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CONTENTS

SECTION 1: NEONATOLOGY

1. **Neonatal Jaundice** 2
   Lead Author: Naveen Jain
   Co-Authors: Ravi Sachan, Praveen Vaenkatagiri

2. **Neonatal Hypoglycemia** 10
   Lead Author: VC Manoj
   Co-Authors: Mamta Jajoo, Nilesh Rao

3. **Neonatal Sepsis** 15
   Lead Author: Sridhar Santhanam
   Co-Authors: Pratima Anand, Pankaj Kumar Mohanty

4. **Neonatal Seizure** 21
   Lead Author: Sachin Shah
   Co-Authors: Tejo Pratap Oleti, Kumar Ankur

5. **Neonatal Cholestasis** 26
   Lead Author: Surender Kumar Yachha
   Co-Authors: Sushil Choudhary, Mohit Sahni

6. **Preterm with Respiratory Distress** 31
   Lead Author: Roy K Philip
   Co-Authors: Viraraghavan V Ramaswamy, Piyush Chandel

7. **Respiratory Distress in the Term Newborn** 38
   Lead Author: Srinivas Murki
   Co-Authors: Umamaheswari B, Rameshwor Yengkhom

8. **Feeding in Preterm and Feed Intolerance** 50
   Lead Author: Naveen Bajaj
   Co-Authors: Bijan Saha, Giridhar Sethuraman

9. **Oral Thrush (Oral Candidiasis)** 57
   Lead Author: Pankaj Garg
   Co-Authors: Ravishankara Marpalli, Susrut Das

10. **TORCH Infections** 62
    Lead Author: Dinesh Chirla
    Co-Authors: Sanjeev Chetry, Sudhindrashayana R Fattepur

11. **Neonatal Hypothermia** 68
    Lead Author: Somashekhar Nimbalkar
    Co-Authors: Akumtoshi, Ravi Shankar Swamy

12. **Difficulties in Breastfeeding** 76
    Lead Author: Chandrakala BS
    Co-Authors: Dipen V Patel, Febi Francis

13. **Ophthalmia Neonatorum** 82
Lead Author: Arvind Shenoi
Co-Authors: Tunu Gadi, Sachin A Shah

14. **Neonatal Resuscitation Program** 87
Lead Author: Lalan K Bharti
Co-Authors: A Prakash, Manish Jain

15. **Retinopathy of Prematurity** 96
Lead Author: Amit Upadhyay
Co-Authors: Reeta Bora, Johny Vakayil Francis

16. **Early Detection and Intervention of a High-risk Neonate** 104
Lead Author: Zafar Mahmood Meenai
Co-Authors: MKC Nair, Anjan Bhattacharya

17. **Antenatally Detected Hydronephrosis** 112
Lead Author: Mehul Shah
Co-Authors: Abhijeet Saha, Ranjeet Thergaonkar

SECTION 2: PULMONOLOGY

18. **Acute Pharyngitis/Acute Tonsillopharyngitis** 117
Lead Author: PS Suresh Babu
Co-Authors: Sonia Bhatt, Jijo Joseph John

19. **Acute Otitis Media** 124
Lead Author: Jagdish Chinnappa
Co-Authors: Chetan Trivedi, Sudip Dutta

20. **Sinusitis** 129
Lead Author: Indu Khosla
Co-Authors: Hema Gupta Mittal, Sarika Gupta

21. **Community-acquired Pneumonia** 137
Lead Author: TU Sukumaran
Co-Authors: Rashmi Ranjan Das, Sagar S Warankar

22. **Atypical Bacterial Pneumonia** 143
Lead Author: Joseph L Mathew
Co-Authors: B Antony Terance, Ritika Goyal

23. **Empyema** 146
Lead Author: NC Gowrishankar
Co-Authors: Javeed Iqbal Bhat, Krishna Mohan Gulla

24. **Pneumothorax in Children** 153
Lead Author: B Sarath Balaji
Co-Authors: Jagdish Prasad Goyal, Nitin Dhochak

25. **Bronchiolitis** 162
Lead Author: Pallab Chattopadhyay
Co-Authors: Vineet Sehgal, Samir Shah

26. **Under 5 Wheeze** 169
Lead Author: Shishir Modak
Co-Authors: Venkatesh Chandrasekaran, Pankaj C Vaidya

27. Bronchial Asthma 177
Lead Author: Subhasis Roy
Co-Authors: Samiya Razvi, Shilpa Hazare

28. Tropical Pulmonary Eosinophilia 186
Lead Author: Somashekar AR
Co-Authors: Vijay Warad, Srinivas Jakka

29. Protracted Bacterial Bronchitis 193
Lead Author: BS Sharma
Co-Authors: Somu Sivabalan, Samik Basu

30. Management of Cough in Office Practice 198
Lead Author: Yeshwant Amdekar
Co-Authors: Rajesh Chokhani, R Palaniraman

31. Post-COVID Lung Disease in Children 204
Lead Author: Sushil Kumar Kabra
Co-Authors: Kana Ram Jat, Prawin Kumar

SECTION 3: ALLERGY

32. Allergic Rhinitis 211
Lead Author: H Paramesh
Co-Authors: Narayan Prasad Modi, Nayan Mani Deka

33. Atopic Dermatitis 217
Lead Author: C Vijayabhaskar
Co-Authors: Dipti Pujari, Manjunath V

34. Urticaria 221
Lead Author: Jayakar Thomas
Co-Authors: Bindusha S, Mukesh Gupta

35. Anaphylaxis 227
Lead Author: Neeraj Gupta
Co-Authors: Akash Bang, Nihar Ranjan Mishra

36. Food Allergy 232
Lead Author: Jaidev MD
Co-Authors: Uppin Narayan Reddy, Vikram Patra

37. Cow's Milk Protein Allergy 237
Lead Author: RK Gupta
Co-Authors: Sowmya Nagarajan, Dhanesh Volvoikar

38. Allergic Conjunctivitis 244
Lead Author: Jose O
Co-Authors: Mohit Poddar, A Srimukhi

SECTION 4: EMERGENCIES

39. Acute Epiglottitis 250
Lead Author: Narendra Nanivadekar
Co-Authors: Vivin Abraham, Revanth Baineni

40. Croup in Children 260
Lead Author: S Thangavelu
Co-Authors: Partha Pratim Borah, Parmarth Chandane

41. Epistaxis in Children 265
Lead Author: Shalu Gupta
Co-Authors: Arpita Gogoi, Swathy Rao

42. Hypertension 275
Lead Author: Santosh Soans
Co-Authors: Mritunjay Pao, Gaurav Garg

43. Acute Gastrointestinal Bleed 284
Lead Author: GV Basavaraja
Co-Authors: Shubhadeep Das, Upender Shava

44. Acute Kidney Injury in Children 287
Lead Author: Mukta Mantan
Co-Authors: Bipin Jose, Mihir Sarkar

45. Traumatic Brain Injury 294
Lead Author: Bakul Jayant Parekh
Co-Authors: Rohit Bhowmick, Niladri Sekhar Bhunia

46. Injuries in Office Practice 302
Lead Author: Chetan Ginigeri
Co-Authors: Alok Bhandari, Ramakant Patil

47. Scalds and Burns 310
Lead Author: Sujata Sarabahi
Co-Authors: Palash Ranjan Gogoi, Balachandar D

SECTION 5: INTENSIVE CARE

48. Shock in Office Practice 325
Lead Author: Lokesh Tiwari
Co-Authors: Maninder Singh Dhaliwal, Ajit Chhetri

49. Evaluation and Management of Status Epilepticus in Children 331
Lead Author: Kavita Srivastava
Co-Authors: Biswaroop Chakrabarty, Debjani Gupta

50. CPR/BLS in Office Practice 335
Lead Author: LN Taneja
Co-Authors: Samarendra Mahapatro, Pranam Gowdar

51. Oxygen Therapy in Office Practice 342
Lead Author: Rakshay Shetty
Co-Authors: Madhumita Nandi, Kirit Sisodiya

52. Common Poisoning in Children 348
Lead Author: Karunakara BP
Co-Authors: Lakshmi Shobhavat, Ashwath Duraiswamy

53. Paracetamol Poisoning 358
Lead Author: Arun Kumar Baranwal
Co-Authors: Supraja Chandrasekar, Ashok Chowdary

54. Snakebite 365
Lead Author: Rajakumar PS
Co-Authors: M Singaravelu, Dayanand P Nakate

55. **Scorpion Envenomation** 374
Lead Author: S Mahadevan
Co-Authors: Daisy Khera, A Chenthil

56. **Rabies Prophylaxis in Children** 382
Lead Author: Anurag Agarwal
Co-Authors: Shivaprakash Sosale C, Ashwath Narayan

SECTION 6: INFECTIOUS DISEASES

57. **Management of Fever without Focus in Office Practice** 390
Lead Author: S Balasubramanian
Co-Author: S Lakshan Raj

58. **Enteric Fever** 397
Lead Author: Tapisha Gupta
Co-Authors: Bhaskar Shenoy, Darshan Chauhan

59. **Diphtheria** 402
Lead Author: Deepak Ugra
Co-Author: Amol Jaybhaye

60. **Pertussis in Children** 409
Lead Author: Jayant G Joshi
Co-Authors: Arun Kumar Manglik, Durgappa H

61. **Leptospirosis** 414
Lead Author: Jaydeep Choudhury
Co-Authors: Tushar Shah, Kewal Kishore Arora

62. **Rickettsial Disease** 421
Lead Author: Atul Kulkarni
Co-Authors: Rosina Ksoo, Geeta MG

63. **Diagnosis and Management of Childhood Tuberculosis** 430
Lead Author: Varinder Singh
Co-Authors: Ankit Parakh, Sushant Mane

64. **Infectious Mononucleosis** 440
Lead Author: Abhay K Shah
Co-Authors: Mrutunjay Dash, Manu Chaudhary

65. **Varicella** 447
Lead Author: Shyam Kukreja
Co-Authors: Yagnesh Popat, Kalpana Datta

66. **Hand, Foot and Mouth Disease** 453
Lead Author: Narayanappa D
Co-Authors: Sailendra K Das, Bakulesh Chauhan

67. **Herpes Simplex** 459
Lead Author: P Ramachandran
Co-Authors: Ramesh Choudhary, Sourabh G Duwarah

68. **Acute COVID-19 Infection in Children** 464
Lead Author: Sheeja Sugunan
Co-Authors: Srikrishna RSV, Mahesh Maheshwari

69. **Influenza in Children** 471
Lead Author: Rohit Agrawal
Co-Author: Mithila Amin

70. **Dengue in Children** 476
Lead Author: Sanjay K Ghorpade
Co-Authors: K Sasidharan, Sujith Kumar Tummala

71. **Nipah, Zika, and Monkeypox** 486
Lead Author: Tanu Singhal

72. **Malaria** 492
Lead Author: Digant D Shastri
Co-Authors: Kheya Ghosh Uttam, Vijaykumar G

73. **Tinea Infections** 499
Lead Author: Anandh
Co-Authors: Anil Parchuri, Prasant Kumar Saboth

74. **Common Worm Infestations** 505
Lead Author: Shivananda S
Co-Authors: Kripasindhu Chatterjee, S Srikrishna

75. **Measles** 511
Lead Author: Janani Sankar
Co-Author: Raja Rajeswari, Navya Mallisetty

76. **Cellulitis/Erysipelas** 516
Lead Author: Santanu Deb
Co-Authors: Narmada Ashok, Pawan Kalyan

77. **Antimicrobial Stewardship in Office Practice** 519
Lead Author: Dhanya Dharmapalan
Co-Author: Vijay Yewale

SECTION 7: NEUROLOGY AND NEURODEVELOPMENT

78. **Febrile Seizures** 528
Lead Author: Ananda Kesavan TM
Co-Authors: Rachna Sehgal, Ushma Patel

79. **Acute Bacterial Meningitis** 535
Lead Author: Lokesh Lingappa
Co-Authors: Harsh Patel, Devajit Sharma

80. **Encephalitis in Children** 543
Lead Author: PAM Kunju
Co-Authors: Nigam Prakash Narain, Ramesh Konanki

81. **Autoimmune Encephalitis** 547
Lead Author: Suresh Kumar Angurana
Co-Authors: Renu Suthar, Bindu Madhavi, Girish S

82. **Pediatric Headache** 557
Lead Author: Anoop Verma
Co-Authors: S Balasankar, Ranjith Kumar Manokaran

83. **Cerebral Palsy** 566
Lead Author: Sheffali Gulati
Co-Authors: Jaya Shankar Kaushik, P Sudhakar

84. Guillain–Barré Syndrome 574
Lead Author: Siddharth Shah
Co-Authors: Renu Suthar, Sangeetha Yoganathan

85. First Unprovoked Seizures 582
Lead Author: Mahesh Kamate
Co-Authors: Rekha Mittal, Ritesh Shah

86. Neurocysticercosis 588
Lead Author: Vykunta Raju KN
Co-Authors: Juhi Gupta, Tarun Gondaliya

87. Autism Spectrum Disorders 592
Lead Author: Samir Hasan Dalwai
Co-Authors: Shabina Ahmed, CP Ravi Kumar

88. Attention Deficit Hyperactivity Disorder 598
Lead Author: Jeeson C Unni
Co-Authors: Leena Deshpande, Ajay Srivastava

89. Specific Learning Disorders 604
Lead Author: Nandita de Souza
Co-Authors: A Somasundaram, Swati Vinchurkar

SECTION 8: GASTROENTEROLOGY

90. Acute Watery Diarrhea 611
Lead Author: Nirmala Cherukuri
Co-Authors: Nishanth Wadhwa, Prasanth K Sobhan

91. Acute Dysentery 618
Lead Author: Vidyut Bhatia
Co-Authors: Kaustav Nayek, Sujal Dave

92. Persistent Diarrhea 623
Lead Author: Riyaz A
Co-Authors: Kosha Gajera, Vishnu Biradar

93. Gastroesophageal Reflux Disease 630
Lead Author: Ramesh Srinivasan
Co-Authors: Jaswinder Kaur, Jubin Kamar

94. Viral Hepatitis 639
Lead Author: Sutapa Ganguly
Co-Authors: Rajeev Khanna, MS Vishwanathan

95. Constipation in Children 650
Lead Author: Srinivas S
Co-Authors: Mohit Vohra, Vibhor Borkar

SECTION 9: NEPHROUROLOGY

96. Urinary Tract Infection in Children 658
Lead Author: Sudha Ekambaram
Co-Authors: Afsana Jahan, Kiran P Sathe

97. Acute Glomerulonephritis (Acute Nephritic Syndrome) 662
Lead Author: Susan Uthup
Co-Authors: Sudheer Kumar Reddy, Priyanka Khandelwal

98. **Nephrotic Syndrome** 667
Lead Author: Arvind Bagga
Co-Authors: Anil Vasudevan, Aditi Sinha

99. **Enuresis: What to Know and How to Treat?** 674
Lead Author: Pankaj Deshpande
Co-Authors: Fagun Shah, Rajiv Sinha

SECTION 10: HEMATOLOGY

100. **Iron Deficiency Anemia** 680
Lead Author: Deepak Bansal
Co-Authors: Nita Radhakrishnan, Anand Prakash

101. **Megaloblastic Anemia** 686
Lead Author: Deenadayalan M
Co-Authors: Abhilasha S, Rishab Bharadwaj

102. **Thalassemia** 690
Lead Author: Ajith Kumar VT
Co-Authors: Amita Mahajan, Joy Bhaduri

103. **Practicing Pearls for Sickle Cell Disease Management** 696
Lead Author: Vibha Bafna
Co-Authors: Ankitkumar B Parmar, Shruti Kakkar

104. **G6PD Deficiency** 704
Lead Author: Sarala Rajaji
Co-Authors: Manas Kalra, Deepa Trivedi

105. **Immune Thrombocytopenic Purpura** 712
Lead Author: Nitin K Shah
Co-Authors: Anand Kumar, Anil Rawat

106. **Hemophilia** 718
Lead Author: Sirisha Rani S
Co-Authors: Vineeta Gupta, Fiji MD

107. **Febrile Neutropenia** 726
Lead Author: Revathi Raj
Co-Authors: Richa Jain, Gaurav Kharya

108. **Hemophagocytic Lymphohistiocytosis** 733
Lead Author: Anupam Sachdeva
Co-Authors: Divij Sachdeva, Manas Kalra

SECTION 11: ENDOCRINOLOGY

109. **Hypothyroidism** 741
Lead Author: Ahila Ayyavoo
Co-Authors: Ravindra Kumar, Tushar Godbole

110. **Hyperthyroidism** 745
Lead Author: Riaz I
Co-Authors: Bhanu K Bhakhri, Shalmi Mehta

111. **Childhood Obesity** 751
Lead Author: Anurag Bajpai
Co-Authors: Mohan T Shenoy, Prachi Karia-Shah

112. Diabetes Mellitus 759
Lead Author: Shaila Bhattacharyya
Co-Authors: Sophy Korula, Aashima Dabas

113. Menstrual Irregularities 767
Lead Author: M Vijayakumar
Co-Authors: Zalak Upadhyay, Kavitha Sakamuri

SECTION 12: RHEUMATOLOGY

114. Acute Rheumatic Fever 774
Lead Author: Rashna Dass Hazarika
Co-Authors: Ketan H Shah, Dhrubajyoti Sharma

115. Kawasaki Disease 780
Lead Author: Surjit Singh
Co-Authors: Deepti Suri, Subroto Chakrabartty

116. Henoch-Schönlein Purpura 787
Lead Author: Sagar Bhattad
Co-Authors: Anju Singh, Himesh Barman

117. Multisystem Inflammatory Syndrome in Children 792
Lead Author: Rakesh Lodha
Co-Authors: Jolly Chandran, Mahendra Jain

118. Juvenile Idiopathic Arthritis 798
Lead Author: Sathish Kumar
Co-Authors: Narendra Bagri, Chandrika S Bhat

119. Childhood Systemic Lupus Erythematosus 808
Lead Author: Nutan Kamath
Co-Authors: Amit Rawat, Aaradhana Singh

120. Growing Pains 818
Lead Author: Rakesh Mondal
Co-Authors: Anand P Rao, Suma Balan

SECTION 13: CARDIOLOGY

121. Myocarditis 823
Lead Author: Ebor Jacob James
Co-Authors: Sanjay Khatri, Mily Ray

122. Heart Failure 835
Lead Author: R Krishna Kumar
Co-Authors: Neeraj Awasthy, Debasree Gangopadhyay

123. Cyanotic Spell 842
Lead Author: Smita Mishra
Co-Authors: Anuradha Sridhar, Jyothi Prakash R

124. Supraventricular Tachycardia 849
Lead Author: Amitabha Chattopadhyay
Co-Authors: Vikram Kudumula, KS Remadevi

125. Indications and Timing of Surgeries in Congenital Heart Diseases 859
Lead Author: Niraj Agarwal
Co-Authors: Ritesh Sukharamwala, Srinath Reddy

SECTION 14: DERMATOLOGY

126. Hypopigmentation 871
Lead Author: Sridhar Ganapathy
Co-Authors: Atanu Bhadra, Manish Gupta

127. Hyperpigmented Lesions in Children 878
Lead Author: Ram Gulati
Co-Authors: J Balaji, Ravi M Rathod

128. Staphylococcal Scalded Skin Syndrome 884
Lead Author: Madhu Rengasamy
Co-Authors: Sahana M, Parang Mehta

129. Stevens–Johnson Syndrome/Toxic Epidermal Necrolysis 890
Lead Author: Rashmi Sarkar
Co-Authors: Kaustabh Chaudhuri, K Rajendran

SECTION 15: ADOLESCENCE

130. Puberty (Delay/Precocious) 895
Lead Author: Sangita Yadav
Co-Authors: Geeta Patil, Shamik Ghosh

131. Short Stature in Adolescence 905
Lead Author: Himabindu Singh
Co-Authors: B Lakshmi Shanthi, Shilpa C

132. Teen Depression and Suicide Prevention 911
Lead Author: Preeti M Galagali
Co-Authors: KVS Saiprasad, Swati Ghate

133. Anticipatory Guidance in Adolescents 920
Lead Author: MKC Nair
Co-Authors: Piyali Bhattacharya, Shilpa Toshniwal

134. Social Media: Do's and Don'ts 925
Lead Author: Harish Kumar Pemde
Co-Authors: Newton Luiz, Reena Rathi

135. Substance Use Disorders in Adolescents 930
Lead Author: TP Jayaraman
Co-Authors: Yatesh Pujar, Kamlesh Parekh

136. Coping with Stress in Adolescents 936
Lead Author: Swati Y Bhave
Co-Authors: Jayashree K, Sandeep Kavade

137. Adolescent Sexuality 940
Lead Author: CP Bansal
Co-Authors: Vaishali Deshmukh, Sonia Bhatt

SECTION 16: PEDIATRIC SURGERY AND ORTHOPEDIC CONDITIONS

138. Cleft Lip and Palate 946
Lead Author: Ruchira Gupta
Co-Authors: Amar Shah, AS Kireeti

139. Pulled Elbow 952
Lead Author: Vijay Sriram
Co-Authors: Madhu S Pujar, Rekha Khaund Borkotoky

140. CTEV and Flat Foot 956
Lead Author: Suryakanth Kalluraya
Co-Authors: Nandkumar MK, Srisailam Kottooru

141. Developmental Dysplasia of the Hip 964
Lead Author: Ashima Choudhry
Co-Authors: SN Prashanth, Devender Gaba

142. Inguinal Hernia and Hydrocele 971
Lead Author: VVS Chandrasekharan
Co-Authors: Mamta Sengar, Aroon Trivedi

143. Phimosis 975
Lead Author: Abraham Mammen
Co-Authors: V Gopinath, Sanjay Deshmukh

144. Hypospadias 978
Lead Author: Abraham Mammen
Co-Authors: V Gopinath, Sanjay Deshmukh

145. Undescended Testes and Testicular Torsion 982
Lead Author: Shivaji Mane
Co-Authors: Arun Kumar, DM Gupta

SECTION 17: MISCELLANEOUS

146. Severe Acute Malnutrition 993
Lead Author: Upendra Kinjawadekar
Co-Authors: Manazar Ali, Shivanand I

147. Rickets 1006
Lead Author: Vaman Khadilkar
Co-Authors: Hemchand K Prasad, Preeti Singh

148. Breath-holding Spell 1013
Lead Author: C Jayakumar
Co-Authors: Pinaki Chakraborty, K Muralidhar Reddy

149. Dental Caries 1019
Lead Author: Rajesh Chokhani
Co-Authors: Ajay Gupta, Chandra Mohan Kumar

150. Temper Tantrums 1025
Lead Author: Tilak Chandra
Co-Authors: M Hrishikesh Giri Prasad, Arpita Gupta

Index 1029

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Neonatal Seizure

4

Lead Author: **Sachin Shah**
Co-Authors: **Tejo Pratap Oleti, Kumar Ankur**

Introduction

- ☑ Seizures in the newborn represent the most distinctive common manifestations of neurological disease in the neonatal period. The incidence increase with lower gestational age and birth weight and is most common in the very low birth weight (VLBW) infant.
- ☑ Estimated incidences are up to 58/100 live births in the VLBW infant and 1 to 3.5/1000 live births in the term infant.
- ☑ Most seizures during the newborn period are acute symptomatic seizures due to cerebral injury or dysfunction due to varied etiology.
- ☑ Important manifestation to alert the clinician to underlying neurological disorders.
- ☑ Seizure onset and semiology will guide in identifying possible etiology and determining appropriate management.
- ☑ Amplitude-integrated electroencephalography (aEEG) can pick up 70–80% of seizures in monitoring.

Clinical Versus Electrical Seizures

- ☑ As per the World Health Organization (WHO) recommendations, all clinically apparent seizures lasting for >3 minutes or brief serial seizures are to be treated.
- ☑ If continuous electroencephalogram (EEG) monitoring is available, all electrical seizures should be treated even in absence of clinically apparent seizures, especially if babies are paralyzed.

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Types of Neonatal Seizures

- ☑ Electrical activity that evolves over time and meets criteria
- ☑ *Electroclinical seizure:* Electrographic seizure with associated clinical signs
- ☑ *EEG-only (subclinical, nonconvulsive, and occult) seizures:* Electrographic seizures without clinical signs

Electrographic Criteria for Neonatal Seizures

- ☑ Sudden change in EEG
- ☑ Repetitive waveforms that evolve in morphology, frequency, and/or location
- ☑ *Amplitude:* At least 2 μV
- ☑ *Duration*: At least 10 seconds
- ☑ Seizures must be separated by at least 10 seconds to be considered separate
- ☑ Clinical signs may or may not be present
- ☑ EEG seizures can be as follows:
  - Unifocal—seizures arise from a single region
  - Multifocal—seizures originate from at least three independent foci with at least one in each hemisphere
  - Lateralized—seizures propagate within a single hemisphere
  - Bilateral independent—seizures occur simultaneously in two regions and begin, evolve, and behave independently
  - Bilateral—both hemispheres involved
  - Migrating—the seizure moves sequentially from one hemisphere to another
  - Diffuse—asynchronous involvement of all brain regions

Nonepileptic Phenomenon

- ☑ Roving eye movement, nystagmoid jerks, sucking, and other limb movement during sleep or in drowsy state
- ☑ May be mistaken as seizure activity
- ☑ Movement stops with gentle restrain, and no autonomic phenomena occurs
- ☑ Causes could be mild hypoxic-ischemic encephalopathy (HIE)/metabolic/drug withdrawal

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Etiology

Etiologies of neonatal seizure are given in **Box 1**.

BOX 1: Common underlying etiologies (responsible for 80–85% of seizure).

- ☑ Hypoxic-ischemic encephalopathy (38%)
- ☑ Stroke (18%)
- ☑ Intracranial hemorrhage (11%)
- ☑ Intracranial infections (5%)
- ☑ Cerebral dysgenesis (4%)
- ☑ Metabolic and genetic (12–15%)

Classification of Neonatal Seizure

- ☑ Subtle seizure
- ☑ Clonic seizure
- ☑ Tonic seizure
- ☑ Spasm
- ☑ Myoclonic seizure
- ☑ Term versus preterm **(Table 1)**

TABLE 1: Term versus preterm neonatal seizure.

Cause	*Preterm*	*Full term*
Hypoxic-ischemic encephalopathy (HIE)	+++	+++
Intracranial hemorrhage	++	+
Intracranial infection	++	++
Development defect	++	++
Hypoglycemia	+	+
Hypocalcemia	+	+
Epilepsy syndrome	–	+

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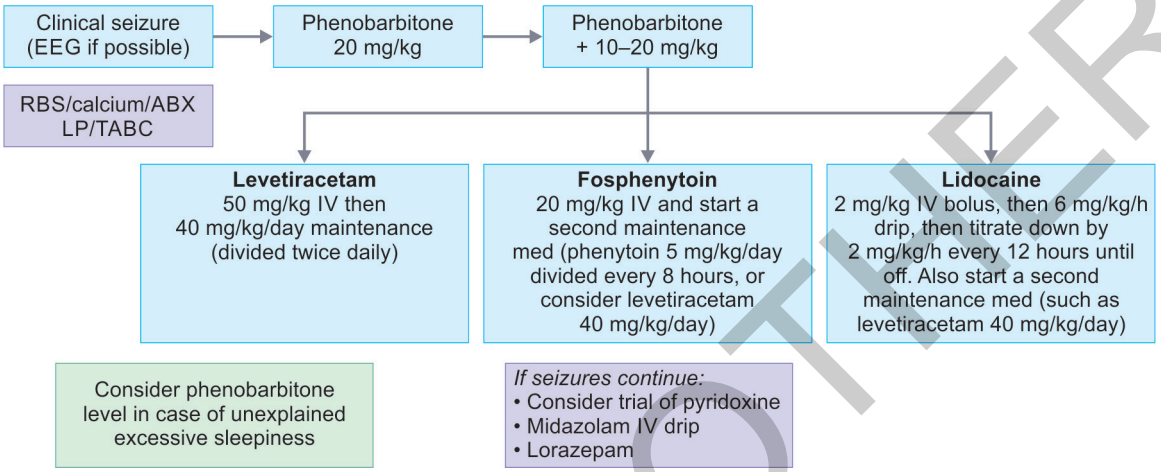
Management

Management of neonatal seizure is depicted in **Flowchart 1**.

Flowchart 1: Management of neonatal seizure.



(ABX: antibiotics; EEG: electroencephalogram; LP: lumbar puncture; RBS: random blood sugar; TABC: temperature/airway/breathing/circulation)

How to Plan to Wean the Anticonvulsants if no Clinical Seizure or EEG Awaited

- ☑ Monitor EEG (if available)
- ☑ If on phenobarbitone (PB) maintenance (get trough level, if available)
- ☑ Get MRI brain/lumbar puncture and other relevant investigations to rule out the cause of seizure
- ☑ Always attempt to wean to one drug for maintenance
- ☑ Try to stop all medication before discharge if seizure free for 48–72 hours

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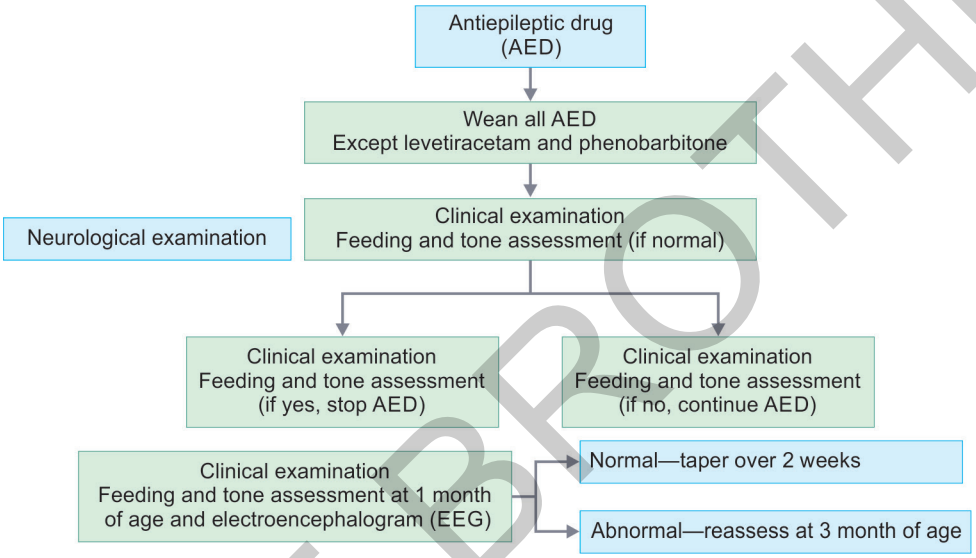
Determinants of Duration and When to Stop Anticonvulsant Therapy (Flowchart 2)

It is mainly depends on three factors:

1. Neurological examination at the time of discharge—examine for feeding pattern and tone assessment
2. Cause of neonatal seizure
3. EEG pattern

Flowchart 2: Weaning of all AEDs.



Further Reading

☑ Volpe J. Neonatal seizure. In: Volpe J, Inder T, Darras B, de Vries L, du Plessis A, Neil J, Perlman J (Eds). Volpe's Neurology of the Newborn, 6th edition. Amsterdam, Netherlands: Elsevier; 2017.

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