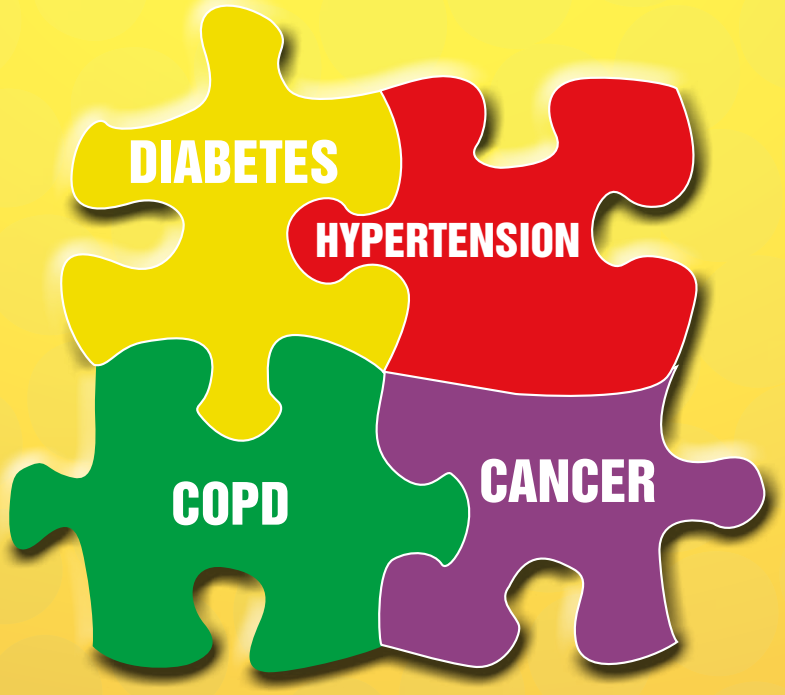
Ministry of Health

Kingdom of Eswatini Clinical Guidelines for the Management of NCDs at Secondary and Tertiary Care



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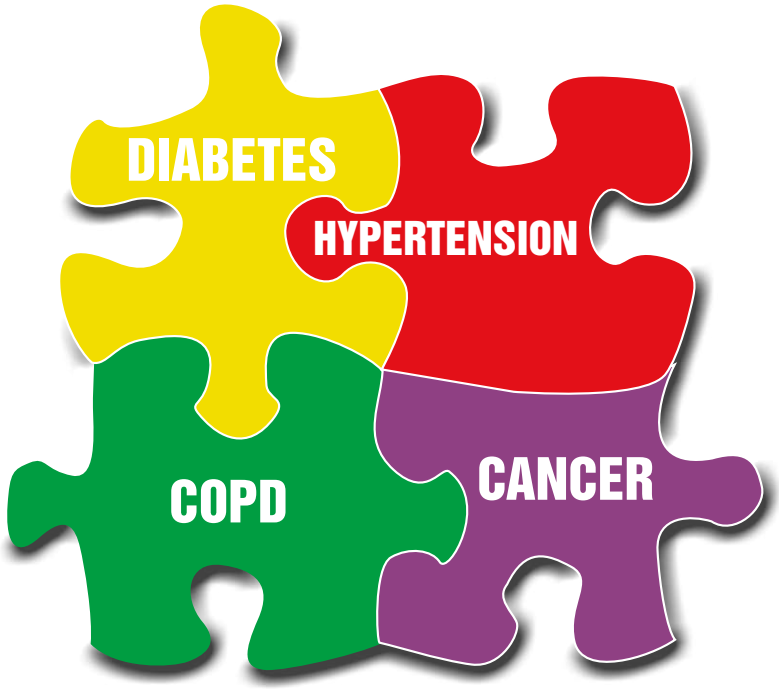

PUBLICATION NOTICE

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NCD Clinical Guidelines First Edition 2020

PREFACE

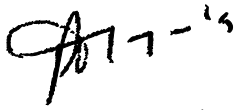
Non-Communicable Diseases (NCDs) are the world's biggest killers, causing an estimated 36 million deaths each year which constitute about 61% of all deaths globally. However, some of these deaths are premature and preventable by enabling health systems to respond more effectively and equitably to health care needs of people with NCDs.

Tackling the shared risk factors- namely tobacco use, unhealthy diet, physical inactivity, and harmful use of alcohol also significantly contributes towards the prevention of NCDs. Early detection and effective management of non-communicable diseases also significantly reduce deaths.

Eswatini is not spared from the increasing burden of NCDs. To respond to this situation, the Ministry of Health (MoH) developed the national non-communicable diseases clinical management guidelines to complement efforts towards reducing morbidity and mortality due to NCDs. The guidelines are a product of joint efforts and intensive consultation process between health workers and experts in NCD clinical management.

Finally, I would like to request all health workers to make use of the guidelines and provide standardised high-quality care to all patients suffering from non-communicable diseases.

Thank you all



Dr S. V. Magagula
Director Health Services

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We are singularly indebted to all the stakeholders whose tireless efforts, dedication, comments, suggestions, and contributions have tremendously helped in making this guiding document possible. Special thanks go to National NCD Technical Working Group, specialist doctors, medical officers, nurses, and dieticians for their valuable technical support received throughout the development of these guidelines.

The following individuals are particularly commended for their efforts to realize these NCD guidelines:

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Thank you

Dr. V. Okello
Deputy Director Health Services

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ACRONYMS AND ABBREVIATIONS

6MWD	6 Minutes Walked Distance
ACEI	Angiotensin Converting Enzyme Inhibitor
ARB	Angiotensin 2 Receptor Blocker
BP	Blood Pressure
CCB	Calcium Channel Blocker
CCF	Congestive Cardiac Failure
CKD	Chronic Kidney Disease
COPD	Chronic Obstructive Pulmonary Disease
CXR	Chest X-Ray
DBP	Diastolic Blood Pressure
DKA	Diabetes Ketoacidosis
DM	Diabetes Mellitus
ECG	Electrocardiogram
eGFR	estimated Glomerular Filtration Rate
FEV1	Forced Expiratory Volume in 1 second
HDL	High Density Lipids
ICS	Inhaled Corticosteroids
LABA	Long Acting Beta-Adrenoreceptor Agonist
NCD	Non-Communicable Disease
PEFR	Peak Expiratory Flow Volume
RFM	Raleigh Fitkin Memorial
SABA	Short Acting Beta-Adrenoreceptor Agonist
SBP	Systolic Blood Pressure
TFTs	Total
URTI	Upper Respiratory Tract Infection

CHAPTER I: INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

Non-communicable diseases are chronic conditions that do not result from an acute infectious process, but infectious diseases can be a contributing cause. NCDs cause death, dysfunction, or impairment in the quality of life and usually develop over relatively long period at first without causing symptoms but after the disease's manifestations develop, there may be a period of protracted impaired health. These guidelines deal with priority NCDs which have immensely contributed to the global burden of disease as well as share common risk factors which can be tackled in unison. Though, the hitherto –held beliefs and practices to prevent and control NCDs tilts to tertiary centres and specialists, the goal of widest possible access to services cannot be achieved without the contribution of primary care facilities. Similarly, high quality cannot be achieved without the link with secondary and tertiary centres. These guidelines deal in a comprehensive manner with all realms of NCDs interventions such as prevention, treatment, and care. The Kingdom of Eswatini is not an exception in the growing burden of NCDs, thus the need to put guidelines in place to inform service delivery.

- These guidelines will support implementation of very cost-effective interventions through an integrated approach.
- These guidelines will enable early detection and management of cardiovascular diseases, diabetes, chronic respiratory diseases and life-threatening complications (e.g. heart attacks, stroke, kidney failure, amputations and blindness).
- Effective implementation of these guidelines, combined with other very cost-effective population-wide interventions, will help our country to attain the global voluntary targets related to the reduction of premature mortality and prevention of heart attacks and strokes.

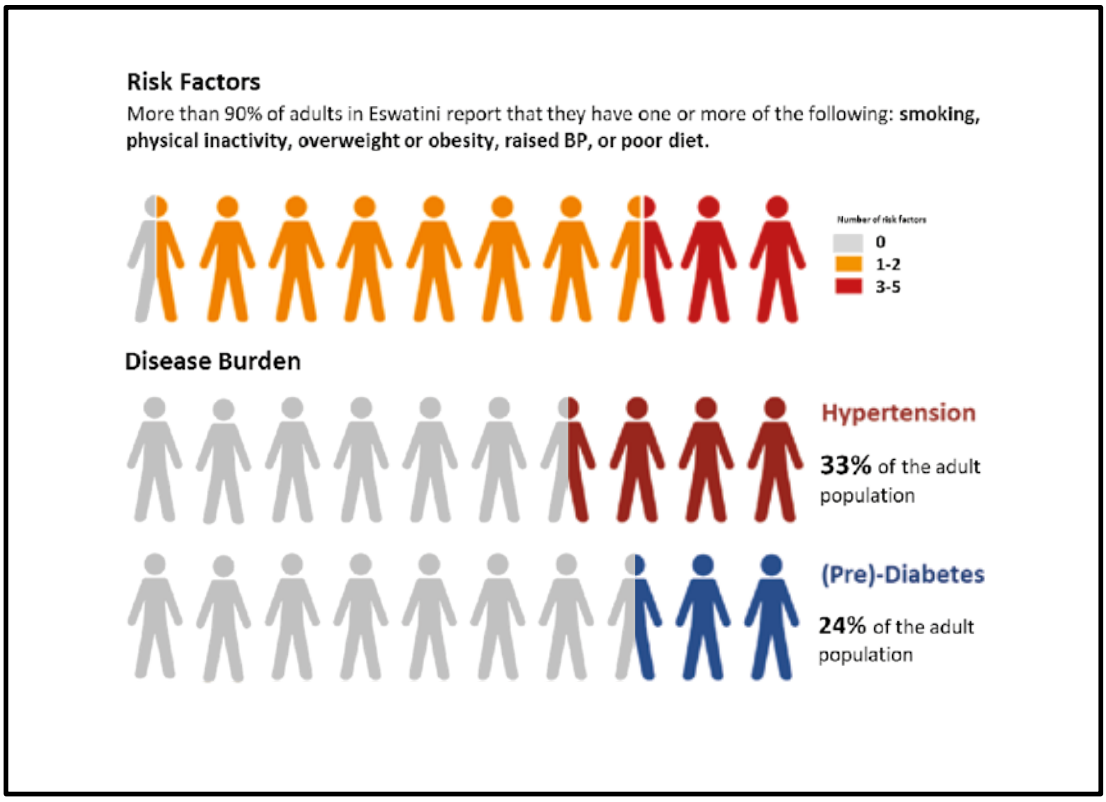
1.2 BACKGROUND

Non-communicable diseases are the leading causes of death globally, killing more people each year than all other causes combined. Contrary to a widely held opinion, available data demonstrate that nearly 85% of deaths due to non-communicable diseases occur in low- and middle-income countries. NCDs kill approximately 41 million people each year, equivalent to 71% of all deaths globally. Each year, 15 million people die from an NCD between the ages of 30 and 69 years; over 85% of these "premature" deaths occur in low- and middle-income countries. Cardiovascular diseases account for most NCD deaths, or 17.9 million people annually, followed by cancers (9.0 million), respiratory diseases (3.9 million), and diabetes (1.6 million) (1, 2). These 4 groups of diseases account for over 80% of all premature NCD deaths. Tobacco use, physical inactivity, the harmful use of alcohol and unhealthy diets all increase the risk of dying from an NCD. Detection, screening and treatment of NCDs, as well as palliative care, are key components of the response to NCDs (3, 4). The combined burden of these diseases is rising fastest among lower-income countries, populations, and communities.

World Health Organisation predicted deaths from NCDs will increase globally by 17% over the next ten years where the greatest increase will be in the African region (by 27% or 28 million deaths from NCDs). In Africa, projections indicated death from NCDs to exceed all combined communicable, maternal, perinatal, and nutritional diseases as the most common causes of death by 2030 (5, 6). The prevalence of NCDs, and associated mortality, is rising globally, with the fastest rises predicted in the African region, including Eswatini (2). The majority of NCD cases could be prevented or reversed with reductions in the main risk factors of obesity, smoking and physical inactivity. In Eswatini, NCDs are a large and rising public health threat. The prevalence of major NCD risk factors among the Swati population is among the highest in Africa. Over 90% of the population in Eswatini has at least one major risk factor for NCD, with a quarter of the population having three or more major risks for NCD (7, 8). This high burden of risk has resulted in an epidemic of NCDs among the population with one in three adults living with cardiovascular disease and one in four adults with diabetes or pre-diabetes.

In order to address the large and rising burden of NCD, and NCD risk, among the population, the Eswatini Ministry of Health, has set upon an ambitious plan of service planning, reform and expansion in order to ensure accelerated and universal coverage of prevention and treatment services for all emaSwati living with NCDs.

Figure 1. Risk Factors and Disease Prevalence in Eswatini



CHAPTER 2: HEALTH EDUCATION AND COUNSELLING ON HEALTHY BEHAVIOURS

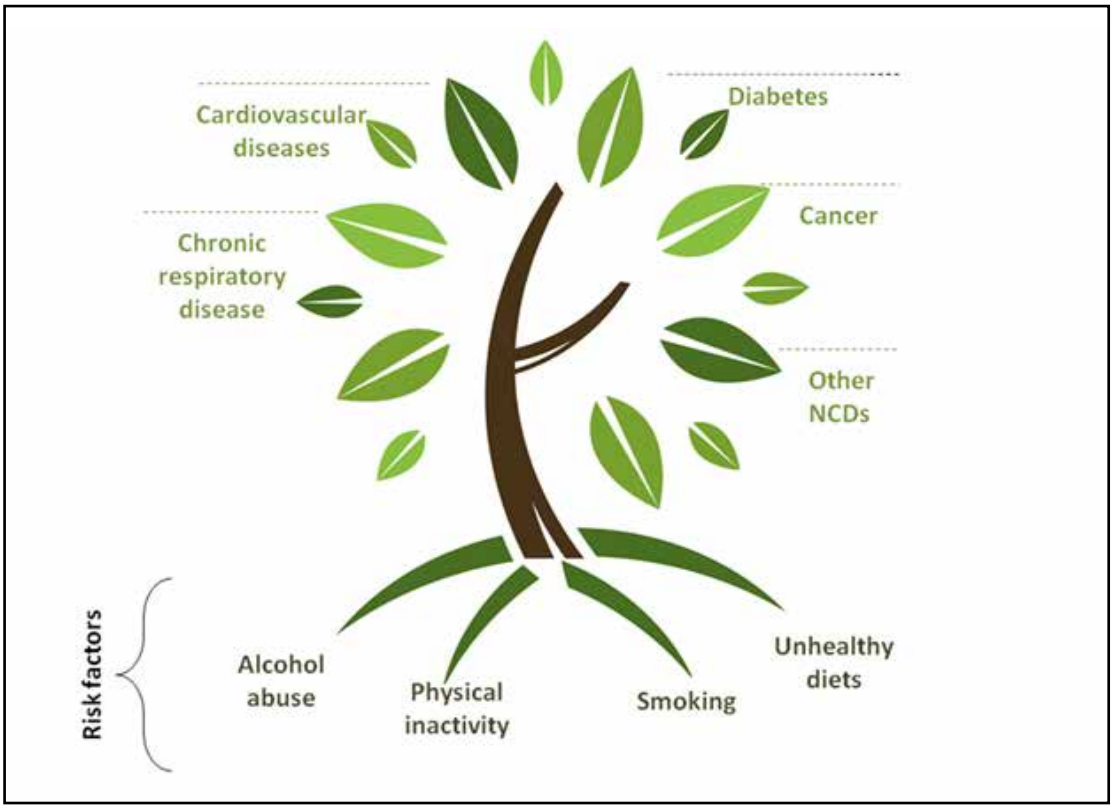
2.1 INTRODUCTION

People of all age groups, regions and countries are affected by NCDs. These conditions are often associated with older age groups, but evidence shows that 15 million of all deaths attributed to NCDs occur between the ages of 30 and 69 years. Of these "premature" deaths, over 85% are estimated to occur in low- and middle-income countries. Children, adults and the elderly are all vulnerable to the risk factors contributing to NCDs, whether from unhealthy diets, physical inactivity, exposure to tobacco smoke or the harmful use of alcohol (1).

This chapter reviews the NCD risk factors with special focus on the four main risk factors: tobacco use, harmful use of alcohol, unhealthy diets, and physical inactivity in relation to the four main groups of NCDs namely, cardiovascular diseases, cancer, chronic respiratory diseases, and diabetes. WHO global disease burden recognizes tobacco, alcohol consumption, obesity, hyperlipidemia, hypertension, and hyperglycemia as most important shared risk factors to the four NCDs cited as major global burdens. Tobacco use has been cited and remains the number one preventable cause of death globally. Tobacco kills nearly 6 million people each year and results in the economic loss of hundreds of billions of dollars globally. An additional 600,000 people are estimated to die from the effects of secondhand smoking, and 80% of deaths related to tobacco occurred in low- and middle-income countries (9).

Throughout all stages of life, there are ways in which these risk factors may be targeted to help prevent the development of NCDs and mental health disorders later in life.

Figure 2. Common Risk Factors and their Relationships to NCDs



2.2 PREVENTION APPROACHES

All NCD risk factors will benefit from identification, support, and systematic patient engagement. This chapter suggests the use of the '5As' model of patient counseling, outlined below.

A summary of how this method can be applied to each risk factor is outlined below. This is followed by a brief discussion on each risk factor in turn.

Table 1. Applications of the 5A's Approach to NCDs

ASK	▪ It is vital that all patients are asked whether they use tobacco or alcohol and about their diet and physical activity.
ASSESS	▪ Quantify the issue. Does this pose a risk to health? ▪ If yes, does the patient know this? Do they understand the risks and potential consequences? Would they be willing to change, stop or cut down?
ADVISE	▪ If the patient is willing, give advice on how – this will depend on which activity is the focus (see below). Agree on a focus and target, as some people may not want to make all changes at once. ▪ If patient is not willing, give brief advice and support, be empathetic and review again at their next appointment. Be understanding of the barriers to patients and the specific reasons this patient may feel unable. ▪ Ensure any advice you give is appropriate to the age, gender, circumstances, and abilities of the patient sitting in front of you.
ASSIST	▪ Work with the patient. ▪ Help the patient by providing support, empathy and planning with them. ▪ Give advice about any support organizations or groups (including online) that may be available to the patient. ▪ As a healthcare professional it is useful to explore local or regional services and organizations and keep up-to-date knowledge about this.
ARRANGE	▪ Always arrange to see the patient again to follow-up on their progress.

A summary of how this method can be applied to each risk factor is outlined over the page. This is followed by a brief discussion on each risk factor in turn.

Table 2. The 5 A's Approach and Risk Factors

ASK ABOUT...	ASSESS	ADVISE/AGREE	ASSIST	ARRANGE
Tobacco	Type of tobacco, amount, duration, readiness to change	Advise on risks, give brief advice, motivation, empathy, agree on a quit date	Make and document a plan, consider nicotine replacement	Make a follow-up plan with the patient
Alcohol	Amount of alcohol, type of alcohol, recognition as a problem, readiness to change	Advise on risks, give brief advice, motivation, empathy	Refer if severe, give avoidance tips, give support	Make a follow-up plan with the patient
Diet	Assess BMI/waist circumference, normal diet and access to different foods, ability to alter diet, recognition of harm, readiness to change	Advise on the benefits of a healthier diet, give patient-specific appropriate advice, agree on realistic changes	Make an individualized plan, involve entire family, if appropriate	Make a follow-up plan with the patient
Physical Activity	Assess BMI/waist circumference, normal activity levels, ability to increase activity, readiness to change	Advise on benefits of an active life, reassurance activity possible for all people, give patient-specific advice, agree on realistic changes	Make an individualized plan, involve entire family, if appropriate	Make a follow-up plan with the patient

As a Health Professional, you have a responsibility to identify, explore and manage risk factors as part of your NCD care.

2.3 GENERAL COUNSELLING

Risk factor screening and lifestyle advice should be offered to all clients. Figure 3, below, shows the four main areas of counselling which should be covered. For specific counselling messages, see overleaf.

Figure 3. Counselling for All Clients

2.4 SPECIFIC COUNSELLING MESSAGES

2.4.1 Take Regular Physical Activity

- Progressively increase physical activity to moderate levels (such as brisk walking); at least 30 minutes per day on 5 days of the week
- Control body weight and avoid overweight by reducing high-calorie food and taking adequate physical activity

2.4.2 Stop Tobacco and Avoid the Harmful Use of Alcohol

- Encourage all non-smokers not to start smoking
- Strongly advise all smokers to stop smoking and support them in their efforts
- Individuals who use other forms of tobacco should be advised to quit
- Alcohol abstinence should be reinforced.
- People should not be advised to start taking alcohol for health reasons
- Advise patients not to use alcohol when additional risks are present, such as:
    - driving or operating machinery
    - pregnant or breast feeding
    - taking medications that interact with alcohol
    - having medical conditions made worse by alcohol
    - having difficulties in controlling drinking

2.4.3 Eat a Heart Healthy Diet

- Salt (sodium chloride)
    - Restrict to less than 5 grams (1 teaspoon) per day
    - Reduce salt when cooking, limit processed and fast foods
- Fruits and vegetables
    - 5 servings (400-500 grams) of fruits and vegetable per day
    - 1 serving is equivalent to 1 orange, apple, mango, banana or 3 tablespoons of cooked vegetables
- Fatty food
    - Limit fatty meat, dairy fat and cooking oil (less than two tablespoons per day)
    - Replace palm and coconut oil with olive, soya, corn, rapeseed, or safflower oil
    - Replace other meat with chicken (without skin)
- Fish
    - Eat fish at least 3 times per week, preferably oily fish such as tuna, mackerel, salmon

CHAPTER 3: ASTHMA AND CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)

3.1 BRONCHIAL ASTHMA

3.1.1 Definition

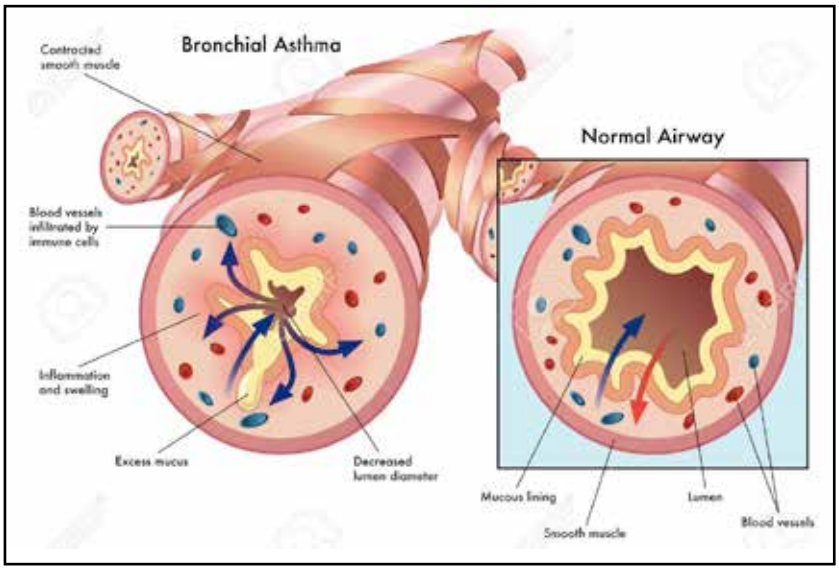
Asthma is a common lung condition that causes sporadic breathing difficulties. It often starts in childhood, although it can also develop in adults, and affects people of all ages. Asthma is caused by the swelling and narrowing of the tubes that carry air to and from the lungs.

Asthma is characterized by paroxysmal and reversible obstruction of the airways. It is increasingly understood as an inflammatory condition combined with bronchial hyper-responsiveness.

Acute asthma involves:

- Bronchospasm (smooth muscle spasm narrowing airways).
- Excessive production of secretions (plugging airways).

Figure 3. Bronchial Asthma



Triggers unleash an inflammatory cascade within the bronchial tree, leading to the typical symptoms of asthma, e.g.:

Wheeze	Cough	Difficulty breathing	Chest tightness

With treatment, persistent inflammation only occurs in patients with under-treated asthma. If their inflammation is appropriately treated there will not be any evidence of ongoing inflammation. Patients with under-treated asthma who continue to have chronic low levels of inflammation may then undergo remodeling of the airways and develop fixed airways disease, which no longer responds as well or even at all to bronchodilator therapy.

Acute severe asthma (status asthmaticus) can be life-threatening and the disease causes significant morbidity, so it is imperative to treat it energetically. The bulk of asthma management has taken place within primary care.

3.1.2 Epidemiology

Asthma affects approximately 14% of the adult population in the Kingdom of Eswatini. Evidence from other African countries suggests that rates of asthma are rising, particularly in children.

Adult-onset asthma differs from childhood asthma in that it is more often non-atopic and severe and has a lower remission rate.

Although asthma has a relatively low mortality in younger adults, it is associated with substantial morbidity and mortality in the elderly.

Practice Point

Asthma is common and underdiagnosed in Eswatini.
Maintain a high index of suspicion at secondary and tertiary care for undiagnosed asthma.

3.1.3 Risk Factors

There is a long list of possible risk factors which includes:

- Smoking
- Personal history of atopy
- Family history of asthma or atopy
- Inner city environment; socio-economic deprivation
- Obesity
- Prematurity and low birth weight
- Viral infections in early childhood
- Maternal smoking
- Early exposure to broad-spectrum antibiotics

Possible protective factors include:

- Breast-feeding[1]
- Vaginal birth - observational studies suggest that caesarean delivery might be associated with a greater risk of asthma[2]
- Increasing sib ship
- Farming environment

3.1.4 Presentation

Features that increase the probability of asthma in adults include. More than one of the following symptoms: **wheeze, breathlessness, chest tightness** and **cough**, particularly if:

- Symptoms are worse at night and in the early morning.
- Symptoms are present in response to exercise, allergen exposure and cold air.
- Symptoms are present after taking aspirin or beta-blockers.
- History of atopic disorder.
- Family history of asthma and/or atopic disorder.
- Widespread wheeze heard on auscultation of the chest.
- Otherwise unexplained low forced expiratory volume in one second (FEV1) or peak expiratory flow (historical or serial readings).
- Otherwise unexplained peripheral blood eosinophilia.

For children, see separate Diagnosing Childhood Asthma in Primary Care article.

3.1.5 History

The history is extremely important, as patients may present between acute attacks when examination and investigation may be completely normal.

Ask about wheeze

Wheezing or rhonchi may be the cardinal feature, but this can be misleading. Ensure that the patient or their parent/care's understanding of 'wheeze' is the same as yours - whistling, squeaking or gasping sounds, or a different style, rate or timbre of breathing are all sometimes described as 'wheeze', so it is important to clarify. Also, wheeze can be absent in severe asthma when there is insufficient air flow to cause wheeze - **beware the silent chest.**

Ask about attacks

Ask what happens in an attack. There are several possibilities, including wheeze (common but not invariable), cough, shortness of breath and chest tightness.

Ask if there is an obvious precipitating or aggravating factor for attacks:

- **Cold symptoms** - upper respiratory tract infection (URTI) - frequently trigger exacerbations.
- **Cold air** - if this causes chest pain in an adult, it may be angina.
- **Exercise** - symptoms may occur during exercise but more classically after exercise. Running tends to be worse than cycling.
- **Pollution** - especially cigarette smoke.
- **Allergens** - exacerbations may occur seasonally around pollen exposure or following exposure to animals such as cats, dogs or horses.
- **Time of day** - there is a natural dip in peak flow overnight and in a vulnerable person this may precipitate or aggravate symptoms. It may cause nocturnal waking or simply being rather short of breath or wheezy in the morning.
- **Work-related** - if symptoms are better at home/during holidays, asthma may be related to occupation. This has significant implications and it is sensible to refer the person to an occupational physician

3.1.6 Past Medical History and Family History

Take a thorough social history, past medical history and family history for relevant features:

- Ask about **smoking**, including **passive smoking.**
- Ask about **fuel source** – is client burning wood in the house for cooking or heating?
- Atopic **eczema, asthma** and **hay fever** tend to run together in individuals and in families.
- Ask about medication, particularly:
    - **beta-blockers** (including drops for glaucoma)
    - *anti***-inflammatory drugs** (including aspirin and naproxen)

3.1.7 Examination

The chest should be examined but this may be normal between attacks:

Before examining the chest, check the vitals.

- **Pulse rate** may be artificially elevated by excessive use of beta2 agonists but, nevertheless, tachycardia is a significant feature.
- **Respiratory rates** above 25 breaths per minute and heart rate above 110 beats per minute are regarded as significant signs in adults[4].
- **Oxygen saturations** should be checked, particularly in acute attacks
    - **Note**: Saturations of <92% may indicate **acute asthma attack**

Examine the chest, look at the patient's breathing:

- Is it **fast**?
- Is it **labored**?
- Do they **appear anxious**?
- Can they **speak in full sentences**?
- Are **accessory muscles of respiration** employed?
- Is there **pursed lip breathing**?
- Is there **cyanosis**?
- Is there **intercostal recession**?

Signs present?

This could be an asthma attack!

3.1.8 Diagnosis

Undertake a structured clinical assessment to assess the initial probability of asthma.

This should be based on:

- **History of recurrent episodes (attacks) of symptoms**, ideally corroborated by variable peak flow when symptomatic and asymptomatic.
- Symptoms of **wheeze**, **cough**, **breathlessness,** and **chest tightness** that vary over time.
- Recorded **observation of wheeze** heard by a healthcare professional.
- Personal or family history of other atopic conditions – **eczema, asthma, hay fever**
- No symptoms/signs to suggest alternative diagnoses.

Compare the results of diagnostic tests undertaken whilst a patient is asymptomatic with those undertaken when a patient is symptomatic to detect variation over time.

Consider spirometry (available at Mbabane Government Hospital and RFM Hospital)

Where possible, carry out spirometry using the lower limit of normal to demonstrate airway obstruction, provide a baseline for assessing response to initiation of treatment and exclude alternative diagnoses. Normal spirometry in an asymptomatic patient does not rule out the diagnosis of asthma.

In patients with a high probability of asthma:

- Record the patient as likely to have asthma
- Commence a carefully monitored initiation of treatment:
    - Typically, six weeks of inhaled corticosteroids.
- If there is good symptomatic and objective response to treatment:
    - Confirm the diagnosis of asthma, and

- Record the basis on which the diagnosis was made.

- If the response is poor or equivocal:
  - **check inhaler technique** and **adherence**.
  - **arrange further tests,** and.
  - Consider **alternative diagnoses.**

Practice Point

There is no single test that can diagnose asthma.
Keep a high index of suspicion, and follow-up the client to confirm the diagnosis.

3.1.9 Differential Diagnoses

The differential diagnoses differ between adults and children. For differential diagnoses in children, see **Diagnosing Childhood Asthma in Primary Care desk guide**

Always distinguish wheezing from shortness of breath on exertion - this can be due to heart failure, severe anemia, and obesity, often aggravated by lack of physical fitness.

For adults presenting with asthma symptoms, consider also:

- **Tuberculosis**
- **COPD**
  - **Reversibility distinguishes asthma from COPD,** although the reversibility is relative rather than absolute.
  - **Almost all patients with COPD do smoke or have smoked in the past.** People with asthma can also develop COPD. Whether or not this reflects disease progression or comorbidity is debatable.
  - People with severe asthma may never achieve completely normal parameters for lung function and COPD is rarely totally refractory to medication.
  - People with asthma who have been undertreated or non-compliant (not necessarily with severe asthma) may develop re-modelling of the airways due to chronic inflammation and therefore may not show significant reversibility.
  - Asthma-COPD overlap syndrome is characterized by persistent airflow limitation with several features usually associated with asthma and several features usually associated with COPD[5]
- **Heart failure** can cause nocturnal cough and cardiac asthma
- **Coronary Heart Disease** - chest tightness or pain, especially on meeting a stiff wind on a cold morning - may be asthma or angina.
- **Malignancy** is important to remember, especially in smokers. Look for clubbing which also occurs in bronchiectasis. Malignancy is not just lung cancer but may

be in the upper airways

- **Gastro-esophageal reflux** can cause nocturnal cough and a postnasal drip may cause more coughing when lying down.
- **Vocal cord dysfunction** mimics steroid refractory asthma6

Practice Point

Always screen and test for tuberculosis in clients presenting with symptoms of wheeze, cough, shortness of breath and/or difficult breathing.

3.1.10 Investigations

3.1.10.1 Peak Flow

Measurement of peak expiratory flow rate (PEFR) is the simplest and most basic test. Caution should be used when diagnosing asthma based on peak flow readings, but it has an important role in the management of established asthma.
Lung function tests, whether peak flow or spirometry, are unreliable below the age of 5 years and even among some older children and adults who lack comprehension or co-ordination for the task. As well as obstruction of airways, poor effort or neuromuscular disease will limit performance. In those able to use a peak flow meter reliably, it is often helpful to prescribe a peak flow meter for home use to encourage self-monitoring and adjustment of treatment in line with a self-management plan.

Technique

- Advise the patient to **take in a deep breath and expel it as rapidly and as forcefully as possible** into the meter.
- **The very first part is all that matters for this test** and it is not necessary to empty the lungs completely.
- **Record the best of three tests.** Continue blows if the two largest are not within 400 L/minute, as the patient is still acquiring the technique.

Interpretation

A patient's peak flow can be compared with that listed normal for their age, sex and height. However, it is often more helpful in a patient with asthma to compare changes with an individual's best peak flow, recorded in a clinically stable period on optimal treatment. Thus, a patient with asthma may have a 'predicted' PEFR of 500 L/minute but know that a peak flow of 400 L/minute indicates reasonable control and that, where it falls to 300 L/minute, appropriate action is required.

Patients are frequently asked to record a peak flow diary (recording PEFR several

times a day over a couple of weeks). It is normal for peak flow to fall slightly overnight and these 'nocturnal dips' may be accentuated in asthma. A marked diurnal variation in peak flow (>20%) is significant. There may be significant day-to-day variation and the patient may be able to demonstrate that testing PEFR after certain aggravating activities causes measurable dips. PEFR is best recorded on a chart which provides graphical illustration of this variability. Peak flow variability is not specific to asthma and so its diagnostic value is debatable[4,7].

Reversibility testing can be performed with PEFR testing in subjects with pre-existing obstruction of the airways and is demonstrated by an increase of >60 L/minute.

3.1.10.2 Spirometry

Spirometry is now preferred over peak flow measurement for initial confirmation of obstruction of airways in the diagnosis of asthma, as it is felt to offer clearer identification of airway obstruction, to be less effort-dependent and more repeatable[4,7]. Spirometry measures the whole volume that may be expelled in one breath (vital capacity). It also permits calculation of the percentage exhaled in the first second - the FEV1. However, as with peak flow, some (particularly young children) may not be able to undertake it reliably.

Spirometry may be normal in individuals currently asymptomatic and does not exclude asthma, and should be repeated, ideally when symptomatic. However, a normal spirogram when symptomatic does make asthma an unlikely diagnosis.

It also offers good confirmation of reversibility in subjects with pre-existing obstruction of the airways where a change of >400 mL in FEV1 is found after short-term bronchodilator/longer-term corticosteroid therapy are trialed.

3.1.10.3 Chest X-Ray (CXR)

CXR is remarkably normal, even in very severe asthma. It should not be used routinely in the assessment of asthma but consider CXR in any patient presenting with an atypical history or with atypical findings on examination[4].

3.1.11 Assessment of Asthma in Clients Not Yet on Treatment

The severity of asthma can be graded based on the frequency of asthma symptoms. The severity of asthma is the main determinant of treatment choice in clients.

Use the **Protocol for Assessing Asthma in Clients Not Yet on Treatment.**

3.1.12 Management

Current international and regional guidelines on the management of asthma provide the following recommendations for the management of asthma:

3.1.12.1 General Principles of Management

- **Always assess symptom severity and impact on patient's life,** this is the guide for treatment.
- **Step up/down treatment** according to disease severity to maintain good control and minimize drug-related side-effects.
- **Start at the step most fitting to the initial severity** of the asthma.
- **Treatment plans and goals should be negotiated with the patient,** but usual aims would be to minimize impact of symptoms on life, reduce reliance on reliever medication and prevent severe exacerbations.
- **Self-management education should be offered,** including individualized written asthma action plans.
- **Always check concordance with medication/existing action plan,**
- **Always check inhaler technique** and the presence/absence of trigger factors before initiating new drug therapy.

3.1.12.2 Assessment and Reviews for Established Asthma

Routine asthma care is largely undertaken at outpatient. All patients with asthma should be reviewed at least annually, more often if disease is less well controlled or recently diagnosed. Reviews should be carried out by a nurse or doctor with appropriate and up-to-date training and should include:

- **Assess current symptoms:** Assessment of Asthma Severity in Established Asthma)
- **Record an up-to-date smoking status; offer smoking cessation advice** and support where appropriate.
- **Record any acute exacerbations** since last seen.
- **Check medication use.** The following are associated with poorly controlled and high-risk asthma:
    - The use of more than two canisters of short-acting beta2 agonist per month, or
    - 10-12 puffs of short acting beta2 agonist per day
- **Check immunization** (pneumococcal/influenza) status.
- **Record current peak flow / spirometry readings.**
- **Provide/update a written action plan.**
- **Agree duration of subsequent follow-up.**
- **Ensure the patient is aware of how to seek help** if their asthma deteriorates.

Figure 4. Assessment of Asthma Severity in Established Asthma

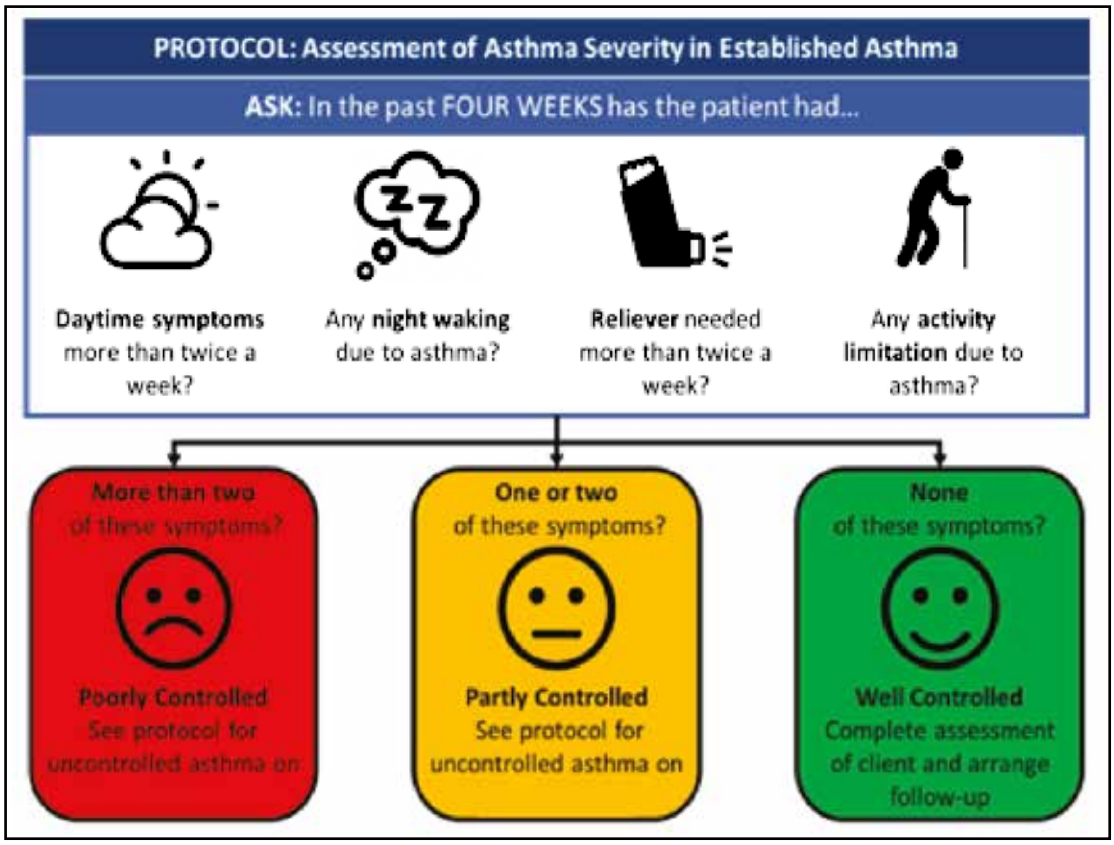
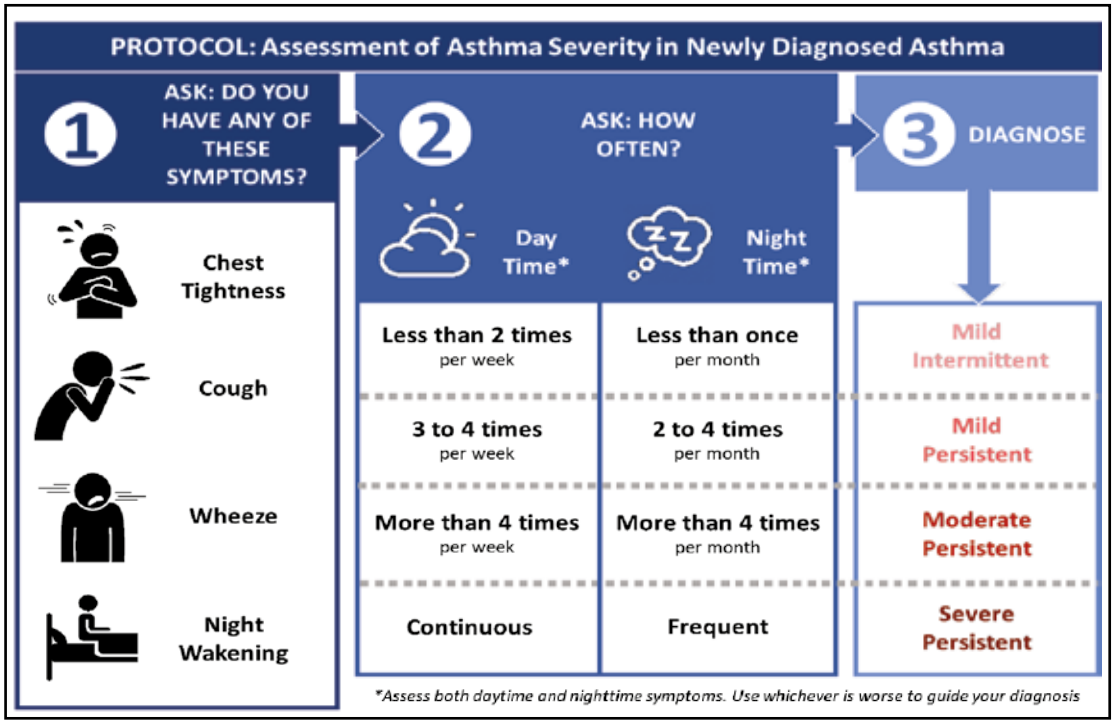


Figure 5. Assessment of Asthma Severity in Newly Diagnosed Asthma



3.1.13 Treatment Options

Treatment for asthma can be divided into **non-drug** treatment, focused on psycho-social intervention and risk factor reduction, and **drug treatment,** centered around inhaled drug therapy.

3.1.13.1 Non-Drug Treatment

All people with asthma (and/or their cares) should be offered self-management education which should include a written personalized asthma action plan and be supported by regular professional review.

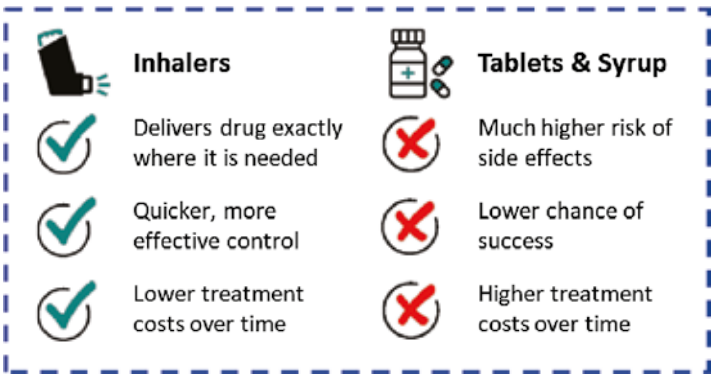
- **Written personalized asthma plan.** This should include guidance on medication frequency and dosage, clear instructions on when to seek help, and an indication of the next review date.
- **Smoking cessation.** Smoking exacerbates asthma symptoms. Clear personalized advice should be given to stop smoking and help provided with nicotine replacement therapy, where available and appropriate.
- **Weight reduction in obese patients** improves asthma symptoms and should be encouraged.

3.1.13.2 Drug Treatment – General Principles

When making decision on drug therapy for asthma, it is important to understand the profile, characteristics, benefits, and contraindications of the core asthma medications.

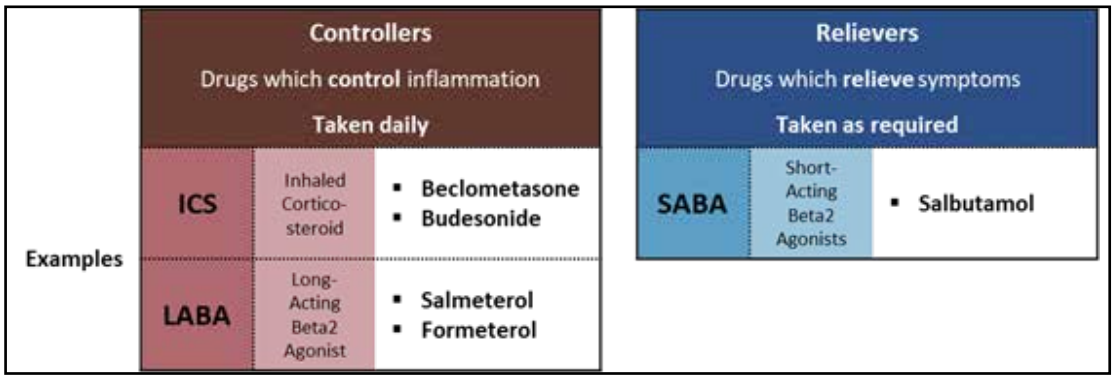
Inhalers are superior to oral therapy

Oral therapies have a limited role in asthma management for most clients. Oral salbutamol tablets or syrup has no place in the management of asthma.



Controller vs. Reliever Medications

The target of modern asthma treatment is to **control** the disease. For all but the mildest cases of asthma, a controller drug therapy is required to meet this goal.



3.1.13.3 Drug Treatment - Stepwise Management

Table 3. Principles of Stepwise Asthma Management

Principles of Stepwise Asthma Management	
▪ Short acting Bronchodilators should be given as needed in all steps	▪ LABAs are more effective than leukotriene antagonist e.g. Montelukast
▪ All persistent asthma should be treated with steroids in a stepwise manner since it reduces exacerbation and hospitalizations.	▪ LABA can be effective with low and medium dose of ICS instead of using a high dose of ICS.
▪ ICS can also be commenced if the patient has a future risk of adverse outcomes. Exacerbation, persistent airflow limitation, persistent exposure to allergens) and comorbidities even the severity is mild intermittent.	▪ LABA is not recommended for children less than 6 years old. Better to increase the ICS to higher dose.
▪ Start at dose of steroids appropriate to severity of disease.	▪ Once asthma treatment has been commenced. Ongoing treatment decisions are based on the cycle of assessment, adjustment, and review of response.
▪ For mild persistent asthma 400mcg/ day in divided dose is an appropriate starting point for many patients	▪ Review patient's response after 1-3 month or earlier depending on clinical urgency.
▪ Inhaled corticosteroids are first line controllers.	▪ Any step-up should be regarded as a therapeutic trial and the response should be reviewed after 1-3 month or earlier depending the clinical urgency.
▪ The second line long term drugs can be used as an add on therapy	

Step up

It is recommended for patients who fail to respond adequately to initial treatment.

Before considering any step-up in treatment, correct the following common problems

- Incorrect inhaler technique
- Poor adherence
- Persistent exposure at home/work such as allergens or medications
- Comorbidities
- Incorrect diagnosis
- In the absence adequate control in step 2 increase steroids up to 800 or step up to step 3
- In Step 3 you can add LABA with low and medium dose subsequently you can increase the ICS from low dose to medium from medium to high dose of inhaled corticosteroids and increase the dose of ICS to 800-1000mcg

Step down

- Review and consider stepping down at intervals of 6 month or more by maintaining the lowest dose of ICS controlling the symptoms.
- Consider stepping down if there have not been no symptoms for 6 -12 month
- Prior to stepping down treatment the patient should be given a written asthma action plan and instructions for how and when to resume their previous treatment if their symptom worsens because of stepping down

Table 4. Step Down Strategies

Step Down Strategies		
Current step	Current medication	Options for stepping down
Step 4	Moderate to high dose ICS+LABA	Reduce ICS dose by 50% Then remove LABA and then others after 6 months
Step 3	Low dose ICS+LABA	Reduce ICS by 50%
Step 2	Low dose ICS	Reduce ICS to once daily

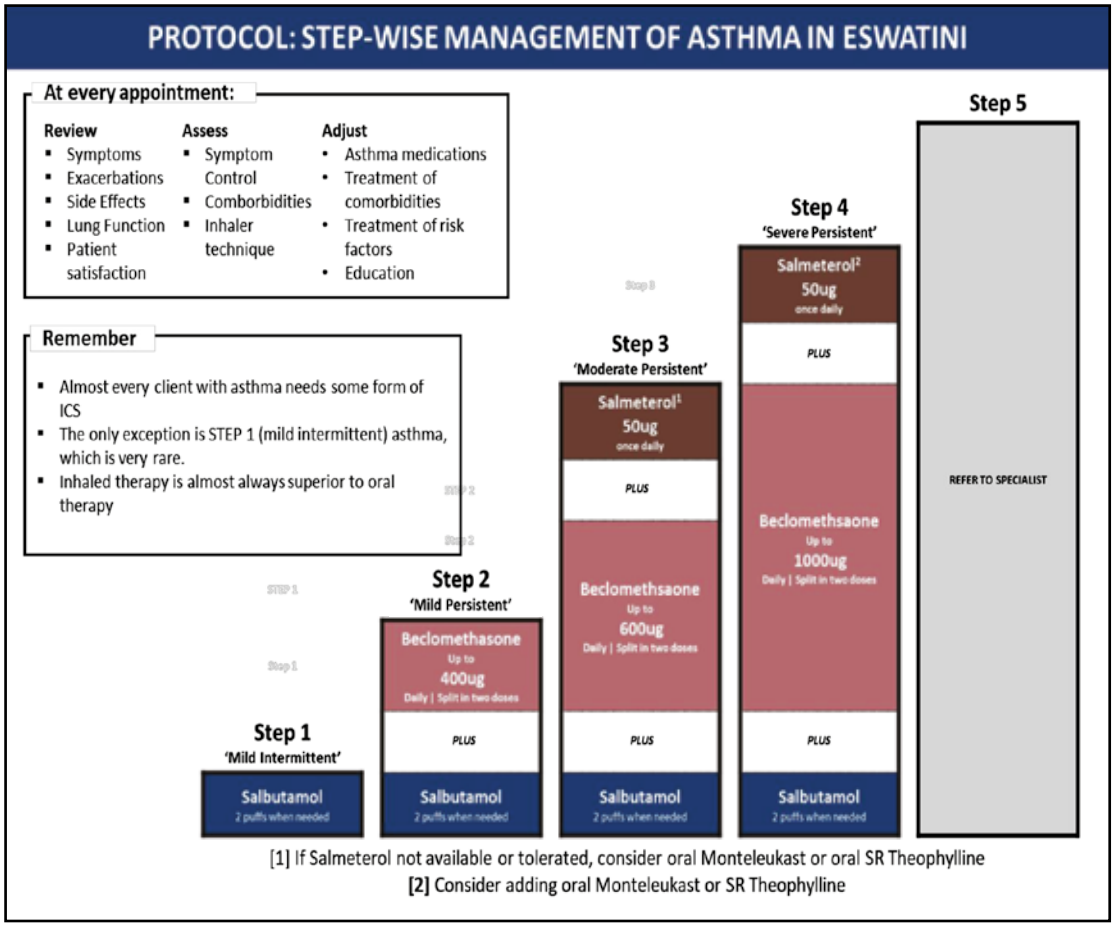
3.1.13.4 Follow-Ups

Conduct regular review of asthma control and assess future risk of adverse outcomes (exacerbation, persistent airflow limitation, persistent exposure to allergens and medication side effect) ranging from two weeks up to every three or six months depending the clinical urgency.

- Manage and assess comorbidities
- Assess lung function test every 3-6 month

- Check for adherence to medications and reinforce.
- Identify barriers for adherence
- Check inhaler technique
- Step up or step down depending on asthma control
- Adjust action plan

Figure 6. Stepwise Management of Asthma in Eswatini



3.1.14 Special Cases

3.1.14.1 Exercise-Induced Asthma Guidelines

- Administration of an inhaled SABA before exercise (strong recommendation)
    - SABA is typically administered 15 minutes before exercise
- A controller agent is added whenever SABA therapy is used daily or more frequently
- Interval or combination warm-up exercise before planned exercise (strong recommendation)
- Recommend against daily use of an inhaled long-acting beta2-agonist as single therapy (strong recommendation)

- For patients who continue to have symptoms despite using an inhaled SABA before exercise or who require an inhaled SABA daily or more frequently:
    - (1) Daily ICS (strong recommendation),
    - (2) Daily administration of an LTRA (strong recommendation)
    - (3) Administration of a mast cell–stabilizing agent before exercise (strong recommendation)
    - (4) Inhaled anticholinergic agent before exercise (weak recommendation)
- For patients with EIB and allergies who continue to have symptoms despite using an inhaled SABA before exercise or who require an inhaled SABA daily or more frequently consider administration of an antihistamine (weak recommendation)
- For exercise in cold weather, routine use of a device (e.g., mask) that warms and humidifies the air during exercise (weak recommendation)

3.1.14.2 Asthma in Pregnancy

Asthma complicates 4-8% of pregnancies. Mild and well-controlled moderate asthma can be associated with excellent maternal and perinatal pregnancy outcomes. Severe and poorly controlled asthma may be associated with increased prematurity and other perinatal complications, to include maternal morbidity and mortality. Optimal management of asthma during pregnancy includes objective monitoring of lung function, avoiding or controlling asthma triggers, patient education, and individualized pharmacologic therapy. Inhaled corticosteroids are the preferred medication for all levels of persistent asthma during pregnancy. For pregnant women with asthma, it is safer to be treated with asthma medications than to have asthma symptoms and exacerbations. The goal of asthma therapy is to maintain adequate oxygenation of the foetus by prevention of hypoxic episodes in the mother.

Apart from alpha-adrenergic compounds other than pseudoephedrine and some antihistamines, most drugs used to treat asthma and allergic rhinitis have not been shown to increase any risk to the mother or foetus. The National Institute of Health stated that albuterol (Proventil HFA), beclomethasone (QVAR), budesonide (Pulmicort Flex haler or Respules), prednisone (Deltasone, Orasone), and theophylline, when clinically indicated, are considered appropriate for the treatment of asthma in pregnancy.

3.2 CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)

3.2.1 Definition

Chronic bronchitis is defined clinically as the presence of a chronic productive cough for 3 months during each of 2 consecutive years (other causes of cough being excluded).

Emphysema is defined pathologically as an abnormal, permanent enlargement of the air spaces distal to the terminal bronchioles, accompanied by destruction of their walls and without obvious fibrosis.

3.2.2 Diagnosis

3.2.2.1 Clinical Symptoms and Physical Examination

Patients typically present with a combination of signs and symptoms of chronic bronchitis, emphysema, and reactive airway disease. Symptoms include the following:

- Cough: usually worse in the mornings and productive of a small amount of colourless sputum
- Breathlessness: The most significant symptom, but usually does not occur until the sixth decade of life
- Wheezing: May occur in some patients, particularly during exertion and exacerbations

While the sensitivity of physical examination in detecting mild-to-moderate COPD is relatively poor, the physical signs are quite specific and sensitive for severe disease. Findings in severe disease include the following:

- Tachypnoea and respiratory distress with simple activities
- Use of accessory respiratory muscles and paradoxical in drawing of lower intercostal spaces (Hoover sign)
- Cyanosis
- Elevated jugular venous pulse (JVP)
- Peripheral oedema

Thoracic examination reveals the following:

- Hyperinflation (barrel chest)
- Wheezing – Frequently heard on forced and unforced expiration
- Diffusely decreased breath sounds
- Hyperresonance on percussion
- Prolonged expiration
- Coarse crackles beginning with inspiration in some case

Table 5. Symptoms of Chronic Bronchitis and Emphysema

Chronic Bronchitis	Emphysema
• Patients may be obese • Frequent cough and expectoration are typical • Use of accessory muscles of respiration is common • Coarse rhonchi and wheezing may be heard on auscultation • Patients may have signs of right heart failure (i.e., cor pulmonale), such as oedema and cyanosis	• Patients may be very thin with a barrel chest • Patients typically have little or no cough or expectoration • Breathing may be assisted by pursed lips and use of accessory respiratory muscles; patients may adopt the tripod sitting position • The chest may be hyper- resonant, and wheezing may be heard • Heart sounds are very distant

3.2.2.2 Investigations

3.2.2.2.1 Arterial blood gas (ABG)

Arterial blood gas (ABG) findings are as follows:

- ABGs provide the best clues as to acuteness and severity of disease exacerbation
- Patients with mild COPD have mild to moderate hypoxemia without hypercapnia
- As the disease progresses, hypoxemia worsens and hypercapnia may develop, with the latter commonly being observed as the FEV1 falls below 1 L/s or 30% of the predicted value pH usually is near normal; a pH below 7.3 generally indicates acute respiratory compromise
- Chronic respiratory acidosis leads to compensatory metabolic alkalosis

3.2.2.2.2 Chest X-Ray

In patients with emphysema, frontal and lateral chest radiographs reveal the following:

- Flattening of the diaphragm
- Increased retrosternal air space
- A long, narrow heart shadow
- Rapidly tapering vascular shadows accompanied by hyperlucency of the lungs
- Radiographs in patients with chronic bronchitis show increased Broncho vascular markings and cardiomegaly

3.2.2.2.3 CT Scan

Advantages of high-resolution CT include the following:

- Greater sensitivity than standard chest radiography
- High specificity for diagnosing emphysema (outlined bullae are not always

visible on a radiograph)
- May provide an adjunctive means of diagnosing various forms of COPD (e.g., lower lobe disease may suggest alpha1-antitrypsin (AAT) deficiency
- May help the clinician determine whether surgical intervention would benefit the patient

3.2.2.2.4 Other Tests

Other tests are as follows:

- **Haematocrit**: Patients with polycythaemia (Haematocrit greater than 52% in men or 47% in women) should be evaluated for hypoxemia at rest, with exertion, or during sleep
- **Serum potassium:** Diuretics, beta-adrenergic agonists, and theophylline act to lower potassium levels
- **AAT**: Measure AAT in all patients younger than 40 years, in those with a family history of emphysema at an early age, or with emphysematous changes in a non-smoker (also see Alpha1-Antitrypsin Deficiency).
- **Sputum**: Sputum evaluation will show a transformation from mucoid in stable chronic bronchitis to purulent in acute exacerbations
- **Pulse Oximetry:** Pulse oximetry, combined with clinical observation, provides instant feedback on a patient's status
- **ECG**: Electrocardiography can help establish that hypoxia is not resulting in cardiac ischemia and that the underlying cause of respiratory difficulty is not cardiac in nature
- **6MWD**: The distance walked in 6 minutes (6MWD) is a good predictor of all-cause and respiratory mortality in patients with moderate COPD [2, 3] ; patients with COPD who desaturate during the 6MWD have a higher mortality rate than do those who do not desaturate
- **Ultrasound**: Two-dimensional echocardiography can screen for pulmonary hypertension.
- **Catheterization**: Right-sided heart catheterization can confirm pulmonary artery hypertension and gauge the response to vasodilators

3.3 MANAGEMENT

Smoking cessation continues to be the most important therapeutic intervention for COPD. Risk factor reduction (e.g., influenza vaccine) is appropriate for all stages of COPD. Approaches to management by stage include the following:

Table 6. Approach to COPD Management

Stage I (mild obstruction)	Short-acting bronchodilator as needed
Stage II (moderate obstruction)	Short-acting bronchodilator as needed; long-acting bronchodilator(s); cardiopulmonary rehabilitation

Stage III (severe obstruction)	Short-acting bronchodilator as needed; long-acting bronchodilator(s); cardiopulmonary rehabilitation; inhaled glucocorticoids if repeated exacerbations
Stage IV (very severe obstruction or moderate obstruction with evidence of chronic respiratory failure)	Short-acting bronchodilator as needed; long-acting bronchodilator(s); cardiopulmonary rehabilitation; inhaled glucocorticoids if repeated exacerbation; long-term oxygen therapy (if criteria met); consider surgical options such as lung volume reduction surgery (LVRS) and lung transplantation

Agents used include the following:	
Short-acting beta$_2$	agonist bronchodilators (e.g., albuterol, metaproterenol, levalbuterol, pirbuterol)
Long acting beta$_2$	agonist bronchodilators (e.g., salmeterol, formoterol, arformoterol, indacaterol, vilanterol)
Respiratory anticholinergics	ipratropium, tiotropium, aclidinium, revefenacin
Xanthine derivatives	Theophylline
Phosphodiesterase-4 Inhibitors	Roflumilast
Inhaled corticosteroids	fluticasone, budesonide: Peripheral blood eosinophil counts may help stratify the likelihood of efficacy
Oral corticosteroids	Prednisone
Beta$_2$ -agonist and anticholinergic combinations	ipratropium and albuterol, umeclidinium bromide/ vilanterol inhaled
Beta$_2$ -agonist and corticosteroid combination	budesonide/formoterol, fluticasone and salmeterol, vilanterol/fluticasone inhaled
Short-acting beta$_2$	agonist bronchodilators (e.g., albuterol, metaproterenol, levalbuterol, pirbuterol)
Long acting beta$_2$	agonist bronchodilators (e.g., salmeterol, formoterol, arformoterol, indacaterol, vilanterol)
Respiratory anticholinergics	ipratropium, tiotropium, aclidinium, revefenacin
Xanthine derivatives	Theophylline
Phosphodiesterase-4 Inhibitors	Roflumilast
Inhaled corticosteroids	fluticasone, budesonide: Peripheral blood eosinophil counts may help stratify the likelihood of efficacy
Oral corticosteroids	Prednisone
Beta$_2$ -agonist and anticholinergic combinations	ipratropium and albuterol, umeclidinium bromide/ vilanterol inhaled

$Beta_2$ -agonist and corticosteroid combination	budesonide/formoterol, fluticasone and salmeterol, vilanterol/fluticasone inhaled

Prevention and maintenance therapy recommendations are as follows:	
Smoking cessation is key	Pharmacotherapy and nicotine replacement increase long-term smoking abstinence rates, as do legislative bans on smoking. The effectiveness and safety of e-cigarettes as a smoking cessation aid is uncertain.
Pharmacologic therapy	Can reduce the symptoms of COPD, can reduce the severity and frequency of exacerbations, and can improve exercise tolerance and health status.
Pharmacologic treatment regimens should be individualized.	They should be guided by symptom severity; exacerbation risk; adverse effects; comorbidities; drug availability and cost; and patient response, preference, and ability to utilize the various drug delivery devices.
Inhaler technique	Should be assessed regularly
Pneumococcal and influenza vaccinations	Decrease the incidence of lower respiratory tract infections
Pulmonary rehabilitation	Improves symptoms, physical and emotional participation in everyday activities, and quality of life.
Long-term oxygen therapy	Patients with severe resting chronic hypoxemia have improved survival with long-term oxygen therapy
Stable COPD and resting or exercise-induced moderate desaturation	In patients with stable COPD and resting or exercise-induced moderate desaturation, routine long-term oxygen treatment is not recommended; however, consider individual patient factors regarding the need for supplemental oxygen
Severe chronic hypercapnia	With severe chronic hypercapnia and a history of hospitalization for acute respiratory failure, long-term noninvasive ventilation may prevent re-hospitalization and decrease mortality.
Advanced emphysema refractory	Select patients with advanced emphysema refractory to optimized medical care may benefit from surgical or bronchoscopy interventional treatments.
Advanced COPD	Palliative approaches are effective in controlling symptoms

Stable COPD recommendations are as follows:

- Base the management strategy on an individualized assessment of the symptoms and risk of exacerbations.
- Strongly urge smoking cessation in patients who smoke.

- Treatment goals are symptom reduction and reduction in future exacerbations.
- Pharmacologic treatments should be complemented by non-pharmacologic interventions.

Exacerbation recommendations are as follows:

- A COPD exacerbation is defined as acute respiratory symptom worsening with the need for additional therapy. Several factors can lead to an exacerbation, the most common being respiratory tract infections.
- The recommended initial bronchodilators to treat an exacerbation are short-acting beta2-agonists, with or without short-acting anticholinergics.
- As soon as possible before hospital discharge, initiate maintenance therapy with a long-acting bronchodilator.
- Systemic corticosteroids can improve lung function and oxygenation. They also shorten recovery time and hospital duration. The duration of systemic corticosteroid therapy should not exceed 5-7 days.
- If indicated, antibiotic therapy can shorten recovery time, reduce the risk of early relapse and treatment failure, and reduce hospitalization duration. The duration of antibiotic therapy should not exceed 5-7 days.
- Owing to increased adverse effect profiles, methylxanthines are not recommended.
- The first mode of ventilation used in COPD with acute respiratory failure and without contraindications is noninvasive mechanical ventilation. It improves gas exchange, reduces
- The work of breathing, decreases the need for intubation, decreases hospitalization duration, and improves survival.

COPD and comorbidity recommendations are as follows:

- Should not be altered by the presence of comorbidities.
- Lung cancer is a common comorbidity with COPD and is a main cause of mortality.
- Cardiovascular disease is an important frequent COPD comorbidity, as are osteoporosis and anxiety/depression. The latter two are underdiagnosed and associated with poor health status and prognosis.
- Gastroesophageal reflux disease can increase the risk of exacerbations and poor health status.
- Simplicity of treatment and minimization of polypharmacy are emphasized in a multi-morbidity and COPD treatment plan
- Treat COPD comorbidities with the usual standard of care, regardless of the presence of COPD. COPD treatment

Pulmonary rehabilitation programs are typically multidisciplinary approaches that emphasize the following:

- Patient and family education
- Smoking cessation
- Medical management (including oxygen and immunization)
- Respiratory and chest physiotherapy
- Physical therapy with bronchopulmonary hygiene, exercise, and vocational rehabilitation
- Psychosocial support

Indications for admission for acute exacerbations include the following:

- Failure of outpatient treatment
- Marked increase in dyspnea
- Altered mental status
- Increase in hypoxemia or hypercapnia
- Inability to tolerate oral medications such as antibiotics or steroids

Patient Education

It is important to educate the patient with COPD about the disease and to encourage his or her active participation in therapy. The 2 most essential points for the patient to understand are as follows:

- The dangers of smoking and the improvement in quality of life attainable with smoking cessation

The need to seek medical care early during an exacerbation and to not wait until they are in distress.

CHAPTER 4: CARDIOVASCULAR DISEASE

4.1 HYPERTENSION

4.1.1 Definition

Hypertension is defined as a systolic blood pressure (SBP) of 140 mm Hg or more, or a diastolic blood pressure (DBP) of 90 mm Hg or more or taking antihypertensive medication.

Hypertension may be primary, which may develop because of environmental or genetic causes, or secondary, which has multiple aetiologies, including renal, vascular, and endocrine causes. Primary or essential hypertension accounts for 90-95% of adult cases, and secondary hypertension accounts for 2-10% of cases.

4.1.2 Classification

The classification of BP for adults aged 18 years or older has been as follows:

- Normal: Systolic lower than 120 mmHg, diastolic lower than 80 mmHg
- Prehypertension: Systolic 120-139 mmHg, diastolic 80-89 mm Hg
- Stage 1: Systolic 140-159 mmHg, diastolic 90-99 mmHg
- Stage 2: Systolic 160-179 mmHg, diastolic 100-109 mmHg
- Stage 3: >180/110 or greater

4.1.3 History

Following the documentation of hypertension, which is confirmed after an elevated blood pressure (BP) on at least 3 separate occasions (based on the average of 2 or more readings taken at each of ≥2 follow-up visits after initial screening), a detailed history should extract the following information:

- Extent of end-organ damage (e.g., heart, brain, kidneys, eyes)
- Assessment of patients' cardiovascular risk status
- Exclusion of secondary causes of hypertension

The patient's lifestyle factors should also be included, such as changes in weight, dietary intake of sodium and cholesterol, exercise level, smoking/tobacco use and psychosocial stressors.

4.1.4 Diagnostic Criteria

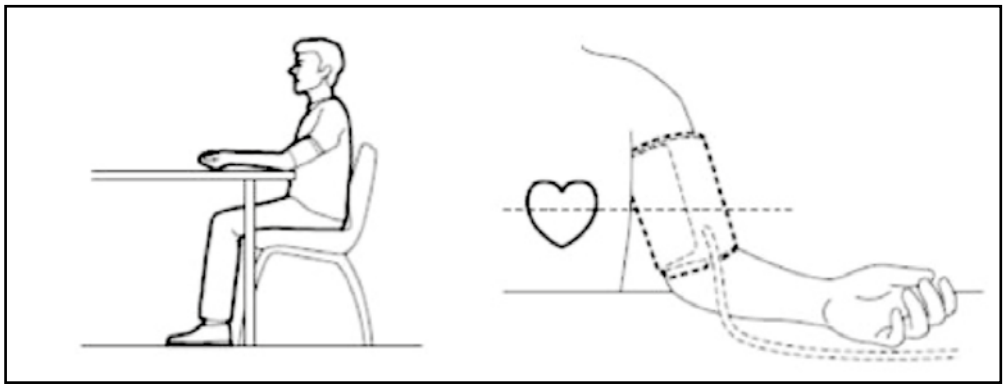
- The evaluation of hypertension involves accurately measuring the patient's

blood pressure. At any given visit, an average of 3 blood pressure readings taken 5 minutes apart is preferable. On the first visit, blood pressure should be checked in both arms and in one leg.

- The patient should rest quietly for at least 5 minutes before the measurement. Blood pressure should be measured in both the supine and sitting positions. As the improper cuff size may influence blood pressure measurement, a wider cuff is preferable, particularly if the patient's arm circumference exceeds 30 cm.
- Ambulatory or home blood pressure monitoring provides a more accurate prediction of cardiovascular risk than do office blood pressure readings.
- Palpation of all peripheral pulses should be performed. In addition, examine the neck for carotid bruits, distended veins, or enlarged thyroid gland and listen for renal artery bruit over the upper abdomen.
- A careful cardiac examination should be performed.

4.1.5 Diagnosis

An accurate measurement of blood pressure is the key to diagnosis.



Take Note:

- Patient should be seated, back supported, arm bared, and arm supported at the heart level
- Allow patient to sit quietly for 3-5 minutes before commencing measurement
- Patients should not have smoked or ingested caffeine beverages in the previous 30 minutes
- Use correct size cuff
- Lower edge of the cuff should be placed 3 cm above the inner crease of the elbow
- Cuff bladder should be centered over the brachial artery (approximately midway between the Shoulder and the elbow crease)
- Take two readings 1-2 minutes apart. If consecutive readings differ by >5 mm, take additional readings

4.1.6 Baseline Laboratory Evaluation

Initial workup

Initial work up tests may include:

- Urinalysis.
- Fasting blood glucose (FBC)
- Serum sodium, potassium, creatinine, and calcium.
- Lipid profile
- TFTs
- CXR
- A 12-lead ECG

Other studies may be obtained based on clinical findings or in individuals with suspected secondary hypertension and/or evidence of target-organ disease.

4.2 MANAGEMENT

4.2.1 Lifestyle Modification

Lifestyle modification is recommended as the first step in managing hypertension.

Educate	▪ Engage in regular physical activity ▪ Eat a healthy diet, low saturated fat ▪ Stop tobacco use and avoid harmful use of alcohol ▪ Attend regular medical follow-up
Physical activity	▪ Engage in moderate levels of physical activity (e.g. walking at least 150 minutes per week) ▪ Reduce and control body weight by reducing high calorie food intake
Tobacco	▪ Encourage all non-smokers not to start smoking ▪ Strongly advise smokers to quit smoking and support them in their effort
Harmful use of alcohol	▪ Avoid alcohol
Eat a heart healthy diet	▪ Restrict salt to less than 5 grams (1 teaspoon) per day ▪ Fatty food: limit fatty meat, dairy fat and cooking oil ▪ Eat a diet high in fruits and vegetables

4.2.2 Pharmacologic Therapy

If lifestyle modifications are insufficient to achieve the goal BP, there are several drug options for treating and managing hypertension.

Table 7. Anti-hypertensive Drugs

First Line	Starting Dose	Increase dose by	Maximum dose	Notes*
Hydrochlorothiazide (thiazide diuretic)	12.5 mg od	12.5 mg od	25 mg od	Can cause hypokalemia; may exacerbate gout; diabetes risk if used with non-selective beta blockers e.g. atenolol as first and second line. Not effective alone in the setting of chronic kidney disease with eGFR <45ml/min
Second Line				
Nifedipine SR(CCB)	10mg od	10mg	90mg a day in divided doses	It should be taken on an empty stomach
Amlodipine (CCB)	5 mg od	5 mg od	10 mg od	Can cause lower-extremity edema
Enalapril (ACEI)	5 mg od	5 mg od	20 mg od	Contraindicated in pregnancy and acute renal failure Can cause cough and angioedema
Captopril (ACEI)	12.5 mg bd or tid	12.5 mg	50 mg bd or tid	Contraindicated in pregnancy and acute renal failure Can cause cough and angioedema

Third Line				
Atenolol (Beta Blocker)	25 mg od	25 mg od	100 mg od	Contraindicated in bradycardia, asthma, and AV Block
Hydralazine (Central Acting vasodilator)	10 mg qid	10-25 mg qid	50 mg qid	Headache is a common side effect. Safe in pregnancy
Special Consideration				
Irbesartan (ARB)	75mg od	75mg od	300mg od	Helpful after maximizing other drug dosages in patients with ACEI induced cough **do not combine with ACEI
Methyldopa (Central Acting)	250 mg bd or tid	250mg bd or tid	1000mg in divided doses	USED ONLY IN PREGNANCY UP TO SIX WEEKS POST PARTUM

Compelling indications for specific agents include comorbidities such as heart failure, ischemic heart disease, chronic kidney disease, and diabetes. Drug intolerability or contraindications may also be factors.

4.2.3 How to Start Pharmacological Therapy for Uncomplicated Essential Hypertension with No Added Risk

Entry Point	Management
Step 1: Community Clinic Level	
Mild hypertension: BP 140-159/90-99	▪ Lifestyle modification if patient is committed ▪ If not controlled after 1-3 months, go to Step 2 ▪ If multiple risk factors present, go to Step 2 ▪ For complex patients refer to doctor led service
Step 2: Community Clinic Level	
Failure at Step 1 OR Moderate hypertension: BP 160-179/100-109	Lifestyle modification + Hydrochlorothiazide* 12.5 to 25mg PO daily until target BP reached

Step 3: Initiation at hospital level. Follow up at clinic level when stable	
Failure at Step 2 OR Severe hypertension: BP ≥ 180/110	Lifestyle modification + Hydrochlorothiazide 25mg PO daily + Ace inhibitor (e.g. Captopril) OR calcium channel blocker (e.g. Nifedipine SR)
Step 4: Initiation at hospital level. Follow up at clinic level when stable	
Failure at Step 3	Lifestyle Modification + Hydrochlorothiazide 25mg PO daily + Ace inhibitor (e.g. Captopril) + Calcium channel blocker (e.g. Nifedipine SR)
Step 5: Hospital level	
Failure at Step 4	Patients who have failed at Step 4 should be managed by doctor led service

Note:

- Review in 1 to 2 months
- If target is not reached but BP <160/100mmHg, either maximise the dose of the one drug or add a second drug at the starting dose.
- Aim to reach target BP within 3 months
- In adults of all ages with diabetes mellitus or chronic kidney disease or congestive heart failure or history of stroke
- Nondiabetic and diabetic adults with no albuminuria – target BP ≤140/≤90mmHg
- Nondiabetic and diabetic adults with CKD but no albuminuria – target BP ≤140/90mmHg
- Nondiabetic and diabetic adults with albuminuria – target BP ≤130/80mmHg
- Nondiabetic and diabetic adults with CKD and albuminuria – target BP ≤130/80mmHg

Recommended anti-hypertensive in special cases

Special Cases/ Comorbidities	Recommended First drugs	If second drug is needed to achieve a BP of < 130/80 add	If third drug is needed to achieve a BP of 130/80 add
Hypertension and Diabetes	ACEI or ARB if ACEI cough or angioedema	CCB/Thiazide (if GFR <45 use loop diuretic)	CCB or Thiazide *(the one not used as first drug)*
Hypertension and Chronic Kidney Disease	ACEI or ARB if ACEI cough or angioedema *(monitor K+ and creatinine closely)*	CCB or Thiazide	
Hypertension and Coronary Artery Disease	Beta-blocker and ACEI *(initiate these 2 drugs regardless of blood pressure.)*	CCB or Thiazide	
Hypertension and Stroke history	CCB	ACEI or Thiazide	
Hypertension and Heart failure	ACEI or ARB Beta-blockers Loop diuretic Mineralocorticoid receptor antagonist e.g. spironolactone (Refer to Cardiologist)		
Pregnancy	Methyldopa	CCB	Refer to specialist

**** Do not combine ACEI and ARBS**

4.2.4 Interaction Between Anti-Hypertensive and ART

Routine blood pressure measurement should be done for All HIV positive clients at every clinic visit. The following should be considered in patients who are on treatment for both HIV and Hypertension:

1. Calcium channel blockers and Non-nucleoside reverse transcriptase inhibitors (NNRTIs)
   - ✓ Non-nucleoside reverse transcriptase inhibitors such as Efavirenz and Nevirapine are liver enzyme inducers and increase the metabolism of calcium channel blockers.
   - ✓ This can potentially reduce the anti-hypertensive effect of calcium channel blockers.

2. Calcium channel blockers and Protease Inhibitors
   - ✓ Protease inhibitors decrease the rate of calcium channel blocker metabolism.
   - ✓ This can increase calcium channel blocker blood levels with the risk of hypotension.

- ✓ Particular care must be taken in patients receiving first-line antiretroviral therapy where the BP is controlled with calcium channel blockers.

3. Beta blockers and Protease Inhibitors
   - ✓ Protease inhibitors may inhibit beta blocker metabolism.
   - ✓ This can lead to increased blood levels of beta blockers with the risks of hypotension and bradycardia.
   - ✓ If required, low doses of beta blockers must be initiated if concomitant use of protease inhibitors.

4.3 HYPERTENSIVE EMERGENCIES

The most common clinical presentations of hypertensive emergencies are:

- Cerebral infarction (24.5%),
- Pulmonary oedema (22.5%),
- Hypertensive encephalopathy (16.3%),
- Congestive heart failure (12%).

Other clinical presentations associated with hypertensive emergencies include intracranial haemorrhage, acute myocardial infarction, aortic dissection, acute kidney failure as well as eclampsia.

Severe Hypertension Management Protocol

Severe hypertension (stage 3: systolic BP ≥ 180mmHg or diastolic BP ≥110mmHg or above the 95th percentile in children). Note can occur at lower BPs in pregnancy and in children.
Aim BP reduction by no more than 15-20% in the first 24 hours to avoid precipitating a stroke or other organ hypo-perfusion

Asymptomatic Severe Hypertension – absence of rapidly progressive target organ damage

- Treatment: dual oral therapy (such as calcium channel blocker and diuretic) such as
- Nifedipine (Adalat) slow release 20 mg orally + Hydrochlorothiazide 25 mg orally in non-chronic kidney disease patients
- In chronic kidney disease give furosemide intravascularly 40mg to 120 mg in chronic kidney disease to target salt and water retention + Nifedipine slow release 20mg orally.
- Re-check blood pressure within 1 hour.
- If safely reduced with no symptoms, patient to be booked follow up within one week and sent home on oral dual therapy (calcium channel blocker and diuretic).

- Investigations to be as for first visit with search for secondary cause of hypertension.
- If BP no better – patient to be monitored in the hospital for safe BP lowering and investigations.

Hypertensive Urgency – non-immediately life-threatening target organ damage (for example presence of headache but with a normal level of consciousness)

- Admit for monitored BP lowering
- Treatment should be commenced with **2 oral agents** with an aim to lower the DBP to 100 mmHg, slowly over 48 - 72 hours.

Examples of Oral Anti-hypertensive that can be used:

- Long-acting CCBs such as Amlodipine 5mg or Nifedipine SR 20mg orally
- ACE-Is used initially in very low doses and avoided if there is severe hyponatraemia (serum sodium <130 mmol/l indicates hyper-reninaemia from e.g. renal artery stenosis and BP may fall dramatically with ACE-Is)
    - For example: Captopril 6.25mg od
- β-blockers such as Atenolol 50mg
- Diuretics (which may potentiate the effects of the other classes of drugs), for example hydrochlorothiazide 25mg. If there is kidney impairment or pulmonary congestion give Furosemide 80mg to 160mg in twice daily doses 6 hours apart.

4.3.1 Hypertensive Emergency

- Acute BP rise with ongoing target organ damage (such as grades 3 or 4 hypertensive retinopathy, brain – hypertensive encephalopathy with confusion, seizures, heart, and kidneys)
- Admit to intensive care or high care unit for close monitoring and controlled BP lowering
- Do not lower the BP by greater that 25% within 30 minutes to 2 hours
- In the next 2 to 6 hours, aim to decrease to a target BP of 160/100 mmHg.

Treatment

- This may be achieved using intravenous or oral medicines.

Intravenous Therapy

- Labetalol, IV, 2mg/ minute to a total dose on 1-2mg/kg, while trying to achieve control with other agents.

Caution in Acute Pulmonary Oedema

- Hydralazine IV 2.5mg slow IV push over one minute. ONLY repeat after 20 mins. MAXIMUM dose in 1 hour is **10mg (avoid if any history of cardiac disease and if patient has severe tachycardia 160/min)**

In case of suspected myocardial ischaemia and CCF:

- Glyceryl trinitrate, IV, 5-10 mcg/minute.
- Refer to dosing table in ST elevation myocardial infarction (STEM).
- Furosemide, IV, 40-80 mg
    - Duration of action: 6 hours
    - Potentiates all the above medicines.
    - Total dose must not exceed 240 mg

In case of severe pre-eclampsia and eclampsia

- Loading dose of magnesium sulphate IV 4g in 200 ml of 0.9% sodium chloride over 5-10 minutes
- Refer to obstetrics /obstetrics guidelines

Oral Therapy

- ACE – Inhibitor e.g.: Enalapril, oral, 2.5 mg as a test dose

Medication	Dosing	Notes
Captopril Enalapril	25 mg orally 2.5mg starting dose	Contraindicated in pregnancy and-renal failure (Cr≥μmol/L)
Nifedipine (immediate release)	10 mg orally	
Hydralazine	25 mg orally	
Furosemide	40 mg orally or 20mg IV	If evidence of pulmonary congestion
Labetalol	IV 2mg/min with total of 1-2mg/kg whilst still trying to achieve BP target using oral agents	
Glyceryl trinitrate	IV 5-10mcg/min	

Hydralazine	IV 2.5mg slow iv push over 1-minute repeat only after 20mins.maximun dose 10mg in one hour	DO NOT USE IN PATIENTS with known cardiac disease and if patient has severe tachycardia 160/min

4.3.2 Approach to Severe Hypertension in Ischaemic Stroke

Even though the BP may be elevated in many patients with ischaemic stroke, caution should be taken when lowering the blood pressure because:

- ✓ The BP usually drops during the first days after ischaemic stroke, even without specific medical treatment.
- ✓ In this setting, cerebral autoregulation is impaired, and rapid BP reduction may result in an ischaemic stroke extension.

Only a persistently elevated DBP >120 mmHg or SBP >220 mmHg should be treated, with caution and an initial 15% reduction in mean arterial pressure.

Avoid and treat hypotension in the setting of acute stroke.

Urgent brain CT should be done, and patient managed accordingly with consultation with a neurosurgeon.

4.3.3 Approach to Severe Hypertension in Haemorrhagic Stroke

Aim Systolic BP range 130-140mmHg to reduce risk of recurrent haemorrhage and haematoma growth. Involve Neurosurgeons and ICU.

4.3.4 Hypertension in Paediatric Patients

Systemic hypertension is less common in children than in adults, but the incidence of hypertension in children is approximately 1-5%. The presence of hypertension in children is usually indicative of an underlying disease process (secondary hypertension). In children, approximately 5-25% of cases of secondary hypertension are attributed to Reno vascular disease.

Hypertension is defined as systolic and/or diastolic blood pressure ≥ the 95th percentile for gender, age, and height percentile on at least three consecutive occasions. A sustained blood pressure of > 115/80 is abnormal in children between 6 weeks and 6 years of age.

Stage 1 hypertension:

SBP or DBP from 95th to 99th percentile + 5 mm Hg

In adolescents if BP>140/90 mmHg, even < 95th percentile

Stage 2 hypertension:

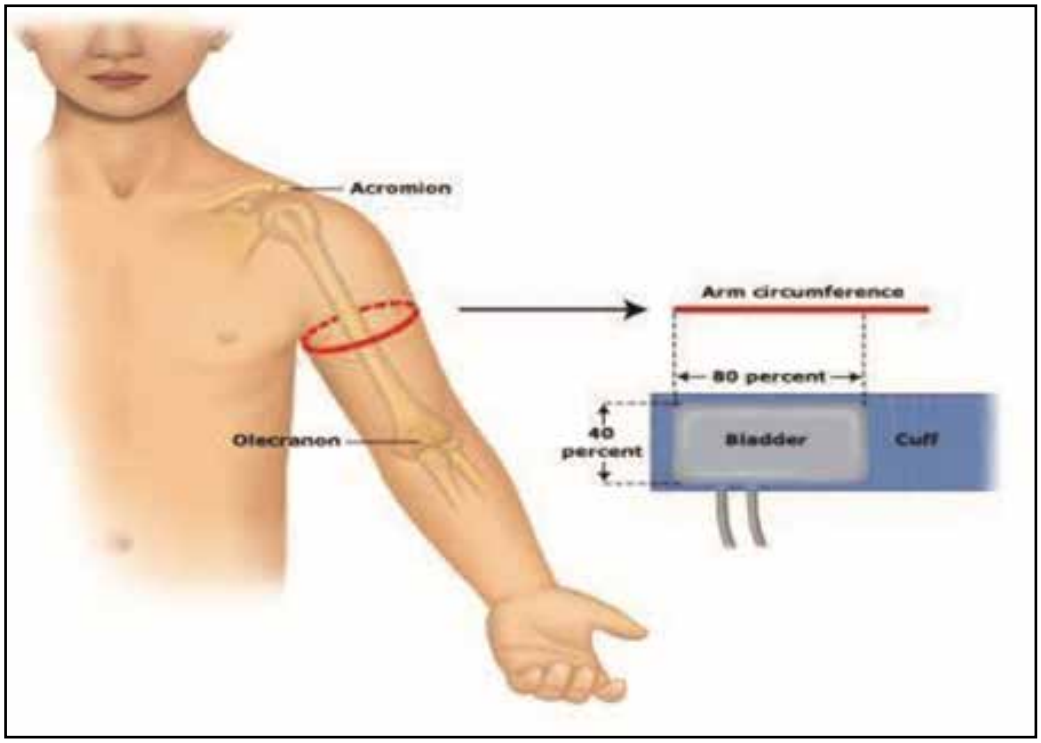
SBP or DBP greater than 99th percentile + 5 mm Hg

Hypertensive urgency is defined as a significant elevation of blood pressure without accompanying end organ damage.

Signs of complications are:

Encephalopathy, convulsions, retinal hemorrhages, or blindness

Causes



Generally, severe hypertension suggests renal disease accurate measurement of BP:

- Use the widest cuff that can be applied to the upper arm
- The cuff bladder must encircle at least 80% of the upper arm and should cover at least 75% of the distance between the elbow and the shoulder joints
- It is better to use a cuff that is slightly too large than one that is too small (see below)

Most common causes of secondary hypertension by age

Newborn:

- Renal abnormalities
- Coarctation of the aorta
- Renal artery stenosis o Renal artery or vein thrombosis

First year

- Coarctation of the aorta
- renal vascular disease
- Tumor (Neuroblastoma)
- Medications (steroids)

1-6 years

- Renal vascular diseases
- Renal parenchymal diseases (glomerulonephritis, hemolytic uremic syndrome…)
- Coarctation of the aorta o Medications (steroids) o Essential hypertension o Tumor

6-15 years

- Renal vascular diseases
- Renal parenchymal diseases (glomerulonephritis, hemolytic uremic syndrome…)
- Essential hypertension, Coarctation of the aorta, Endocrine causes, Nutritional causes (obesity), Tumor (pheochromocytoma)

Signs and symptoms

- Oedemic, hematuria, proteinuria
- Headache, convulsions
- coma and visual symptoms
- Acute heart failure and pulmonary edema
- Acute respiratory distress
- Some children may be asymptomatic

Table 8. Blood Pressure in Children Correlates with Body Size and Increases with Age

Age of child	95th Percentile of Systolic and Diastolic Blood Pressure	
	First 12 hours	First week
newborn prem	65/45 mmHg	80/50 mmHg
newborn fullterm	80/50 mmHg	100/70 mmHg
	Systolic mmHg	Diastolic mmHg
6 weeks–6 years	115	80
8 years	120	82
9 years	125	84
10 years	130	86
12 years	135	88
14 years	140	90

95th percentile of systolic and diastolic BP in relation to the height of child:

Height cm	Systolic mmHg	Diastolic mmHg
100	114	70
110	116	72
120	118	74
130	120	74
140	125	75
150	130	75
160	135 (131)	77
170	140 (133)	80
180	145 (135)	83

Diagnosis

Clinical

- Investigations: FBC, urinalysis, urea, creatinine, Electrolytes (Na+, K+) proteinuria, renal ultrasound + Doppler,
- ECG
- Echocardiogram, fundoscopy

Note: Investigations should be based on etiology.

Management

- Admit patient to pediatric high dependency unit
- Monitor BP every 60 minutes for 24 hours
- Insert peripheral line for drugs
- Bed rest
- Control fluid intake and output (restriction)
- Restrict dietary sodium
- Manage end organ effects
- Do not combine drugs of the same class
- Furosemide, IV, 1–2 mg/kg as a bolus slowly over 5 minutes
- If oliguric, maximum dose: 5 mg/kg/dose
- Nifedipine 0.25-0.5mg/kg (max: 10mg) sublingual. May be repeated 6 hours later, thereafter every 12 hours OR amlodipine, oral, 0.2 mg/kg/dose daily. OR Hydralazine 0.2-0.6mg/kg/dose. The dose can be repeated every 4 hours.
- Refer the patient to a specialist

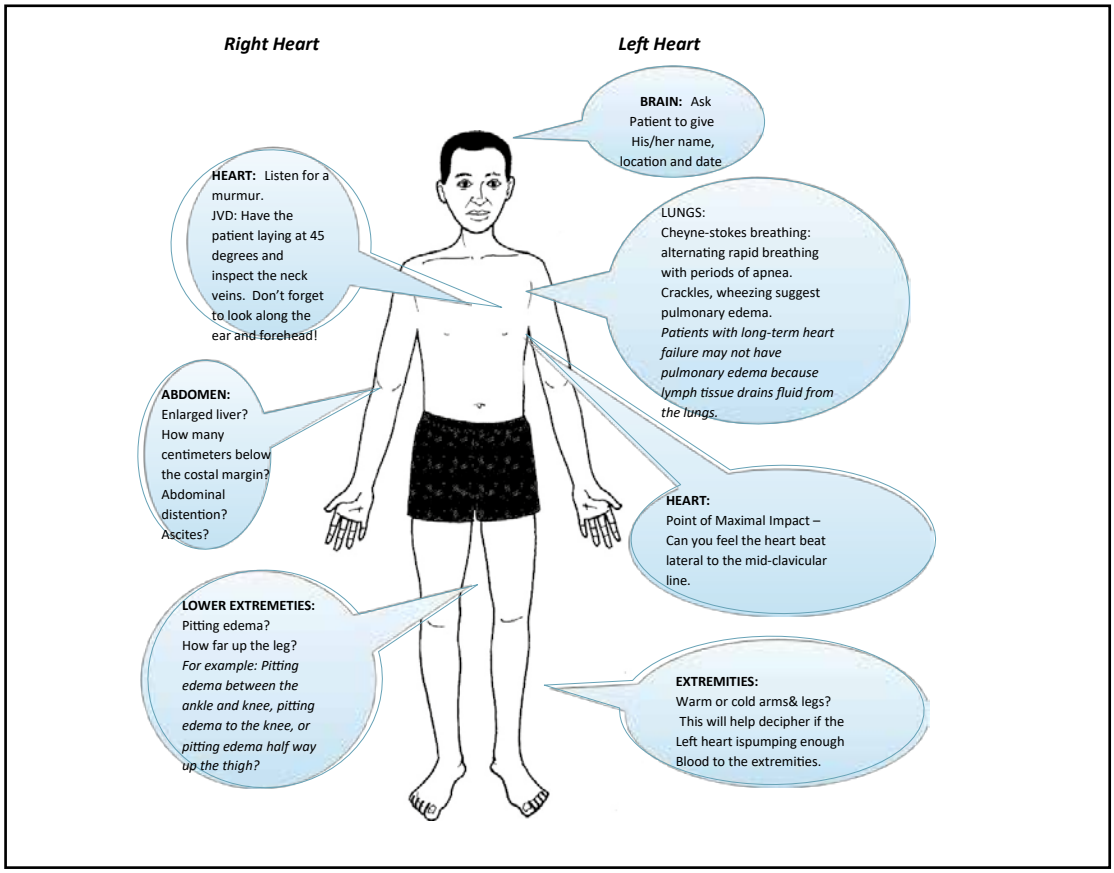
Recommendations (10)

- For acute or chronic hypertension blood pressure needs to be lowered cautiously
- Aim to reduce the SBP slowly over the next 24 - 48 hours
- Do not decrease BP to < 95th percentile in first 24 hours
- Advise a change in lifestyle
- Institute and monitor a weight reduction programme for obese individuals
- Regular aerobic exercise is recommended in essential hypertension
- Dietary advice
- Limit salt and saturated fat intake
- Increase dietary fiber intake
- For all children with no CKD and no proteinuria – target BP <90th percentile for age, sex and height
- For all children with CKD with or without proteinuria – target less than 50th percentile for age, sex and height.

4.3.5 Heart Failure

How to Check for Heart Failure

1. Observe the patient.
    a. If they are sitting upright, trying to stay still, and unable to hold a conversation because they are trying to catch their breath, these are signs of NYHA Class IV HF.
2. Conduct a head to toe evaluation of the left heart.
3. Conduct a head to toe evaluation of the right heart.



Heart Failure Emergencies

Patients with heart failure may present with acute exacerbation of their condition. They may present with the following signs and symptoms

- Inability to lie flat
- Dyspnoea at rest,
- SBP < 80 or > 180, mmHg
- Pulse < 40 or > 120, /min
- Oxygen saturation < 90%,

- Respiratory rate > 24/min

Decompensated Heart Failure (SBP > 80, warm extremities, not confused, good urine output)

- Volume Overload: Lasix 40 IV x 1. If no improvement in 30 minutes, give 80 IV x1
-
- Do not initiate beta-blockers unless patient has RHD
- Check urea/Cr, potassium, CBC, other electrolytes
- If SBP > 180, lower BP with ACE-Inhibitor, hydralazine, or calcium channel blocker
- ADMIT TO WARD

Decompensated Heart Failure and Cardiogenic Shock (SBP < 80, warm extremities, not confused, good urine output)

- Use 1-3 above.
- Add digoxin 0.125 mcg to therapy above to improve contractility
- ADMIT TO THE WARD

Volume Status Management

- Hypovolemia: Decrease or stop furosemide.
- Euvolemia: Maintain furosemide
- Hypervolemia:
- NYHA 1 or 2: Start or increase oral furosemide.
- NYHA 3 or 4: This is an emergency! See above.

CHAPTER 5: DIABETES MELLITUS

5.1 OVERVIEW

Diabetes is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The chronic hyperglycemia of diabetes is associated with long-term damage and dysfunction of different organs, especially the eyes, kidneys, nerves, heart, and blood vessels.

Classification

The ADA/WHO classification of Diabetes Mellitus includes four clinical classes:

1. **Type 1 Diabetes Mellitus** - results from-cell destruction due to immune mediated or idiopathic, causing absolute insulin deficiency.
2. **Type 2 Diabetes Mellitus** - due to a progressive insulin secretary defect on the background of insulin resistance.
3. **Other specific types of Diabetes Mellitus** - e.g. Diseases of the exocrine pancreas, and drug-induced diabetes (long-term steroid use) and some endocrine diseases like thyrotoxicosis.
4. **Gestational Diabetes Mellitus (GDM)** - Hyperglycemia diagnosed during pregnancy in previously non-diabetic women.

This guideline will focus on the two main types of diabetes.

Type 1 diabetes is a chronic illness characterized by the body's inability to produce insulin due to the autoimmune destruction of the beta cells in the pancreas. Although onset frequently occurs in childhood, the disease can also develop in adults.

Type 2 diabetes consists of an array of dysfunctions characterized by hyperglycemia and resulting from the combination of resistance to insulin action, inadequate insulin secretion, and excessive or inappropriate glucagon secretion

Table 9. Clinical Differences between Type 1 and Type 2 Diabetes

Type 1	Type 2
Onset most common in childhood and adolescence	Onset most common in adulthood (>30 years)
The pancreas produces little or no insulin	Characterized by insulin resistance where the body does not respond to insulin
Immediate insulin replacement is required	Insulin replacement is not usually required. Treatment involves lifestyle modification and normally oral mediations
Usually unexplained weight loss	Most common in obesity

5.2 PRESENTATION

The classic symptoms of DM:

- Polyuria
- Polydipsia
- Polyphagia
- Lethargy or fatigue
- Susceptibility to infections, especially of the urinary tract, respiratory tract, and skin
-

Patients with diabetes may present with symptoms of acute or chronic complications, including:

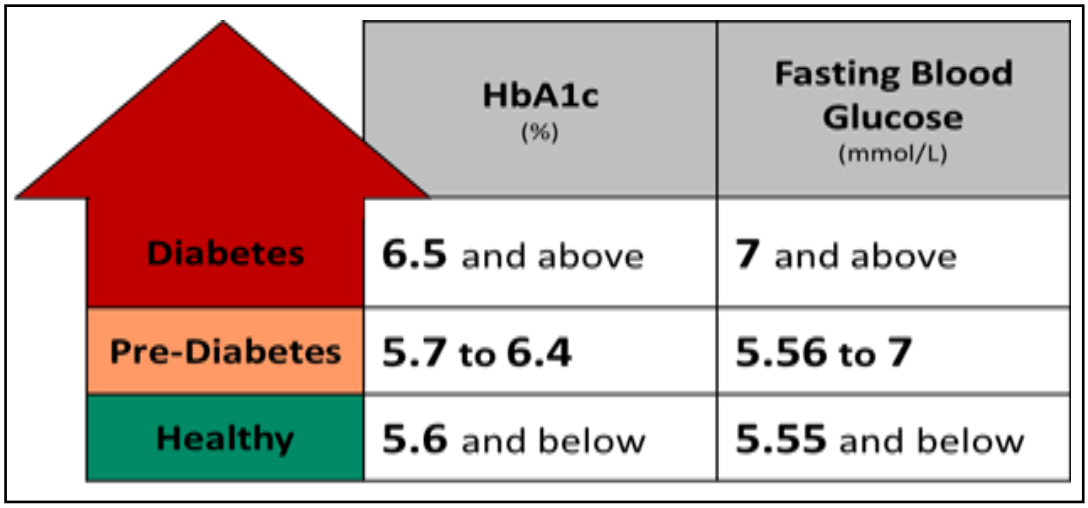
- Blurred vision
- Paresthesia
- Nausea

5.3 SCREENING

Mass screening of individuals through random blood glucose measurements is expensive, has a low diagnostic yield and, in the absence of symptoms, has a low specificity.
Indications for diabetes screening in asymptomatic adults include the following:

- Age 40 years or above
- Sustained blood pressure >135/80 mm Hg
- Overweight and 1 or more other risk factors for diabetes (e.g., first-degree relative with diabetes, BP >140/90 mm Hg, and HDL < 35 mg/dL and/or triglyceride level >250 mg/dL)

5.4 DIAGNOSIS



	HbA1c (%)	Fasting Blood Glucose (mmol/L)
Diabetes	6.5 and above	7 and above
Pre-Diabetes	5.7 to 6.4	5.56 to 7
Healthy	5.6 and below	5.55 and below

Management: General Principles

Goals of treatment are as follows:

- Microvascular (i.e., eye and kidney disease) risk reduction through control of glycaemia and blood pressure
- Macrovascular (i.e., coronary, cerebrovascular, peripheral vascular) risk reduction through control of lipids and hypertension, smoking cessation
- Metabolic and neurologic risk reduction through control of glycaemia

Key points

- Individualized glycemic targets and glucose-lowering therapies
- Diet, exercise, and education as the foundation of the treatment program
- Where possible, all treatment decisions should involve the patient, with a focus on patient preferences, needs, and values

5.5 NON-PHARMACOLOGICAL MANAGEMENT OF TYPE 2 DIABETES

Diet and Patient Education

All diabetic patients should have a comprehensive diet plan, created with the help of a professional dietician that includes the following:

- A daily caloric intake prescription
- Recommendations for amounts of dietary carbohydrate, fat, and protein
- Instructions on how to divide calories between meals and snacks

- Exercise is also an important aspect of diabetes management.

At every encounter, the clinician should educate the patient and in the case of children, the parents about the disease process, management, goals, and long-term complications. Clinicians should do the following:

- Make patients aware of the signs and symptoms of hypoglycemia and how to manage it
- Help patients understand and acknowledge the course of diabetes
- Reassure patients about the prognosis in properly managed diabetes

5.5.1 Management of Type 1 Diabetes

Patients with Type 1 diabetes require **lifelong insulin therapy. Most** require 2 or more injections of insulin daily, with doses adjusted based on self-monitoring of blood glucose levels.

Insulin can be short/ rapid-acting, intermediate-acting, and long-acting.

Insulin Type	Preparations	Onset of Action	Peak Action	Duration of Action	When to Give
Short acting	Regular human insulin (Actrapid)	30-60 minutes	2-3 hours	8-10 hours	30 minutes prior to meal
Intermediate acting	Humulin NPH insulin (Protaphane)	2-4 hours	4-12 hours	12-20 hours	
Mixed acting	Mixture of regular human and Humulin NPH insulin (Actraphane 30/70)	30 minutes	2-12 hours	8-24 hours	
Long acting	Lantus (glargine)	2-4 hours	Peak less	24 hours or less	Once or twice a day

Continuous subcutaneous insulin infusion

Rapid-acting insulin infused continuously 24 hours a day through an insulin pump at 1 or more basal rates, with additional boluses given before each meal and correction doses administered if blood glucose levels exceed target levels. Insulin kept in a pump reservoir for longer than 3 days may lose its clinical effectiveness (though insulin as a part has now been approved for use for as long as 6 days in a pump).

Note: Insulin is sensitive to heat and exposure to oxygen. Once a bottle of insulin is

open, it should be used for no more than 28 days and then discarded; even if there is still some insulin in the bottle, it may have lost its clinical effectiveness.

Initiation of insulin therapy in children

- Consult with a pediatric endocrinologist or pediatrician with experience in diabetes care of children under 5
- Children who have been diagnosed with diabetes may be started with a subcutaneous injection of 0.5-1 U/kg/day of intermediate-acting insulin alone.
- The aim is to select a regimen that allows the achievement of glycemic control without disabling hypoglycemia.
- This also requires a support program for the child and family enabling the implementation of an appropriate diet and other care strategies.

Table 10. Insulin Regimen

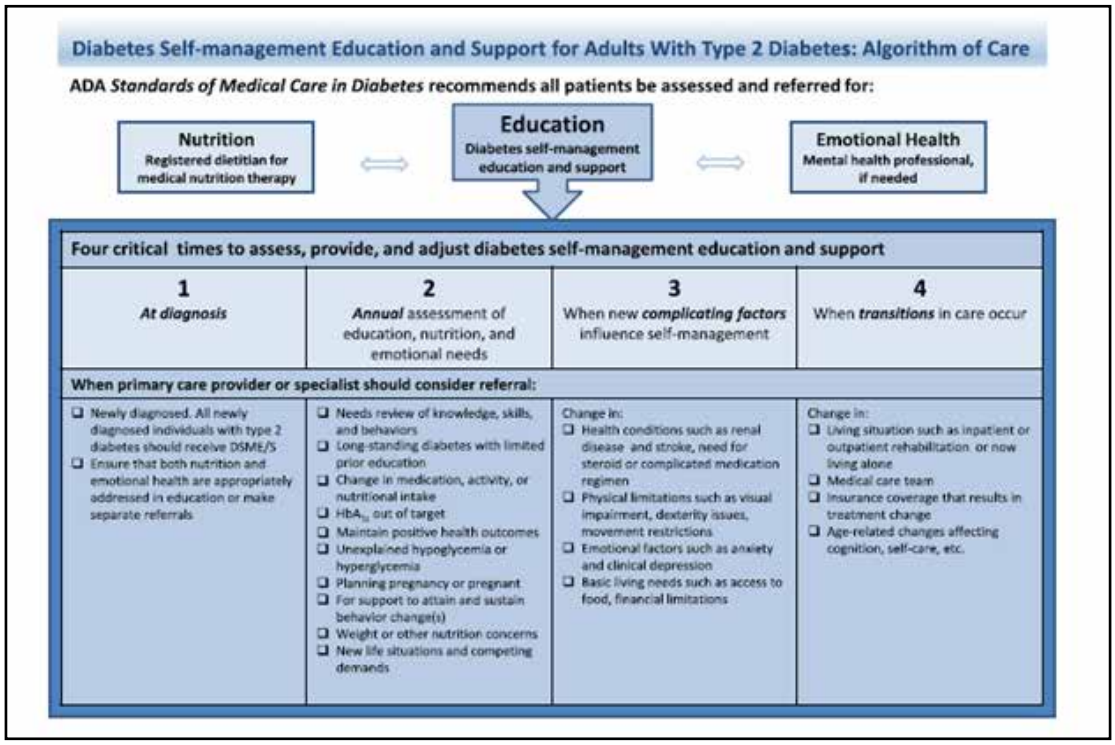
Regimen 1: Biphasic Insulins 30/70		
Breakfast	Intermediate acting (70% of morning dose) + Short acting insulin (30 % of morning dose)	2/3 of total daily dose 30 minutes before breakfast
Supper	Intermediate acting (70% of evening dose) + Short acting insulin (30 % of evening dose)	1/3 of total daily dose 30 minutes before supper
Regimen 2 in case of Early Morning Hyperglycemia		
Breakfast: *Biphasic Insulins 30/70*	Short acting insulin (30% of morning dose) + intermediate acting (70% of morning dose)	2/3 of total daily dose 30 minutes before breakfast
Supper	Short acting insulin (1/3 of evening dose)	1/3 of total daily dose
At night (no later than 10pm)	Intermediate acting (2/3 of evening dose)	
Regimen 3: Basal-bolus		
Breakfast	Short acting insulin*	20% of total daily dose
Lunch	Short acting insulin*	20% of total daily dose

Supper	Short acting insulin*	20% of total daily dose
At night (no later than 10pm)	Intermediate acting (ideally this ought to be a basal insulin acting over 24 hours)	40% of total daily dose
*Rapid acting insulin is indicated in the child (especially < 3 years of age) with erratic eating habits despite adequate education)		

5.5.2 Diabetes and Intercurrent Illness

Illness associated with fever tends to raise blood glucose because of higher levels of stress hormones, gluconeogenesis, and insulin resistance. Illness associated with vomiting and or diarrhea may lower blood glucose with the possibility of hypoglycemia and the development of starvation ketones.

5.5.3 Diabetes Education and Self-Management



5.5.4 Diabetic Ketoacidosis (Paediatric)

DKA occurs with a relative or absolute insulin deficiency, either caused by non-adherence to insulin regimen or by excessive secretion of counter-regulatory hormones during stress, e.g. infection, trauma, and surgery.

Diagnostic Criteria

- Heavy glycosuria (2+ or more)
- Hyperglycemia i.e. blood glucose > 11 mmol/l, ketonuria, or / and pH < 7.3
- Bicarbonate < 15 mmol/l and clinically dehydrated patients
- May be vomiting
- Maybe drowsy

Note: in rare cases, blood glucose is not elevated.

Management

General and supportive measures

- Admit all children to an ICU or ward
- Seek specialist advice in the early management

The objective of managing DKA would be to restore volume loss, electrolytes imbalance, to enhance clearance of glucose from the blood and to reduce the risk of cerebral edema.

Medical Management

First hour

- 10-20 mL/kg IV bolus 0.9% NaCl or RL
- Quick volume expansion; may be repeated.
- NPO.
- Monitor I/O, neurologic status.
- Use a flow sheet.
- No Insulin drip at this stage

Second hour until DKA resolution

- Clinical assessment of dehydration to determine the fluid volume
- Children with DKA have a fluid deficit in the range of 5-10%
- 0.45% NaCl: IV rate= 85mL/kg + maintenance – bolus; Over 48 hrs.
- Insulin drip at 0.10 units/kg/hr. Continue until acidosis clears (pH >7.30, HC03 >15 mEq/L
- Administer potassium 30 – 40 mEq/L in IV solution to maintain serum potassium at 3.5 – 5.0 mmol/L
- If K <3 mEq/L, give 0.5-1.0 mEq/kg as oral K solution or increase IV K to 80 mEq/L
- 5% glucose if blood sugar <250 mg/dL (14 mmol/L)

5.5.5 Insulin Therapy

Insulin

Insulin short-acting, 0.1 unit/kg/hour as a continuous IV infusion.

- Add insulin, 50 units (0.5 mL) to 50 mL sodium chloride 0.9% in a syringe pump to get a solution of 1 unit/mL.
- Attach this using a Y-connector to the IV fluids already being administered.
- Do not add insulin directly to the fluid bags.
- The solution should be administered at a rate of 0.1 mL/kg/hour (0.1 unit/kg/hour).

If the rate of blood glucose fall exceeds 5 mmol/ L/hour or the blood glucose falls to 14 mmol/L:

- Add a dextrose-containing fluid.
- Do not stop the insulin infusion while dextrose is being infused.

If the blood glucose falls below 4 mmol/L:

- Give a bolus of 2 mL/kg of dextrose 10% and increase the concentration of dextrose in the infusion.
- Continue with IV insulin until:
- the base deficit is < 5 or bicarbonate is 15 mmol/L,
- there is no ketonuria,
- blood glucose is 10 mmol/L.

Alternative to Insulin Infusion

- Where there are no facilities for insulin infusion, e.g. no syringe pumps, staff constraints, etc., administer insulin short-acting, IV, 0.1 unit/kg, hourly.

Changing from Intravenous to Subcutaneous Insulin

- Continue with intravenous fluids until the child is drinking well and able to tolerate snacks.
- When oral fluids are tolerated, reduce intravenous fluids.
- Subcutaneous insulin can be started once the child is well hydrated and able to tolerate a normal diet.
- The most convenient time to change to subcutaneous insulin is just before a meal.
- Administer the first dose of subcutaneous insulin 30 minutes before the meal and continue with the insulin infusion for 90 minutes after the subcutaneous injection to prevent rebound hyperglycemia.

In Newly Diagnosed Diabetics

Basal-Bolus regimen is started as described in Type 1 Diabetes Mellitus:

- Insulin Regimens, in a low range dose
    - Prepubertal children: 0.7 units/kg.
    - Pubertal children: 1 unit/kg.

In Established Diabetics, Give Maintenance Insulin

Give supplemental subcutaneous short-acting insulin before meals if the blood glucose > 11 mmol/L:

Table 11. Supplemental Short Acting Insulin Doses by Body Weight for BG >11mmol/L

Blood glucose (mmol/L)	Short acting insulin units/kg/dose
11 to 12	0.06
13 to 16	0.09
> 16	0.12

Indication for Referral

- No improvement
- Deterioration of condition i.e.:
    - pH <7.1
    - hyperventilation, shock
    - depressed level of consciousness
    - persistent vomiting
    - age < 5 years
    - Rising blood glucose

5.5.6 Hypoglycaemia in a Pediatric Diabetic Patient

Presenting Symptoms

- Autonomic symptoms (hunger, nausea, anxiety, pallor, palpitation, sweating and trembling)
- Neuroglycopaenic symptoms (impaired thinking, change in mood, irritability, dizziness, headache, tiredness, confusion and later convulsions and coma

NB: nightmares and headache maybe be suggestive of nocturnal hypoglycemia (blood glucose levels fall to their lowest levels between 2 am and 4 am

Diagnostic Criteria

Blood glucose below 3.5-4 mmol/l with symptoms in a known diabetic patient.

Table 12. Clinical Diagnostic of Hypoglycemia in Pediatric Diabetic Patient

Severity	Symptoms
Mild	Child aware, respond to and treat hypoglycaemia
Moderate	Child cannot respond to hypoglycaemia and needs help but respond to oral treatment. Any child < 6 years
Severe	Child is semi-conscious/ unconscious with or without convulsions requiring intravenous glucose

Medical Management

Mild or moderate hypoglycemia:

- Immediate oral rapidly absorbed simple carbohydrate, e.g.: Glucose, oral, 5–15 g or 1-3 level teaspoons of sugar (depending on child's age) in a small amount of water.
- Wait for 10–15 minutes. If blood glucose has not risen to 6-8 mmol/L, repeat above.
- As symptoms improve, the next meal or oral complex carbohydrate should be ingested, e.g. fruit, bread, cereal, milk, etc.

Severe hypoglycemia: outside hospital

Glucagon, IM/SC, 0.1-0.2 mg/10kg body weight

- If < 12years of age: 0.5mg
- If > 12years of age: 1.0mg

If glucagon is not available:

A teaspoon of sugar moistened with water placed under the tongue, every 20 minutes until patient awakes.

Severe hypoglycemia: in hospital

If there is an unsatisfactory response or inability to take oral carbohydrates and signs of disorientation, stupor, convulsion, coma.
Dextrose 10%, IV, 2–5 mL/kg.

- Dilute dextrose 50% solution to 10% strength before use
- I.e. Dextrose 50% 1 mL + water for injection 4 mL = 5 mL 10% dextrose solution.

If IV dextrose cannot be given:

Glucagon, IM/SC, 0.1–0.2 mg/10 kg body weight.

- If < 12 years of age: 0.5 mg.
- If > 12 years of age: 1.0 mg.

Monitor blood glucose every 15 minutes until stable, then repeat 1–2 hourly. Keep blood glucose between 6 and 8 mmol/L.

5.5.7 Indication for Referral

- Recurrent episodes of hypoglycemia

5.5.8 Pharmacologic Management of Type 2 Diabetes

- Use metformin as the optimal first-line drug unless contraindicated
- After metformin, the use of 1 additional oral or injectable agent, to minimize adverse effects is possible
- Ultimately, insulin therapy alone or with other agents may be needed to maintain blood glucose control

Early initiation of pharmacologic therapy is associated with improved glycaemic control and reduced long term complications. Drug classes used for the treatment of Type 2 diabetes include the following.

Drug	Prescription Advice	Starting dose	Maximum dose	Cautions
Metformin	Titrate dose every 8 weeks depending on blood glucose levels or HbA1C to a maximum dose of 2250mg in divided doses. If still no glycaemic control, add Glibenclamide	500 mg 12 hourly	2550/day in divided doses 8 hourly or 12 hourly	Avoid use in hepatic impairment and CCF (risk of lactic acidosis) Not recommended if eGFR ≤ 30 ml/ minute
Gliclazide		40 mg po daily	320 mg daily in divided doses	Contraindicated in type 1 diabetes and DKA
Glibenclamide* See notes on Glibenclamide usage below.	Titrate dose 2-4 weeks depending on HbA1c and/ or fasting blood glucose levels to 10 mg 12 hourly.	2.5 mg po daily	10 mg 12 hourly	Hypersensitivity (sulphur allergy) Contraindicated in type 1 diabetes and DKA

5.5.9 Other Sulphonylurea Options (As Available)

- Glimeperide 1mg once daily (max 8mg)
- Glipizide 2.5-5mg once daily (max 40mg)
- Tolbutamide 0.5 g daily (max 2 g)
- If the above drugs are not tolerated
- Acarbose 50mg daily (max 200mg TDS)

5.5.10 Oral Hypoglycemics and Antiretroviral Drugs

- Co-administration of metformin (500 mg twice daily) with once-daily DTG increase metformin Cmax and AUC by 66% and 79% and co-administration with twice-daily DTG increases metformin Cmax and AUC by 111% and 145%.
- A dose adjustment of metformin should be considered When co-administering DTG with metformin to maintain glycemic control.
- Monitoring renal function and blood glucose are recommended when metformin and DTG are co-administrated.
- As metformin is eliminated renally, patients with moderate renal impairment may be at increased risk for lactic acidosis due to increased
- Metformin concentrations.

Below is a table that illustrates the drug-drug interactions between the most used oral hypoglycemics and the most used antiretroviral drugs in Eswatini.

TABLE 3: DRUG INTERACTION TABLE
Source: University of Liverpool, hiv-druginteractions.org

Antihypertensive	TDF/ TAF	AZT	3TC	FTC	EFV	NVP	DTG	LPV/r	ATV/r	DRV/r
Metformin							↑			
Glibenclamide					↓	↓		↓	↓	↓
Glipizide					↑			↓	↓	↓
Gliquidone					↑			↓	↓	↓
Gliclazide					↑			↓	↓	↓
Glimepiride					↑			↓	↓	↓

*Essential medicines list includes atenolol, metoprolol, carvedilol as alternatives

No interaction

Potential interaction with increased or decrease levels of the sulfonylurea which may require dose adjustment of the sulfonylurea. Monitor blood glucose and adjust the sulfonylurea dosage as needed.

Caution should be exercised when coadministering metformin with DTG as metformin levels are increased and dose reduction of metformin should be considered. The US Prescribing Information recommends limiting the total daily dose of metformin to 1,000 mg when co-administered with DTG. **Renal monitoring is recommended as PLHIV with renal impairment are at increased risk of lactic acidosis due to increased metformin levels in the presence of DTG.**

↑ Increase in antidiabetic agent level

↓ Decrease in antidiabetic agent level

5.5.11 Insulin Therapy in Type 2 Diabetes Mellitus

Initiation of Insulin Therapy in Adults

The following are indications for using insulin in Type 2 diabetes:

- Failure to control blood glucose with oral drugs
- Temporary use for major stress, e.g. surgery, medical illness or when hospitalized
- Advanced kidney or liver failure
- Pregnancy
- Initial therapy for patients presenting with fasting blood glucose >14mmol/l, random glucose consistently >17mmol/l, or ketonuria
- The initial daily insulin dose is calculated based on the patient's weight.
- After selecting the initial dose, adjust the amounts, types, and timing according to the plasma glucose levels.
- Adjust the dose to maintain pre-prandial plasma glucose at 4-8 mmol/L.
- The insulin dose is often adjusted in increments of 10% at a time, and the effects are assessed over about 3 days before any further changes are made.
- More frequent adjustments of regular insulin can be made if a risk of

hypoglycemia is present.

Local Allergic Reactions

Generalized insulin allergy is rare. Symptoms occur immediately after the injection and include urticarial, angioedema, pruritus, bronchospasm, and, rarely, circulatory shock. As a rule, allergy may be treated with antihistamines. Some cases may require epinephrine and intravenous (IV) steroids.

Local allergic reactions can occur at the site of insulin injections and can cause pain, burning, local erythema, pruritus, and induration. These complications are less common with human insulins.

5.5.12 Complications of Diabetes

Complications of diabetes may be acute (diabetic emergencies) and chronic (long term).

Diabetic Emergencies

- Hypoglycemia
- DKA / HHS

Long term Complications

- Cardiovascular disease which may include stroke, coronary artery disease, atherosclerosis
- Diabetic neuropathy
- Diabetic nephropathy
- Diabetic retinopathy
- Skin infections
- Diabetic foot

The following are measures to minimize diabetic complications:

- HbA1c every 3-6 months
- Yearly dilated eye examinations
- Annual microalbuminuria checks
- Foot examinations at each visit
- Maintain blood pressure < 130/80 mm Hg, lower in diabetic nephropathy
- Initiate statin therapy to reduce low-density lipoprotein cholesterol

5.5.13 Acute: Management of Hypoglycemia

Hypoglycemia may result from a change in insulin dose

- Poor meal adherence,
- Poor adherence
- Strenuous exercise.
- Alcohol abuse
- The advent of renal failure
- Pancreatic disease / malabsorption
- Inappropriate management

Regular insulin doses may cause hypoglycemia if the patient becomes anorexic or has another cause for reduced food intake, such as gastroparesis, or is vomiting.

Signs and Symptoms of Hypoglycemia

Common symptoms of hypoglycemia are light-headedness, dizziness, confusion, shakiness, sweating, and headache. Patients should be made aware of these symptoms and educated to respond rapidly with sugar intake. They should be advised to carry biscuits, sweets, or sugar.

Emergency Management

In an emergency, initial treatment consists of a bolus injection of 50 ml of 50% glucose solution followed by a continuous glucose infusion.

5.6 ACUTE: MANAGEMENT OF HYPERGLYCEMIA

Outpatient Management

- Rule out honk/DKA (urine dipstick and chemistry)
- Rule out infection
- Review patient treatment and adherence (if failing on ceiling doses of oral hypoglycemic consider a switch to insulin therapy)
- If on insulin, assess the technique of administration
- Review diet

In Hospital Hyperglycemia

- All admitted patients should be on an insulin regimen for the duration of their hospital stay
- Treat underlying cause
- Regular meal pattern maintained

Well Controlled

- Continue usual therapy if the patient was on oral hypoglycemic prior to hospitalization use basal-bolus therapy

Poorly Controlled

- Basal bolus therapy
- Estimate TDD (conservatively 0.2 to 0.5u/kg)
- Basal (50%) + pre-prandial (50%) insulin

WITH

- Correction dose insulin
- Correction factor (CF) = 100/TDD or 85/TDD (for regular human insulin)
- Correction dose = (Measured BG – target BG) CF

E.g. 49yr old weighing 100kg taking Actraphane 40IU mane and /20IU nocte prior to hospitalization

  - Estimated TDD = 60IU
  - Give 30IU NPH/long acting analogue at night +
  - 10IU pre-meal rapid analogue or short acting regular
  - **Target pre-prandial glucose 7.8mmol/L; <10 at any other time
  - CF = 100/60 = 1.7 (85/60 for regular human insulin)
  - If post-meal BG is 20mmol/L, correction dose = 20 (current) - 10 (target) x 1.7 =17IU
  - Add 80% of daily correction dose to next day's basal-bolus insulin

5.7 REGULAR MEAL PATTERN DISRUPTED

NPO

- Use only correction dose insulin, or NPH twice daily or long-acting analogue once daily
- Bolus enteral feeds
- Basal bolus therapy + correction doses

Continuous enteral feeds

- NPH 12-hrly or long-acting analogue 3 scheduled regular insulin, OR
- Premixed insulin 8-hourly

TPN

- IV insulin infusion (infusion protocol), or
- 50% TDD added to TPN as regular insulin, and 50% given as basal
- Calculate TDD: 1IU/10g carbohydrate

5.8 IN-HOSPITAL GLYCEMIC CONTROL FOR CRITICALLY ILL PATIENTS

- Insulin infusion preferred if facilities and staff training exist, if not use basal bolus + correction doses
- Target BG is 7.8 – 10.0 mmol/L; not lower than 6.1mmol/L
- Mix 50u insulin in 100ml 5% dextrose water
- Detailed response protocol needed for staff

5.9 ACUTE: HYPERGLYCEMIA WITHOUT DKA, DIABETIC KETOACIDOSIS (DKA) AND HYPEROSMOLAR HYPERGLYCEMIC STATE (HHS)

Diabetic ketoacidosis (DKA) is an acute, major, life-threatening complication of diabetes that mainly occurs in patients with Type 1 diabetes, but it is not uncommon in some patients with Type 2 diabetes. This condition is a complex disordered metabolic state characterized by hyperglycemia, ketoacidosis, and ketonuria.

Hyperosmolar hyperglycemic state (HHS) is a syndrome characterized by impaired consciousness, extreme dehydration severe hyperglycemia and sometimes accompanied by seizures that are not accompanied by severe ketoacidosis (pH usually > 7.2)

Signs and Symptoms

The most common early symptoms of DKA / HHS are the insidious increase in polydipsia and polyuria. The following are other signs and symptoms of DKA /HHS:

- Malaise, generalized weakness, and fatigability
- Nausea and vomiting; may be associated with diffuse abdominal pain, decreased appetite, and anorexia
- Rapid weight loss in patients newly diagnosed with Type 1 diabetes
- History of failure to comply with insulin therapy or missed insulin injections due to vomiting or psychological reasons
- Decreased perspiration
- Altered consciousness (e.g. mild disorientation, confusion); frank coma is uncommon but may occur when the condition is neglected or with severe dehydration/acidosis

Physical examination can reveal:

- Dry skin and mucus membrane
- Laboured respiration /Kussmaul respiration
- Characteristic acetone (ketotic) breath odour
- Decreased level of consciousness (confusion, coma)
- Signs of hypovolemic shock (tachycardia, hypotension, tachypnea, and hypothermia)
- Fever, if an infection is present
- Search for signs of infection is mandatory in all cases.

Note that high serum glucose levels may lead to dilutional hyponatremia; high triglyceride levels may lead to factitious low glucose levels, and high levels of ketone bodies may lead to factitious elevation of creatinine levels.

5.10 MANAGEMENT

Approach Considerations

Managing DKA in an intensive care/ high care unit during the first 24-48 hours always is advisable. When treating patients with DKA, the following points must be considered and closely monitored:

1. Fluid Resuscitation

Initial correction of fluid loss is either by isotonic sodium chloride solution or by lactated Ringer solution. The recommended schedule for restoring fluids is as follows:

- Administer 15-20 ml/ kg in the first hour.
- Administer fluids at a rate of 10 ml/ kg in the next 3 hours.
- Do not exceed 50 ml /kg in the first 4 hours
- Administer 1 L every 4 hours, depending on the degree of dehydration and central venous pressure readings and comorbidity
- When blood sugar decreases to less than 15 mmol/L, isotonic sodium chloride solution is replaced with 5-10% dextrose with half isotonic sodium chloride solution.

NB: although initial aggressive fluid replacement is necessary for all patients, particular care must be taken in those with comorbidities such as renal failure or congestive heart failure because of the risk of pulmonary edema.

2. Reduction in the plasma glucose concentration to normal (insulin therapy)

Patients should be preferentially managed with continuous intravenous infusion of short-acting insulin. Subcutaneous absorption of insulin is reduced in DKA because of dehydration; therefore, using intravenous routes is preferable.

In the absence of infusion pump, dilute 50 units of short acting insulin with 200 ml of 0.9% sodium chloride:

- 4 ml = 1 unit of insulin
- Initial infusion; 0.1 unit / kg/ hr.
- Usually 5-7 units/hr. i.e. 20-30 ml/hr.
- If plasma glucose does not fall by 3mmol/l in the first hour double the insulin infusion (hourly) until a steady reduction of plasma glucose is achieved i.e. at least 3-4 mmol/l per hour
- If plasma glucose < 14 mmol/l reduce insulin infusion rate to 1-2 units per hour and adjust subsequently according to an hourly capillary bedside glucose level
- Blood sugar should be monitored hourly while giving insulin infusion
- Once the patient can eat and urine is free of ketones to commence on subcutaneous insulin therapy and only stop IV infusion 30 minutes after the first subcutaneous dose.
- In the presence of the infusion pump dilute 50 units of short-acting insulin with 50 ml 0.9% sodium chloride
    - 1ml =1 unit of insulin
    - Initial infusion 0.1 unit /kg /hr.
    - Usually 5-7 units / hr. i.e. 5-7 ml /hr.
    - If plasma glucose does not fall by 3mmol/l in the first hour double the insulin infusion (hourly) until a steady reduction of plasma glucose is achieved i.e. at least 3-4 mmol/l per hour
    - If plasma glucose < 14 mmol/l reduce insulin infusion rate to 1-2 units per hour and adjust subsequently according to hourly capillary bedside glucose level
    - Blood sugar should be monitored hourly while giving insulin infusion
    - Once the patient can eat and urine is free of ketones to commence on subcutaneous insulin therapy and only stop IV infusion 30 minutes after the first subcutaneous dose

3. Replenishment of electrolytes

Stop KCl if K+ > 6 .0 mmol /l or if patient is anuric
NB: IV infusion KCl should be given slowly at least over 4 hours or more
NB: There is no proven role for the use of intravenous sodium bicarbonate, and it could potentially cause harm

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