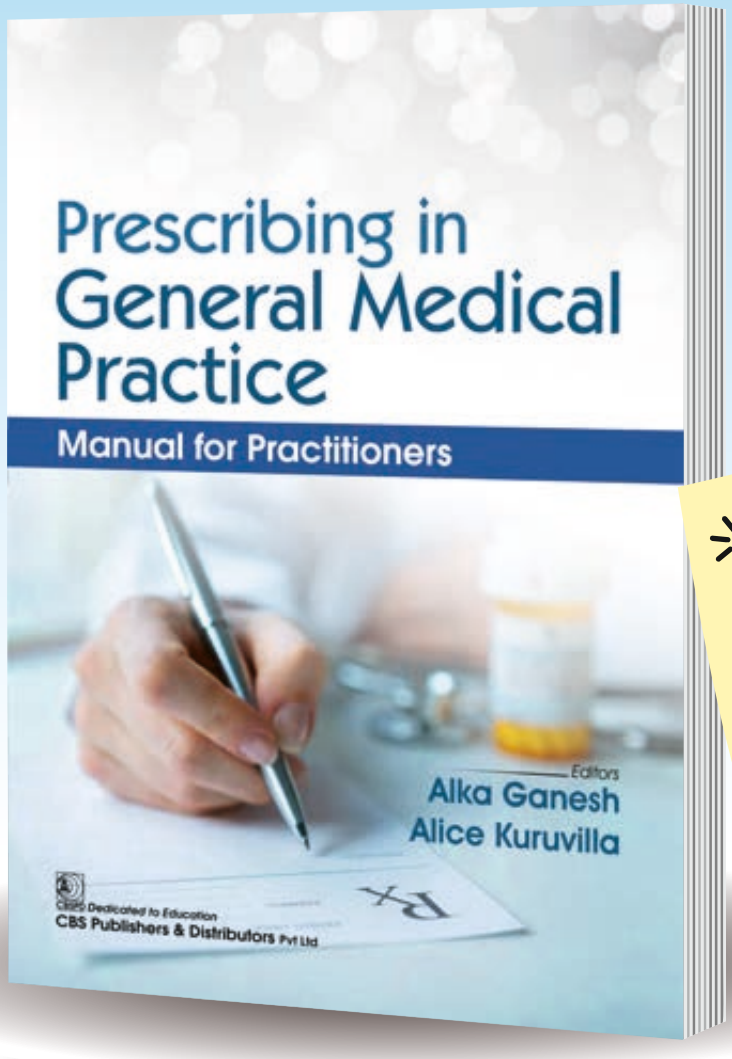

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Key Feature of Book

- Not sure how to start insulin in a type 1 diabetes in adults? for children available pg 26 -27..
- Does everyone with high cholesterol need statins? No, then read When & why.....
- Do you know the rational way to correct sodium levels? If not, read on...
- Read how to tailor inhaler therapy to level of severity of COPD. One size does not fit all!...
- Blood components are precious! What is the right quantity needed ? Read on .....

Explained at below pages

Not sure how to start insulin in a type 1 diabetes in adults?...
..... for children read pg 26 -27

All patients must be educated about the disease and its complications. Patients requiring insulin should be encouraged to take the injections by themselves; this process is made easier with the use of prefilled insulin pens. Family members will offer to give the injections, but this should be discouraged as patients are likely to miss doses when the relative is absent, or late; it also encourages a culture of dependency. Patients with visual impairment, or with small joint deformities, or the frail elderly are exceptions.

SELF-MONITORING OF BLOOD GLUCOSE

Meticulous control of blood glucose requires frequent monitoring with a glucometer. After the initial stabilization of insulin requirement, the patient must continue to measure glucose as follows:

- Choose 2 days of the week. Check blood glucose 7 times on those days (fasting and before and after each meal and once again at 3 am). These measurements will detect pre-meal and post-meal excursions. The 3 am level is to check for early morning hypoglycemia.
- Flash glucometers continuously monitor glucose levels in the interstitial fluid. This sensor device is attached to the lateral aspect of the upper arm, where it can estimate the tissue glucose level. The results are displayed on a hand-held device. The sensor has to be changed every 2 weeks. This device is useful for patients with frequent hypoglycemia, Type 1 diabetes and those who require very strict glucose control as in pregnancy. At the current time it is very expensive and is best reserved for patients with widely fluctuating values, and in cases where very meticulous control is required.

INSULIN TREATMENT REGIMEN

Patients with type 1 diabetes have no endogenous production of insulin and are completely dependent on exogenous insulin. They normally require between 0.6–1 unit insulin/kg/day.

The two types of insulin regimens are:

1. Basal bolus regimen
2. Split mix insulin regimen.

Basal Bolus Regimen

This consists of (1) a long-acting (basal) insulin given at bedtime and (2) a short-acting (bolus) insulin given three times a day prior to each major meal.

This is the ideal Insulin regimen, as it mimics the manner in which insulin is produced from the pancreas. Long-acting insulin analogues like detemir and glargine provide steady basal coverage for 12 and 24 hours respectively. These insulins are expensive (insulin analogues).

Basal insulin: If using glargine/detemir insulin start with 0.1 units/kg and this will work out to 5 units in a 50 kg patient. Glargine insulin with a longer half-life is given once a day at bed time, while detemir insulin with a shorter half-life is given twice daily. Subsequently increase the dose once in 3–4 days until the target (fasting) blood sugar levels are achieved.

Bolus insulin: Short-acting insulin (regular/aspart/lispro/glulisine) is administered 5–10 minutes before meals. Titrate the dose by 1–2 unit increments, twice weekly until target (post-prandial) blood sugar levels are achieved. In case of hypoglycemia reduce the dose by 10–20%.

Not sure how to start insulin in a type 1 diabetes in adults?...
..... for children read pg 26 -27

Example 1: Basal/bolus insulin dosage in a 50 kg patient who needs (0.6 units/kg/ day) i.e. 30 units insulin/day.

Basal dose (0.1 units/kg/day) = 5 units; Bolus dose (0.5 units/kg/day) = 25 units which is to be divided between the 3 meals.

It works out to 6 units before breakfast, 6 units before lunch and 6–7 units before dinner.

Example 2: Basal/bolus insulin dosage in a 50 kg patient who needs (1 units/kg/day), i.e. 50 units insulin/day.

Basal dose (0.2 units/kg/day) = 10 units; Bolus dose (0.8 units/kg/day) = 40 units which is to be split between the 3 major meals.

SPLIT MIX INSULIN REGIMEN

For those who cannot afford analogue insulins, the split-mix regimen consists of a mixture of 2 insulins (intermediate-acting NPH + short-acting regular insulin) given twice daily prior to breakfast and prior to dinner. The level of control is as good as what is achieved with the basal bolus regime, however, there is an increased risk of hypoglycemia.

Split Mix Regimen using Intermediate-acting and Short-acting Insulins

Step 1: Calculating the total daily dose of insulin: Start with 0.5 units/kg/day.
Example: A 50 kg man will require 25 units insulin/day.
Most patients will ultimately require 0.6-0.7 units/kg/day.

Step 2: Determine the dose for each injection. Two-thirds of the daily dose is given prior to breakfast and one-third of the daily dose is given prior to dinner. A 50 kg man who requires 25 units/day will receive 15 units before breakfast, and 10 units before dinner.

Step 3: Determine the components of each dose, i.e. 2/3 intermediate (NPH) + 1/3 short-acting (regular) insulin.

In the above example: It works out to 15 units insulin (NPH 10 + Regular 5) before breakfast and 10 units insulin (NPH 6 + Regular 4) before dinner.

Both the insulins can be drawn up into the same syringe. Care should be taken to first draw up regular insulin and then the NPH insulin. If NPH insulin is drawn first into the syringe, it will contaminate the bottle containing regular insulin and convert regular insulin into NPH insulin .

Split Mix Regimen using Pre-mixed Biphasic Insulins

Biphasic insulins have short-acting insulin mixed with intermediate-acting insulins in one vial. They are mixed in different proportions, the most commonly used proportions are 30/70, or 50/50 (short-acting/intermediate-acting). Well -known trade names are Mixtard (30/70) and Huminsulin (30/70). These are given twice daily before meals; two-thirds of the calculated dose is given before breakfast and the remaining 1/3rd is given before dinner.

Example: Split mix regimen in a 50 kg patient who needs (0.6 units/kg/day) i.e. 30 units insulin/day; 20 units before breakfast, and 10 units before dinner.

TYPES OF INSULIN

All human insulins contain the same amino acid sequence as human insulin, produced by recombinant technology. Insulin analogues have the same amino acids as in human insulin, but their sequence is altered to make them more easily absorbable and hence improve efficacy. When "regular" insulin is modified chemically, its action is prolonged (Table 3.1.8).

A quick calculation of total cholesterol (TC)/HDL ratio gives an idea whether the values are within permissible range:

TC/HDL ratio: <5: 1. The ideal ratio is 3.5 :1 if TC is 230, and HDL is 60, the ratio is 3.8. Hence even though TC is high, the high HDL has brought the ratio down to permissible level.

Non-HDL cholesterol level is also one parameter which is used by some to assess the need for therapy.

INDICATIONS FOR USING LIPID-LOWERING DRUGS

Step 1

Lipid lowering drugs are only indicated if elevated lipid levels are associated with the following factors:

1. The presence of athero-sclerotic vascular disease (ACSVD) such as:
   - Clinical evidence of coronary artery disease.
   - Peripheral vascular disease
   - Abdominal aortic aneurysm
   - Significant carotid artery disease.
2. The presence of the following clinical laboratory-based factors:
   - ECG showing LVH (left ventricular hypertrophy) or hypertensive retinopathy
   - Total cholesterol >320 mg%, or LDL >240 mg%
   - Raised BP >160–170/100–105
   - Type 1 or 2 diabetes with nephropathy
   - Known renal impairment

If any of the above are present, elevated lipid levels require pharmacological therapy, apart from lifestyle modifications. Proceed to step 2 if none of the factors in step 1 are relevant.

Step 2

In the absence of the above factors, all patients with elevated lipid levels should be assessed for a future risk over the next 10 years of developing ASCVD. Refer to Box 4.1.

Box 4.1: ASCVD risk factors (without including LDL levels)

- Cigarette smoking
- Hypertension >140/90 or on treatment
- Family history of premature CHD (CHD in male first degree <55 years. Female: <65 years
- Age (men >45 years; women >55 years)
- HDL cholesterol <40 mg% (HDL >60 mg% counts as a negative risk factor).

All patients having >2 of the risk factors, require lipid-lowering drugs. If there are 0 or 1 risk factor for coronary artery disease, go to step 3.

Step 3

Assess the future 10 years risk for coronary artery disease by using risk assessment charts.

Compared to people in different regions of the globe, South Asians, have a higher risk for ASCVD due to the following factors:

- Prevalence of highly atherogenic small dense molecules LP(a). This is not routinely checked in clinical laboratories.

- Increased prevalence of metabolic syndrome which is associated with atherogenic dyslipidemia—high triglyceride levels combined with low HDL.
- Increased pro-inflammatory markers and pro-thrombotic markers.

The WHO has brought out a risk assessment chart for different regions of the world. The South Asian chart which includes Indians is available at the following site: https://linkscommunity.org/assets/PDFs/hearts-r-module.pdf

Alternatively, the UK has brought out a calculator which includes South Asian ethnicity as one variable. This calculator may also be used and is available at the following site: https://qrisk.org/2017/index.php

Using the above calculators, establish the three levels of 10-year risk prediction for ASCVSD:

- High risk: 20%
- Moderately high risk: 10–20%
- Moderate risk: <10% + >2 risk factors
- Low risk: 0 to 1 risk factor

Now go to step 4 to establish the goals of LDL levels. If the patients current LDL is above the goal, then drugs can be started, using Table 4.2.

Step 4

Table 4.2: Target LDL levels and ASCVD risk assessment

Risk category	*Goal LDL (mg)*	*Consider drug therapy when LDL level at (mg)*	*Initiate Therapeutic lifestyle changes*
Very high			
Prior ASCVD or multiple risk factors (metabolic syndrome)			
+ 10-year risk >20%	<70	100	All
Moderately high >2 risk factors for ASCVD +			
10 years risk 10–20%	<130	>130	All
Moderate >2 risk factors ASCVD, and 10 year risk <10%	<130	>160	>130
Low: 0–1 risk factor	<160	>190	>160

STATIN-BASED PHARMACOLOGICAL THERAPY

Statins are the first-line drugs to be used as per the assessment process described above. Table 4.3 shows the commonly available statins and their dosages.

Table 4.3: Recommended dosages of statins

Name of drug	*Starting dosage (mg) single dose*	*Maximum dosage (mg)*
Atorvastatin	5–10	80
Rosuvastatin	5	20
Simvastatin	10	40
Lovastatin	10	40
Pravastain	10	40

Approach to Hyponatremia

In a patient whose serum sodium is <130 mEq/L, the following steps will identify the mechanism:

Step 1: First ascertain whether the plasma is hypotonic (<275), isotonic (275 to 290), or hypertonic (>300)

Of these three states, only hypotonic hyponatremia needs to be corrected.

In "isotonic" plasma, hypertriglyceridemia, or the presence of too much proteins (paraproteins), interfere with sodium estimation when done by "flame photometry" as is done in most clinical laboratories; this is spurious and can be ignored.

In hypertonic plasma, osmotically active solutes such as high levels of glucose, and mannitol allow too little plasma to accommodate the usual level of sodium, even though the amount of sodium in the plasma is normal. Hence these can be ignored.

Step 2: In cases of hypotonic hyponatremia, the cause of low sodium can be ascertained by checking the volume status as in dehydration, normal volume or overhydration (edema).

1. In hypovolumic (dehydration), conditions, such as in vomiting, diarrhoea, diuretic usage, or blood loss, the patient should be treated with normal saline infusion at a rate to correct the hypovolemia. The urinary sodium will be <20 to 40 mEq/L.
2. In hypervolumic states, such as with edema, hypertension, heart failure, cirrhosis liver, and advanced renal failure, there is no salt deficit, and patient may benefit from diuretics, preferably loop diuretics.
3. In euvolumic hyponatremia, the problem is predominantly that of excess water retention with normal body sodium due to the syndrome of inappropriate ADH (SIADH). This is the case in many elderly patients. SIADH is present in patients with meningitis, pneumonias, glucocorticoid deficiency, hypothyroidism, and several medications (given below).

The urinary abnormalities in SIADH include urinary sodium >40 mEq/L, and urinary osmolarity of 100 mOms/L.

Such patients need to decrease the amount of free water in order to elevate the serum concentration of sodium.

CORRECTION OF SIADH AT DIFFERENT LEVELS

Asymptomatic Hyponatremia

- 125–135 mEq/L but not symptomatic and likely to be chronic: Restrict water intake to 800 mL/24 hours and reassess daily. Remove any drugs which can cause hyponatremia (Box 7.1). Treat the underlying infection if present as mentioned.
- <125 mEq/L or falling with above management, not symptomatic: 150 mL of 3% saline over 20 minutes (once). Recheck sodium and repeat if target not achieved.

Symptomatic Hyponatremia

- *Moderate symptoms:*
  a. 150 mL 3% saline over 20 minutes and
  b. Add tolvaptan 7.5 mg od, increasing to 15 mg od, and allow free water access. This should not be given beyond 1 month without supervision.
- *Severe symptoms:* <125 mEq/L + altered sensorium or seizure: 150 mL 3% saline over 20 minutes × 2–3 doses (as needed) + add tolvaptan.

Do you know the rational way to correct sodium levels?
If not, read on……

TARGET OF SERUM SODIUM CORRECTION

The upper limit of correction is 10 mEq/L in 24 hours. If more rapid correction is done, serious consequence of demyelination of the pontine fibres can occur. This is especially important in patients with hypokalemia, alcoholism, malnutrition, cirrhosis.

Causes of Hyponatremia due to SIADH (Box 7.1.1)

Box 7.1.1: Causes of SIADH

- CNS disturbances such as hypopituitarism, meningitis,
- Major surgery
- Trauma
- Lung tumors
- Respiratory infection
- Hypothyroidism
- Medications:

Anti-depressants	SSRI, SNRI, tricyclic anti-depressants
Anticonvulsants	carbamazepine, valproate, phenytoin, lamotrigine, phenobarbitone
Anti-psychotics	haloperidol, respiridone, phenothiazines, quetiapine
Pain medications	tramadol, gabapentin, pregabalin, duloxetine
Others	desmopressin, glibenclamide, herbal preparations

7.2 ABNORMALITIES OF POTASSIUM BALANCE

Normal level of potassium is 3.5 to 5.0 mEq/L

HYPERKALEMIA

Hyperkalemia is a medical emergency, because it can cause sudden, unanticipated cardiac arrest if left untreated. The symptoms and signs are not contributory, but if an ECG is taken, the signs of hyperkalemia can be detected as tall, peaked, wide T waves, and wide QRS complexes. The clinical situations in which it is likely to occur are:

- Concurrent or individual usage of ACEI, ARB, spironolactone, eplerenone, amiloride, triamterene, and large doses of potassium salts of penicillin.
- Metabolic acidosis, acute kidney injury, chronic kidney disease, diabetics with type 4 renal tubular disorder (hyporenninemic hypoaldosteronism).
- Massive third degree burns, rhabdomyolysis, muscle injury

Treatment of Hyperkalemia

Serum level of 5.5 mEq/L needs caution and any drugs or supplements likely to increase levels further should be stopped such as ACEI/ARB/spironolactone/eplerenone, and potassium supplements. All the following steps should be taken in all cases.

Step 1: Potassium >6 mEq/L infuse 10–20 mL of 10% calcium gluconate IV over 2–3 minutes. A repeat dose can be given if ECG changes persist.

Step 2: Inj regular insulin 10 units IV in 50 mL of 50% glucose over 30 min and recheck K^+/random glucose value. Repeat dose, if required.

Step 3: Salbutamol nebulization every 2 hours

Step 4: Calcium polystyrene sulfonate (K-Bind) 15 g + mannitol powder 12.5 g BD, with a glass of water, till serum K^+ level reaches 5.0 mEq/L and the precipitating cause has been identified and removed.

Step 5: Others: Correct acidosis, if present, with bicarbonate (*see* below).

Dialysis may be required in patients with impaired renal function if above measures fail.

the progression of the disease, reduce hospitalizations, and improve the quality of life of the patient and family.

Unfortunately, it is not diagnosed early, and so these benefits are denied to the patient.

It is important to consider the diagnosis of COPD in any person above the age of 40 years with the following symptoms as shown in Box 11.4.1.

Box 11.4.1: Symptoms in COPD

Persistent dyspnoea, worse with exercise and progressive over time, without evidence of heart disease
Chronic cough with sputum production Recurrent lower respiratory tract infection.
History of tobacco smoking, exposure to smoke from home cooking/heating or occupational dusts vapours and fumes.

Diagnosis is further strengthened by the following investigations in new cases if in doubt, and to characterize the severity of the disease.

- Spirometry—a post-bronchodilator FEV1/FVC less than 0.70 confirms presence of persistent airflow limitation. If not available, then the above historical points can be used.
- Chest radiograph/CT chest to rule out competing differential diagnoses. A normal image does not rule out OPD.
- Pulse oximetry/ABG to decide on need for supplemental oxygen therapy.

ASSESSMENT OF SEVERITY OF COPD

The severity of COPD is difficult to assess using one parameter. The methods of assessing severity include:

- mMRC (modified Medical Research Council) grading of dyspnoea Box 11.4.2
- Spirometric grading as per GOLD criteria (Global initiative for Obstructive Lung Disease) (Box 11.4.3)
- CAT (COPD Assessment Test): Clinical symptoms (Table 11.4.2)
- BODE index combines symptoms, exercise performance and spirometry (Table 11.4.1)
- Acute exacerbations of COPD per year (see below)

These gradings of severity are utilized to decide on the treatment pathways for individual patients.

Box 11.4.2: mMRC dyspnoea scale

- Grade 0: Dyspnoea only with strenuous exercise
- Grade 1: Dyspnoea walking fast, or uphill
- Grade 2: Dyspnoea when walking with people of own age, or has to stop while walking at own pace.
- Grade 3: Dyspnoea after walking on level ground for a few minutes, or walking 100 feet.
- Grade 4: Dyspnoea while dressing or bathing, and is housebound due to dyspnoea

Spirometric Grading of COPD

Spirometric grading of COPD using GOLD is shown in Box 11.4.3, using the FEV1 (Forced Expiratory Volume in 1 second). This does not take into account the clinical state. It is useful to predict long-term mortality, and to categorise patients for research studies. It does not help in deciding treatment modalities.

Spirometry is not generally available in primary or many secondary care settings. Hence a patient will often require referral.

Box 11.4.3: GOLD grading of severity of COPD

- ***Grade 1:*** Mild: FEV1 >80% predicted
- ***Grade 2:*** Moderate: FEV1 >50% to <80% predicted
- ***Grade 3:*** Severe: FEV1 >30% to <50% predicted
- ***Grade 4:*** Very severe <30% predicted

The BODE Index (Body Mass Index/Obstruction to Airflow/Dyspnoea/Exercise Capacity)

The BODE index (Table 11.4.1) includes clinical status. It has been found useful to predict 4 year mortality rates. This index also requires the value of FEV1, so it may not be feasible in resource-poor setting.

Table 11.4.1: Grading and severity of COPD-BODE index

Variable	*0 points*	*1 point*	*2 points*	*3 points*
FEV1 % of predicted value	>65	50–64	36–49	<35
6-minute walk test in metres covered	>350	250–349	150–249	<149
**mMRC score	0–1	2	3	4
*BMI	>21	<21		

*BMI: Body Mass Index
**mMRC: Modified Medical Research Council
Interpretation of COPD severity: Mild: 0-1; Moderate=3–5; Severe ≥6

COPD Assessment Test (CAT)

This is a simple clinical questionnaire self-administered by the patient regarding presence of symptoms. It has been found to be very reliable in assessing the symptomatic state of the patient, and helps to guide the treatment.

The following 8 questions (Table 11.4.2) regarding severity of symptoms are answered by the patient on a scale of 0 to 5.

Table 11.4.2: CAT scoring

Variable	*0 to 5*	*Total*
Cough		
Phlegm		
Chest tightness		
Breathless on walking 1 flight steps		
Limitation household activities		
Can leave the house in spite of symptoms		
Quality of sleep		
Energy levels		
Score		0 to 40

The score can range from 0 to 40. The lower the score, the better the patient's symptoms.

Acute Exacerbations

Patients can be categorized as having 1) infrequent exacerbations with or without hospitalizations per year (0 to 1), or, 2) frequent exacerbations with or without hospitalizations (>2 per year).

ABCD Formula for Treatment Guideline (GOLD Criteria 2020)

Using some of the grading criteria above, a patient can be categorized into ABCD groups as follows:

- **Group A** (Mild symptoms, low risk): 1 or fewer exacerbation per year, no hospitalization, mMRC 0-1, and CAT score less than 10.
- **Group B** (Low risk, more symptoms): 1 or fewer exacerbation per year no hospitalization, mMRC 2 or higher, and CAT >10
- **Group C** (High risk, less symptoms): 2 or more exacerbations per year, 1 or more hospitalization, mMRC 0–1, and CAT <10
- **Group D** (High risk, more symptoms): 2 or more exacerbations per year, 1 or more hospitalizations, mMRC 2 or higher or CAT >10

CLINICAL MANAGEMENT OF COPD

The various modalities of treatment of COPD involve:

- Smoking cessation and pneumococcal vaccination
- Inhaler therapy
- Oral medications
- Mucolytics
- Oxygen therapy
- Pulmonary rehabilitation

Smoking Cessation and Pneumococcal Vaccination

- All physicians should enquire about smoking and tobacco usage of every new patient. Once identified, smokers must be counselled to stop smoking, by assessing their willingness, and if so, to arrange social support, intensive repeated encouragement, and a planned pharmacotherapy to quit smoking. *See* Section VII Chapter 35 for details of smoking cessation programme.
- Pneumococcal vaccination and annual influenza vaccinations are recommended to reduce frequency of exacerbations (*see* immunizations adult Section VII Chapter 32)

Inhaler Therapy

Several inhaled bronchodilators are useful in reducing airflow limitation and improving oxygenation. The beta-2 agonists and inhaled corticosteroids are similar to those used in asthma, but other agents such as anti-muscarinic agents are more useful in COPD than in asthma. Unlike in asthma, inhaled corticosteroids (ICS) are used only in the later stages of COPD.

How are these Inhalers Used?

Using the categorization of patients into the ABCD groups, inhaler therapy can be started as follows:

- Group A: SABA (salbutamol) or SAMA (ipratropium) as required, up to 4 treatments per day.

Administration

- Must be ABO and RhD compatible with the recipient.
- Never add medication to a unit of blood.
- The rate of transfusion is: Adults, 100 mL/hour. Children 2 to 5 mL/kg /hour.

RED CELL CONCENTRATES [PACKED RED BLOOD CELLS (PRBC)]

150–200 mL red blood cells from which most of the plasma has been removed. Hb concentration will be approximately 20 g/100 mL (not less than 45 grams per unit). Transfusion should be completed in 90 to 120 minutes. If 4 mL/kg is transfused, the Hb will rise by approximately 1 gm%.

Indications for PRBC

a. Women during pregnancy and at the time of delivery who have anaemia of pregnancy uncorrected with oral or intravenous iron; bleeding in pre- or post-partum stage of delivery.
b. Patients with chronic blood disease, e.g. thalassemia, leukaemia.
c. Preoperative if Hb<8 gm% for patients undergoing cardiovascular surgery, orthopaedics and acute GI bleeding.
d. Chronic anemia. <6 gm in adults, but if hypoxia or if cardiovascular risk factors are present transfusion indicated even if Hb is >6 gm%.
e. Acute blood loss of >30% blood volume or hemodynamically unstable.

Platelets

Dosage: One unit of platelet concentrate/10 kg body weight. For an adult of 60–70 kg, 4–6 single donor units containing at least 240,000/cu mm platelets should raise the platelet count by 20–40,000/cu mm. Increment will be less if there is splenomegaly, disseminated intravascular coagulation (DIC) or septicaemia.

Points to be Followed While Transfusing Platelets

Administration: Platelet concentrates after pooling should be infused as soon as possible because of the risk of bacterial proliferation. Depending on the condition of the recipient, one therapeutic dose of platelets should be infused over period of 30 to 60 minutes. Do not give platelet concentrates prepared from RhD positive donors to an RhD negative female with childbearing potential. Give platelet concentrates that are ABO compatible, whenever possible.
Complications: Febrile non-haemolytic and allergic urticarial reactions are not uncommon, especially in patients receiving multiple transfusions. This can be treated with Inj. pheniramine (Avil) 25 mg IM, and oral paracetamol 500 mg in adults.

Indications for Platelet Transfusions

1. In patients who are bleeding and have thrombocytopenia, or platelet function defects.
2. Without bleeding, prophylactic platelet transfusions are given to:
   a. Maintain platelet count >10,000/cu mm in non-bleeding, non-infected patient.
   b. Maintain platelet count >20,000/cu mm in an infected/pyrexial patient.
   c. Use in DIC: For acute DIC, where bleeding is associated with thrombocytopenia, maintain platelet count above 20,000/cu mm, even in the absence of overt bleeding.

3. ***Use in massive blood transfusion:*** Maintain platelet count >50,000/cu mm in patients receiving massive transfusions (dilutional thrombocytopenia occurs when >1.5 times of the blood volume of patient is transfused).
4. ***Use in cardiopulmonary bypass surgery:*** Platelet function defects and thrombocytopenia often occur after cardiac bypass surgery. Platelet transfusion is recommended for patients who have bleeding once surgically correctable causes have been ruled out. Prophylactic platelet transfusions are not required for all bypass procedures.

Do not give platelets in patients with:

a. Idiopathic autoimmune thrombocytopenic purpura (ITP).
b. Thrombotic thrombocytopenic purpura (TTP).
c. Untreated DIC.
d. Thrombocytopenia associated with septicaemia, or in cases of hypersplenism.

Prophylaxis for Surgery

- Ensure platelet count is >50,000/cu mm for procedures such as lumbar puncture, epidural anaesthesia, insertion of indwelling lines, trans-bronchial biopsy, liver biopsy, renal biopsy and laparotomy.
- Maintain platelet count >100,000/cu mm for neurological and ophthalmic surgery.

Fresh Frozen Plasma (FFP)

FFP contains normal plasma levels of stable clotting factors, albumin, immunoglobulin and factor VIII at level of at least 70% of normal fresh plasma. Before use it should be thawed in the blood bank between 30°C and 37°C and used within 6 hours.

Should be ABO compatible. *Dosage:* 15 mL/kg. 1 unit (bag) = 200 to 250 mL

Definite Indications for FFP

1. Replacement of single coagulation factor deficiency, and C1 esterase deficiency where a specific or combined factor concentrate is unavailable or contraindicated.
2. Immediate reversal of warfarin effect where prothrombin complex concentrate is unavailable.
3. Thrombotic thrombocytopenic purpura.

Conditional indications

1. Massive blood transfusion.
2. Acute DIC if there are coagulation abnormalities and patient is bleeding.
3. Liver disease, with abnormal coagulation and bleeding and prophylactic use to reduce prothrombin time (PT) to 1.6–1.8 X normal for liver biopsy.
4. Cardiopulmonary bypass surgery in the presence of bleeding but where abnormal coagulation is not due to heparin. Routine perioperative use is not indicated.
5. Severe sepsis, particularly in neonates (independent of DIC).
6. Plasmapheresis.

Precautions

Acute allergic reactions are not uncommon, especially with rapid infusions.

Cryoprecipitated Anti-haemophilic Factor (Cryo-AHF)

This product is not used in developed countries because though the unit is tested for transfusion transmitted infections (TTI), viral inactivation is not usually possible.