ESSENTIALS

ESSENTIAL PAEDIATRICS AND CHILD HEALTH

MARY RUDOLF | ANTHONY LUDER | KERRY JEAVONS

FOURTH EDITION

WILEY Blackwell

Essential Paediatrics and Child Health

This book is dedicated to the coming generations of students and their patients

Essential Paediatrics and Child Health

Fourth Edition

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Companion website

This book is accompanied by a companion website:

www.wiley.com/go/rudolf/paediatrics

- multiple-choice questions
- interactive patient scenarios
- illustrations from the book for download
- examination instruction videos

Foreword

Paediatrics and medical education have changed radically over the last 40 years. When I was a medical student in the early 1970s the student was expected to have a wide knowledge of every specialty including rare and abstruse conditions. Times have changed and now we expect students to know the basics of the subject and to be able to know how to obtain more information if required. Now the newly qualified doctor is a mere beginner in the process of assessing, diagnosing, and treating patients and receives progressive training in his or her own area of interest over years before they are experienced enough to be appointed to a specialist post. Medical education has changed to match the recalibration of what the student is required to know and paediatrics has led the way in this respect. The latest edition of *Paediatrics and Child Health* reflects the core knowledge that is required by a British medical student at the end of their paediatric rotation.

When I was a student we mostly used the textbook written by Hugh Jolly *Diseases of Children*. This was first published in 1964 and it rapidly became a core text for medical students studying paediatrics. When I undertook my paediatric rotation at medical school in 1972, the book was in its second edition and when I did my first house position post in paediatrics at Charing Cross hospital, London where Hugh was a consultant it was in its third edition. Paediatrics was changing considerably, particularly in respect to advances in neonatal medicine and the introduction of more modern investigation techniques. Hugh asked me to assist him in updating the fourth edition and kindly added me as a co-author on the fifth edition published in 1985 when I was a newly appointed consultant paediatrician.

Hugh sadly died in 1986 and knowing that he was dying had asked me to continue his book, and in 1990 I published as editor the sixth edition of the renamed *Jolly's Diseases of Children* with the assistance of a number of colleagues. At that time undergraduate education in paediatrics was changing enormously; students were spending less time on children's wards and many children were being seen by doctors based in the community, an area previously relatively neglected in textbooks.

I had the great pleasure of working in Leeds at that time with Mary Rudolf who had been appointed as a community paediatrician and we decided to produce a totally new undergraduate textbook on the basics of paediatrics including the way that children presented to doctors both in primary care and at hospital. In particular, a section on the adolescent was added. This book was entitled *Paediatrics and Child Health* and was published in 1999. It grew from Hugh Jolly's vision of holistic child health and understanding how children reacted to their environment, but took a modern approach to the way that paediatrics has evolved in the modern medical undergraduate curriculum. The second edition was published in 2006 and Dr Tim Lee joined us in collaboration with the third edition in 2011. Although I am no longer involved in writing, this fourth edition continues Hugh's legacy of showing how health and disease in children are closely related and is an up-to-date book for undergraduates to learn from.

Malcolm Levene
Emeritus Professor of Paediatrics
July 2018

Preface to the fourth edition

He who studies medicine without books sails an uncharted sea, but he who studies medicine without patients does not go to sea at all.

William Osler

In the preface to the third edition of this book, Benjamin Disraeli was cited as saying that one 'cannot learn men from books'. William Osler, one of the fathers of modern Medicine, endorses this view but balances it with the notion that books provide the charts needed for the navigation of the stormy seas of suffering and disease. Even though more than a century has passed since these words were written, the truth behind them was never so compulsively true as now. Witness the increasing flow of quality publications in every sphere of Medicine, not least in Paediatrics.

Since the last edition of this book was published, advances in the understanding of human biology and medical practice have accelerated at a dizzying pace along with society and people's expectations. Today's patients are increasingly informed by instant on-line communication and information, and technology is transforming the practice of Medicine and its management. These developments and more, constitute huge challenges for the traditional doctor–patient relationship and the bioethical environment in which it exists, and from which it derives its acceptance in society and its professional legitimacy. These challenges have to be met by equally fundamental, and responsible, changes in the way that Medicine is taught and learnt. In this new and revised edition, we have tried to reflect these seismic shifts in a manner that presents to the student a clear, comprehensive and up-to-date reflection of contemporary Paediatrics.

Chapters have been revised and extensively re-written to ensure that the latest information about diagnosis, investigation and management is discussed. New chapters have been added on communication and prescribing, together with a new introduction. New additions include reference to national guidelines and flow charts and diagrams. The recent emphasis on outcome-based education has been reflected through clear highlighting of the key competences expected of students. Scientific aspects that strengthen the book include new imaging techniques, genetics and epigenetics, environmental medicine, aspects of emergency paediatrics, paediatric pharmacology, toxicology and lifestyle paediatrics. The sections on student experience, learning and self-assessment have been recast, through chapters on doing well in paediatrics and practice multiple-choice questions.

The on-line edition of the book is now an independent, although closely linked, entity. It continues to include the printed version as well as physical examination instruction videos, but now also provides new experiences: two 'mock' examinations are provided, which students can use to test their skills in taking a time-limited challenge in the same way as their final examinations are given; and a complete set of interactive patient scenarios are presented, which provide readers with an on-line simulation opportunity to work through real-life clinical problems, with extensive feedback discussion provided at every point and for every choice. These both test clinical knowledge and judgement and also provide opportunities for curious and enquiring students to broaden their knowledge and deepen their reading into more detailed and specialised channels. We hope that students of every ability will find a fascination with paediatrics stimulated and their interest awakened. If we achieve this, then our purposes will have been fulfilled and this new edition of our book will take its place as a landmark in the education of students in paediatrics.

Acknowledgements

We acknowledge the considerable energy and time that Professor Malcolm Levene and Dr Tim Lee invested in writing the first three editions of this textbook. We are grateful to the following who have contributed significantly to chapters in the book: Dr Michael Harari, Professor Eric Shinwell, Dr Mervyn Jaswon and Kim Roberts, and Dr Micha De Vries for photographs for the cover. We are grateful too to the following who have contributed illustrations: Dr Elizabeth Morris, Dr Rosemary Arthur, Mr P.D. Bull, Dr Tony Burns, Professor Martin Curzon, Dr Mark Goodfield, Dr Phillip Holland, Mr Tim Milward, Dr P.R. Patel, Dr John Puntis, Mr Mark Stringer, Dr David Swirsky, Ms Clare Widdows, Dr Susan Wyatt, Dr Jane Wynne and Matteo Gray and his mother Tina Meharry.

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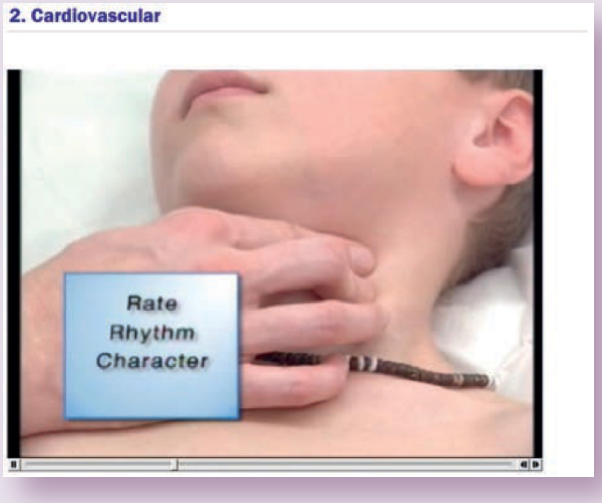

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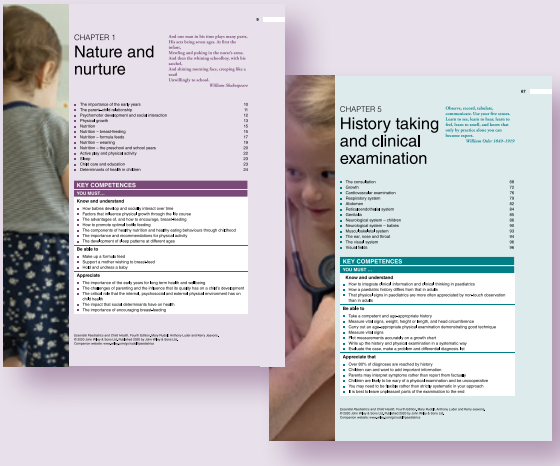

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Online Interactive Qs

Red flags: Worrying symptoms and signs indicative of serious conditions that you must not miss are highlighted with red flags.

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At a Glance boxes: These boxes concisely summarize the aetiology, clinical features, investigations and management of common and important conditions for quick re-cap.

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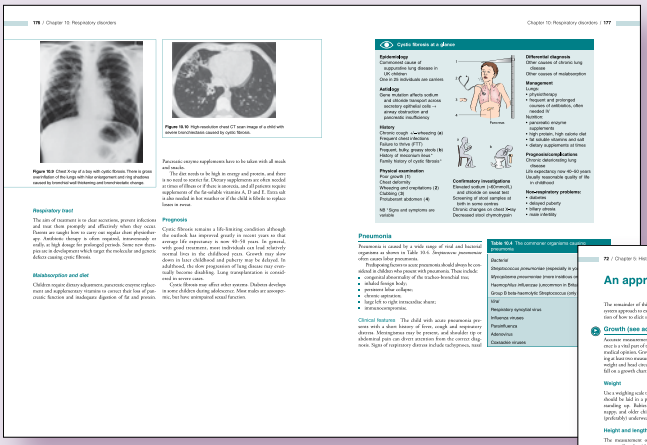

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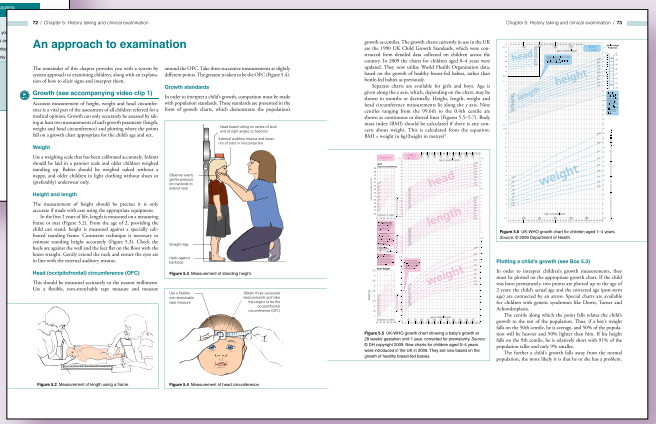

We hope you enjoy using your new textbook. Good luck with your studies!

INTRODUCTION: Doing well in paediatrics

How this book can help you learn paediatrics and acquire paediatric skills:

- It guides you step by step on how to work up common symptoms and signs
- Important and common conditions are described in detail
- It helps you prepare for OSCE examinations through
  - Videos on how to examine each organ system
  - Downloadable examination checklists for use by the bedside
- You can test your knowledge through a bank of examination questions and two, timed practice examinations
- Links are provided to key evidence-based guidelines
- There are interactive questions if you wish to go into paediatric problems in further depth

Essential Paediatrics and Child Health, Fourth Edition. Mary Rudolf, Anthony Luder and Kerry Jeavons.

Companion website: www.wiley.com/go/rudolf/paediatrics

Background

Paediatrics is a relatively young specialty in Medicine. Although the medical problems of infancy and childhood were discussed in ancient times, the first hospitals for children in the Western world were opened only in the nineteenth century, and the professional specialty developed into its modern form during the twentieth. Thus, paediatrics is still very much a work in progress; and what progress there has been! Beginning as a branch of internal medicine, paediatrics has like a child, gone through its growth stages and is today a mature and critical part of any health system.

We have seen the emphasis shift from hospital-based treatment, through social concerns and preventative initiatives, to today's complex picture of hospital-based intensive and surgical care working side-by-side with fully developed ambulatory and community health services including rehabilitation, palliative and health maintenance programmes. There have been revolutionary changes of approach where it is recognised today that most common paediatric problems can and should be managed outside the hospital, with admission being often a last resort and then only for as short a time as possible. In this respect paediatrics is a leader in Medicine.

There has also been an increasing awareness that health and disease in childhood has important implications for adults, family and society. Thus we now know that many of the 'big killers' in adult life like hypertension, handicap, immune disorders, addiction, diabetes, heart and vascular disease, obesity and even cancer, have their origins and beginnings in the paediatric age group, and that the paediatrician's responsibility is far wider than simply treating individual children, important as that is. The scientific underpinning of this holistic understanding has expanded rapidly in recent decades with the explosion of knowledge in genetics, epigenetics, bioenergetics, therapeutics and, most recently, microbiomics.

The aim of this book is to present you with the essential principles and practice of paediatrics in a clear and consistent way that will aid learning, develop skills, arouse interest and hopefully inspire love for this fascinating profession.

How to get the most out of your paediatric rotation

The aim of the paediatric rotation is to provide you with a broad understanding of the common and important illnesses and disorders of childhood, child health and its maintenance, and child growth and development. The underlying purpose is to make sure that all medical graduates, whatever specialty they ultimately choose, know when children need investigation or intervention and the principles of correct management. The focus is on how children present, and management, rather than specialist areas in detail. The ability to take a good paediatric history and conduct an effective paediatric physical examination are fundamental skills that you need to acquire.

As with any clinical placement, you will get the most out of your time in paediatrics by:

1. Becoming familiar with the location and layout of the wards, departments and clinics you will be working in, including academic and other areas.
2. Getting to know nursing and other allied healthcare staff as well as the principal teaching and administrative staff, with necessary contact details and on-line communication resources.
3. Attending registration formalities and obtaining required means of identity.
4. Learning the structure of the rotation including the time and place of activities.
5. Making sure you have all the necessary materials to hand, including syllabi, curricula, skills list, any learning aids and logbooks, and personal equipment.
6. Making sure that you understand how to access library and other academic resources you will need.
7. Most importantly – making your own learning schedule and keeping to it. Remember that after intensive activity like preparing a seminar, doing a test or even being on-call in the evening you need time for rest and recreation.

Figure 1 Senior clinical teacher and medical students discussing patients at a ward meeting.

Relating to children of all ages and understanding their developmental status are important skills which are most easily acquired on the wards where young patients and their parents are 'captive', often with time to spare. Take every opportunity to relate to them informally or simply observe them. Playing with them, talking to them and helping with their care by feeding and offering to assist in changing nappies will help you appreciate child development in a way that you can never learn from books. Try 'guessing' children's ages from what you observe. Observing behaviour, activity, colour and respiration from a distance will also help you develop your clinical skills in identifying sick children who may not participate in a formal examination.

Combining reading with clinical experience is the most effective way to learn. This book has been laid out so that each clinical chapter is in two parts: the first part provides you with the work up of common and important symptoms and presentations, guiding you through the history, physical examination and investigations, and leading you to make a coherent differential diagnosis. The second half covers key conditions in detail required at the undergraduate level. Any duplication of coverage is deliberate, as we recognise that learners do not generally read whole chapters but rather sections that they need at a particular time.

The chapter on physical examination shows you how to examine each organ system and is accompanied by purpose made video clips demonstrating the correct technique you require to elicit signs competently. Downloadable reminders or checklists for each system allow you to easily check in real time whether there were features you have omitted.

For those of you who wish to learn more in depth there are a series of on-line interactive questions you can access, which offer you the opportunity to work through, in a realistic manner, actual clinical cases that mimic what you are likely to see in the emergency department, clinics and wards. The purpose is to introduce you to some core topics and the associated clinical thinking at a more advanced level than required for examination purposes alone but based on your studies and teaching during your rotations. The cases are designed to lead you through logical steps in the evaluation of clinical problems in which correct and incorrect possible choices are both explained. They are based mainly on history, physical examination and investigations, but some diseases or pathophysiologic details that are not necessarily included in the main book are discussed, since they are necessary for the management of real-life situations. Finally, there is a denouement in which some details of management and follow-up are described.

Ways you may be assessed

There are a variety of ways you may be assessed to judge your progress. Departments should provide you at the start of the rotation with the types of assessment that will be used. These may include:

- *Student logbooks*. Logbooks record your various educational experiences; for example, procedures, activities and conditions that you have witnessed and clinics you have attended. They may need to be countersigned by supervising clinicians or other staff and submitted at the end of the course to demonstrate that you have achieved appropriate clinical experience.
- *Workplace-based assessments* (*WPBA)*. Students are often required to conduct a number of clinical examinations – for example, a respiratory examination, developmental examination, etc. – under direct observation of a supervising clinician, who then fills out a formal WPBA feedback form. You are required to submit these forms at the end of the course to demonstrate that you have acquired good clinical examination skills.
- *Multi-source feedback (MSF)*. Occasionally you will be asked to arrange a multi-source feedback, where members of a multidisciplinary team provide feedback that focuses on your clinical skills, communication skills and professional attitude.
- *Written case reports*. Case reports require a detailed history and examination, followed by a list of key problems and concerns, an investigation plan, the differential diagnosis and initial management plan. They are generally written in a similar way to entries made in children's medical records. Case reports allow for assessment of many of the key skills that you are expected to acquire during the attachment.
- *Written feedback from supervising clinicians/course teachers*. These reports are often helpful in identifying the quality of your skills and attitudes, as well as when you are struggling with the course.
- *Written examination*. Most courses have some form of written examination, usually extended matching questions (EMQ), or multiple-choice questions (MCQ). Some of the questions may be based on images, or on written stems. Stem questions usually focus on testing diagnostic reasoning, and you are required to choose the most likely diagnosis or next intervention, based on a short clinical description or 'stem'. The electronic version of this book now includes examples of interactive clinical questions for extended learning and practice.
- *Objective Structured Clinical Examination (OSCE)*. OSCEs consist of a circuit of short 5- to 15-minute stations, mostly with an examiner at the station and a real or simulated parent and/or child. They focus on key clinical skills such as history taking, counselling or clinical examination. Some may include video clips, photographs or investigations that you need to interpret. Students rotate through all of the stations in turn.

Preparing for examinations

In order to make sure that you perform well in written examinations, you need to work at acquiring a broad knowledge of the whole syllabus (Box 1). The best way to prepare is to attend

Box 1 Tips for performing well in paediatric assessments and examinations

- Read the course material carefully at the start of the attachment
- Check through all the ways you will be assessed and how these assessments contribute to your final mark
- Take every opportunity to meet children and parents, and take a history and perform an examination as often as you can
- Use the bedside checklist to make sure you do not omit key aspects of the examination
- Attend all of the available course seminars and workshops, as these will often cover much of the course syllabus
- When you have seen a child with a particular condition, read the appropriate section of this textbook and consider the differential diagnoses
- Watch the video on the companion website showing how to examine children section by section and practise the technique on children on the ward
- Try and complete your in-course assessments as soon as you can, rather than doing them all in a rush at the end of the attachment
- Practise written exam questions (MCQ, EMQ) and read through the topics for questions you get wrong
- Practise OSCE scenarios with colleagues and give feedback to each other

the whole course and its seminars and workshops. It is especially worthwhile to spend a good amount of time seeing children in any setting – community and hospital, acutely via the accident and emergency department, and in outpatient clinics. Remember, what you see you tend to remember, so do maximize every possible opportunity to extend your clinical exposure.

Many multiple-choice questions (MCQs) and extended matching questions (EMQs) test your ability to link symptoms and signs to particular diagnoses. Reading through the chapters in this book will be good preparation. The 'symptoms and signs' section of each chapter, guides you systematically to link particular presentations to relevant diagnoses. A box lists the most significant symptoms and signs providing you with clues as to how to come to a differential diagnosis.

An important skill to master is the exam technique itself. Read the stem carefully and do not skim; often single words or nuances can alter the significance of the question and this can cause misunderstanding and lead to an incorrect answer. Remember that your first considered response is likely to be the correct one; changing answers later is usually counterproductive. Timing is critical. Look at the whole paper and do not dwell over long on hard questions, there may be a few simpler ones you can get credit for in the same time. Lastly, do not try to second guess the results; self-evaluation is notoriously unreliable. After the exam, relax!

An important aspect of preparation is to practise answering exam questions, such as those provided in this book. Many courses will also provide mock questions or past papers. This enables you to familiarize yourself with the question structure and technique, as well as checking your knowledge. In order to learn from questions that you get wrong, you should try to understand why you chose the wrong answer. Reading through the section of this book appropriate to the question stem will help. Chapter 26 – 'Practice MCQ and examination questions' – provides you with a bank of sample questions to try. If you get any wrong, you are guided to the section of the book that will provide you with the correct answer. You also have two exam papers provided which you can use to time yourselves as well as providing you with a mark. Try to do these within the recommended time only, as this will provide the best simulation of an actual examination experience.

Preparing for Objective Structured Clinical Examinations

OSCEs assess basic clinical skills. At each of the stations you are asked to interact with a patient or a simulated patient. Your performance is scored by an examiner with a checklist or rating scale. Often an actor or simulated patient may also give a score. Scores may be awarded for content and style separately.

Many students get exceptionally nervous prior to OSCEs. The rigid time limits for each station, and the need to move on rapidly to a completely new station tend to fill students with apprehension, especially if there has been a mishap on a previous station.

The key to OSCEs is to ensure that during the paediatric course you practise all the skills you may have to perform in the OSCE in real life, with real children and parents. It helps if you

Figure 2 A simulation exercise during an OSCE examination.

aim to perform at least one detailed history and examination every day during your paediatric attachment, so that the skill becomes second nature by the time of the examination. The website associated with this book provides videos to demonstrate the correct technique for examining children, and you will find it most helpful if you watch it section by section rather than in one go. In addition, the specific aspects of the history and physical examination relevant to each presenting symptom and sign are provided for you at each chapter's opening and as a downloadable checklist. Remember, too, it is always helpful to spend time observing how experienced clinicians counsel parents and children.

Try to practise the scenarios with student colleagues prior to the exam. Common counselling scenarios should be listed in your course documentation; they often include immunisation, enuresis, soiling, febrile convulsion, asthma and constipation. Remember that marks are given not only for appropriate content, but also for good counselling skills such as active listening, eye contact and emotional empathy. Practise by counselling a student colleague and then asking them to give you feedback.

On the day of the OSCE, try to channel your nerves into performing well. Often there is a 'change-over' minute between each station, so make the most of this by trying to forget your performance on the previous station, and focusing on the next station. There may be some written information outside the station for you to read. If so, use this to plan how you will approach the next station. For example, if the written information suggests the station concerns the examination of the lower limbs in a child with an abnormal gait, then think what the differential diagnosis might be. Plan to ask if the child is able to walk for you to demonstrate the gait, as well as planning to observe the child's legs and assess tone, power and reflexes. Remember, as you enter the station, to take time to introduce yourself well to both parents and children, as a good friendly start really helps the rest of the station go well and will help you make the most of the time available. And always wash your hands!

Endnote

Learning paediatrics should be an enjoyable, inspiring and interesting experience for every student, not least because children are naturally fun to work with, even if ill. They often have a more innocent or optimistic attitude than their parents. In this chapter we have given you practical tips on how to get the most out of your rotation. There may seem a lot to learn but once you are in the thick of things it should fall into place. If you are diligent, the evaluation tests and examinations should not pose any special problem; especially if you do not leave everything to 'cramming' at the end. We hope this book is useful in guiding your learning through your paediatrics rotation and, perhaps for some, may lead to a lifelong attachment to this very special specialty.

Part 1
About children

CHAPTER 1

Nature and nurture

And one man in his time plays many parts,
His acts being seven ages. At first the infant,
Mewling and puking in the nurse's arms.
And then the whining schoolboy, with his satchel,
And shining morning face, creeping like a snail
Unwillingly to school.

William Shakespeare

KEY COMPETENCES

YOU MUST…

Know and understand

- How babies develop and socially interact over time
- Factors that influence physical growth through the life course
- The advantages of, and how to encourage, breast-feeding
- How to promote optimal bottle feeding
- The components of healthy nutrition and healthy eating behaviours through childhood
- The importance and recommendations for physical activity
- The development of sleep patterns at different ages

Be able to

- Make up a formula feed
- Support a mother wishing to breast-feed
- Hold and undress a baby

Appreciate

- The importance of the early years for long term health and wellbeing
- The challenges of parenting and the influence that its quality has on a child's development
- The critical role that the internal, psychosocial and external physical environment has on child health
- The impact that social determinants have on health
- The importance of encouraging breast-feeding

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Companion website: www.wiley.com/go/rudolf/paediatrics

This chapter describes children's neurological, psychological, emotional and physical development. It discusses the importance of the early years and parenting, children's nutritional, physical activity and sleep needs, and the impact that social determinants have on children's health.

The importance of the early years

The early years are a period of enormous growth and development. Much of the infant brain develops after birth, shaped by events in the first years of life. Babies have relatively few synapses at birth. Over the next few years synapses develop and are refined by stimulation and experience: nature interacting with nurture.

The formation of synapses follows a 'bottom-up' sequence, with lower level brain 'circuits' wired first. The skills and abilities that emerge in young babies reflect this sequence. From a focus on bodily functions such as hunger and the need for sleep, babies rapidly start to explore the world around them, develop emotional bonds and then manifest higher brain functions such as reasoning, language, self-control and language.

Neuronal circuits strengthen the more that experiences (positive or negative) are repeated. Over time they stabilize, making alteration harder at a later date. By the age of six years 'pruning' starts where infrequently used synapses are eliminated and well-used ones are retained (see Figure 1.1). Pruning ensures that the most important networks of synapses grow and become more complex.

The developmental process is not uniform and there are periods, or windows, of opportunity when specific parts of the brain are particularly developmentally sensitive. Vison and hearing develop first, peaking in the first few months, followed by language circuits later in the first year and higher cognitive function peaking during the second year of life (see Figure 1.2).

Influences on early development

Responsive caregiving and positive stimulation are essential for development:

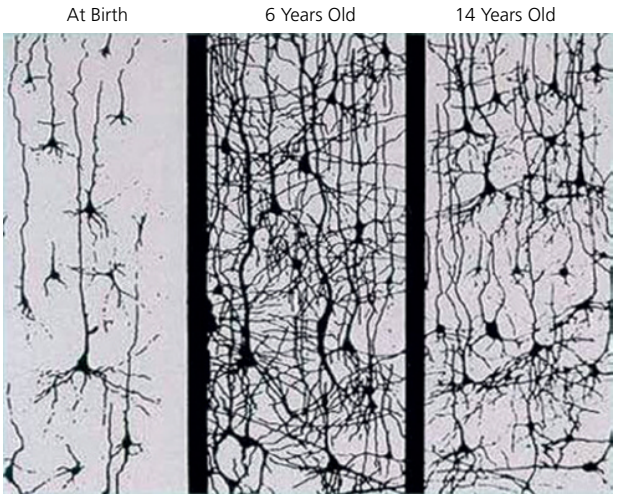


Figure 1.1 Synaptic density in children at birth, 6 years and 14 years old. *Source:* Reproduced with permission from Families and Work Institute (1997) New York.

Relationships

Attachments through one-to-one interaction with adults begin developing at birth. Babies who form secure attachments develop a secure sense of self and a lifelong ability to form healthy relationships, while those whose earliest attachments are negative or insecure may have continuing difficulty in developing positive relationships.

Nutrition

A balance of nutrients is needed for healthy brain growth and development. Undernourished children grow more slowly and have less energy for learning and exploring. When there is severe undernutrition, brain growth may be slowed and affect physical and emotional development.

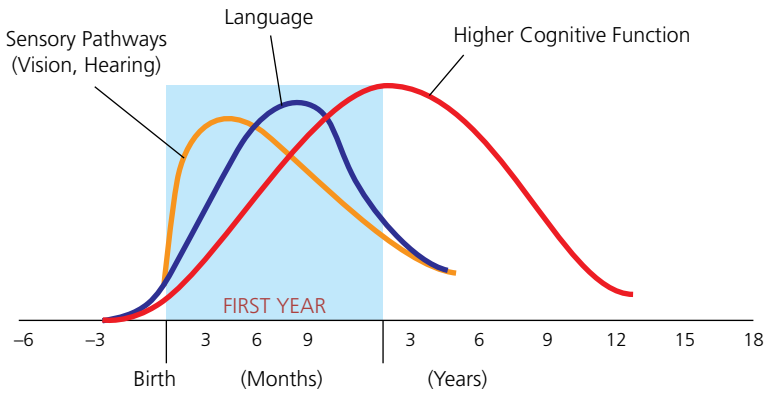


Figure 1.2 Sequence of development of neural circuits illustrating developmentally sensitive periods.

Stress

Stress can have a profound effect. Three different levels of stress are described:

- *Positive stress* – everyday events such as minor injuries, meeting new people or experiencing frustration are inevitable and contribute to building emotional resilience.
- *Tolerable stress* – time-limited events such as moving home, parental separation, changing child care or a sibling's birth can profoundly affect a child but are usually tolerable if there is a nurturing adult supporting the child emotionally.
- *Toxic stress* – when a child experiences physical and emotional abuse, neglect or severe parental mental health problems, long-term damage can occur resulting in learning, behaviour and emotional problems.

Figure 1.3 shows structural changes in the brain that were found in a child suffering from severe neglect.

Poverty

Children growing up in extreme poverty are particularly susceptible to stress, poorer nutrition and less nurturing stimulation. MRI scans show that in these circumstances the brain's grey matter is reduced, with lags in the development of areas of the brain responsible for language, cognition and spatial perception.

If babies and young children's life circumstances are not ideal for optimal development, it does not inevitably mean that brain development is affected. The brain has a good degree of plasticity, so some effects of early deprivation can be subsequently mitigated. It is, however, more difficult for the child to develop skills once specific periods of sensitivity have passed and, in some areas, such as vision, emotional stability and language, early damage can never be completely repaired.

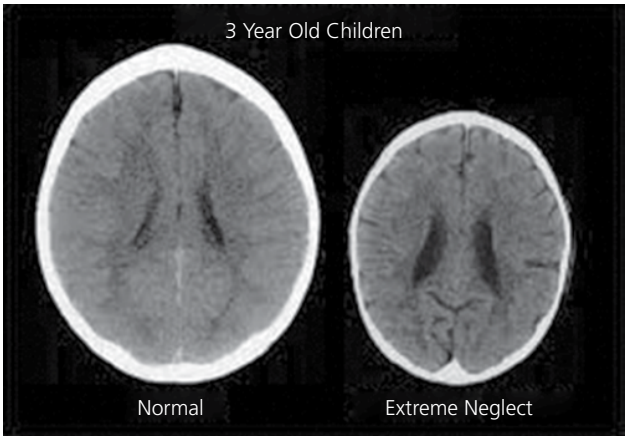


Figure 1.3 Abnormal brain development following neglect in early childhood: The CT scan of a healthy 3 year old (left) and a 3 year old suffering from severe sensory-deprivation neglect, showing microcephaly, enlarged ventricles and cortical atrophy. *Source:* Permission obtained from Springer Nature.

The parent–child relationship

The relationship between baby and parent has a particular impact on the emerging capacity for rational thought, empathy and self-control, which develop almost entirely in response to social experiences. How parents talk and listen to their baby, play with them, comfort them and cuddle them influences their development. When babies and young children experience consistent emotionally responsive parenting, it helps to develop neurological pathways that, over time, help them to manage their feelings and calm themselves as they grow older.

Babies need stressful experiences managed for them. Being held and cuddled regulates babies' arousal system, triggering a hormonal response to reduce the stress they are experiencing. If they do not get the soothing they need in early life, children can grow up with an over-sensitive stress response – prone to experiencing the world as a hostile and threatening place and making them more vulnerable to depression, anxiety and stress-related physical illnesses in later life.

Attachment

Attachment has been defined as the propensity to make strong emotional bonds and is a basic component of human nature. A human baby is extremely immature and dependent at birth and has to rely on motivating adults to protect, feed, care for and comfort them. From the moment they arrive in the world, they are focused on the adults around them – showing a preference for faces and face-like patterns, and quickly learning to show a preference for their mother's voice, smell and face. They quickly develop an understanding of facial expressions, distinguishing surprise, fear, sadness, anger and delight, and express this by making corresponding expressions of their own.

The fact that babies are able to make connections between what they do and the response they get primes them to learn from early interactions. Children whose early interactions communicate that they matter and are loveable are more likely to grow up with self-respect and confidence in their own worth and trust others. Babies and young children with secure attachment feel able to rely on their parents as a source of comfort and safety in times of upset and stress. This is related to greater self-confidence, improved social skills and higher school achievement.

Parenting styles and their influence

How parents respond to their children has an enduring impact on children's sense of self, relationships and wellbeing. Studies of parent–child interactions describe four core parenting styles that are based on the extent to which the parent is more or less responsive to their child, and is in charge as an adult (see Figure 1.4).

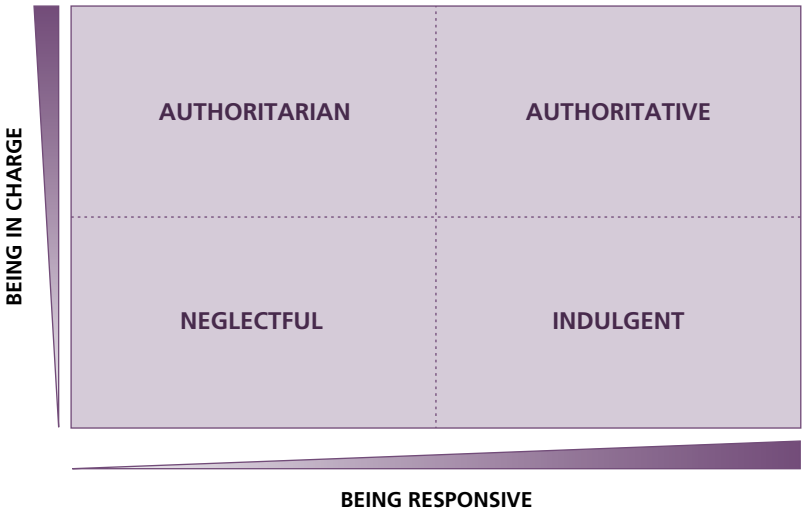


Figure 1.4 Styles of parenting: the four styles relate to how responsive parents are to the child and how much they are in charge within the family.

Authoritative style The optimal style is authoritative where the parent is sensitive and responsive to their child's needs and emotions, yet maintains appropriate boundaries for behaviour. Authoritative parenting is linked to a number of positive outcomes such as social development, self-esteem, mental health, higher academic achievement, lower levels of problem behaviour, less depression and less risk taking.

Authoritarian style Parents with a largely authoritarian style exercise a high degree of control and tend to be very restricting without taking children's needs, feelings and preferences into account. Children raised in this way are likely to become anxious and withdrawn, or rebellious and defiant.

Indulgent style The indulgent style is a kind but weak approach to parenting, in which the parent is responsive to the child's wishes and demands but is unable or unwilling to set limits and maintain boundaries. Children as a result may tend to become demanding and lack security.

Neglectful style A neglectful parenting style differs in that the parent is disengaged, neither in charge nor responsive to the child. Parents may be unaware of the child's needs and set few boundaries. Children as a result may be confused or resort to extreme behaviour as a way of attracting attention.

Parenting is influenced by many factors. How comfortably parents relate to a baby depends on their mental health, ability to provide for the baby, confidence and self-esteem, levels of support, emotional maturity and their cultural background. Health professionals have a key role in supporting parents, particularly as parents are so often bombarded with conflicting advice from family and friends. Common parenting difficulties and how they can be addressed are discussed in Chapter 21.

Psychomotor development and social interaction

Babies are born into a social world and through interacting initially with their parents, then other close carers and eventually other children and adults achieve full social development.

Early social development is divided into discrete periods corresponding to developmental landmarks; each period being an important milestone. More detail about developmental milestones and how to assess them are covered in Chapter 6. Here you are provided with an outline of a child's development through the stages of childhood. Development cannot be accelerated from outside, but external factors, particularly environment and to a lesser extent illness, can retard it.

Babyhood and the preschool years

0-2 months

Mothers of new babies 'bond' with their baby during the first hours and days after birth. This is not an automatic process and is facilitated by close physical contact. Mothers who are separated from their babies after birth (e.g. because they are sick or premature and require admission to a neonatal unit) find bonding more difficult. For this reason, parents should be encouraged to handle their babies even when their baby is receiving intensive care.

Infants are born with a variety of needs that must be met by their parents. In the first 2 months babies start to adapt their behaviour into states of arousal. Sleep and wake cycles begin to emerge and are influenced by routine in the house. The longest period of sleep usually occurs in the night.

Infants show a great degree of alertness and are particularly attracted to human faces and the spoken word. Contact is

achieved with the mother particularly during feeding. Mothers and babies coordinate their behaviour and take turns to initiate contact by means of alternating sucking with pauses for eye contact. It appears that infants are programmed to respond to their carers in particular ways, and in turn carers are profoundly influenced through their own programming to stimulate the infant and to respond to the baby's contact. A major milestone in the development of babies as social beings in these early weeks is the start of the first smile (at around 6 weeks).

2-5 months

A major developmental change that occurs in the first weeks is the infant's visual development. At 2 months a baby can sustain eye contact, and this is a vital stimulus for parent–child interaction. Over time infants show progressively more gaze interaction, and parents respond with facial expression, speech and intonation.

Another important milestone is the beginning of vocalization. When babies start to babble, carers respond as if engaging in 'conversation'. They respond to their baby's sounds by questioning or talking to the infant, with pauses for a response. Although infants do not understand the meaning of their carer's speech, the pattern and interaction are essential for the child's own language and social development.

5-8 months

At this age babies begin to pay more detailed attention to objects. They begin to reach for toys and so start to explore the inanimate world. Through interaction with their carers, simple play starts to emerge. At 6 weeks of age babies spend about 70% of contact time regarding their carers, but by 6 months two-thirds of the time is taken up with regarding the rest of the world. First contact with objects is by gaze and later by pointing.

At this stage too, infants transform from being egocentric to realizing that they live in a world which is shared with people and objects.

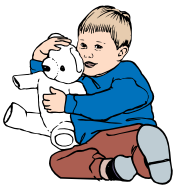
8-18 months

During this period mobility rapidly develops and children start to leave the safety of their carer to interact further with the environment. They begin to initiate contact rather than simply reacting to it, and the concept of reciprocation begins to emerge. They can play 'peek-a-boo' and control the game by adapting their response to the adult's. They begin to 'learn the rules' of games and of social interaction in general. They begin to use carers to obtain a desired object, and can also manipulate objects to attract adults' attention.

At this stage, babies also learn to associate their cry with response and, for example, know that if they are uncomfortable due to a dirty nappy, relief will be provided. Babies who are institutionalized become apathetic if their cries are unanswered, because communication has been extinguished.

In the first half of the second-year babies begin to take more interest in other children. Initially children play side by side, occasionally sharing a toy. By 18 months they may play together, but there is less vocal contact than when they are engaged with an adult. Carers, particularly parents, are the principal influence on social development at this stage.

18 months and beyond



By 18 months children begin to communicate verbally using speech to describe an event or effect a wish. Make-believe play develops by 2 years, when children use familiar objects to reconstruct events. Examples include using a brush to brush their hair or 'cooking' with pots and pans. They also develop the ability to recognise shapes, including letters (which is the first stage of reading), and then to copy shapes with a pencil.

School-age children

Motor, language and social skills continue to develop rapidly during the school years. Horizons are broadened by starting school, and often for the first time, children need to learn to function outside the security and safety of their own home. Expectations for appropriate behaviour in a variety of situations increase. During school years children also begin to develop a conscience and an understanding of right and wrong.

Socialization is particularly important at this age, and children need to learn to relate to a variety of other children and adults. Play is an extremely important part of this process and brings benefits far beyond its impact on physical development and motor skills. It is necessary for children's happiness and well being, impacts on the quality of friendships, cultural understanding, and social, emotional and cognitive functioning, and allows the development of imagination, creativity and exploration. Through play children practise adult roles, learn a variety of competences, enhance their academic performance, and work out how to handle challenges, work in groups, make decisions and develop leadership skills.

Adolescence

Adolescence bridges childhood and maturity and is a period of biological, psychological and sociological maturation. This is discussed in detail in Chapter 25.

Physical growth

Growth and development are intimately related but are not necessarily dependent on one another. *Growth* is a combination of increase in the number of cells (hyperplasia) and in the size of cells (hypertrophy). *Development* is an increase in

complexity of the organism due to the maturation of the nervous system. A child may develop normally but be retarded in growth, and vice versa. Brain injury does not necessarily cause impaired growth, although many children who have severe intellectual disabilities are small due to malnourishment.

Factors that affect growth

Growth is influenced by a number of semi-independent factors (see Box 1.1):

- *Genetics*. Growth patterns and final height are largely genetically determined. A normal child's final height can be predicted to fall close to the centile midway between the parents' centiles.
- *Hormones*. The principal hormones influencing early growth are growth hormone and thyroid hormone. The sex hormones play an important part in the pubertal growth spurt. Disturbance of any of these affects a child's growth.
- *Nutrition*. World wide, malnutrition is an important factor that influences growth, and is the major factor accounting for differences in height observed between developing and more developed countries. Overnutrition, a leading cause of obesity, is on the increase.
- *Illness*. Illness causes a child's growth to slow down. If the illness is short-lived, rapid catch-up occurs. Chronic illness can affect growth profoundly and irreversibly.
- *Psychosocial factors*. Sociodemographically, children and adults from higher socioeconomic classes are taller than their peers from lower classes. An adverse psychosocial environment, particularly if there is emotional neglect, can have a profound effect on a child's growth.

Growth through the life course

Growth in infancy

The rate of growth in the first year of life is more rapid than at any other age. Between birth and 1 year of age, children on average increase their length by 50%, and triple their birthweight. Head circumference increases by one-third. During the second year of life the rate of growth slows down and babies change so their shape takes on the leaner and more muscular appearance of childhood.

Growth in the preschool and school years

In the preschool years a child continues to gain weight and height steadily. Beyond the age of 2 or 3 years until puberty, the growth rate is steady at about 3–3.5 kg and 6 cm per year.

Growth in adolescence

Adolescence is characterised by a growth spurt which occurs under the influence of emerging sex hormone levels. During the 3 or 4 years of puberty, boys grow about 25 cm and girls 20 cm. Growth in the pubertal years is discussed in Chapter 25.

Catch-up growth

During a period of illness or starvation the rate of growth is slowed. After the incident children usually grow more rapidly, catching up towards, or actually to, their original growth ('catch-up growth'). The degree to which catch-up is successful depends on the timing of onset of slow growth and its duration. This is particularly important in infants who have suffered intrauterine growth retardation (see pp. 434–6), and who may have reduced growth potential.

In nutritionally compromised children, weight falls before height is impaired, and head growth is the last to be affected. If growth has been slowed for too long or into puberty, complete catch-up is not achieved. Early detection of children with abnormal growth velocity patterns has important therapeutic implications. Early treatment is more likely to ensure that acceptable adult height is achieved.

Organ growth

Not all body systems grow at the same rate, and in some respects the growth rates of some organs are independent of others. Full maturation is not complete until the end of the second decade.

Box 1.1 Factors necessary for normal growth

- Genetic potential (mid-parental height)
- Optimal intrauterine nutrition
- Appropriate postnatal nutrition
- Good health
- Normal psychosocial factors (nurture)
- Normal hormonal milieu

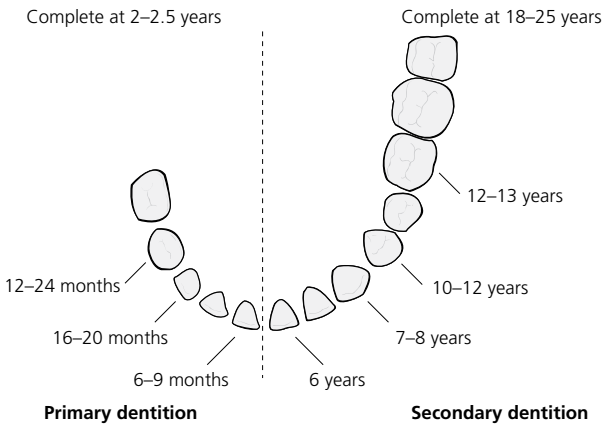


Figure 1.5 Dental development, showing the age at which teeth generally erupt.