for all review questions in this guideline. See Supplement 2 for further information.

Appendix L – Research recommendations

Research recommendations for review question:

No research recommendations were made for this review question.

Appendix M – Clinically relevant abnormalities

Clinically relevant abnormalities have been categorised as follows:

- Tumour
  - Brain metastases
  - Primary brain tumours, including meningiomas
- Vascular
  - Arterio-venous malformation (AVM)/vascular malformation/abnormality
  - Haemorrhage
  - Infarct/ Infarction
  - PRES (posterior reversible encephalopathy syndrome)
  - Vasculitis
  - Venous sinus thrombosis
- Scarring
  - Encephalomalacia/cystic encephalomalacia
  - Gliosis
  - Hippocampal sclerosis/ Mesial temporal sclerosis
  - Ulegyria
- Congenital/developmental
  - Dysmyelination
  - Hydrocephalus
  - Malformations of cortical development
  - Phakomatoses
- Inflammatory/infective/immune
  - Autoimmune encephalitis/limbic encephalitis
  - Demyelination
  - Infections
  - Oedema/edema
- Metabolic /Genetic
  - Congenital disorders of glycosylation/Carbohydrate deficient glycoprotein disorders
  - Disorders of amino acid metabolism
  - Glucose transporter deficiency
  - Leucodystrophy (including very long chain fatty acid disorders)
  - Lysosomal enzyme disorders
  - Mitochondrial Disorders
  - Molybdenum cofactor deficiency
  - Organic acidurias
  - Sulphite oxidase deficiency