



La-Net

PAE 504

CHILD HEALTH AND PRIMARY CARE



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Course code: PAE 504

Course title: Child Health and Primary Care

Course credit load: 3 Units

Series 1: Immunisation and the National Programme on Immunisation

- **Part 1.1: Vaccine Types**
 - Sub Part 1.1.1: General principles of immunisation
 - Sub Part 1.1.2: Live attenuated and inactivated vaccines
 - Sub Part 1.1.3: Subunit, toxoid, and conjugate vaccines
- **Part 1.2: Vaccine Storage and the Cold Chain**
 - Sub Part 1.2.1: General principles of vaccine storage
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Introduction



Picture a busy primary health centre on immunisation day, with mothers queuing patiently with their infants for the next round of scheduled vaccines, while a health worker carefully checks that the vaccine refrigerator has remained within the correct temperature range overnight.

Immunisation remains one of the most cost-effective public health interventions available, preventing millions of childhood deaths each year, and this Series opens the PAE 504 course by building a thorough understanding of vaccines, their storage, and the National Programme on Immunisation in Nigeria.

The aim of this Series is to equip you with the knowledge required to understand the types and storage of vaccines, the National Programme on Immunisation schedule, and the implementation and challenges of immunisation in Nigeria.

This Series begins with **vaccine types**, before turning to **vaccine storage and the cold chain**. Next, we examine the **National Programme on Immunisation and schedule**, then **National Immunisation Days and implementation in Nigeria**, before concluding with the **challenges facing immunisation in Nigeria**.

Series Learning Outcomes

At the end of this Series, you should be able to:

- **SLO 1.1:** describe the general principles of immunisation,
- **SLO 1.2:** list and describe the types of vaccines used in childhood immunisation,
- **SLO 1.3:** describe the requirements for vaccine storage and the cold chain,
- **SLO 1.4:** describe the National Programme on Immunisation schedule in Nigeria,
- **SLO 1.5:** describe the vaccines given at each point of the immunisation schedule,
- **SLO 1.6:** describe National Immunisation Days and their purpose,
- **SLO 1.7:** describe the implementation of immunisation programmes in Nigeria,
- **SLO 1.8:** describe common contraindications and adverse events following immunisation,
- **SLO 1.9:** list the challenges facing immunisation implementation in Nigeria, and
- **SLO 1.10:** describe strategies to address these challenges.



1.1 Vaccine Types

1.1.1 general principles of immunisation

Priming the immune system without causing disease

Immunisation works by exposing the immune system to a **vaccine antigen**, derived from or resembling a specific pathogen, stimulating a **protective immune response**, including the production of **antibodies** and **memory cells**, without causing the actual disease itself, so that if the vaccinated individual is later exposed to the true pathogen, the immune system can respond **rapidly and effectively**, generally preventing or significantly reducing the severity of infection.

Active immunisation, the basis of routine childhood vaccination, stimulates the individual's **own immune system** to produce this protective response, generally providing **long-lasting protection**, while **passive immunisation**, providing pre-formed antibodies directly, such as immunoglobulin, provides **immediate but temporary** protection, a distinction relevant to understanding the different roles these two approaches play in preventing infectious disease.

Fill in the blank: Active immunisation stimulates the individual's own immune system, generally providing _____ protection.

1.1.2 live attenuated and inactivated vaccines

Live attenuated vaccines contain a **weakened**, but still living, form of the pathogen, which replicates within the vaccinated individual to a limited degree, generally producing a **strong, long-lasting immune response**, often after a single or few doses, though they are generally **contraindicated** in individuals who are significantly **immunocompromised**, given the small risk of the weakened organism causing disease in this group. Examples include the **measles, oral polio, and BCG** vaccines.

Inactivated vaccines, by contrast, contain a pathogen that has been **killed** or otherwise rendered non-infectious, and are therefore **safe** for use in immunocompromised individuals, though they generally produce a **weaker immune response** than live vaccines, often requiring **multiple doses** and periodic **booster doses** to maintain adequate protection over time. Examples include the **inactivated polio vaccine** and most **pertussis** vaccine formulations.

Fill in the blank: Inactivated vaccines contain a pathogen that has been _____ or otherwise rendered non-infectious.



1.1.3 subunit, toxoid, and conjugate vaccines

Subunit vaccines contain only a **specific component** of the pathogen, such as a particular protein, rather than the whole organism, reducing the risk of vaccine-related side effects while still stimulating a protective immune response, and **toxoid vaccines**, a specific type of subunit approach, contain an **inactivated bacterial toxin**, stimulating antibodies against the toxin itself rather than the bacterium, as used in **tetanus** and **diphtheria** vaccines.

Conjugate vaccines chemically link a **polysaccharide antigen**, which alone produces a poor immune response in young children, to a **protein carrier**, considerably improving the immune response in this age group, and are used for several important childhood vaccines, including **Haemophilus influenzae type b** and **pneumococcal conjugate vaccine**, both targeting bacteria with a polysaccharide capsule that would otherwise be poorly immunogenic in infants.

Fill in the blank: Conjugate vaccines link a polysaccharide antigen to a protein _____ to improve the immune response in young children.



Figure 1.1: A healthcare worker preparing a vaccine dose for administration.

Pilot questions 1.1



1. Describe how immunisation stimulates protective immunity. (Linked to SLO 1.1)
2. Distinguish active from passive immunisation. (Linked to SLO 1.1)
3. Describe live attenuated vaccines and give two examples. (Linked to SLO 1.2)
4. Describe inactivated vaccines and explain why they are safe in immunocompromised individuals. (Linked to SLO 1.2)
5. Describe conjugate vaccines and explain why they are used for certain childhood vaccines. (Linked to SLO 1.2)

1.2 Vaccine Storage and the Cold Chain

1.2.1 general principles of vaccine storage

Most vaccines are biological products sensitive to temperature

Most vaccines are **biological products** that lose their **potency** if not stored within a specific, correct **temperature range**, generally between **2 and 8 degrees Celsius** for most routine childhood vaccines, and exposure to temperatures **outside this range**, whether too warm or, for some vaccines, freezing temperatures, can permanently and irreversibly reduce vaccine effectiveness, even if the vaccine appears entirely unchanged in appearance.

Certain vaccines have specific storage requirements, such as some **live attenuated vaccines** requiring **frozen storage** at certain stages of the supply chain, while others, such as most **diphtheria, tetanus, and pertussis-containing vaccines**, are particularly sensitive to **freezing** and lose potency if inadvertently frozen, meaning correct storage requires specific knowledge of the particular requirements of each individual vaccine product used.

Fill in the blank: Most routine childhood vaccines require storage between 2 and _____ degrees Celsius.

1.2.2 the cold chain

The **cold chain** refers to the continuous, unbroken series of temperature-controlled storage and transport conditions required to maintain vaccine potency from the point of **manufacture** through **national, regional, and local storage facilities**, to the final point of **administration** to the child, with any break in this chain at any point risking permanent loss of vaccine effectiveness.



Maintaining the cold chain requires appropriate **refrigeration equipment** at each level of the supply chain, regular **temperature monitoring**, using devices such as temperature loggers or simple thermometers, and, particularly at the peripheral, facility level, **reliable electricity supply** or appropriate **backup systems**, such as solar-powered refrigeration, since inconsistent power supply remains a genuine, practical challenge to reliable cold chain maintenance in many settings.

Fill in the blank: The cold chain refers to the continuous, unbroken series of temperature-controlled storage from manufacture to _____.

1.2.3 vaccine vial monitors and identifying compromised vaccines

Vaccine vial monitors, a heat-sensitive label attached to certain vaccine vials, provide a simple, visual indication of whether a vaccine has been exposed to excessive **cumulative heat** over time, changing colour progressively as heat exposure accumulates, allowing health workers to identify a **compromised vaccine** even without detailed knowledge of the vial's specific storage history, an important practical tool given the imperfect cold chain conditions that can occur in some settings.

Health workers should be trained to **regularly inspect** vaccine vial monitors and storage temperature logs, and to **discard** any vaccine identified as compromised, whether through an unfavourable vaccine vial monitor reading, evidence of freezing in a freeze-sensitive vaccine, or a documented break in the cold chain, since administering a compromised vaccine, even if it appears visually normal, risks providing **inadequate protection** to the child despite the appearance of a completed vaccination.

Fill in the blank: Vaccine vial monitors change colour progressively as cumulative _____ exposure accumulates.





Figure 1.2: A health worker checking the temperature of a vaccine storage refrigerator.

Pilot questions 1.2

1. State the recommended storage temperature range for most routine childhood vaccines. (Linked to SLO 1.3)
2. Define the cold chain and describe its scope from manufacture to administration. (Linked to SLO 1.3)
3. List two requirements for maintaining an effective cold chain at facility level. (Linked to SLO 1.3)
4. Describe the purpose of a vaccine vial monitor. (Linked to SLO 1.3)
5. Explain why a compromised vaccine should be discarded even if it appears visually normal. (Linked to SLO 1.3)

1.3 The National Programme on Immunisation and Schedule

1.3.1 overview of the National Programme on Immunisation

A structured, nationwide effort to protect every child

The **National Programme on Immunisation**, abbreviated **NPI**, is Nigeria's structured public health programme responsible for delivering routine childhood immunisation across the country,



aiming to protect children against a defined set of **vaccine-preventable diseases** through a coordinated national schedule, delivered through **primary health care facilities**, supported by state and local government immunisation structures.

The programme covers vaccines against diseases including **tuberculosis, poliomyelitis, diphtheria, pertussis, tetanus, hepatitis B, Haemophilus influenzae type b, pneumococcal disease, rotavirus, measles**, and **yellow fever**, among others, with the specific vaccine schedule periodically **updated** as new vaccines become available and are incorporated into the national programme.

Fill in the blank: The National Programme on Immunisation is delivered through _____ health care facilities in Nigeria.

1.3.2 the routine immunisation schedule

The Nigerian immunisation schedule begins **at birth**, with **BCG, oral polio vaccine zero dose, and hepatitis B birth dose**, and continues through a series of scheduled visits, typically at **6, 10, and 14 weeks** of age, providing further doses of **oral and inactivated polio vaccine, pentavalent vaccine**, combining diphtheria, pertussis, tetanus, hepatitis B, and Haemophilus influenzae type b, **pneumococcal conjugate vaccine**, and **rotavirus vaccine**.

At **9 months** of age, children receive **measles-containing vaccine** and **yellow fever vaccine**, with a further dose of measles-containing vaccine and, in many schedules, **meningococcal** or additional booster vaccines given at **15 to 18 months**, and understanding this specific sequence and timing allows health workers to accurately assess whether a given child's immunisation status is **up to date** for their age, and to identify and address any missed doses.

Fill in the blank: In the Nigerian schedule, measles-containing vaccine and yellow fever vaccine are given at _____ months of age.

1.3.3 contraindications and adverse events following immunisation

True contraindications to vaccination are relatively **few**, and include a **severe allergic reaction** to a previous dose of the same vaccine or a specific vaccine component, and, for **live vaccines** specifically, significant **immunocompromise**, while common minor illnesses, such as a mild cold without fever, are generally **not** contraindications and should not lead to unnecessary delay of scheduled vaccination.

Adverse events following immunisation range from common, generally mild and self-limiting reactions, such as **local injection site pain or swelling** and **mild fever**, to rare but more serious events, and health workers should be trained to **recognise**, appropriately **manage**, and **report**



adverse events, since accurate reporting supports ongoing vaccine safety monitoring and helps maintain public confidence in the overall immunisation programme.

Fill in the blank: Health workers should recognise, manage, and _____ adverse events following immunisation.

Table 1.3: Overview of the routine Nigerian immunisation schedule.

Age	Vaccines given
At birth	BCG, oral polio vaccine (zero dose), hepatitis B birth dose
6, 10, 14 weeks	Oral and inactivated polio, pentavalent, pneumococcal conjugate, rotavirus
9 months	Measles-containing vaccine, yellow fever vaccine
15 to 18 months	Measles-containing vaccine booster and additional boosters as scheduled

Pilot questions 1.3

1. Describe the purpose and structure of the National Programme on Immunisation. (Linked to SLO 1.4)
2. List the vaccines given at birth in the Nigerian immunisation schedule. (Linked to SLO 1.5)
3. List the vaccines given at 9 months of age. (Linked to SLO 1.5)
4. List two true contraindications to vaccination. (Linked to SLO 1.8)
5. Describe the general approach to adverse events following immunisation. (Linked to SLO 1.8)

1.4 National Immunisation Days and Implementation in Nigeria

1.4.1 national immunisation days

Supplementary campaigns to reach every child

National Immunisation Days, abbreviated **NIDs**, are periodic, intensive **supplementary immunisation campaigns**, historically most associated with **polio eradication** efforts, in which vaccination teams aim to reach **every eligible child** within a short, defined period, regardless of their prior vaccination status, providing an additional opportunity to reach children who may have been missed by routine immunisation services.



NIDs typically involve **house-to-house** vaccination teams, together with **fixed vaccination posts** at markets, motor parks, and other high-traffic community locations, supported by extensive **community mobilisation** and public awareness campaigns to maximise participation, and have played a significant role in Nigeria's progress towards **polio eradication** and continue to be used for other vaccine-preventable diseases, including periodic **measles** campaigns.

Fill in the blank: National Immunisation Days are historically most associated with _____ eradication efforts.

1.4.2 implementation of immunisation in Nigeria

Implementation of routine immunisation in Nigeria involves coordination across **federal, state, and local government** levels, with vaccine **procurement** and overall policy typically coordinated **nationally**, while actual **service delivery** occurs predominantly through **primary health care facilities** at the local government level, supported by trained **health workers, community volunteers**, and traditional and religious leaders who play an important role in community mobilisation and acceptance.

Cold chain logistics, discussed earlier in this Series, **vaccine supply management**, and ongoing **data collection and reporting** on immunisation coverage are all essential components of effective implementation, with routinely collected coverage data used to identify **underperforming areas** requiring additional targeted support, whether through supplementary outreach activities or specific efforts to address local barriers to uptake.

Fill in the blank: Vaccine procurement and overall policy in Nigeria are typically coordinated at the _____ level.

1.4.3 the role of outreach and community engagement

Outreach immunisation services, bringing vaccination to communities located some distance from a fixed health facility, are an important strategy for reaching children in **hard-to-reach** or **rural** areas, and are typically conducted on a **scheduled, periodic basis**, requiring careful advance planning for vaccine transport, cold chain maintenance in the field, and community notification to maximise turnout.

Community engagement, including work with **traditional and religious leaders, women's groups**, and other trusted local structures, is essential to building and maintaining **community trust** and acceptance of immunisation, since vaccine hesitancy or resistance, discussed further in the next Part of this Series, is often most effectively addressed through **locally trusted messengers** rather than external health system representatives alone.



Fill in the blank: Vaccine hesitancy is often most effectively addressed through locally trusted _____ rather than external representatives alone.



Figure 1.4: A vaccination team administering vaccines during a community outreach session.

Pilot questions 1.4

11. Describe National Immunisation Days and their purpose. (Linked to SLO 1.6)
12. Describe the levels of coordination involved in implementing immunisation in Nigeria. (Linked to SLO 1.7)
13. Explain the role of coverage data in identifying underperforming areas. (Linked to SLO 1.7)
14. Describe the purpose of outreach immunisation services. (Linked to SLO 1.7)
15. Explain why community engagement with trusted local leaders is important for immunisation uptake. (Linked to SLO 1.7)



1.5 Challenges Facing Immunisation in Nigeria

1.5.1 logistical and health system challenges

Reaching every child requires overcoming real practical barriers

Significant **logistical challenges** affect immunisation implementation in Nigeria, including **unreliable electricity supply** affecting cold chain maintenance, particularly at peripheral facility level, **inadequate transport infrastructure** hampering vaccine distribution and outreach activities to remote areas, and periodic **vaccine stockouts**, in which a facility temporarily runs out of a specific vaccine, disrupting the ability to complete scheduled immunisation for children presenting during that period.

Health workforce challenges, including an **inadequate number** of trained health workers relative to the population requiring services, particularly in rural areas, and **insufficient ongoing training** on updated immunisation guidelines and cold chain management, further constrain effective programme implementation, meaning strengthening the broader health system, not simply vaccine supply alone, is essential to improving immunisation coverage.

Fill in the blank: Periodic vaccine _____, in which a facility temporarily runs out of a specific vaccine, disrupt scheduled immunisation.

1.5.2 sociocultural and vaccine hesitancy challenges

Vaccine hesitancy, reluctance or refusal to vaccinate despite vaccine availability, results from a range of factors, including **misinformation** about vaccine safety, **religious or cultural beliefs** in some communities, historical **mistrust** of health authorities in some regions, and **low awareness** of the value and importance of immunisation, all of which can significantly reduce vaccination uptake even where vaccines themselves are readily available.

Gender and social factors also influence uptake, since decision-making around a child's healthcare, including immunisation, may rest predominantly with one parent or family member in some households, and **maternal education level**, **household income**, and **distance to the nearest health facility** all independently influence the likelihood of a child completing the full recommended immunisation schedule, meaning multiple, overlapping barriers frequently affect any given family.

Fill in the blank: Vaccine hesitancy results from factors including misinformation, cultural beliefs, and low _____.



1.5.3 strategies to address challenges

Strategies to address these challenges include **strengthening cold chain infrastructure**, including investment in **solar-powered refrigeration** for areas with unreliable electricity, improving **vaccine supply chain management** to reduce stockouts, and **strengthening the health workforce** through recruitment, training, and appropriate support and supervision of health workers delivering immunisation services.

Addressing **vaccine hesitancy** requires sustained **community engagement** and **health education**, using trusted local messengers as discussed earlier in this Series, together with **targeted outreach** to hard-to-reach populations, and **improved data systems** to more accurately track coverage and identify specific underserved communities requiring focused intervention, reflecting the reality that improving immunisation coverage requires a genuinely **multifaceted, coordinated approach** rather than any single intervention alone.

Fill in the blank: Addressing vaccine hesitancy requires sustained community engagement and health _____.



Figure 1.5: A community health worker discussing immunisation with a group of caregivers.

Pilot questions 1.5



1. List two logistical challenges affecting immunisation implementation in Nigeria. (Linked to SLO 1.9)
2. Define vaccine hesitancy and list two contributing factors. (Linked to SLO 1.9)
3. List two social or household factors influencing immunisation uptake. (Linked to SLO 1.9)
4. Describe two strategies to strengthen cold chain infrastructure. (Linked to SLO 1.10)
5. Describe the general approach to addressing vaccine hesitancy. (Linked to SLO 1.10)

Series Summary

This Series examined **immunisation**, beginning with vaccine types, before turning to **vaccine storage and the cold chain**.

We then examined the **National Programme on Immunisation and schedule**, followed by **National Immunisation Days and implementation in Nigeria**, before concluding with the **challenges facing immunisation** and strategies to address them. Having worked through this Series, you should now understand vaccine types, storage, the national immunisation schedule, and the practical challenges of implementation in Nigeria. The next Series turns to **childhood poisoning, dog bites, and snake bites**.

Glossary of Terms

- **Active immunisation:** immunisation that stimulates the individual's own immune system, generally providing long-lasting protection.
- **Live attenuated vaccine:** a vaccine containing a weakened, living form of the pathogen.
- **Inactivated vaccine:** a vaccine containing a killed or non-infectious pathogen, safe for immunocompromised individuals.
- **Conjugate vaccine:** a vaccine linking a polysaccharide antigen to a protein carrier to improve immune response in young children.
- **Cold chain:** the continuous, temperature-controlled storage and transport system required to maintain vaccine potency.
- **Vaccine vial monitor:** a heat-sensitive label indicating cumulative heat exposure of a vaccine vial.



- **National Programme on Immunisation (NPI):** Nigeria's structured public health programme for delivering routine childhood immunisation.
- **Pentavalent vaccine:** a combination vaccine covering diphtheria, pertussis, tetanus, hepatitis B, and Haemophilus influenzae type b.
- **National Immunisation Days:** periodic supplementary immunisation campaigns aiming to reach every eligible child.
- **Vaccine hesitancy:** reluctance or refusal to vaccinate despite vaccine availability.
- **Outreach immunisation:** immunisation services brought to communities located away from a fixed health facility.
- **Adverse event following immunisation:** any untoward medical occurrence following immunisation, ranging from mild to rare, serious events.



Concept Check Questions [Series 1]

Objective questions

1. Active immunisation stimulates the individual's own immune system, generally providing _____ protection.
2. Inactivated vaccines contain a pathogen that has been _____ or otherwise rendered non-infectious.
3. Most routine childhood vaccines require storage between 2 and _____ degrees Celsius.
4. In the Nigerian schedule, measles-containing vaccine and yellow fever vaccine are given at _____ months of age.
5. National Immunisation Days are historically most associated with _____ eradication efforts.

Short-answer questions

6. Distinguish active from passive immunisation.
7. Describe conjugate vaccines and explain why they are used for certain childhood vaccines.
8. Define the cold chain and describe its scope from manufacture to administration.
9. List the vaccines given at birth in the Nigerian immunisation schedule.
10. Define vaccine hesitancy and list two contributing factors.

Long-answer questions

- Discuss the general principles of immunisation and the types of vaccines used in children. (Linked to SLO 1.1, SLO 1.2)
- Discuss the requirements for vaccine storage and the cold chain. (Linked to SLO 1.3)
- Discuss the National Programme on Immunisation schedule in Nigeria. (Linked to SLO 1.4, SLO 1.5)
- Discuss National Immunisation Days and the implementation of immunisation in Nigeria. (Linked to SLO 1.6, SLO 1.7)
- Discuss the challenges facing immunisation implementation in Nigeria and strategies to address them. (Linked to SLO 1.9, SLO 1.10)



Answers to Concept Check Questions [Series 1]

Objective questions

- Long-lasting.
- Killed.
- 8.
- 9.
- Polio.

Short-answer questions

- Active immunisation stimulates the individual's own immune response; passive immunisation provides pre-formed antibodies for immediate, temporary protection.
- Conjugate vaccines link a polysaccharide antigen to a protein carrier, improving the immune response in young children who respond poorly to polysaccharide alone.
- The cold chain is the continuous, temperature-controlled system from manufacture through national, regional, and local storage to administration.
- BCG, oral polio vaccine (zero dose), and hepatitis B birth dose are given at birth.
- Vaccine hesitancy is reluctance or refusal to vaccinate despite availability, contributed to by misinformation and cultural beliefs.

Long-answer questions

- **Basic response:** Immunisation stimulates a protective immune response through active or passive means, using live attenuated, inactivated, subunit, toxoid, or conjugate vaccines depending on the target pathogen.

Value-added response: Live vaccines generally produce stronger, longer-lasting immunity but are contraindicated in immunocompromise, while inactivated vaccines are safer but often require multiple doses.

- **Basic response:** Most vaccines require storage between 2 and 8 degrees Celsius, maintained through an unbroken cold chain from manufacture to administration.

Value-added response: Vaccine vial monitors help identify compromised vaccines from cumulative heat exposure, and compromised vaccines should always be discarded even if visually normal.

- **Basic response:** The Nigerian schedule begins at birth with BCG, OPV zero dose, and hepatitis B, continuing through 6, 10, and 14 weeks, then measles and yellow fever at 9 months.



Value-added response: Understanding this schedule allows health workers to assess whether a child is up to date and identify missed doses requiring catch-up vaccination.

- **Basic response:** National Immunisation Days are supplementary campaigns reaching every eligible child, while routine implementation involves coordination across federal, state, and local levels.

Value-added response: Outreach services and community engagement with trusted local leaders are essential for reaching hard-to-reach populations and addressing vaccine hesitancy.

- **Basic response:** Challenges include logistical barriers such as unreliable electricity and stockouts, alongside sociocultural factors including vaccine hesitancy and low awareness.

Value-added response: Addressing these challenges requires a multifaceted approach combining infrastructure investment, workforce strengthening, and sustained community engagement.



Answers to Pilot Questions [Series 1]

Part 1.1

1. Immunisation exposes the immune system to a vaccine antigen, stimulating a protective response without causing disease.
2. Active immunisation stimulates the individual's own immune system; passive immunisation provides pre-formed antibodies.
3. Live attenuated vaccines contain a weakened, living pathogen; examples include measles and BCG vaccines.
4. Inactivated vaccines contain a killed pathogen, making them safe since there is no risk of causing disease.
5. Conjugate vaccines link a polysaccharide antigen to a protein carrier, improving immune response in young children.

Part 1.2

1. Most vaccines require storage between 2 and 8 degrees Celsius.
2. The cold chain is the continuous temperature-controlled system from manufacture through storage to administration.
3. Appropriate refrigeration equipment and regular temperature monitoring are requirements at facility level.
4. A vaccine vial monitor gives a visual indication of cumulative heat exposure to identify a compromised vaccine.
5. A compromised vaccine may provide inadequate protection despite appearing visually normal.

Part 1.3

1. The NPI is Nigeria's structured programme delivering routine childhood immunisation through primary health care facilities.
2. BCG, oral polio vaccine (zero dose), and hepatitis B birth dose are given at birth.
3. Measles-containing vaccine and yellow fever vaccine are given at 9 months.
4. Severe allergic reaction to a previous dose, and immunocompromise for live vaccines, are true contraindications.
5. Mild, self-limiting reactions are managed supportively, while all adverse events are recognised, managed, and reported.

Part 1.4



1. National Immunisation Days are supplementary campaigns aiming to reach every eligible child within a short period.
2. Implementation involves coordination across federal, state, and local government levels.
3. Coverage data helps identify underperforming areas requiring additional targeted support.
4. Outreach brings immunisation to communities away from fixed health facilities, particularly in rural areas.
5. Trusted local leaders can more effectively build community trust than external health system representatives alone.

Part 1.5

1. Unreliable electricity affecting cold chain, and inadequate transport infrastructure, are logistical challenges.
2. Vaccine hesitancy is reluctance to vaccinate despite availability; contributing factors include misinformation and mistrust.
3. Maternal education level and distance to the nearest health facility are factors influencing uptake.
4. Investment in solar-powered refrigeration and improved supply chain management strengthen cold chain infrastructure.
5. Sustained community engagement and health education using trusted local messengers address vaccine hesitancy.



References and Attributions [Series 1]

- Kliegman, R. M., St Geme, J. W., Blum, N. J., Shah, S. S., Tasker, R. C. and Wilson, K. M. (2020). Nelson Textbook of Pediatrics (21st ed.). Elsevier.
- World Health Organization (2015). Immunization in Practice: A Practical Guide for Health Staff. WHO Press.
- National Primary Health Care Development Agency, Nigeria (2021). National Routine Immunization Strategic Plan.
- World Health Organization (2021). WHO Vaccine Position Papers Summary.

Figures, Plates, Tables, and Boxes

- Figure 1.1: A healthcare worker preparing a vaccine dose for administration. AI-generated using the prompt: "A realistic clinical illustration of a healthcare worker carefully drawing vaccine liquid from a small vial into a syringe on a clean clinic tray. Single clean medical illustration, soft clinical lighting, no text overlays, no multiple panels, accurate and professional depiction."
- Figure 1.2: A health worker checking the temperature of a vaccine storage refrigerator. AI-generated using the prompt: "A realistic clinical illustration of a health worker checking a thermometer and writing on a temperature log sheet beside an open vaccine storage refrigerator with neatly arranged vaccine boxes. Single clean medical illustration, soft clinical lighting, no text overlays, no multiple panels, accurate and professional depiction."
- Table 1.3: Overview of the routine Nigerian immunisation schedule. AI-generated using the prompt: "Create a clean reference table titled Overview of the Nigerian Immunisation Schedule, listing age and vaccines given. Simple clinical reference table style with outside border."
- Figure 1.4: A vaccination team administering vaccines during a community outreach session. AI-generated using the prompt: "A warm, realistic illustration of a health worker administering a vaccine to a young child held by a caregiver at an outdoor community vaccination post, with a few other families waiting in line nearby. Single clean illustration, natural daylight, no text overlays, no multiple panels, respectful and accurate depiction."
- Figure 1.5: A community health worker discussing immunisation with a group of caregivers. AI-generated using the prompt: "A warm, realistic illustration of a community health worker speaking with a small group of attentive mothers holding their children at an outdoor community gathering. Single clean illustration, natural daylight, no text overlays, no multiple panels, respectful and accurate depiction."



Series 2: Childhood Poisoning, Dog Bites, and Snake Bites

- **Part 2.1: Definition and Clinical Features of Childhood Poisoning**
 - Sub Part 2.1.1: Definition of poisons and examples
 - Sub Part 2.1.2: Clinical toxidromes
 - Sub Part 2.1.3: General clinical presentation of poisoning
- **Part 2.2: Evaluation and Principles of Management of Poisoning**
 - Sub Part 2.2.1: Evaluation of a child with suspected poisoning
 - Sub Part 2.2.2: Decontamination and general management principles
 - Sub Part 2.2.3: General principles of management and disposition
- **Part 2.3: Common Childhood Poisonings**
 - Sub Part 2.3.1: Paracetamol and kerosene poisoning
 - Sub Part 2.3.2: Organophosphate and iron poisoning
 - Sub Part 2.3.3: Corrosive and carbon monoxide poisoning
- **Part 2.4: Dog Bite**
 - Sub Part 2.4.1: Epidemiology of dog bite
 - Sub Part 2.4.2: Clinical features and wound assessment
 - Sub Part 2.4.3: Management of dog bite
- **Part 2.5: Snake Bite**
 - Sub Part 2.5.1: Epidemiology of snake bite
 - Sub Part 2.5.2: Clinical features of snake bite
 - Sub Part 2.5.3: Management of snake bite

Introduction

In the last Series, we explored immunisation and the National Programme on Immunisation. We now turn to childhood poisoning, dog bites, and snake bites, common paediatric emergencies encountered in both urban and rural Nigerian settings. Picture a two year old brought to the emergency unit after swallowing an unknown quantity of a household cleaning product found under the sink, alongside a different child bitten by a snake while playing near tall grass.



Recognising and promptly managing these presentations, and understanding how to prevent them, is the focus of this Series.

The aim of this Series is to equip you with the knowledge required to evaluate and manage childhood poisoning, and to recognise and manage dog and snake bites in children.

This Series begins with the **definition and clinical features of childhood poisoning**, before turning to its **evaluation and principles of management**. Next, we examine **common childhood poisonings**, then **dog bite**, before concluding with **snake bite**.

Series Learning Outcomes

At the end of this Series, you should be able to:

- **SLO 1.1:** define poisons and give examples relevant to childhood poisoning,
- **SLO 1.2:** list the clinical features of childhood poisoning, including clinical toxidromes,
- **SLO 1.3:** describe how to evaluate a patient with suspected childhood poisoning,
- **SLO 1.4:** enumerate the principles of management of poisoning in children,
- **SLO 1.5:** list the common childhood poisonings and how to manage them,
- **SLO 1.6:** discuss the epidemiology of dog and snake bite in children,
- **SLO 1.7:** describe the clinical features of dog bite and snake bite,
- **SLO 1.8:** describe the management of dog bite,
- **SLO 1.9:** describe the management of snake bite, and
- **SLO 1.10:** describe the prevention of childhood poisoning, dog bite, and snake bite.

2.1 Definition and Clinical Features of Childhood Poisoning

2.1.1 definition of poisons and examples

Almost anything can be a poison at the wrong dose

A **poison** is defined as any substance that, when introduced into the body in sufficient quantity, causes **harmful effects** through its chemical action, and **childhood poisoning** remains a significant, largely preventable cause of paediatric emergency presentations, particularly in **toddlers**, whose natural curiosity and tendency to explore their environment orally places them at particular risk of accidental ingestion.



Common examples of substances involved in childhood poisoning include **household cleaning products, medications**, both prescription and over-the-counter, **pesticides** and **agricultural chemicals**, **kerosene** and other **petroleum products**, and, in some settings, **traditional or herbal remedies**, with the specific pattern of exposure often reflecting locally available substances within the home environment.

Fill in the blank: A poison causes harmful effects through its chemical _____ when introduced in sufficient quantity.

2.1.2 clinical toxidromes

A **toxidrome** refers to a recognisable **cluster of clinical signs and symptoms** associated with a particular category of poisoning, and recognising a specific toxidrome can help narrow the likely causative agent even before the specific substance is confirmed, guiding both immediate management and further evaluation, particularly important when the specific substance ingested is unknown or uncertain.

Common toxidromes include the **cholinergic toxidrome**, seen with organophosphate poisoning, producing **salivation, lacrimation, diarrhoea, and bradycardia**, the **anticholinergic toxidrome**, producing **dry skin, dilated pupils, and agitation**, the **opioid toxidrome**, producing **pinpoint pupils, respiratory depression, and sedation**, and the **sympathomimetic toxidrome**, producing **tachycardia, hypertension, and agitation**, each pattern providing valuable diagnostic clues at the bedside.

Fill in the blank: A toxidrome is a recognisable cluster of clinical signs associated with a particular _____ of poisoning.

2.1.3 general clinical presentation of poisoning

Beyond specific toxidromes, childhood poisoning can present with a wide range of **non-specific features**, including **vomiting, abdominal pain, altered consciousness**, ranging from mild drowsiness to coma, **seizures**, and **respiratory or cardiovascular compromise**, meaning poisoning should be actively considered in the differential diagnosis of any child presenting with **sudden, unexplained illness**, particularly in the appropriate age group and setting.

Specific clues on history, such as an empty medication container found near the child, unusual **odours** on the breath, such as a kerosene smell, or characteristic **skin or mucous membrane findings**, such as burns from a caustic substance, can provide important supporting evidence, meaning a thorough, targeted history and examination remain essential even where the story of ingestion itself is unclear or unwitnessed.



Fill in the blank: An empty medication container found near the child is an important clue on _____ suggestive of poisoning.



Figure 2.1: A toddler exploring household items, illustrating a common context for accidental poisoning.

Pilot questions 2.1

1. Define a poison and give two examples relevant to childhood poisoning. (Linked to SLO 2.1)
2. Define a toxidrome and explain its clinical value. (Linked to SLO 2.1)
3. Describe the cholinergic toxidrome. (Linked to SLO 2.1)
4. Describe the opioid toxidrome. (Linked to SLO 2.1)
5. List two specific clues on history or examination that might suggest childhood poisoning. (Linked to SLO 2.1)



2.2 Evaluation and Principles of Management of Poisoning

2.2.1 evaluation of a child with suspected poisoning

History guides everything that follows

Evaluation of a child with suspected poisoning begins with a **rapid assessment** of **airway**, **breathing**, and **circulation**, addressing any immediately life-threatening compromise before proceeding to detailed history taking, and a focused history should establish **what** substance was involved, wherever possible, **how much**, **when** the exposure occurred, and the **route** of exposure, whether ingestion, inhalation, or skin contact.

Where the specific substance is unknown, examination for a recognisable **toxidrome**, discussed in the previous Part of this Series, together with collection of any available **container**, **remaining substance**, or **vomit** for later identification, can provide valuable diagnostic information, and contacting a **poison information centre**, where available, or referring to a recognised **toxicology reference**, supports safe, informed decision-making regarding management.

Fill in the blank: Evaluation of suspected poisoning begins with rapid assessment of airway, breathing, and _____.

2.2.2 decontamination and general management principles

Decontamination, aiming to reduce further absorption of the poison, may include **activated charcoal**, effective for many, though not all, ingested substances when given within an appropriate time window, and, less commonly used today given limited evidence of benefit and potential harm, **gastric lavage**, generally reserved for specific, unusual circumstances rather than routine use, reflecting evolving evidence-based practice in poisoning management over recent decades.

Skin decontamination, through thorough washing with water, is important for substances involved in **dermal exposure**, and **specific antidotes** are available for certain poisons, such as **naloxone** for opioid poisoning and **N-acetylcysteine** for paracetamol poisoning, though the majority of childhood poisonings are managed with **supportive care** alone, since a specific antidote is not available for most ingested substances.

Fill in the blank: Activated charcoal is effective for many ingested substances when given within an appropriate time _____.

2.2.3 general principles of management and disposition



Supportive care, addressing specific complications as they arise, including **airway protection**, **respiratory support**, **circulatory support**, and management of **seizures** or **altered consciousness**, remains the cornerstone of managing the great majority of poisoning presentations, together with close **monitoring** for evolving toxicity, since the clinical effects of some substances develop or worsen over subsequent hours after initial presentation.

Disposition decisions, whether a child requires hospital admission, a period of observation, or can be safely discharged, depend on the specific substance involved, the **quantity** ingested, the child's **clinical status**, and the reliability of the **home environment** to prevent recurrence, and every case of childhood poisoning should prompt consideration of underlying **safety factors** within the home to reduce the risk of future episodes.

Fill in the blank: Disposition decisions after poisoning depend on the substance, quantity, clinical status, and reliability of the _____ environment.



Figure 2.2: A clinician assessing a child with suspected poisoning in the emergency unit.

Pilot questions 2.2

1. Describe the initial approach to evaluating a child with suspected poisoning. (Linked to SLO 2.3)
2. Describe the role of activated charcoal in decontamination. (Linked to SLO 2.3)
3. Name two specific antidotes and the poisons they treat. (Linked to SLO 2.4)



4. Describe the general principles of supportive care in poisoning management. (Linked to SLO 2.4)
5. List the factors that influence disposition decisions after childhood poisoning. (Linked to SLO 2.4)

2.3 Common Childhood Poisonings

2.3.1 paracetamol and kerosene poisoning

Two very different but commonly encountered poisonings

Paracetamol poisoning is among the most common medication poisonings in children, and, while a single, modest ingestion is often asymptomatic initially, significant overdose can cause delayed, severe **hepatotoxicity**, meaning **serum paracetamol levels**, interpreted against a **treatment nomogram**, guide the decision to give the specific antidote, **N-acetylcysteine**, which is highly effective when given within an appropriate time window after ingestion.

Kerosene poisoning, common in settings where kerosene is stored in accessible containers for household use, typically presents with **coughing**, **choking**, and **respiratory symptoms**, since the greatest risk relates to **aspiration** into the lungs, causing **chemical pneumonitis**, rather than systemic toxicity from absorption, meaning inducing vomiting is specifically **avoided** in kerosene ingestion, as this increases the risk of aspiration during the vomiting episode itself.

Fill in the blank: Inducing vomiting is specifically avoided in kerosene ingestion because it increases the risk of _____.

2.3.2 organophosphate and iron poisoning

Organophosphate poisoning, from pesticide exposure, produces the classic **cholinergic toxidrome**, discussed earlier in this Series, and is managed with **atropine**, to counteract the excessive cholinergic effects, together with **pralidoxime** where available, to reactivate the enzyme inhibited by the organophosphate, alongside meticulous **decontamination** and supportive care, given the potential severity of significant exposure.

Iron poisoning, from accidental ingestion of iron-containing supplements, can cause severe **gastrointestinal toxicity** and, in significant overdose, **metabolic acidosis** and **shock**, with **serum iron levels** guiding the decision to use the specific chelating agent **desferrioxamine** in significant poisoning, and, since iron tablets are often attractively coloured and can resemble



sweets to a young child, safe storage of iron supplements is a particularly important preventive consideration.

Fill in the blank: Iron poisoning is managed with the specific chelating agent _____ in significant cases.

2.3.3 corrosive and carbon monoxide poisoning

Corrosive poisoning, from ingestion of strong acids or alkalis found in some household cleaning products, causes direct **chemical burns** to the oropharynx, oesophagus, and stomach, and management focuses on **supportive care** and specialist evaluation for oesophageal injury, since **inducing vomiting** or attempting **neutralisation** is specifically avoided, as either can worsen tissue damage during re-exposure of already injured tissue to the corrosive substance.

Carbon monoxide poisoning, from exposure to fumes from generators, charcoal, or other combustion sources in poorly ventilated spaces, produces **non-specific symptoms** including headache, nausea, and confusion, that can easily be mistaken for a viral illness, and management centres on prompt removal from the source together with **high-flow oxygen therapy**, since carbon monoxide displaces oxygen from **haemoglobin**, and oxygen accelerates its clearance from the body.

Fill in the blank: Management of carbon monoxide poisoning centres on removal from the source and high-flow _____ therapy.

Table 2.3: Common childhood poisonings and key management points.

Poison	Key management point
Paracetamol	Serum levels guide use of N-acetylcysteine antidote
Kerosene	Avoid inducing vomiting; risk is aspiration, not systemic absorption
Organophosphates	Atropine and pralidoxime; classic cholinergic toxidrome
Iron	Desferrioxamine chelation in significant overdose
Corrosives	Avoid inducing vomiting or neutralisation; risk of worsening tissue injury

Pilot questions 2.3

1. Describe the management of significant paracetamol poisoning. (Linked to SLO 2.5)
2. Explain why inducing vomiting is avoided in kerosene ingestion. (Linked to SLO 2.5)
3. Describe the toxidrome and management of organophosphate poisoning. (Linked to SLO 2.5)



4. Describe the management of significant iron poisoning. (Linked to SLO 2.5)
5. Explain the mechanism and management of carbon monoxide poisoning. (Linked to SLO 2.5)

2.4 Dog Bite

2.4.1 epidemiology of dog bite

A common injury with a serious potential consequence

Dog bites are a common cause of childhood injury, with **young children** at particular risk, both because of their smaller size, bringing the face and head into closer proximity to a dog, and their limited understanding of appropriate behaviour around animals, and most bites occur from a **familiar dog**, whether a family pet or a neighbour's animal, rather than an unknown, stray animal.

Beyond the immediate physical injury, dog bites carry the risk of **wound infection** and, of particular public health importance, transmission of **rabies**, a fatal viral infection if untreated, meaning every dog bite should be evaluated not only for the immediate wound itself but also for the **rabies risk** posed by the specific biting animal and local rabies epidemiology.

Fill in the blank: Most dog bites occur from a _____ dog rather than an unknown, stray animal.

2.4.2 clinical features and wound assessment

Clinical assessment of a dog bite should characterise the **wound**, including its **location**, **depth**, and whether it involves **puncture wounds**, **lacerations**, or **crush injury**, since dog bites frequently combine these different wound types given the combination of sharp teeth and considerable bite force, and bites to the **face** or **hands** carry particular functional and cosmetic significance requiring careful specialist assessment.

Assessment should also evaluate for signs of established **infection**, including **redness**, **swelling**, **warmth**, and **discharge**, particularly relevant for wounds presenting some time after the initial bite, and, in bites involving deeper structures, evaluation for possible **tendon**, **nerve**, or **bone** injury underlying the visible wound, since dog bites can cause considerably more significant deep tissue damage than their surface appearance might initially suggest.



Fill in the blank: Assessment for infection should evaluate for redness, swelling, warmth, and _____.

2.4.3 management of dog bite

Management of a dog bite wound includes thorough **wound cleaning and irrigation**, generally with copious volumes of clean water or saline, to reduce bacterial contamination, together with careful **wound assessment**, and a decision regarding **primary closure** versus **delayed closure** or healing by **secondary intention**, since some bite wounds, particularly those at higher infection risk, are best left open rather than immediately sutured closed.

Tetanus prophylaxis should be reviewed and updated as needed according to the child's immunisation status, **prophylactic antibiotics** are often given, particularly for bites at higher risk of infection, such as puncture wounds or hand bites, and **rabies post-exposure prophylaxis**, including vaccine and, where indicated, rabies immunoglobulin, should be considered based on the biting animal's vaccination status and local rabies risk, discussed further in the context of the closely related topic of snake bite in the remainder of this Series.

Fill in the blank: Rabies post-exposure prophylaxis includes vaccine and, where indicated, rabies _____.



Figure 2.4: A clinician cleaning and assessing a dog bite wound on a child's arm.



Pilot questions 2.4

1. Describe the epidemiology of dog bite in children. (Linked to SLO 2.6)
2. Explain why dog bites carry a risk of rabies transmission. (Linked to SLO 2.7)
3. Describe the key components of clinical assessment of a dog bite wound. (Linked to SLO 2.7)
4. Describe the general management of a dog bite wound. (Linked to SLO 2.8)
5. Describe when rabies post-exposure prophylaxis should be considered. (Linked to SLO 2.8)

2.5 Snake Bite

2.5.1 epidemiology of snake bite

A significant, under-recognised cause of childhood morbidity

Snake bite remains an important, if often under-recognised, cause of childhood morbidity and mortality in many parts of Nigeria and the wider region, particularly affecting children in **rural, agricultural** communities, where exposure to snake habitats during outdoor activities, including farming, herding, or simply playing outdoors, is common, and children may be at particular risk given their smaller body size relative to the venom dose received.

The clinical significance of a snake bite depends heavily on the specific **species** involved, since **venomous** species produce a range of significant, potentially life-threatening effects, while **non-venomous** species typically cause only a minor, localised wound, meaning identification of the snake, where safely possible, or recognition of a characteristic **envenomation syndrome**, provides valuable guidance for management.

Fill in the blank: Snake bite particularly affects children in rural, _____ communities in Nigeria and the wider region.

2.5.2 clinical features of snake bite

Clinical features of venomous snake bite vary by the specific type of venom involved, broadly grouped into **cytotoxic** effects, causing local **swelling, pain, blistering**, and, in severe cases, **tissue necrosis** at the bite site, **haemotoxic** effects, causing **bleeding** and **coagulopathy**, sometimes with bleeding from the gums, venepuncture sites, or internally, and **neurotoxic** effects, causing progressive **paralysis**, potentially including life-threatening **respiratory muscle paralysis**.



Local signs, including two clear **fang marks**, though these are not always both visible or present, together with **progressive swelling** extending from the bite site, provide important clues to significant envenomation, and the **absence** of any local or systemic symptoms within several hours of a bite from a snake capable of causing significant envenomation is generally reassuring, though children should still be observed for an appropriate period given the potential for delayed symptom onset with certain venom types.

Fill in the blank: Haemotoxic snake venom effects cause bleeding and _____.

2.5.3 management of snake bite

First aid for suspected venomous snake bite includes keeping the child **calm** and the affected limb **immobilised** and, where possible, at or slightly below the level of the heart, to reduce venom spread, and **prompt transport** to an appropriate health facility, while **traditional practices** such as incision, suction, or application of a tight tourniquet are specifically **discouraged**, since these interventions have not been shown to improve outcome and can cause additional harm.

Definitive management of significant envenomation centres on **antivenom** therapy, where available and indicated based on clinical evidence of significant envenomation, together with **supportive care** addressing specific complications, including management of **coagulopathy**, **respiratory support** in neurotoxic envenomation with respiratory muscle involvement, and careful **wound care** for local cytotoxic effects, with the decision to give antivenom, and the specific product used, guided by the clinical picture and, where known, the likely responsible snake species.

Fill in the blank: Traditional practices such as incision, suction, or tourniquet application are specifically _____ in snake bite first aid.





Figure 2.5: First aid immobilisation of a child's limb following a suspected snake bite.

Pilot questions 2.5

- Describe the epidemiology of snake bite in children in Nigeria. (Linked to SLO 2.6)
- Distinguish cytotoxic, haemotoxic, and neurotoxic effects of snake venom. (Linked to SLO 2.7)
- Describe the appropriate first aid for a suspected venomous snake bite. (Linked to SLO 2.9)
- Explain why traditional practices such as incision and tourniquet are discouraged. (Linked to SLO 2.9)
- Describe the definitive management of significant snake envenomation. (Linked to SLO 2.9)



Series Summary

This Series examined **childhood poisoning**, beginning with its definition and clinical features, including toxidromes, before turning to its **evaluation and principles of management**.

We then examined **common childhood poisonings**, before turning to **dog bite** and concluding with **snake bite**. Having worked through this Series, you should now be able to evaluate and manage a child with poisoning, dog bite, or snake bite. The next Series turns to **non-accidental injuries and child abuse**.

Glossary of Terms

1. **Poison:** a substance that causes harmful effects through its chemical action when introduced in sufficient quantity.
2. **Toxidrome:** a recognisable cluster of clinical signs and symptoms associated with a particular category of poisoning.
3. **Cholinergic toxidrome:** a toxidrome including salivation, lacrimation, diarrhoea, and bradycardia, seen in organophosphate poisoning.
4. **Activated charcoal:** a decontamination agent effective for many, though not all, ingested poisons.
5. **N-acetylcysteine:** the specific antidote for paracetamol poisoning.
6. **Desferrioxamine:** the specific chelating agent used for significant iron poisoning.
7. **Chemical pneumonitis:** lung inflammation resulting from aspiration of a substance such as kerosene.
8. **Rabies:** a fatal viral infection that can be transmitted through a dog bite if untreated.
9. **Envenomation:** the introduction of venom into the body, as occurs with a venomous snake bite.
10. **Cytotoxic venom effect:** local tissue damage, swelling, and necrosis caused by certain snake venoms.
11. **Neurotoxic venom effect:** progressive paralysis, potentially including respiratory muscles, caused by certain snake venoms.
12. **Antivenom:** the definitive treatment for significant venomous snake envenomation.



Concept Check Questions [Series 2]

Objective questions

6. A poison causes harmful effects through its chemical _____ when introduced in sufficient quantity.
7. Inducing vomiting is specifically avoided in kerosene ingestion because it increases the risk of _____.
8. Iron poisoning is managed with the specific chelating agent _____ in significant cases.
9. Most dog bites occur from a _____ dog rather than an unknown, stray animal.
10. Traditional practices such as incision, suction, or tourniquet application are specifically _____ in snake bite first aid.

Short-answer questions

11. Define a toxidrome and give one example.
12. Describe the role of activated charcoal in decontamination.
13. Explain why inducing vomiting is avoided in kerosene ingestion.
14. Describe the key components of clinical assessment of a dog bite wound.
15. Distinguish cytotoxic, haemotoxic, and neurotoxic effects of snake venom.

Long-answer questions

1. Discuss the definition and clinical features of childhood poisoning, including clinical toxidromes. (Linked to SLO 2.1, SLO 2.2)
2. Discuss the evaluation and principles of management of a child with suspected poisoning. (Linked to SLO 2.3, SLO 2.4)
3. Discuss the clinical features and management of two common childhood poisonings. (Linked to SLO 2.5)
4. Discuss the epidemiology, clinical features, and management of dog bite. (Linked to SLO 2.6, SLO 2.7, SLO 2.8)
5. Discuss the epidemiology, clinical features, and management of snake bite. (Linked to SLO 2.6, SLO 2.7, SLO 2.9)

Answers to Concept Check Questions [Series 2]

Objective questions



6. Action.
7. Aspiration.
8. Desferrioxamine.
9. Familiar.
10. Discouraged.

Short-answer questions

6. A toxidrome is a recognisable cluster of clinical signs associated with a category of poisoning, such as the cholinergic toxidrome in organophosphate poisoning.
7. Activated charcoal binds many ingested poisons in the gut, reducing further absorption when given within an appropriate time window.
8. Kerosene poses a primary risk of aspiration into the lungs, and vomiting increases the chance of this occurring.
9. Location, depth, wound type, signs of infection, and possible deep structure injury.
10. Cytotoxic causes local tissue damage; haemotoxic causes bleeding and coagulopathy; neurotoxic causes progressive paralysis.

Long-answer questions

16. **Basic response:** Childhood poisoning presents with non-specific features or a recognisable toxidrome, and evaluation includes rapid ABC assessment and a focused history of the substance, amount, and timing.

Value-added response: Recognising a specific toxidrome, together with contacting a poison information centre, supports informed decision-making even when the exact substance is uncertain.

17. **Basic response:** Management principles include decontamination such as activated charcoal, specific antidotes where available, and supportive care for the majority of cases without a specific antidote.

Value-added response: Disposition depends on the substance, quantity, clinical status, and home safety, with every case prompting review of preventive measures.

18. **Basic response:** Paracetamol poisoning is managed with N-acetylcysteine guided by serum levels, while kerosene poisoning avoids induced vomiting due to aspiration risk.

Value-added response: Organophosphate poisoning produces a cholinergic toxidrome managed with atropine and pralidoxime, while iron poisoning may require desferrioxamine chelation.



19. **Basic response:** Dog bites are common in young children, usually from familiar animals, and carry infection and rabies risk requiring wound care and consideration of post-exposure prophylaxis.

Value-added response: Assessment should evaluate wound depth, deep structure involvement, and infection signs, with tetanus and rabies prophylaxis reviewed as needed.

20. **Basic response:** Snake bite particularly affects rural children, with venom effects classified as cytotoxic, haemotoxic, or neurotoxic, guiding recognition and management.

Value-added response: First aid involves immobilisation and prompt transport, avoiding harmful traditional practices, with antivenom and supportive care central to definitive management.

Answers to Pilot Questions [Series 2]

Part 2.1

11. A poison is a substance causing harmful effects through its chemical action; examples include household cleaners and medications.
12. A toxidrome is a recognisable cluster of signs associated with a poisoning category, helping narrow the likely causative agent.
13. Salivation, lacrimation, diarrhoea, and bradycardia characterise the cholinergic toxidrome.
14. Pinpoint pupils, respiratory depression, and sedation characterise the opioid toxidrome.
15. An empty container near the child and unusual breath odour are helpful clues.

Part 2.2

1. Rapid assessment of airway, breathing, and circulation, followed by focused history of substance, amount, and timing.
2. Activated charcoal binds many ingested poisons, reducing further absorption when given within an appropriate window.
3. Naloxone for opioids and N-acetylcysteine for paracetamol are examples of specific antidotes.
4. Supportive care addresses airway, breathing, circulation, and neurological complications as they arise.



5. The substance, quantity, clinical status, and reliability of the home environment influence disposition.

Part 2.3

1. Serum levels guide use of N-acetylcysteine within the appropriate treatment window.
2. Vomiting increases the risk of aspirating kerosene into the lungs during the vomiting episode.
3. The cholinergic toxidrome is managed with atropine and, where available, pralidoxime.
4. Desferrioxamine chelation is used, guided by serum iron levels, in significant overdose.
5. Carbon monoxide displaces oxygen from haemoglobin, managed with removal from source and high-flow oxygen.

Part 2.4

1. Young children are at particular risk, most commonly from a familiar dog.
2. Dogs can transmit rabies, a fatal viral infection if untreated.
3. Assessment evaluates wound location, depth, type, infection signs, and possible deep structure injury.
4. Management includes thorough cleaning, wound assessment, and decision on closure type.
5. Rabies prophylaxis is considered based on the biting animal's vaccination status and local rabies risk.

Part 2.5

1. Snake bite particularly affects rural, agricultural children exposed to snake habitats during outdoor activity.
2. Cytotoxic causes local damage; haemotoxic causes bleeding and coagulopathy; neurotoxic causes progressive paralysis.
3. Keep the child calm, immobilise the limb, and arrange prompt transport to a health facility.
4. These practices have not been shown to improve outcome and can cause additional harm.
5. Antivenom therapy, guided by clinical evidence of envenomation, together with supportive care for specific complications.



References and Attributions [Series 2]

1. Kliegman, R. M., St Geme, J. W., Blum, N. J., Shah, S. S., Tasker, R. C. and Wilson, K. M. (2020). Nelson Textbook of Pediatrics (21st ed.). Elsevier.
2. World Health Organization (2010). Guidelines for the Management of Snakebites (2nd ed.). WHO Press.
3. American Academy of Pediatrics (2020). Pediatric Toxicology Reference. In Nelson Textbook of Pediatrics.
4. World Health Organization (2018). Rabies Fact Sheet. WHO Press.

Figures, Plates, Tables, and Boxes

- Figure 2.1: A toddler exploring household items, illustrating a common context for accidental poisoning. AI-generated using the prompt: "A realistic, gentle illustration of a toddler crawling towards an open low kitchen cupboard with household bottles visible, in a home setting. Single clean illustration, soft natural lighting, no text overlays, no multiple panels, safety-conscious and accurate depiction."
- Figure 2.2: A clinician assessing a child with suspected poisoning in the emergency unit. AI-generated using the prompt: "A realistic clinical illustration of a clinician examining a child on an emergency department bed, with a caregiver standing nearby holding a small bottle. Single clean medical illustration, soft clinical lighting, no text overlays, no multiple panels, accurate and professional depiction."
- Table 2.3: Common childhood poisonings and key management points. AI-generated using the prompt: "Create a clean reference table titled Common Childhood Poisonings and Key Management Points, listing poison and key management point. Simple clinical reference table style with outside border."
- Figure 2.4: A clinician cleaning and assessing a dog bite wound on a child's arm. AI-generated using the prompt: "A realistic clinical illustration of a clinician gently cleaning a bandaged wound on a child's forearm with irrigation fluid, in a clinic treatment room. Single clean medical illustration, soft clinical lighting, no text overlays, no multiple panels, accurate and professional depiction, no graphic wound detail."
- Figure 2.5: First aid immobilisation of a child's limb following a suspected snake bite. AI-generated using the prompt: "A realistic, calm illustration of a caregiver gently supporting and immobilising a child's lower leg with a simple splint while the child rests calmly, in an outdoor rural setting. Single clean illustration, natural daylight, no text overlays, no multiple panels, reassuring and accurate depiction."



Series 3: Non-Accidental Injuries and Child Abuse

1. **Part 3.1: Non-Accidental Injury: Epidemiology and At-Risk Groups**
 1. Sub Part 3.1.1: Introduction and epidemiology of non-accidental injury
 2. Sub Part 3.1.2: At-risk groups for non-accidental injury
 3. Sub Part 3.1.3: The significance of recognising at-risk situations
2. **Part 3.2: Non-Accidental Injury: Clinical Presentation and Evaluation**
 1. Sub Part 3.2.1: Clinical presentation suggestive of non-accidental injury
 2. Sub Part 3.2.2: Evaluation of a suspected case
 3. Sub Part 3.2.3: The multidisciplinary approach to evaluation
3. **Part 3.3: Non-Accidental Injury: Management and Prevention**
 1. Sub Part 3.3.1: Immediate management of suspected non-accidental injury
 2. Sub Part 3.3.2: The role of the multidisciplinary child protection team
 3. Sub Part 3.3.3: Prevention of non-accidental injury
4. **Part 3.4: Child Abuse: Definition, Epidemiology, and At-Risk Groups**
 1. Sub Part 3.4.1: Definition and forms of child abuse
 2. Sub Part 3.4.2: Epidemiology of child abuse
 3. Sub Part 3.4.3: At-risk groups for child abuse
5. **Part 3.5: Child Abuse: Clinical Presentation, Evaluation, and Management**
 1. Sub Part 3.5.1: Clinical presentation of child abuse
 2. Sub Part 3.5.2: Evaluation of a suspected case of child abuse
 3. Sub Part 3.5.3: Management and prevention of child abuse

Introduction

In the last Series, we explored childhood poisoning, dog bites, and snake bites. We now turn to a different, sensitive, but equally important area of child health, non-accidental injuries and child abuse. Picture a nine month old infant brought to the emergency unit with a fracture that does not match the history provided, or a story that changes each time it is retold. Recognising when an



injury or presentation may not be accidental, and responding appropriately, sensitively, and within an appropriate child protection framework, is the focus of this Series.

The aim of this Series is to equip you with the knowledge required to recognise, evaluate, and appropriately manage suspected non-accidental injury and child abuse.

This Series begins with the **epidemiology and at-risk groups for non-accidental injury**, before turning to its **clinical presentation and evaluation**. Next, we examine its **management and prevention**, then the **definition and epidemiology of child abuse**, before concluding with its **clinical presentation, evaluation, and management**.

Series Learning Outcomes

At the end of this Series, you should be able to:

6. **SLO 1.1:** describe the epidemiology of non-accidental childhood injuries,
7. **SLO 1.2:** list the groups of children at risk of non-accidental injury,
8. **SLO 1.3:** describe the clinical presentation of non-accidental injury,
9. **SLO 1.4:** describe the evaluation of a suspected case of non-accidental injury,
10. **SLO 1.5:** describe the management and prevention of non-accidental injury,
11. **SLO 1.6:** define child abuse and describe its epidemiology,
12. **SLO 1.7:** list the groups of children at risk of child abuse,
13. **SLO 1.8:** describe the clinical presentation of child abuse,
14. **SLO 1.9:** describe the evaluation of a suspected case of child abuse, and
15. **SLO 1.10:** describe the management and prevention of child abuse.

3.1 Non-Accidental Injury: Epidemiology and At-Risk Groups

3.1.1 introduction and epidemiology of non-accidental injury

A sensitive but genuinely important area of paediatric practice

Non-accidental injury, sometimes termed **inflicted injury**, refers to physical harm inflicted upon a child **deliberately** by a caregiver or other individual, distinct from the far more common **accidental injury** that occurs in the normal course of childhood activity, and represents an important, if sensitive, area of paediatric practice, since missed non-accidental injury carries a genuine risk of further, potentially fatal, harm to the child.



The true **prevalence** of non-accidental injury is difficult to establish precisely, given significant **under-recognition** and **under-reporting**, but available data suggests it remains a **significant** contributor to childhood injury and death in many settings, including Nigeria, meaning every clinician working with children should maintain awareness of this possibility as part of routine clinical practice, rather than treating it as a rare consideration reserved for unusual cases.

Fill in the blank: Non-accidental injury is distinct from the far more common _____ injury of normal childhood activity.

3.1.2 at-risk groups for non-accidental injury

Certain **child factors** are associated with increased risk of non-accidental injury, including **younger age**, particularly **infants under one year**, who are both physically more vulnerable and less able to communicate what has happened, **prematurity** or **low birth weight**, and children with **disability** or **chronic illness**, who may place additional caregiving demands and stress on a family.

Caregiver and family factors associated with increased risk include significant **parental stress**, **substance misuse**, **domestic violence** within the household, **parental mental illness**, and **social isolation** with limited support networks, though it is important to recognise that these are **risk factors**, increasing statistical likelihood, rather than certainties, and non-accidental injury can occur in families without any of these recognised risk factors present.

Fill in the blank: Infants under one year are at particular risk of non-accidental injury, being both physically more vulnerable and less able to _____.

3.1.3 the significance of recognising at-risk situations

Recognising these at-risk groups and factors is valuable for maintaining an appropriate level of clinical **vigilance**, but should never be used to **exclude** the possibility of non-accidental injury in a child without recognised risk factors, nor should the presence of risk factors alone be used to **presume** abuse has occurred without appropriate clinical evaluation, since risk factors inform, rather than replace, careful clinical assessment.

A **balanced clinical approach**, maintaining genuine open-mindedness to both accidental and non-accidental explanations for a given injury, while being appropriately alert to features that raise specific concern, discussed in the next Part of this Series, is essential to providing appropriate care for the child while avoiding either **missed** cases of genuine abuse or **inappropriate, unfounded accusations** against innocent families.



Fill in the blank: A balanced clinical approach avoids both missed cases of abuse and inappropriate, unfounded _____.



Figure 3.1: A clinician calmly and sensitively assessing a young child in a clinic setting.

Pilot questions 3.1

1. Define non-accidental injury and distinguish it from accidental injury. (Linked to SLO 3.1)
2. Explain why the true prevalence of non-accidental injury is difficult to establish. (Linked to SLO 3.1)
3. List three child factors associated with increased risk of non-accidental injury. (Linked to SLO 3.2)
4. List three caregiver or family factors associated with increased risk. (Linked to SLO 3.2)
5. Explain why risk factors should inform, rather than replace, careful clinical assessment. (Linked to SLO 3.3)

3.2 Non-Accidental Injury: Clinical Presentation and Evaluation

3.2.1 clinical presentation suggestive of non-accidental injury



Certain patterns and stories raise particular concern

Certain features of an injury or its presentation should raise specific concern for a possible non-accidental cause, including a **history inconsistent** with the injury observed, or with the child's **developmental stage**, such as a fracture attributed to a fall in an infant not yet able to roll or crawl, a **delay** in seeking medical attention that is not adequately explained, and a history that **changes** on repeated telling by the same or different caregivers.

Specific injury patterns raising concern include **bruising** in unusual locations not typically subject to accidental trauma, such as the ears, buttocks, or torso, bruising with a **patterned appearance** suggesting a specific implement, multiple **fractures** at different stages of healing, suggesting repeated episodes of injury over time, and certain specific fracture types, such as **posterior rib fractures**, that are rarely caused accidentally in young children.

Fill in the blank: A history that changes on repeated telling by the same or different caregivers is a feature suggestive of _____ injury.

3.2.2 evaluation of a suspected case

Evaluation of a suspected case of non-accidental injury requires a **detailed history**, taken sensitively and, where possible, from multiple sources separately, together with a thorough **physical examination**, documenting all injuries carefully, including their **size, location, colour**, and any **pattern**, since this documentation may later be clinically and, potentially, legally significant.

Further **investigations** may include a **skeletal survey**, a structured series of radiographs to identify occult fractures, particularly important in young infants where injuries may not be otherwise apparent, **coagulation studies**, to exclude a bleeding disorder as an alternative explanation for bruising, and, where indicated, **neuroimaging** or **ophthalmological examination**, particularly in suspected abusive head trauma, discussed further in the context of child abuse later in this Series.

Fill in the blank: A skeletal survey is a structured series of radiographs used to identify _____ fractures.

3.2.3 the multidisciplinary approach to evaluation

Evaluation of suspected non-accidental injury should generally involve a **multidisciplinary team**, including paediatricians, and, where available, specialist **child protection** teams or officers, since accurate assessment often requires combining clinical, radiological, and psychosocial information that no single professional can fully assess alone, and appropriately



trained personnel are better placed to conduct sensitive family interviews and coordinate the broader response.

Throughout evaluation, the clinician's **primary responsibility** remains the **safety and wellbeing of the child**, meaning any child requiring urgent medical treatment should receive it without delay, and any immediate safety concern should prompt appropriate **child protection referral** without waiting for a complete evaluation to be finished, since protecting the child from further potential harm takes priority over completing every element of a thorough diagnostic work up.

Fill in the blank: The clinician's primary responsibility in suspected non-accidental injury remains the safety and _____ of the child.

Table 3.2: Features raising concern for non-accidental injury.

Category	Concerning feature
History	Inconsistent with injury or developmental stage; changes on retelling
Timing	Unexplained delay in seeking medical attention
Bruising	Unusual location (ears, buttocks, torso); patterned appearance
Fractures	Multiple fractures at different healing stages; posterior rib fractures

Pilot questions 3.2

1. List three features of a history that might raise concern for non-accidental injury. (Linked to SLO 3.3)
2. List three specific injury patterns that might raise concern for non-accidental injury. (Linked to SLO 3.3)
3. Describe the purpose of a skeletal survey in suspected non-accidental injury. (Linked to SLO 3.4)
4. Explain why coagulation studies may be performed in a child with unexplained bruising. (Linked to SLO 3.4)
5. Describe the primary responsibility of the clinician when non-accidental injury is suspected. (Linked to SLO 3.5)

3.3 Non-Accidental Injury: Management and Prevention

3.3.1 immediate management of suspected non-accidental injury



Medical care and child safety proceed together

Immediate management of a child with suspected non-accidental injury includes prompt treatment of any **acute medical needs**, since medical care should never be delayed pending completion of a full child protection evaluation, together with careful, **objective documentation** of all findings, avoiding speculative or accusatory language within the medical record, and instead recording factual observations that can be interpreted appropriately by subsequent reviewers.

Where non-accidental injury is genuinely suspected, appropriate **child protection referral** should be made according to local protocols and legal requirements, and, depending on the level of immediate risk identified, this may include consideration of **admission to hospital**, both to allow further evaluation and to provide a period of safety for the child while the broader child protection response is coordinated.

Fill in the blank: Medical care should never be delayed pending completion of a full child protection _____.

3.3.2 the role of the multidisciplinary child protection team

Effective management of suspected non-accidental injury relies on **collaboration** between the medical team, **social welfare services**, and, where appropriate, **law enforcement**, since child protection is a shared societal responsibility spanning several institutions rather than the responsibility of the healthcare system operating in isolation, and clear local protocols supporting this cross-agency collaboration considerably improve the timeliness and appropriateness of the overall response.

Confidentiality must be balanced against the overriding duty to protect the child from harm, meaning information relevant to a child protection concern is generally appropriately shared with relevant child protection authorities even without explicit caregiver consent, reflecting the recognised principle that a child's **safety** takes precedence over routine confidentiality considerations in this specific, defined context.

Fill in the blank: A child's safety takes precedence over routine _____ considerations when a genuine protection concern exists.

3.3.3 prevention of non-accidental injury

Prevention of non-accidental injury operates at multiple levels, including **primary prevention**, such as broad public education on child development and appropriate, non-violent discipline, and **targeted support** for families with recognised risk factors, such as **home visiting programmes**



and **parenting support services**, which have been shown in various settings to reduce the incidence of non-accidental injury among participating families.

Secondary prevention involves prompt recognition and appropriate response to concerning presentations, as discussed throughout this Series, to prevent escalation to more severe injury, and **tertiary prevention** focuses on appropriate, coordinated support for affected children and families after an episode has occurred, including ongoing monitoring and support services, to reduce the likelihood of recurrence and support the child's longer-term wellbeing and recovery.

Fill in the blank: Home visiting programmes and parenting support services represent targeted _____ prevention for at-risk families.



Figure 3.3: A community health worker conducting a supportive home visit with a young family.

Pilot questions 3.3

1. Describe the immediate management priorities for a child with suspected non-accidental injury. (Linked to SLO 3.5)
2. Describe the role of the multidisciplinary child protection team. (Linked to SLO 3.5)



3. Explain how confidentiality is balanced against the duty to protect a child. (Linked to SLO 3.5)
4. Describe two examples of primary prevention of non-accidental injury. (Linked to SLO 3.5)
5. Describe the focus of tertiary prevention after an episode of non-accidental injury. (Linked to SLO 3.5)

3.4 Child Abuse: Definition, Epidemiology, and At-Risk Groups

3.4.1 definition and forms of child abuse

Abuse extends beyond physical harm alone

Child abuse is defined broadly as any act, or failure to act, by a parent or caregiver that results in **harm, potential harm, or threat of harm** to a child, and encompasses several recognised forms, including **physical abuse**, overlapping considerably with the non-accidental injury discussed earlier in this Series, **emotional or psychological abuse**, **sexual abuse**, and **neglect**, the failure to provide for a child's basic physical or emotional needs.

These forms of abuse frequently **coexist**, meaning a child experiencing one form of abuse is at increased risk of experiencing others simultaneously, and evaluation of a child with suspected abuse should therefore actively consider the possibility of **multiple, overlapping** forms rather than assuming a single, isolated form of maltreatment once one has been identified.

Fill in the blank: Neglect is defined as the failure to provide for a child's basic physical or emotional _____.

3.4.2 epidemiology of child abuse

Child abuse occurs across all **socioeconomic, cultural, and geographic** groups, though, as with non-accidental injury discussed earlier in this Series, certain circumstances are associated with increased risk, and, as with non-accidental injury more broadly, the true prevalence of child abuse is likely **considerably underestimated**, given substantial barriers to disclosure and recognition, including fear, shame, and, in some cases, the child's limited ability to communicate what has occurred.



Sexual abuse in particular is frequently **underreported**, given the additional layers of shame, fear of disbelief, and, in many cases, a close or trusted relationship between the child and the perpetrator, who is, in the great majority of cases, someone **known** to the child rather than a stranger, a pattern with important implications for how disclosure is approached and believed.

Fill in the blank: In the great majority of sexual abuse cases, the perpetrator is someone _____ to the child rather than a stranger.

3.4.3 at-risk groups for child abuse

Risk factors for child abuse substantially **overlap** with those discussed for non-accidental injury earlier in this Series, including **child factors** such as young age and disability, and **caregiver and family factors** such as substance misuse, domestic violence, and social isolation, with **poverty** and **household stress** more broadly also recognised as important, though again not deterministic, contributing factors.

Children with disability are at particularly increased risk of abuse, reflecting a combination of increased caregiving burden and, in some cases, reduced ability of the child to disclose or be believed if abuse occurs, meaning healthcare providers caring for children with disability should maintain particular vigilance for signs of abuse, while, as emphasised earlier in this Series, avoiding presumption in the absence of supporting clinical evidence.

Fill in the blank: Children with disability are at particularly increased risk of abuse, reflecting increased caregiving _____.





Figure 3.4: A supportive, trust-building conversation between a clinician and a child.

Pilot questions 3.4

- Define child abuse and list its recognised forms. (Linked to SLO 3.6)
- Explain why forms of abuse should be considered as potentially coexisting. (Linked to SLO 3.6)
- Explain why the true prevalence of child abuse is likely underestimated. (Linked to SLO 3.7)
- Describe the typical relationship between a child and the perpetrator in sexual abuse. (Linked to SLO 3.7)
- Explain why children with disability are at particularly increased risk of abuse. (Linked to SLO 3.8)

3.5 Child Abuse: Clinical Presentation, Evaluation, and Management

3.5.1 clinical presentation of child abuse



Presentation is often subtle and varies by form of abuse

Clinical presentation of child abuse varies by **form**, with physical abuse presenting with findings similar to non-accidental injury discussed earlier in this Series, **emotional abuse** presenting with **behavioural changes, anxiety, or developmental delay** without a clear physical cause, **sexual abuse** presenting with **genital findings**, though frequently with **no abnormal physical findings** at all, or with **behavioural changes**, and **neglect** presenting with **poor hygiene, inadequate growth, or developmental delay**.

Given how frequently physical findings are **absent or non-specific**, particularly in sexual abuse and emotional abuse, a careful, sensitive **history**, ideally obtained using **open-ended, non-leading questions**, is often the most important element of evaluation, since a child's own account, when obtained and interpreted appropriately, frequently provides more diagnostic information than physical examination findings alone.

Fill in the blank: Sexual abuse frequently presents with no abnormal physical findings, meaning careful, non-leading _____ is essential.

3.5.2 evaluation of a suspected case of child abuse

Evaluation of suspected child abuse requires a **sensitive, child-centred approach**, generally best conducted by professionals with **specific training** in this area, using **open-ended, non-leading questions** during any interview to avoid inadvertently influencing the child's account, and careful, **objective physical examination** and documentation, performed with appropriate consent and, wherever possible, in the presence of an appropriate chaperone.

Forensic evaluation, where indicated, particularly in suspected sexual abuse, should ideally be conducted by professionals with **specific forensic training**, given the importance of correctly collecting and preserving evidence that may later be relevant to legal proceedings, and evaluation should always proceed with the child's **welfare and dignity** as the central priority throughout the entire process.

Fill in the blank: Interviews should use open-ended, non-_____ questions to avoid inadvertently influencing the child's account.

3.5.3 management and prevention of child abuse

Management of confirmed or strongly suspected child abuse requires **prompt child protection referral**, treatment of any acute **medical or psychological needs**, and coordinated, **multidisciplinary follow up**, including ongoing **psychosocial support** for the child, since the psychological impact of abuse can be as significant and lasting as any physical injury sustained,



and appropriate mental health support should be considered a core, rather than optional, part of comprehensive management.

Prevention of child abuse, as with non-accidental injury, operates across multiple levels, including broad **public education**, **targeted support** for at-risk families, and robust **child protection systems** capable of promptly recognising and responding to concerns, and, as this Series concludes, effective prevention and management of both non-accidental injury and child abuse ultimately depends on a well-coordinated health, social, and legal system working together in the child's best interest.

Fill in the blank: The psychological impact of abuse can be as significant and lasting as any _____ injury sustained.



Figure 3.5: A multidisciplinary team meeting to coordinate care for a child protection case.

Pilot questions 3.5

1. Describe the typical clinical presentation of neglect. (Linked to SLO 3.9)
2. Explain why history is often more informative than physical examination in suspected sexual abuse. (Linked to SLO 3.9)
3. Describe the key principles of interviewing a child with suspected abuse. (Linked to SLO 3.9)



4. Describe the components of management of confirmed or strongly suspected child abuse. (Linked to SLO 3.10)
5. Describe the levels at which prevention of child abuse operates. (Linked to SLO 3.10)



Series Summary

This Series examined **non-accidental injury**, beginning with its epidemiology and at-risk groups, before turning to its **clinical presentation, evaluation, management, and prevention**.

We then examined **child abuse**, its definition, epidemiology, and at-risk groups, before concluding with its **clinical presentation, evaluation, and management**. Having worked through this Series, you should now be able to recognise, evaluate, and appropriately manage suspected non-accidental injury and child abuse, always keeping the child's safety and wellbeing central to your approach. The next Series turns to **paediatric emergencies**.

Glossary of Terms

6. **Non-accidental injury:** physical harm deliberately inflicted upon a child by a caregiver or other individual.
7. **Skeletal survey:** a structured series of radiographs used to identify occult fractures in suspected non-accidental injury.
8. **Child protection referral:** a formal referral to child protection services when abuse is suspected.
9. **Child abuse:** any act or failure to act by a parent or caregiver resulting in harm, potential harm, or threat of harm to a child.
10. **Physical abuse:** a form of child abuse overlapping considerably with non-accidental injury.
11. **Emotional abuse:** psychological harm to a child, presenting with behavioural change or developmental delay without physical cause.
12. **Sexual abuse:** a form of child abuse frequently presenting with no abnormal physical findings.
13. **Neglect:** failure to provide for a child's basic physical or emotional needs.
14. **Multidisciplinary team:** a coordinated group of professionals, including medical, social, and legal expertise, involved in child protection.
15. **Open-ended question:** a non-leading question format used to avoid influencing a child's account during interview.
16. **Forensic evaluation:** specialist evaluation for evidence collection, particularly relevant in suspected sexual abuse.



17. **Home visiting programme:** a targeted preventive intervention supporting at-risk families in their home environment.

Concept Check Questions [Series 3]

Objective questions

11. Non-accidental injury is distinct from the far more common _____ injury of normal childhood activity.
12. A history that changes on repeated telling by the same or different caregivers is a feature suggestive of _____ injury.
13. Medical care should never be delayed pending completion of a full child protection _____.
14. Neglect is defined as the failure to provide for a child's basic physical or emotional _____.
15. Sexual abuse frequently presents with no abnormal physical findings, meaning careful, non-leading _____ is essential.

Short-answer questions

1. List three child factors associated with increased risk of non-accidental injury.
2. List three specific injury patterns that might raise concern for non-accidental injury.
3. Describe the purpose of a skeletal survey in suspected non-accidental injury.
4. Define child abuse and list its recognised forms.
5. Describe the typical relationship between a child and the perpetrator in sexual abuse.

Long-answer questions

6. Discuss the epidemiology and at-risk groups for non-accidental injury. (Linked to SLO 3.1, SLO 3.2)
7. Discuss the clinical presentation and evaluation of suspected non-accidental injury. (Linked to SLO 3.3, SLO 3.4)
8. Discuss the management and prevention of non-accidental injury. (Linked to SLO 3.5)
9. Discuss the definition, epidemiology, and at-risk groups for child abuse. (Linked to SLO 3.6, SLO 3.7)
10. Discuss the clinical presentation, evaluation, and management of child abuse. (Linked to SLO 3.8, SLO 3.9, SLO 3.10)



Answers to Concept Check Questions [Series 3]

Objective questions

11. Accidental.
12. Non-accidental.
13. Evaluation.
14. Needs.
15. History.

Short-answer questions

6. Younger age, particularly infants under one year, prematurity or low birth weight, and disability or chronic illness.
7. Unusual location bruising, patterned bruising, and multiple fractures at different healing stages.
8. A skeletal survey identifies occult fractures, particularly important in young infants.
9. Child abuse is any act or failure to act causing harm, potential harm, or threat of harm; forms include physical, emotional, sexual abuse, and neglect.
10. The perpetrator is, in the great majority of cases, someone known to the child rather than a stranger.

Long-answer questions

6. **Basic response:** Non-accidental injury is inflicted harm distinct from accidental injury, with risk increased by certain child and caregiver factors, though these are risk factors rather than certainties.

Value-added response: The true prevalence is likely underestimated due to under-recognition and under-reporting, meaning ongoing clinical vigilance is essential across all presentations.

7. **Basic response:** Concerning presentations include inconsistent history, unexplained delay, and specific injury patterns such as multiple fractures of different ages, evaluated through history, examination, and targeted investigation.

Value-added response: A skeletal survey and coagulation studies support evaluation, and assessment should generally involve a multidisciplinary team with the child's safety as the overriding priority.

8. **Basic response:** Management includes prompt treatment of acute needs, objective documentation, and appropriate child protection referral without delaying medical care.



Value-added response: Prevention operates at multiple levels, from broad public education to targeted support for at-risk families, alongside prompt recognition to prevent escalation.

9. **Basic response:** Child abuse encompasses physical, emotional, sexual abuse, and neglect, which frequently coexist and share overlapping risk factors with non-accidental injury.

Value-added response: True prevalence is underestimated, particularly for sexual abuse, given barriers to disclosure and the fact that perpetrators are usually known to the child.

10. **Basic response:** Clinical presentation varies by form of abuse, often with subtle or absent physical findings, meaning careful, non-leading history-taking is essential to evaluation.

Value-added response: Management requires prompt referral, treatment of medical and psychological needs, and coordinated multidisciplinary follow up, with prevention operating across public education, targeted support, and robust protection systems.

Answers to Pilot Questions [Series 3]

Part 3.1

1. Non-accidental injury is deliberately inflicted harm, distinct from the far more common accidental injury.
2. Under-recognition and under-reporting make the true prevalence difficult to establish.
3. Younger age, prematurity or low birth weight, and disability or chronic illness are child risk factors.
4. Parental stress, substance misuse, and domestic violence are caregiver or family risk factors.
5. Risk factors increase statistical likelihood but do not replace the need for careful clinical assessment.

Part 3.2

1. Inconsistent history, unexplained delay in seeking care, and a story that changes on retelling.
2. Unusual location bruising, patterned bruising, and multiple fractures at different healing stages.



3. A skeletal survey identifies occult fractures, particularly in young infants where injuries may not be apparent.
4. Coagulation studies exclude a bleeding disorder as an alternative explanation for bruising.
5. The clinician's primary responsibility is the safety and wellbeing of the child.

Part 3.3

1. Prompt treatment of acute medical needs and careful, objective documentation are immediate priorities.
2. The team combines medical, social welfare, and law enforcement expertise for a coordinated response.
3. Information relevant to protection concerns may be shared with authorities even without explicit consent, since safety takes precedence.
4. Public education on child development and non-violent discipline are examples of primary prevention.
5. Tertiary prevention focuses on coordinated support for affected families to reduce recurrence.

Part 3.4

1. Child abuse is any act or failure to act causing harm; forms include physical, emotional, sexual abuse, and neglect.
2. A child experiencing one form of abuse is at increased risk of experiencing others simultaneously.
3. Barriers to disclosure and recognition mean true prevalence is likely considerably underestimated.
4. The perpetrator is usually someone known and trusted by the child, rather than a stranger.
5. Increased caregiving burden and reduced ability to disclose or be believed increase risk in children with disability.

Part 3.5

1. Neglect presents with poor hygiene, inadequate growth, or developmental delay.
2. Physical findings are frequently absent or non-specific in sexual abuse, making the child's account particularly important.
3. Open-ended, non-leading questions should be used to avoid influencing the child's account.
4. Management includes child protection referral, treatment of medical and psychological needs, and multidisciplinary follow up.



5. Prevention operates through public education, targeted family support, and robust child protection systems.



References and Attributions [Series 3]

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- World Health Organization (2020). Child Maltreatment Fact Sheet. WHO Press.
- Christian, C. W. and Committee on Child Abuse and Neglect (2015). The evaluation of suspected child physical abuse. Pediatrics, 135(5), e1337 to e1354.
- Federal Ministry of Women Affairs and Social Development, Nigeria (2013). Child Protection Policy.

Figures, Plates, Tables, and Boxes

- Figure 3.1: A clinician calmly and sensitively assessing a young child in a clinic setting. AI-generated using the prompt: "A calm, respectful clinical illustration of a clinician gently examining a young child on an examination table in a bright, professional clinic room. Single clean medical illustration, soft clinical lighting, no text overlays, no multiple panels, sensitive and accurate depiction."
- Table 3.2: Features raising concern for non-accidental injury. AI-generated using the prompt: "Create a clean reference table titled Features Raising Concern for Non-Accidental Injury, listing category and concerning feature. Simple clinical reference table style with outside border."
- Figure 3.3: A community health worker conducting a supportive home visit with a young family. AI-generated using the prompt: "A warm, respectful illustration of a community health worker sitting with a parent holding a young child during a friendly home visit in a modest living room. Single clean illustration, soft natural lighting, no text overlays, no multiple panels, supportive and accurate depiction."
- Figure 3.4: A supportive, trust-building conversation between a clinician and a child. AI-generated using the prompt: "A gentle, respectful illustration of a clinician kneeling to a child's eye level, speaking warmly with the child in a calm, softly lit consultation room. Single clean illustration, soft natural lighting, no text overlays, no multiple panels, sensitive and accurate depiction."
- Figure 3.5: A multidisciplinary team meeting to coordinate care for a child protection case. AI-generated using the prompt: "A professional illustration of a small multidisciplinary team, including a clinician and a social worker, seated around a table reviewing notes together in a meeting room. Single clean illustration, soft office lighting, no text overlays, no multiple panels, professional and accurate depiction."



Series 4: Paediatric Emergencies

1. Part 4.1: Definition of Paediatric Emergency and Triage

1. Sub Part 4.1.1: Definition of paediatric emergency
2. Sub Part 4.1.2: Triage in the emergency unit
3. Sub Part 4.1.3: Recognising urgent and non-urgent conditions

2. Part 4.2: Principles of Management of Paediatric Emergencies

1. Sub Part 4.2.1: The systematic ABCDE approach
2. Sub Part 4.2.2: General principles of resuscitation
3. Sub Part 4.2.3: Team-based approach and communication

3. Part 4.3: Respiratory and Circulatory Emergencies

1. Sub Part 4.3.1: Recognition of respiratory emergencies
2. Sub Part 4.3.2: Management of respiratory emergencies
3. Sub Part 4.3.3: Recognition and management of circulatory emergencies

4. Part 4.4: Neurological and Surgical Emergencies

1. Sub Part 4.4.1: Recognition of neurological emergencies
2. Sub Part 4.4.2: Management of neurological emergencies
3. Sub Part 4.4.3: Common surgical and traumatic emergencies

5. Part 4.5: Other Common Paediatric Emergencies and Stabilisation

1. Sub Part 4.5.1: Other common paediatric emergencies
2. Sub Part 4.5.2: General principles of stabilisation
3. Sub Part 4.5.3: Referral and transfer of the unstable child

Introduction

In the last Series, we explored non-accidental injuries and child abuse. We now turn to paediatric emergencies, situations in which prompt recognition and action can be genuinely life-saving.

Picture a busy emergency unit where a triage nurse must rapidly decide, among several waiting children, which requires immediate attention and which can safely wait, while a child with severe respiratory distress is simultaneously being assessed in the resuscitation bay. Developing the knowledge and skills to recognise and manage paediatric emergencies, and to triage appropriately, is the focus of this Series.



The aim of this Series is to equip you with the knowledge required to define and recognise a paediatric emergency, triage effectively, and understand the principles of management of common paediatric emergencies.

This Series begins with the **definition of paediatric emergency and triaging**, before turning to the **principles of management of paediatric emergencies**. Next, we examine **respiratory and circulatory emergencies**, then **neurological and surgical emergencies**, before concluding with **other common paediatric emergencies and stabilisation**.

Series Learning Outcomes

At the end of this Series, you should be able to:

6. **SLO 1.1:** define paediatric emergency,
7. **SLO 1.2:** describe triaging in the emergency unit,
8. **SLO 1.3:** describe how to recognise a paediatric emergency, and distinguish urgent from non-urgent conditions,
9. **SLO 1.4:** enumerate the principles of management of paediatric emergencies,
10. **SLO 1.5:** describe the recognition and management of respiratory emergencies in children,
11. **SLO 1.6:** describe the recognition and management of circulatory emergencies in children,
12. **SLO 1.7:** describe the recognition and management of neurological emergencies in children,
13. **SLO 1.8:** describe the recognition and management of common surgical and traumatic paediatric emergencies,
14. **SLO 1.9:** list other common paediatric emergencies and their general management, and
15. **SLO 1.10:** describe the general principles of stabilisation and referral of a child with a paediatric emergency.

4.1 Definition of Paediatric Emergency and Triage

4.1.1 definition of paediatric emergency

A situation where delay genuinely costs lives

A **paediatric emergency** is defined as any condition in a child that poses an **immediate threat** to life, limb, or long-term wellbeing, requiring **prompt recognition** and **intervention** to prevent



significant morbidity or mortality, distinguishing it from **urgent** conditions, which require timely but not immediate attention, and **non-urgent** conditions, which can safely wait for routine assessment.

Recognising a paediatric emergency depends on a combination of the child's **general appearance**, specific **physiological parameters**, and the **presenting complaint**, since children, particularly infants, can **compensate** for significant physiological derangement for a period before showing obvious signs of decompensation, meaning a systematic, structured approach to assessment is essential rather than relying on appearance alone.

Fill in the blank: A paediatric emergency requires prompt recognition and intervention to prevent significant morbidity or _____.

4.1.2 triaging in the emergency unit

Triage is the process of rapidly assessing and **prioritising** children presenting to the emergency unit according to the **severity** and **urgency** of their condition, ensuring that the sickest children are seen and treated **first**, regardless of order of arrival, and typically uses a structured **triage scale**, categorising children into groups such as **emergency**, **priority**, or **urgent**, and **non-urgent**, or queue, based on rapid assessment findings.

Effective triage requires **brief, structured assessment**, typically completed within a few minutes, focusing on **airway**, **breathing**, **circulation**, and **level of consciousness**, together with specific **danger signs**, discussed further in the next sub-Part, and triage should be an **ongoing process** throughout a child's time in the emergency unit, since a child's condition can change, requiring **re-triage** if their clinical status appears to be deteriorating while waiting.

Fill in the blank: Triage ensures the sickest children are seen and treated first, regardless of order of _____.

4.1.3 recognising urgent and non-urgent conditions

Danger signs prompting immediate, emergency-level triage typically include **inability to drink or breastfeed**, **persistent vomiting**, **convulsions**, **lethargy** or **unconsciousness**, and severe **respiratory distress**, with the presence of any one of these signs generally warranting immediate assessment and intervention ahead of children without such features, reflecting a systematic approach widely used across many emergency and primary care triage systems.



Urgent conditions, such as a child with moderate dehydration or a limb injury without obvious deformity, require assessment within a **defined, relatively short timeframe**, while **non-urgent conditions**, such as a child with a mild upper respiratory infection and no danger signs, can generally be safely assessed after children with more urgent needs, and accurate distinction between these categories is essential to appropriately allocate limited emergency unit resources.

Fill in the blank: Danger signs prompting immediate triage include inability to drink or breastfeed, persistent vomiting, and _____.



Figure 4.1: A triage nurse rapidly assessing a child on arrival at the emergency unit.

Pilot questions 4.1

1. Define paediatric emergency and distinguish it from an urgent condition. (Linked to SLO 4.1)
2. Explain why children can be more difficult to recognise as critically unwell than adults. (Linked to SLO 4.1)
3. Describe the purpose and process of triage in the emergency unit. (Linked to SLO 4.2)
4. List three danger signs that should prompt immediate triage. (Linked to SLO 4.3)
5. Distinguish urgent from non-urgent conditions in the emergency unit. (Linked to SLO 4.3)



4.2 Principles of Management of Paediatric Emergencies

4.2.1 the systematic ABCDE approach

A structured sequence prevents missed, life-threatening problems

Management of any paediatric emergency follows a **systematic, structured approach**, commonly organised as **ABCDE**: **Airway**, ensuring the airway is patent and protected, **Breathing**, assessing and supporting adequate ventilation and oxygenation, **Circulation**, assessing and supporting adequate perfusion, **Disability**, assessing neurological status, and **Exposure**, a full examination while preventing heat loss, with each step addressed **in sequence**, since a problem identified at an earlier step must generally be addressed before proceeding to the next.

This structured approach ensures that immediately **life-threatening problems** are identified and addressed **first**, before moving on to less urgent, though still important, aspects of assessment and management, and is deliberately designed to be applied **consistently** across virtually any paediatric emergency presentation, providing a reliable, memorable framework even under the pressure of a genuine emergency.

Fill in the blank: The systematic approach to paediatric emergency management is commonly organised as _____.

4.2.2 general principles of resuscitation

Airway management in a paediatric emergency may require simple manoeuvres such as **head positioning** and **jaw thrust**, or, in more severe cases, **advanced airway** intervention, and **breathing support** may include supplemental **oxygen**, **bag-valve-mask ventilation**, or, where indicated, more advanced **respiratory support**, with the specific intervention selected according to the severity of the child's presentation.

Circulatory support typically involves establishing **intravenous** or, where venous access is difficult, **intraosseous access**, for administration of **fluids** or **medications**, and accurate **weight estimation**, since paediatric drug and fluid doses are generally calculated on a **weight-based** basis, is an essential, practical component of paediatric emergency management, often using age-based estimation formulae or a length-based resuscitation tape when the child's actual weight is not immediately known.

Fill in the blank: Paediatric drug and fluid doses are generally calculated on a _____-based basis.



4.2.3 team-based approach and communication

Effective management of a paediatric emergency generally requires a **coordinated team**, with **clear role allocation**, a designated **team leader**, and **structured communication**, since a chaotic, poorly coordinated response can significantly delay appropriate treatment even when individual team members are each highly skilled, meaning effective **teamwork** is as important a skill as individual clinical knowledge in this setting.

Communication with the family throughout a paediatric emergency, providing clear, honest, and appropriately timed information about the child's condition and the actions being taken, is also an essential, though sometimes overlooked, component of high-quality emergency care, since a frightened, poorly informed family can add additional stress to an already challenging clinical situation for everyone involved.

Fill in the blank: Effective management of a paediatric emergency generally requires a coordinated _____ with clear role allocation.



Figure 4.2: A resuscitation team working together to manage a child in the emergency unit.

Pilot questions 4.2



1. Describe the ABCDE approach to paediatric emergency management. (Linked to SLO 4.4)
2. Explain why each step of the ABCDE approach is addressed in sequence. (Linked to SLO 4.4)
3. Describe the options for establishing vascular access in a paediatric emergency. (Linked to SLO 4.4)
4. Explain why accurate weight estimation is important in paediatric emergencies. (Linked to SLO 4.4)
5. Describe the importance of team-based communication in managing a paediatric emergency. (Linked to SLO 4.4)

4.3 Respiratory and Circulatory Emergencies

4.3.1 recognition of respiratory emergencies

Look, listen, and feel for the signs of significant distress

Respiratory emergencies in children present with signs of significant **respiratory distress**, including **tachypnoea**, **nasal flaring**, **grunting**, **chest indrawing**, and, in severe cases, **cyanosis**, discussed in an earlier course in the context of respiratory system assessment, and recognising the **severity** of respiratory compromise is essential, since a child with severe distress can deteriorate to **respiratory failure** and cardiac arrest with limited warning if not promptly and appropriately managed.

Common causes of paediatric respiratory emergency include severe **asthma exacerbation**, **foreign body airway obstruction**, severe **croup** or **epiglottitis**, and severe **pneumonia**, each requiring somewhat different specific management, though the general principles of **airway support**, **supplemental oxygen**, and prompt treatment of the underlying cause apply broadly across this group of presentations.

Fill in the blank: A child with severe respiratory distress can deteriorate to respiratory failure with limited _____ if not promptly managed.

4.3.2 management of respiratory emergencies

Immediate management of a respiratory emergency includes ensuring a **patent airway**, providing **high-flow oxygen** where indicated, and, for specific causes, **targeted treatment**, such as **nebulised bronchodilators** for severe asthma, **nebulised adrenaline** for severe croup, or



urgent, controlled **airway management** for suspected epiglottitis, discussed in an earlier course, with the specific approach guided by the identified or suspected underlying cause.

Foreign body airway obstruction requires immediate, specific first aid manoeuvres, including **back blows** and **chest thrusts** in infants, or the **Heimlich manoeuvre** in older children, and any child with significant, ongoing respiratory compromise not responding to initial measures requires urgent escalation, including consideration of **advanced airway management** by an experienced provider.

Fill in the blank: Foreign body airway obstruction in infants is managed with back blows and _____ thrusts.

4.3.3 recognition and management of circulatory emergencies

Circulatory emergencies, most commonly presenting as **shock**, are recognised by signs of **poor perfusion**, including **prolonged capillary refill time**, **cool peripheries**, **weak pulses**, and, in more advanced stages, **hypotension**, though hypotension is often a **late** finding in children, since children can maintain blood pressure through compensatory mechanisms until relatively **advanced** shock has developed, making early recognition based on perfusion signs, rather than blood pressure alone, particularly important.

Management of shock includes **fluid resuscitation**, typically with **isotonic crystalloid**, given as a **bolus** and reassessed, together with identification and treatment of the **underlying cause**, whether **hypovolaemic** shock, from fluid loss, **septic** shock, from severe infection, or, less commonly in children, **cardiogenic** shock, from primary cardiac dysfunction, since the specific underlying cause meaningfully influences the most appropriate subsequent management approach.

Fill in the blank: Hypotension is often a late finding in children with shock, since children can maintain blood pressure through _____ mechanisms until advanced shock develops.

Table 4.3: Recognising respiratory versus circulatory emergency in children.

Feature	Respiratory emergency	Circulatory emergency
Key signs	Tachypnoea, grunting, chest indrawing, cyanosis	Prolonged capillary refill, cool peripheries, weak pulses
Blood pressure	Usually preserved until very late	Hypotension is typically a late finding
Immediate priority	Airway support and oxygen	Fluid resuscitation and treating underlying cause



Pilot questions 4.3

- List four signs of respiratory distress in a child. (Linked to SLO 4.5)
- Describe the immediate management of a severe asthma exacerbation. (Linked to SLO 4.5)
- Describe first aid management of foreign body airway obstruction in an infant. (Linked to SLO 4.5)
- Explain why hypotension is often a late finding in paediatric shock. (Linked to SLO 4.6)
- Describe the initial management of shock in a child. (Linked to SLO 4.6)

4.4 Neurological and Surgical Emergencies

4.4.1 recognition of neurological emergencies

Rapid assessment of conscious level guides urgency

Neurological emergencies in children include **status epilepticus**, a prolonged or repeated seizure without full recovery between episodes, significant **altered consciousness**, assessed using a structured scale such as the **AVPU scale**, Alert, responds to Voice, responds to Pain, Unresponsive, or the more detailed **Glasgow Coma Scale**, and signs suggestive of **raised intracranial pressure**, such as a bulging fontanelle in an infant or specific pupillary changes.

Rapid assessment of conscious level and pupillary response provides essential information for guiding both **urgency** of intervention and likely underlying cause, and any child presenting with significant, unexplained altered consciousness requires prompt evaluation for potentially treatable causes, including **hypoglycaemia**, discussed in an earlier course, **infection**, and **raised intracranial pressure**, since several of these underlying causes require specific, time-sensitive treatment.

Fill in the blank: Status epilepticus is a prolonged or repeated seizure without full recovery between _____.

4.4.2 management of neurological emergencies

Management of **status epilepticus** follows a structured, stepwise approach, typically beginning with a **benzodiazepine**, such as diazepam or lorazepam, given by an appropriate route, with escalation to a **second-line anticonvulsant** if seizures continue despite initial treatment, together with attention to **airway** and **breathing**, since prolonged seizure activity itself can compromise



adequate ventilation, and prompt correction of any identified reversible cause, such as hypoglycaemia.

Management of significant altered consciousness or suspected raised intracranial pressure includes careful **airway and breathing support**, appropriate **positioning**, and urgent evaluation for and treatment of the **underlying cause**, since the specific management, whether for meningitis, a mass lesion, or a metabolic cause, differs considerably depending on the identified aetiology, meaning rapid, targeted evaluation alongside initial stabilisation is essential.

Fill in the blank: Management of status epilepticus typically begins with a _____.

4.4.3 common surgical and traumatic emergencies

Common **surgical emergencies** in children include **appendicitis**, presenting with abdominal pain and requiring prompt surgical evaluation, **intussusception**, presenting with intermittent abdominal pain, vomiting, and, classically, **redcurrant jelly stool**, and **testicular torsion**, a genuine surgical emergency presenting with sudden onset severe scrotal pain, in which delayed recognition and treatment risks permanent loss of the affected testis.

Traumatic emergencies, including significant **head injury**, **abdominal trauma**, and **major limb injury**, require prompt, systematic assessment following the same **ABCDE** approach discussed earlier in this Series, with particular attention to identifying and addressing any immediately life-threatening injury before proceeding to detailed assessment of less urgent injuries, since the priority in major trauma remains addressing threats to life before treating threats to limb or lesser injuries.

Fill in the blank: Testicular torsion is a genuine surgical emergency in which delayed treatment risks permanent loss of the affected _____.





Figure 4.3: A clinician assessing a child's conscious level using a structured scoring approach.

Pilot questions 4.4

1. Describe the AVPU scale and its use in assessing conscious level. (Linked to SLO 4.7)
2. Describe the initial management of status epilepticus. (Linked to SLO 4.7)
3. Describe the classic presentation of intussusception. (Linked to SLO 4.8)
4. Explain why testicular torsion is a genuine surgical emergency. (Linked to SLO 4.8)
5. Describe the general approach to assessing a child with major trauma. (Linked to SLO 4.8)

4.5 Other Common Paediatric Emergencies and Stabilisation

4.5.1 other common paediatric emergencies

A varied group united by the need for prompt recognition

Beyond the categories already discussed, other important paediatric emergencies include **severe dehydration**, discussed in an earlier course, **diabetic ketoacidosis**, also discussed in an earlier course, **anaphylaxis**, a severe, potentially life-threatening allergic reaction requiring **immediate**



intramuscular adrenaline, and significant **burns**, requiring prompt assessment of extent and depth alongside careful fluid management.

Anaphylaxis presents with rapid onset of **skin changes**, such as urticaria or angioedema, together with **respiratory** or **circulatory compromise**, and immediate recognition and treatment with **intramuscular adrenaline**, given without delay once suspected, is genuinely life-saving, with further supportive measures, including **oxygen**, **fluids**, and, in some protocols, **antihistamines** and **corticosteroids**, given as adjuncts rather than as the primary, immediate treatment.

Fill in the blank: Anaphylaxis is treated immediately with intramuscular _____.

4.5.2 general principles of stabilisation

Stabilisation of a child with any paediatric emergency follows the general ABCDE principles discussed earlier in this Series, with the specific goal of achieving a **safe, stable clinical state** before undertaking any further, less urgent assessment or definitive treatment, and stabilisation should always take priority over completing a comprehensive history or detailed investigation when a child's immediate physiological status remains unstable.

Reassessment at regular intervals throughout the stabilisation process is essential, since a child's condition can change rapidly, and each intervention should be followed by prompt reassessment of its effect, allowing the treating team to confirm improvement or recognise the need for further, escalated intervention without unnecessary delay.

Fill in the blank: Reassessment at regular intervals is essential since a child's condition can change _____.

4.5.3 referral and transfer of the unstable child

Where a child requires a level of care not available at the initial facility, **referral** or **transfer** to a facility with appropriate resources should be arranged **promptly**, following initial stabilisation, with clear, structured **communication** between referring and receiving teams, including relevant clinical history, current status, and treatment already given, to ensure continuity of care during the transfer process.

Safe transport requires appropriate **monitoring**, ongoing **treatment** as needed during transit, and, wherever possible, an appropriately trained **accompanying provider**, since a child can deteriorate during transfer, and the transferring team must be prepared to recognise and respond



to this possibility throughout the journey, reflecting the same principles of vigilance and readiness that apply throughout the entire paediatric emergency care pathway discussed across this Series.

Fill in the blank: Safe transport of an unstable child requires appropriate monitoring and an appropriately trained accompanying _____.



Figure 4.4: A child being transferred between facilities with careful monitoring in place.

Pilot questions 4.5

6. Describe the immediate management of anaphylaxis. (Linked to SLO 4.9)
7. List two other common paediatric emergencies beyond those already discussed in this Series. (Linked to SLO 4.9)
8. Describe the general goal of stabilisation. (Linked to SLO 4.10)
9. Explain why regular reassessment is essential during stabilisation. (Linked to SLO 4.10)
10. Describe the key components of safe referral and transfer of an unstable child. (Linked to SLO 4.10)



Series Summary

This Series examined **paediatric emergencies**, beginning with the definition of paediatric emergency and triaging, before turning to the **principles of management**.

We then examined **respiratory and circulatory emergencies**, followed by **neurological and surgical emergencies**, before concluding with **other common paediatric emergencies and the principles of stabilisation and transfer**. Having worked through this Series, you should now be able to recognise, triage, and initiate management of common paediatric emergencies. The next Series turns to **primary care and integrated management of childhood illness**.

Glossary of Terms

11. **Paediatric emergency:** a condition posing an immediate threat to life, limb, or long-term wellbeing in a child.
12. **Triage:** the process of rapidly assessing and prioritising children according to severity and urgency.
13. **ABCDE approach:** a structured sequence for paediatric emergency assessment: Airway, Breathing, Circulation, Disability, Exposure.
14. **Intraosseous access:** a route for administering fluids or medications when intravenous access is difficult.
15. **AVPU scale:** a simple scale for assessing conscious level: Alert, Voice, Pain, Unresponsive.
16. **Status epilepticus:** a prolonged or repeated seizure without full recovery between episodes.
17. **Shock:** a circulatory emergency characterised by inadequate tissue perfusion.
18. **Testicular torsion:** a surgical emergency in which delayed treatment risks permanent loss of the affected testis.
19. **Anaphylaxis:** a severe, potentially life-threatening allergic reaction requiring immediate intramuscular adrenaline.
20. **Stabilisation:** the process of achieving a safe, stable clinical state before further assessment or treatment.
21. **Redcurrant jelly stool:** a classic stool finding associated with intussusception.
22. **Danger signs:** specific clinical features prompting immediate, emergency-level triage.



Concept Check Questions [Series 4]

Objective questions

1. A paediatric emergency requires prompt recognition and intervention to prevent significant morbidity or _____.
2. The systematic approach to paediatric emergency management is commonly organised as _____.
3. Hypotension is often a late finding in children with shock, since children can maintain blood pressure through _____ mechanisms.
4. Status epilepticus is a prolonged or repeated seizure without full recovery between _____.
5. Anaphylaxis is treated immediately with intramuscular _____.

Short-answer questions

6. List three danger signs that should prompt immediate triage.
7. Describe the options for establishing vascular access in a paediatric emergency.
8. List four signs of respiratory distress in a child.
9. Describe the classic presentation of intussusception.
10. Describe the key components of safe referral and transfer of an unstable child.

Long-answer questions

11. Discuss the definition of paediatric emergency and the process of triage. (Linked to SLO 4.1, SLO 4.2, SLO 4.3)
12. Discuss the principles of management of paediatric emergencies, including the ABCDE approach. (Linked to SLO 4.4)
13. Discuss the recognition and management of respiratory and circulatory emergencies in children. (Linked to SLO 4.5, SLO 4.6)
14. Discuss the recognition and management of neurological and surgical emergencies in children. (Linked to SLO 4.7, SLO 4.8)
15. Discuss other common paediatric emergencies and the principles of stabilisation and transfer. (Linked to SLO 4.9, SLO 4.10)



Answers to Concept Check Questions [Series 4]

Objective questions

1. Mortality.
2. ABCDE.
3. Compensatory.
4. Episodes.
5. Adrenaline.

Short-answer questions

6. Inability to drink or breastfeed, persistent vomiting, and convulsions or unconsciousness.
7. Intravenous access, or intraosseous access where intravenous access is difficult.
8. Tachypnoea, nasal flaring, grunting, and chest indrawing.
9. Intermittent abdominal pain, vomiting, and redcurrant jelly stool.
10. Prompt arrangement after stabilisation, structured communication, appropriate monitoring, and an accompanying trained provider.

Long-answer questions

11. **Basic response:** A paediatric emergency is an immediate threat to life or wellbeing, identified through triage, which prioritises children by severity using danger signs and structured assessment.

Value-added response: Children can compensate for significant derangement before showing obvious signs, making structured, ongoing assessment essential rather than relying on appearance alone.

12. **Basic response:** The ABCDE approach addresses airway, breathing, circulation, disability, and exposure in sequence, ensuring life-threatening problems are identified and treated first.

Value-added response: Effective management also requires a coordinated team with clear roles and communication, alongside accurate weight estimation for medication and fluid dosing.

13. **Basic response:** Respiratory emergencies present with distress signs such as grunting and indrawing, managed with airway support and oxygen; circulatory emergencies present with poor perfusion, managed with fluid resuscitation.



Value-added response: Hypotension is a late finding in both categories due to compensatory mechanisms, making early recognition based on perfusion and respiratory signs particularly important.

14. **Basic response:** Neurological emergencies include status epilepticus and altered consciousness, managed with benzodiazepines and airway support; surgical emergencies include appendicitis and testicular torsion.

Value-added response: Testicular torsion and similar time-critical surgical emergencies require urgent recognition, since delay risks permanent organ loss.

15. **Basic response:** Other emergencies include anaphylaxis, managed with immediate adrenaline, and severe dehydration or diabetic ketoacidosis, managed with fluid and specific treatment.

Value-added response: Stabilisation prioritises achieving a safe clinical state with regular reassessment, followed by prompt, well-communicated referral or transfer when a higher level of care is needed.

Answers to Pilot Questions [Series 4]

Part 4.1

1. A paediatric emergency is an immediate threat to life or wellbeing; an urgent condition requires timely but not immediate attention.
2. Children can compensate for significant physiological derangement before showing obvious signs of decompensation.
3. Triage rapidly assesses and prioritises children by severity, ensuring the sickest are seen first regardless of arrival order.
4. Inability to drink or breastfeed, persistent vomiting, and convulsions are examples of danger signs.
5. Urgent conditions require assessment within a defined short timeframe; non-urgent conditions can wait safely.

Part 4.2

1. ABCDE addresses Airway, Breathing, Circulation, Disability, and Exposure in a structured sequence.
2. Each step is addressed in sequence because a problem at an earlier step must generally be resolved before proceeding.



3. Intravenous access, or intraosseous access when intravenous access is difficult, are options for vascular access.
4. Paediatric drug and fluid doses are calculated on a weight basis, so accurate weight estimation guides safe dosing.
5. A coordinated team with clear roles prevents delay and confusion during a genuine emergency response.

Part 4.3

1. Tachypnoea, nasal flaring, grunting, and chest indrawing are signs of respiratory distress.
2. Nebulised bronchodilators, along with oxygen and airway support, are used for severe asthma exacerbation.
3. Back blows and chest thrusts are used for foreign body airway obstruction in infants.
4. Children maintain blood pressure through compensatory mechanisms until relatively advanced shock has developed.
5. Fluid resuscitation with isotonic crystalloid and treatment of the underlying cause are initial management steps.

Part 4.4

- AVPU assesses conscious level as Alert, responds to Voice, responds to Pain, or Unresponsive.
- A benzodiazepine, such as diazepam or lorazepam, is given first, with escalation if seizures continue.
- Intermittent abdominal pain, vomiting, and redcurrant jelly stool are classic features of intussusception.
- Delayed treatment of testicular torsion risks permanent loss of the affected testis.
- Assessment follows the ABCDE approach, prioritising life-threatening injuries before less urgent ones.

Part 4.5

1. Immediate intramuscular adrenaline is given for anaphylaxis, with oxygen and fluids as supportive measures.
2. Severe dehydration and diabetic ketoacidosis are other common paediatric emergencies.
3. Stabilisation aims to achieve a safe, stable clinical state before further assessment or treatment.
4. A child's condition can change rapidly, so reassessment confirms improvement or the need for further intervention.
5. Prompt arrangement, structured communication, monitoring, and an accompanying trained provider are key components.



References and Attributions [Series 4]

- Kliegman, R. M., St Geme, J. W., Blum, N. J., Shah, S. S., Tasker, R. C. and Wilson, K. M. (2020). Nelson Textbook of Pediatrics (21st ed.). Elsevier.
- World Health Organization (2016). Pocket Book of Hospital Care for Children (2nd ed.). WHO Press.
- Advanced Life Support Group (2016). Advanced Paediatric Life Support: The Practical Approach (6th ed.). Wiley-Blackwell.
- American Academy of Pediatrics (2021). Pediatric Education for Prehospital Professionals (4th ed.).

Figures, Plates, Tables, and Boxes

- Figure 4.1: A triage nurse rapidly assessing a child on arrival at the emergency unit. AI-generated using the prompt: "A realistic clinical illustration of a triage nurse quickly examining a child held by a caregiver at an emergency department reception desk, with a calm but focused atmosphere. Single clean medical illustration, clinical lighting, no text overlays, no multiple panels, accurate and professional depiction."
- Figure 4.2: A resuscitation team working together to manage a child in the emergency unit. AI-generated using the prompt: "A realistic clinical illustration of a coordinated team of two or three clinicians attending to a child on an emergency department resuscitation bed, working calmly and purposefully together. Single clean medical illustration, clinical lighting, no text overlays, no multiple panels, accurate and professional depiction, no graphic medical detail."
- Table 4.3: Recognising respiratory versus circulatory emergency in children. AI-generated using the prompt: "Create a clean reference table titled Recognising Respiratory versus Circulatory Emergency in Children, comparing key signs, blood pressure, and immediate priority. Simple clinical reference table style with outside border."
- Figure 4.3: A clinician assessing a child's conscious level using a structured scoring approach. AI-generated using the prompt: "A realistic clinical illustration of a clinician gently assessing a child's responsiveness at a hospital bedside, with a caregiver present nearby. Single clean medical illustration, clinical lighting, no text overlays, no multiple panels, accurate and professional depiction."
- Figure 4.4: A child being transferred between facilities with careful monitoring in place. AI-generated using the prompt: "A realistic clinical illustration of a child on a stretcher being carefully wheeled by a healthcare provider through a hospital corridor, with a small monitor attached. Single clean medical illustration, clinical lighting, no text overlays, no multiple panels, calm and professional depiction."



Series 5: Primary Care and Integrated Management of Childhood Illness

1. Part 5.1: Characteristics of Children and Mothers Attending Primary Health Care

1. Sub Part 5.1.1: Demographic and clinical characteristics of children attending primary health care
2. Sub Part 5.1.2: The economic disposition of mothers attending primary health care
3. Sub Part 5.1.3: Anthropometry and nutritional issues in primary health care

2. Part 5.2: Communication and Triage in Primary Health Care

1. Sub Part 5.2.1: Talking to mothers about hygiene and illness
2. Sub Part 5.2.2: Principles of effective health education
3. Sub Part 5.2.3: Triage in the primary health care clinic

3. Part 5.3: Introduction to IMCI: Background, Rationale, and Components

1. Sub Part 5.3.1: Background and rationale for IMCI
2. Sub Part 5.3.2: Components of the integrated IMCI approach
3. Sub Part 5.3.3: The IMCI strategy in practice

4. Part 5.4: The IMCI Case Management Process

1. Sub Part 5.4.1: Assessment in the IMCI process
2. Sub Part 5.4.2: Classification in the IMCI process
3. Sub Part 5.4.3: Treatment, counselling, and follow up in the IMCI process

5. Part 5.5: Benefits, Limitations, and Improving Practice

1. Sub Part 5.5.1: Benefits of IMCI
2. Sub Part 5.5.2: Limitations of IMCI
3. Sub Part 5.5.3: Improving case management skills and family and community practice



Introduction

In the last Series, we explored paediatric emergencies. We now turn to primary care, where the great majority of childhood illness is actually first recognised and managed, and to the Integrated Management of Childhood Illness strategy, developed specifically to support health workers in this setting. Picture a busy primary health care clinic on an ordinary morning, with a nurse working through a structured checklist to assess each child in turn, systematically screening for the most common, and most dangerous, childhood illnesses using a simple, standardised approach. This final Series of the course brings together the practical, everyday skills of primary child health care.

The aim of this Series is to equip you with an understanding of the children and families seen in primary health care, effective communication with mothers, triage in this setting, and the background, components, and case management process of IMCI.

This Series begins with the **characteristics of children and mothers attending primary health care**, before turning to **communication and triage** in this setting. Next, we examine the **background, rationale, and components of IMCI**, then the **IMCI case management process**, before concluding with its **benefits, limitations, and how to improve practice**.

Series Learning Outcomes

At the end of this Series, you should be able to:

6. **SLO 1.1:** describe the demographic and clinical characteristics of children attending primary health care clinics,
7. **SLO 1.2:** describe common nutritional issues encountered in primary health care,
8. **SLO 1.3:** describe how to communicate effectively with mothers about hygiene and illness,
9. **SLO 1.4:** describe triage in the primary health care clinic,
10. **SLO 1.5:** describe the background and rationale for Integrated Management of Childhood Illness,
11. **SLO 1.6:** describe the components of the integrated IMCI approach,
12. **SLO 1.7:** describe the IMCI strategy,
13. **SLO 1.8:** describe the IMCI case management process,
14. **SLO 1.9:** describe the benefits and limitations of IMCI, and
15. **SLO 1.10:** describe how to improve the case management skills of health workers and family and community practice.



5.1 Characteristics of Children and Mothers Attending Primary Health Care

5.1.1 demographic and clinical characteristics of children attending primary health care

Understanding who actually walks through the door

Children attending **primary health care** clinics represent a broad spectrum of the general child population, with attendance patterns influenced by **age**, since younger children, particularly infants, generally attend more frequently, given both routine immunisation visits and greater susceptibility to common childhood illnesses, and by **seasonal patterns**, with attendance for specific conditions, such as diarrhoeal disease or malaria, often rising during particular times of year.

Clinical characteristics of children presenting to primary health care are dominated by a relatively **small number of common conditions**, including **respiratory infections**, **diarrhoeal disease**, **malaria** in endemic areas, and **routine well-child visits**, including immunisation and growth monitoring, reflecting the reality that primary care serves predominantly as the **first point of contact** for the most common, and often most treatable, childhood health concerns.

Fill in the blank: Attendance patterns at primary health care are influenced by age and _____ patterns.

5.1.2 the economic disposition of mothers attending primary health care

The **economic circumstances** of mothers attending primary health care clinics vary considerably, but many families in settings served predominantly by primary health care face genuine **financial constraints**, which can influence decisions around **timing of presentation**, since delayed presentation due to cost concerns is a recognised, important barrier to timely care, **adherence** to prescribed treatment, and ability to purchase recommended medications or return for follow up visits.

Understanding a family's **economic disposition** is clinically relevant, since recommendations for management should be genuinely **feasible** within the family's actual circumstances, and health workers should be sensitive to these constraints when providing advice, for example considering locally available, affordable options where appropriate, rather than recommending an ideal approach that may be entirely impractical for a specific family to actually implement.

Fill in the blank: Delayed presentation due to cost concerns is a recognised, important barrier to timely _____.



5.1.3 anthropometry and nutritional issues in primary health care

Anthropometric assessment, discussed in detail in an earlier Series of this course, is a routine, essential component of every primary health care visit involving a young child, allowing early identification of growth faltering, malnutrition, or over nutrition as part of standard practice rather than a specialised assessment reserved for specific concerns, reflecting the genuinely central importance of nutrition monitoring within everyday primary care.

Common **nutritional issues** encountered in primary health care include **inadequate complementary feeding** practices, **micronutrient deficiencies**, discussed in an earlier Series, and, increasingly in some populations, **over nutrition**, also discussed earlier in this course, meaning primary health care staff require broad nutritional competence spanning the full spectrum from undernutrition to over nutrition, rather than a narrow focus on a single nutritional concern alone.

Fill in the blank: Anthropometric assessment is a routine, essential component of every primary health care visit involving a young ____.



Figure 5.1: A mother and child waiting to be seen at a primary health care clinic.



Pilot questions 5.1

1. Describe the typical demographic pattern of children attending primary health care. (Linked to SLO 5.1)
2. List three common clinical presentations seen in primary health care. (Linked to SLO 5.1)
3. Explain how a family's economic disposition can influence care-seeking and adherence. (Linked to SLO 5.1)
4. Explain why anthropometric assessment is a routine part of every primary health care visit. (Linked to SLO 5.2)
5. List two common nutritional issues encountered in primary health care. (Linked to SLO 5.2)

5.2 Communication and Triage in Primary Health Care

5.2.1 talking to mothers about hygiene and illness

Clear, respectful communication changes outcomes at home

Effective **communication with mothers** about hygiene and childhood illness is a core skill in primary health care, requiring the use of **clear, simple, jargon-free language**, appropriate to the mother's level of health literacy, and genuine **active listening**, ensuring the mother's own concerns and questions are heard and addressed rather than the consultation being conducted as a purely one-directional flow of information from health worker to mother.

Key hygiene messages commonly discussed include **hand washing** at critical times, safe **water storage and treatment**, and appropriate **food hygiene** practices, and messages should be delivered with attention to what is genuinely **feasible** within the family's specific circumstances, discussed in the previous Part of this Series, since generic advice that ignores a family's actual living conditions is unlikely to be successfully implemented.

Fill in the blank: Effective communication with mothers requires clear, simple, _____-free language.

5.2.2 principles of effective health education



Effective health education in the primary care setting benefits from **teaching a limited number of key messages** at each visit, since attempting to convey too much information at once generally results in poor **retention** of any of it, together with **checking understanding**, asking the mother to repeat back key instructions in her own words, which reliably identifies misunderstanding before the mother leaves the clinic rather than only being discovered at a subsequent, later visit.

Demonstration, showing rather than only telling, for example physically demonstrating correct hand washing technique or appropriate preparation of oral rehydration solution, is generally more effective than **verbal instruction alone**, and involving other family members, where relevant and culturally appropriate, can help reinforce key messages and improve overall adherence to recommended practices at home.

Fill in the blank: Teaching a limited number of key messages at each visit improves _____ of the information given.

5.2.3 triage in the primary health care clinic

Triage in the primary health care setting, while generally less resource-intensive than emergency unit triage discussed in the previous Series, remains an important process for identifying children who require **urgent** attention among the general clinic population, using similar principles of assessing for **danger signs**, such as inability to drink or breastfeed, lethargy, or convulsions, that would warrant expedited assessment or referral to a higher level facility.

A structured, brief triage process, even in a resource-limited primary care setting, helps ensure that a child with a genuinely urgent condition is not inadvertently left waiting behind children with more minor complaints, and health workers should be specifically trained to recognise these danger signs and act promptly, since primary health care is frequently the **first point of contact** where a seriously unwell child is initially identified.

Fill in the blank: Primary health care is frequently the first point of _____ where a seriously unwell child is initially identified.





Figure 5.2: A health worker demonstrating hand washing technique to a mother.

Pilot questions 5.2

- Describe the key principles of effective communication with mothers in primary health care. (Linked to SLO 5.3)
- List two key hygiene messages commonly discussed in primary health care. (Linked to SLO 5.3)
- Explain why checking understanding is an important part of health education. (Linked to SLO 5.3)
- Describe the purpose of triage in the primary health care setting. (Linked to SLO 5.4)
- List two danger signs relevant to triage in primary health care. (Linked to SLO 5.4)

5.3 Introduction to IMCI: Background, Rationale, and Components

5.3.1 background and rationale for IMCI

A response to how children actually get sick

Integrated Management of Childhood Illness, abbreviated **IMCI**, was developed by the **World Health Organization** and **UNICEF** in response to the recognition that childhood deaths



in low resource settings are frequently caused by a relatively small number of common, and often **overlapping**, conditions, including pneumonia, diarrhoea, malaria, measles, and malnutrition, meaning a child presenting to a health facility frequently has more than one of these conditions simultaneously.

Prior to IMCI, many health worker training programmes and clinical guidelines addressed these conditions **separately**, as distinct, single-disease protocols, which risked a health worker missing a coexisting condition not covered by the specific protocol they happened to be following for the presenting complaint, and IMCI was specifically designed to address this gap through a genuinely **integrated**, rather than disease-specific, approach to assessment and management.

Fill in the blank: IMCI was developed by the World Health Organization and _____.

5.3.2 components of the integrated IMCI approach

The IMCI strategy comprises **three main components**: improving **case management skills** of health workers, through training in the standardised IMCI approach, improving the overall **health system**, including drug supply, supervision, and referral systems, required to support effective case management, and improving **family and community practices**, recognising that appropriate care-seeking and home care are equally important to improving child health outcomes.

This **three-pronged approach** reflects the recognition that improving health worker knowledge alone, without also addressing the broader **health system** context in which that health worker practises, or the **family and community behaviours** that influence when and whether care is sought in the first place, would be insufficient to achieve meaningful, sustained improvement in child health outcomes at a population level.

Fill in the blank: The IMCI strategy comprises three main components: case management skills, health system, and family and _____ practices.

5.3.3 the IMCI strategy in practice

In practice, the **IMCI strategy** is delivered through structured **training courses** for health workers, teaching a standardised sequence of **assessment, classification, and treatment** for the common childhood conditions covered, together with accompanying **job aids**, such as chart booklets, that health workers can refer to during actual clinical consultations to support consistent, accurate application of the approach.

IMCI is specifically designed for use by a **range of health worker cadres**, including nurses and community health workers, not exclusively physicians, reflecting the reality that in many low



resource settings, the majority of primary child health care is actually delivered by **non-physician health workers**, meaning an effective strategy must be genuinely usable by this broader group of frontline providers.

Fill in the blank: IMCI is specifically designed for use by a range of health worker cadres, not exclusively _____.



Figure 5.3: A health worker referring to an IMCI chart booklet while assessing a child.

Pilot questions 5.3

1. Describe the background and rationale for the development of IMCI. (Linked to SLO 5.5)
2. Explain the problem with addressing common childhood conditions through separate, single-disease protocols. (Linked to SLO 5.5)
3. List the three main components of the IMCI strategy. (Linked to SLO 5.6)
4. Explain why all three components of IMCI are needed together. (Linked to SLO 5.6)
5. Describe how the IMCI strategy is delivered in practice, including its intended users. (Linked to SLO 5.7)



5.4 The IMCI Case Management Process

5.4.1 assessment in the IMCI process

A structured sequence checks for every major danger

The IMCI case management process begins with a structured **assessment**, checking first for **general danger signs**, such as inability to drink or breastfeed, vomiting everything, convulsions, or lethargy or unconsciousness, present in any sick child regardless of the presenting complaint, before proceeding to ask about and assess for **main symptoms**, including cough or difficulty breathing, diarrhoea, fever, and ear problems, each following its own specific, structured assessment sequence.

Assessment also includes checking for **malnutrition** and **anaemia** using the anthropometric and clinical techniques discussed in an earlier Series of this course, and reviewing the child's **immunisation status**, ensuring that every consultation, regardless of the presenting complaint, also serves as an opportunity to identify and address these additional, important aspects of the child's overall health.

Fill in the blank: IMCI assessment begins with checking for general danger signs present in any sick child regardless of the presenting _____.

5.4.2 classification in the IMCI process

Following assessment, the health worker **classifies** each main symptom using a standardised **colour-coded system**: **pink**, indicating a severe classification requiring **urgent referral**, **yellow**, indicating a classification requiring specific **treatment** at the health facility, and **green**, indicating a classification that can be managed with simple **home care advice**, with this consistent colour system used across all the different symptom categories covered by IMCI.

This structured classification approach ensures that health workers systematically consider the **severity** of each identified problem and select an appropriate management pathway accordingly, rather than relying solely on individual clinical judgement without a structured framework, which is of particular value for less experienced health workers or in settings with high caseloads and limited time available per consultation.

Fill in the blank: The IMCI colour-coded classification system uses pink, yellow, and _____ to indicate management pathway.



5.4.3 treatment, counselling, and follow up in the IMCI process

Following classification, the health worker provides appropriate **treatment**, following standardised **IMCI treatment guidelines** for the identified classification, together with **counselling** for the caregiver on home care, including guidance on **feeding, fluids**, and specific **danger signs** that should prompt an immediate return to the health facility, an essential safety net given that not every possible complication can be anticipated or fully addressed at the initial visit.

Follow up is arranged as needed according to the specific classification, ensuring the child's progress is monitored and any necessary adjustment to treatment is made in a timely manner, and this final treatment, counselling, and follow up step completes the structured IMCI case management sequence, from initial assessment through to appropriate longer-term monitoring and support of the child and family.

Fill in the blank: Counselling for the caregiver includes guidance on feeding, fluids, and specific danger signs prompting a return _____.

Table 5.4: The IMCI colour-coded classification system.

Colour	Meaning	Action
Pink	Severe classification	Urgent referral to a higher level facility
Yellow	Classification requiring specific treatment	Treatment given at the health facility
Green	Mild or no significant illness	Simple home care advice

Pilot questions 5.4

6. List the general danger signs checked at the start of IMCI assessment. (Linked to SLO 5.8)
7. Describe the main symptoms assessed in the IMCI process. (Linked to SLO 5.8)
8. Describe the IMCI colour-coded classification system. (Linked to SLO 5.8)
9. Describe the components of treatment and counselling in the IMCI process. (Linked to SLO 5.8)
10. Explain the purpose of follow up in the IMCI case management process. (Linked to SLO 5.8)



5.5 Benefits, Limitations, and Improving Practice

5.5.1 benefits of IMCI

A single, structured approach with wide-reaching impact

The **benefits** of IMCI include **improved quality of care**, since the structured, standardised approach reduces variability in assessment and management between different health workers, **improved health worker confidence**, given a clear, systematic framework to follow, and **more efficient use of resources**, since children are appropriately classified and managed at the correct level, reducing both unnecessary referrals and, importantly, missed severe illness requiring urgent care.

IMCI has also been shown, in various evaluations across different settings, to be associated with **improved health outcomes**, including reduced childhood mortality where implemented well and consistently, and, since IMCI simultaneously addresses **multiple** common childhood conditions within a single, integrated framework rather than requiring separate assessments for each possible condition, it is also generally more **time-efficient** for busy primary health care settings than managing each potential condition through entirely separate protocols.

Fill in the blank: IMCI reduces variability in assessment and management between different health _____.

5.5.2 limitations of IMCI

Limitations of IMCI include the **time required** to complete a full, thorough assessment, which can be challenging in very high caseload settings, the need for **initial and ongoing training** and periodic **supervision** to maintain quality and consistency of implementation over time, and the reality that IMCI, as a **standardised** protocol, may not fully capture every possible clinical presentation or **less common condition** a child might present with.

IMCI also depends on adequate **health system support**, including reliable **drug supply** and functioning **referral pathways**, meaning the strategy's effectiveness is genuinely constrained by broader health system limitations if these are not also adequately addressed, reinforcing why IMCI was specifically designed as a three-component strategy rather than a health worker training programme alone, as discussed earlier in this Series.

Fill in the blank: IMCI depends on adequate health system support, including reliable drug supply and functioning _____ pathways.



5.5.3 improving case management skills and family and community practice

Improving case management skills of health workers requires initial **structured training**, followed by periodic **refresher training** and **supportive supervision**, including direct observation of consultations with constructive feedback, since skills and adherence to the standardised approach can decline over time without this ongoing reinforcement, and **peer support** among health workers can also help maintain consistent, high-quality practice.

Improving family and community practice requires sustained **community health education**, addressing appropriate **care-seeking behaviour**, recognition of danger signs at home, discussed earlier in this Series, and correct **home management** of common illnesses, and, as emphasised throughout this course, working through **trusted community structures** and **locally relevant messaging** is generally more effective than generic, externally imposed health messaging alone in achieving genuine, lasting behaviour change at the family and community level.

Fill in the blank: Improving case management skills requires initial training, refresher training, and supportive _____.



Figure 5.5: A supervisor providing supportive feedback to a health worker after observing a consultation.



Pilot questions 5.5

11. List two benefits of the IMCI strategy. (Linked to SLO 5.9)
12. List two limitations of the IMCI strategy. (Linked to SLO 5.9)
13. Explain why IMCI depends on adequate broader health system support. (Linked to SLO 5.9)
14. Describe how case management skills of health workers can be improved and maintained over time. (Linked to SLO 5.10)
15. Describe how family and community practice can be improved. (Linked to SLO 5.10)

Series Summary

This Series examined **primary care**, beginning with the characteristics of children and mothers attending primary health care, before turning to **communication and triage** in this setting.

We then examined the **background, rationale, and components of IMCI**, followed by the **IMCI case management process**, before concluding with its **benefits, limitations, and how to improve practice**. Having worked through this Series, and indeed this course, you should now be equipped with a comprehensive foundation in child health and primary care, from immunisation and emergency recognition through to the structured, everyday practice of primary child health care.

Glossary of Terms

1. **Primary health care:** the first point of contact for most childhood illness and routine care.
2. **Economic disposition:** the financial circumstances of a family, influencing care-seeking and adherence to treatment.
3. **Triage:** the process of identifying children requiring urgent attention among the general clinic population.
4. **IMCI:** Integrated Management of Childhood Illness, a strategy developed by WHO and UNICEF.
5. **Case management skills:** one of the three main components of IMCI, focused on health worker training.
6. **Health system component:** the IMCI component addressing drug supply, supervision, and referral systems.



7. **Family and community practices:** the IMCI component addressing appropriate care-seeking and home care.
8. **General danger signs:** signs checked at the start of IMCI assessment in any sick child, regardless of presenting complaint.
9. **Colour-coded classification:** the IMCI system using pink, yellow, and green to indicate severity and management pathway.
10. **Supportive supervision:** ongoing observation and constructive feedback to maintain health worker skills over time.
11. **Job aid:** a structured reference tool, such as an IMCI chart booklet, used to support consistent clinical practice.
12. **Care-seeking behaviour:** the pattern and timing of a family's decision to seek health care for a child.

Concept Check Questions [Series 5]

Objective questions

6. Attendance patterns at primary health care are influenced by age and _____ patterns.
7. Effective communication with mothers requires clear, simple, _____-free language.
8. IMCI was developed by the World Health Organization and _____.
9. The IMCI colour-coded classification system uses pink, yellow, and _____ to indicate management pathway.
10. IMCI reduces variability in assessment and management between different health _____.

Short-answer questions

11. List three common clinical presentations seen in primary health care.
12. Describe the purpose of triage in the primary health care setting.
13. List the three main components of the IMCI strategy.
14. Describe the IMCI colour-coded classification system.
15. List two limitations of the IMCI strategy.

Long-answer questions

1. Discuss the demographic and clinical characteristics of children and mothers attending primary health care. (Linked to SLO 5.1, SLO 5.2)



2. Discuss effective communication with mothers and triage in primary health care. (Linked to SLO 5.3, SLO 5.4)
3. Discuss the background, rationale, and components of IMCI. (Linked to SLO 5.5, SLO 5.6, SLO 5.7)
4. Discuss the IMCI case management process. (Linked to SLO 5.8)
5. Discuss the benefits and limitations of IMCI and how to improve health worker and community practice. (Linked to SLO 5.9, SLO 5.10)

Answers to Concept Check Questions [Series 5]

Objective questions

1. Seasonal.
2. Jargon.
3. UNICEF.
4. Green.
5. Workers.

Short-answer questions

6. Respiratory infections, diarrhoeal disease, and malaria are common presentations.
7. Triage identifies children requiring urgent attention among the general clinic population.
8. Case management skills, health system, and family and community practices are the three components.
9. Pink indicates severe illness requiring urgent referral, yellow indicates specific treatment, and green indicates home care advice.
10. Time required for full assessment and the need for ongoing training and supervision are limitations.

Long-answer questions

16. **Basic response:** Children attending primary health care present predominantly with a small number of common conditions, with attendance and adherence influenced by demographic and economic factors.

Value-added response: Anthropometric assessment and nutritional evaluation are routine components of every visit, given the central importance of nutrition to overall child health.



17. **Basic response:** Effective communication uses clear, simple language and active listening, while triage identifies urgent cases using danger signs similar to those used in emergency settings.

Value-added response: Health education is most effective when limited to key messages, checked for understanding, and reinforced through demonstration rather than verbal instruction alone.

18. **Basic response:** IMCI was developed by WHO and UNICEF to address overlapping common childhood illnesses through an integrated rather than disease-specific approach.

Value-added response: Its three components, case management skills, health system, and family and community practices, work together, since improving one alone is insufficient for population-level impact.

19. **Basic response:** The IMCI case management process moves through assessment for danger signs and main symptoms, colour-coded classification, and appropriate treatment and counselling.

Value-added response: Follow up is arranged as needed to monitor progress, completing a structured sequence from initial assessment through to longer-term support.

20. **Basic response:** IMCI improves quality of care and health worker confidence but requires time, training, and adequate health system support to be effective.

Value-added response: Improving practice requires ongoing supervision for health workers and sustained community education using trusted local structures for families.

Answers to Pilot Questions [Series 5]

Part 5.1

1. Younger children, particularly infants, generally attend more frequently for routine and illness visits.
2. Respiratory infections, diarrhoeal disease, and malaria are common clinical presentations.
3. Financial constraints can delay presentation and affect adherence to treatment and follow up.



4. It allows early identification of growth faltering, malnutrition, or over nutrition as part of standard care.
5. Inadequate complementary feeding and micronutrient deficiencies are common nutritional issues.

Part 5.2

1. Clear, simple language, active listening, and feasible advice tailored to family circumstances.
2. Hand washing at critical times and safe water storage are common hygiene messages.
3. It identifies misunderstanding before the mother leaves the clinic, allowing correction at the same visit.
4. Triage identifies children requiring urgent attention among the general clinic population.
5. Inability to drink or breastfeed and lethargy are examples of relevant danger signs.

Part 5.3

- IMCI was developed by WHO and UNICEF to address overlapping common causes of childhood death through an integrated approach.
- Separate, single-disease protocols risk missing a coexisting condition not covered by the specific protocol being followed.
- Case management skills, health system, and family and community practices are the three components.
- Improving health worker skills alone, without health system or community support, is insufficient for sustained impact.
- IMCI is delivered through structured training and job aids, used by a range of health worker cadres including non-physicians.

Part 5.4

- Inability to drink or breastfeed, vomiting everything, convulsions, and lethargy or unconsciousness are general danger signs.
- Cough or difficulty breathing, diarrhoea, fever, and ear problems are main symptoms assessed.
- Pink indicates severe illness requiring referral, yellow indicates specific treatment, and green indicates home care.
- Treatment follows standardised guidelines, and counselling covers feeding, fluids, and danger signs for return.
- Follow up monitors the child's progress and allows timely adjustment of treatment if needed.



Part 5.5

1. Improved quality of care and improved health worker confidence are benefits of IMCI.
2. Time required for assessment and the need for ongoing training are limitations of IMCI.
3. IMCI relies on adequate drug supply and referral pathways to function effectively as intended.
4. Structured training, refresher training, and supportive supervision maintain case management skills.
5. Sustained community health education using trusted local structures improves family and community practice.



References and Attributions [Series 5]

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- World Health Organization and UNICEF (2014). Integrated Management of Childhood Illness: Chart Booklet. WHO Press.
- World Health Organization (2005). Handbook: IMCI Integrated Management of Childhood Illness. WHO Press.
- Gera, T. et al. (2016). Integrated Management of Childhood Illness (IMCI) strategy for children under five. Cochrane Database of Systematic Reviews, 6, CD010123.

Figures, Plates, Tables, and Boxes

- Figure 5.1: A mother and child waiting to be seen at a primary health care clinic. AI-generated using the prompt: "A warm, realistic illustration of a mother sitting with a young child on her lap in a simple, clean primary health care clinic waiting area, with other families visible in the background. Single clean illustration, natural daylight, no text overlays, no multiple panels, respectful and accurate depiction."
- Figure 5.2: A health worker demonstrating hand washing technique to a mother. AI-generated using the prompt: "A warm, realistic illustration of a health worker demonstrating hand washing at a simple sink to an attentive mother in a primary health care clinic. Single clean illustration, natural daylight, no text overlays, no multiple panels, respectful and accurate depiction."
- Figure 5.3: A health worker referring to an IMCI chart booklet while assessing a child. AI-generated using the prompt: "A realistic clinical illustration of a health worker sitting at a clinic desk, referring to an open reference booklet while gently examining a young child held by a caregiver. Single clean medical illustration, natural clinical lighting, no text overlays, no multiple panels, accurate and professional depiction."
- Table 5.4: The IMCI colour-coded classification system. AI-generated using the prompt: "Create a clean reference table titled The IMCI Colour-Coded Classification System, listing colour, meaning, and action. Simple clinical reference table style with outside border."
- Figure 5.5: A supervisor providing supportive feedback to a health worker after observing a consultation. AI-generated using the prompt: "A warm, professional illustration of a supervisor and a health worker sitting together reviewing notes in a clinic office, in a collaborative, supportive atmosphere. Single clean illustration, natural office lighting, no text overlays, no multiple panels, respectful and accurate depiction."

