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Application of Telemedicine in the Management of Diabetes

4.1 Background

Several studies have reported the usage of telemedicine for delivering clinical care services to patients with diabetes mellitus. Meta-analysis of 35 randomized controlled trials (RCTs) had showed that use of telemedicine in persons with diabetes had led to reduction in glycated haemoglobin (HbA1c) levels by 0.37% ($p < 0.001$) when compared to control group (23). Cochrane review of 21 RCTs had showed a reduction in HbA1c levels by 0.31% ($p < 0.001$) for patients who were receiving an interactive telemedicine intervention, using real time video or remote monitoring, delivered in addition or alternative to standard care (24). Another review of 46 articles had showed that telemedicine was found to be effective in reduction of blood glucose and blood pressure levels among patients with both type 1 and type 2 diabetes mellitus (25).

Studies on use of telemedicine for delivering diabetes care in India are very limited. In a recently published article, mobile van that was customized with telemedicine facility was used and found to be helpful in screening and management of diabetes among people living in underprivileged sections of Delhi (26). In another study, 69% of participants were aware about teleconsultation and 92% were interested in video mode of teleconsultation (27). It is becoming apparent that patients with diabetes need frequent visits to their diabetes specialist, and use of telemedicine could be easy and saves time and money.

The following guidelines have been formulated to improve physician's awareness of basic methods to practice diabetes care using telemedicine.

4.2 Goals of Telemedicine

1. To make healthcare accessible, more readily available to all people, and especially for those living in remote and rural areas, and persons who have a limitation of mobility, transport, time, living alone, and lack family support
2. To provide health care in times of national pandemic or other emergencies.

3. To provide accessible healthcare to people with diabetes via lifestyle changes, monitoring and medications
4. To provide education to prevent the onset of diabetes, self-management of diabetes, and prevent the progression of complications
5. To guide efficient access to emergency care

4.3 Indications for face to face outpatient consultation

At the beginning of consultation, an attempt must be made to discern if the person requires a face-to-face consultation. Here is a check list for the same and detailed evaluation will be found under the heading “emergency consultation”.

1. Breathlessness
2. Recent (< 7 days) onset of weakness/paralysis of part of the body/neurological deficit.
3. Chest pain suggesting typical/atypical angina.
4. Complicated cases of fever with symptom such as (i) breathlessness (ii) altered sensorium (iii) severe abdominal pain
5. Low blood pressure, low oxygen saturation as detected by point of care testing
6. Complicated cases of pregnancy with diabetes.
7. Recently diagnosed type 1 diabetes. These patients may present with diabetic ketoacidosis and may require hospitalization. Further, patient and family will require education on self-administration insulin, home monitoring of capillary glucose, nutrition counselling, diabetes education and psychological counselling.
8. Clinical features of acute or acute-on-chronic diabetes complications such as
 - i. Sudden onset vision loss or blurring.
 - ii. Recent deterioration in kidney function, pedal edema or reduced urine output.
 - iii. Hypertensive crisis.
 - iv. Complicated foot and leg infection (e.g. necrotising fasciitis, limb threatening ischaemic & infections).
 - v. Features of unstable heart failure or unstable angina/myocardial infarction.
 - vi. Any other evidence of clinical or hemodynamic instability.
 - vii. Hyperglycaemic crisis: Diabetes ketoacidosis and marked hyperglycaemia or hyperglycaemic hyperosmolar state. Any patient with hyperglycaemic

crisis; very high blood glucose levels, symptoms of ketoacidosis (vomiting, abdominal pain, drowsiness) or hyperglycemia with associated organ-specific complications.

viii. An episode of severe hypoglycaemia which required assistance from someone else or recurrent episodes of hypoglycaemia.

4.4 Responsibilities of physicians using telemedicine

4.4.1 High Risk Apparently Non-Diabetic Individuals

It is the physician's responsibility to ensure adequate and correct care is given to the patient even without a physical encounter. This requires careful assessment of the patient and their care. It includes

- Careful history taking
- Physical evaluation – to the extent possible
- Treatment
- Counselling

1. Identification of high-risk individuals for development of diabetes (28)

Some patients may not be aware they are diabetic. Some patients may have glucose intolerance and others may have developed diabetes due to medication or stress. It is also known in our country that more than 1/2 of patients with diabetes do not know that they have diabetes. Risk factors include

- One or both parents have diabetes
- Obesity
- History of gestational diabetes mellitus
- History of polycystic ovarian disease
- Sedentary lifestyle
- Hypertension
- Dyslipidaemia
- History of giving birth to large baby (> 3.5 kg birth weight)
- Stress

2. Methods of screening for early diagnosis (28)

When they are not known to have diabetes but are at high risk, it is imperative to do some simple tests to arrive at a diagnosis.

- Random blood glucose $\geq 200\text{mg/dl}$ with osmotic symptoms
- Fasting blood glucose $\geq 126\text{mg/dl}$, Post prandial blood glucose $> 200\text{mg/dl}$
- HbA1c $> 6.5\%$

3. Lifestyle education

The corner stone of diabetic management is lifestyle changes which includes

- Nutrition counselling
 - Individualised
 - To maintain ideal body weight
 - Adjusted macro- and micronutrients according to age, physical activity, and disease stage
- Exercise; a combination of aerobic resistance and flexibility exercises. To maintain 300 minutes per week of such activities.
- Stress management
- Weight loss can be achieved with diet, exercise and drugs if needed.

4.4.2 Education for patients with Diabetes

1. Lifestyle modification

- Counselling for tobacco – cessation of smoking.
- Alcohol- should be counselled against alcohol use. Those who are habituated should be counselled to take less than 60 ml per day. De-addiction referrals must be recommended.
- Physical activity - physical activity, apart from just burning calories has the advantage of improving insulin sensitivity, reducing blood pressure and lipids.
- Nutritional counselling- balanced diet based on their ideal body weight should be given and concept of food exchanges explained. A handout of the different diet charts of 1200 kcal, 1400 kcal, etc can be sent on an electronic platform like Whatsapp (29).
- Stress management- this may include meditation and yoga, to be practiced in addition to aerobic exercises.

2. Blood glucose monitoring

Diabetic patients or a younger relative in the household should be taught how to use a glucometer, advised about the frequency of self-monitoring of blood glucose (SMBG), and the target blood sugar values to be achieved. The testing should be at various times of the day that is pre and post all meals.

- Individualised targets-

The glycemic targets should be individualised as per the American Diabetes Association (ADA) and European Association for Study of Diabetes (EASD) guidelines; a newly diagnosed diabetic should have very tight control with

HbA1C of <6.5%, while a person with comorbidities can have a higher HbA1C target of 7-7.5%.^(8,9) The blood glucose goals should be FBG 100-120 or 126 mg/dL in a young newly diagnosed patient and post prandial BG around 140-160mg/dL. However, in an older long-standing diabetic with comorbidities the targets may be relaxed to FBG 100-140 mg/dL and PPBG of 140-180 mg/dL.

- Self-monitoring of blood glucose is recommended at least 2 to 3 times a week in patients who are on oral hypoglycaemic agents, while those who are on stable doses of insulin need to monitor 5 to 7 times a week. However, those patients who are up titrating the doses of insulin, may require monitoring blood glucose 3 to 4 times a day and at any time when symptoms of hypoglycaemia appear.

- Methods of monitoring-

Monitoring of blood glucose should ideally be at home with the

- i. Glucometer
- ii. Continuous glucose monitoring system (CGMS), Ambulatory glucose profile (AGP) which will be useful for fine tuning the prescription
- iii. Each patient should maintain log of the glucose values with date and time and share the details with the physician at the time of the next consultation.

3. If on insulin

- Insulin injection techniques
 - i. Preferred area of injection is in the abdomen about 3 cms away from the navel. Anterior and lateral aspects of the thigh are another preferred site and self-injection needs to be taught.
 - ii. Site rotation should be explained to change the injection site every time to 2 cms away from the site of previous injection site to prevent it from undergoing lipodystrophy.
 - iii. A printed schedule of insulin dose adjustment and titration can be given.
 - iv. A printed diagram of sites and techniques of insulin injection may also be enclosed with prescription.

4. Hypoglycaemia identification and management

- The symptoms of hypoglycaemia should be explained.
- Management of the different stages of hypoglycaemia also should be explained to the patient.

- A leaflet on hypoglycaemia can be given to the patient.
- Symptoms of hypoglycaemia should be enquired about at every visit and appropriate counselling to avoid hypoglycaemia should be given.

5. Prevention of complications

The major goal of treatment of diabetes is to prevent micro and macrovascular complications. It should be explained to patients that tight glycaemic control will go a long way to achieve this objective.

- Frequency of complication screening (28)
 - a. Annual screening
 - i. Lipid profile- dyslipidaemia and targets of different lipoproteins
 - ii. Serum creatinine and estimated glomerular filtration rate (eGFR).
 - iii. Liver Function Test
 - iv. Complete Blood Count
 - v. Eye evaluation – fundus, acuity and glaucoma
 - vi. ECG
 - b. Quarterly- HbA1c

6. Foot care

- Self-examination with a mirror or children in the house to look at the feet on a daily basis is very important as this is the most common preventable complication in a diabetic. Testing sensation in the feet with a 10-gram monofilament should be taught to the patient and or a relative to detect a foot at risk of ulceration and implement appropriate preventive measures.
- Proper footwear

4.4.3 Review and monitoring

1. Progress regarding glycemia

The importance of monitoring should be emphasised with

- i. Regular SMBG and
- ii. 3 monthly HbA1c

2. Review of comorbid conditions

- i. Obesity – BMI should be calculated at every visit and the importance of achieving a BMI of 23 kg/m² should be explained.

- ii. Self-monitoring of blood pressure with an electronic BP apparatus is easy and can be done at home. Blood pressure should be checked at a frequency advised by the treating physician and a diary maintained and shared with the treating physician under optimal control.

3. Review and management of complications if any

- Neuropathy- History of neuropathy both positive and negative symptoms should be asked for.
- Nephropathy- If present control of albuminuria and the importance of glucose and blood pressure control should be emphasised and an ACE inhibitor or ARB may be prescribed as appropriate. The diet should be reviewed, and protein restriction may be advised, and a revised diet sheet should be given.
- Retinopathy- History of visual problems, floaters or loss of vision should be enquired about. If present patient should be asked for a physical review
- Coronary artery disease and cerebrovascular disease: History of dyspnoea on exertion or rest, pain either in the chest or other areas should be asked for. Symptoms suggestive of transient ischemic attack should be enquired about.
- Infections- In particular screen for symptoms of pulmonary TB.

4. Review of investigations

The reports should be reviewed and discussed with the patient.

5. Adult vaccination

Patients should be advised on hepatitis B, pneumococcal, and influenza vaccines and a printed schedule shared with them

6. Disability limitation and rehabilitation

- Post amputation care of the residual limb,
- Care of the other limb
- Counselling on the possibility that the other limb may also have a diabetic foot, if preventive steps are ignored
- Prosthesis and its suitability
- Physiotherapy.

4.5 Care for Patients with Type 1 diabetes

Type 1 diabetic patients need a little more care as they are young and may have more glycaemic variability (30). Because of their age and maturity, it is very important to -

- Involve their parents in their care as well in the counselling. Diabetes is a disorder which needs family support in times when the patient may feel low and defeated.
- Reinforce diet and exercise
- Assess blood glucose control, variability
- Counsel on insulin titration and give them an easy algorithm
- Counsel on hypoglycaemia
- Give them specific targets of glucose control
- Counsel on sick day rules
- Recognise symptoms of DKA – check urinary ketones
- Counsel on various delivery devices – including syringe, pen and pump
- Educate about importance of monitoring – SMBG, CGMS

4.6 What patient should know after telemedicine consult

4.6.1 High risk apparently non-diabetic individuals

- i. Inadequate physical activity and dietary indiscretions pose an increased risk of weight gain and metabolic dysregulation.
- ii. People who are at a high risk of developing diabetes should know about ideal body weight (height in centimetre minus-100=approximate ideal body weight) and dietary goals (requisite calories calculated as 22 kcal x ideal body weight + 25%/50% of it depending on the extent of physical activity, sedentary to moderate, respectively). Further, 500 kcal should be reduced or added depending upon the baseline ideal body weight.
- iii. Indoor physical activity should be encouraged including cycling, stretching exercises, resistance exercises like push-ups, planks and sit-ups. In addition, accomplishing yoga and meditation could provide a mental solace and peace. Moreover, outdoor physical activity like brisk walking should also be promoted with full precautions of social distancing, masking and frequent sanitization. Sometimes, wearing a mask during exercise becomes uncomfortable and therefore, should only be removed when there are no other people in vicinity.

- iv. They are advised to monitor their blood glucose (fasting or random) once in three/six months and if observed abnormal should be complemented with HbA1c and three-monthly monitoring of blood pressure.

4.6.2 Patients with diabetes

- i. Patients with diabetes should be better equipped regarding knowledge about dietary modifications and exercise schedule. Macronutrients composition should be calculated based on ideal body weight and include 50% carbohydrates, 30% proteins and 20% fat (1/3rd each saturated fat/Polyunsaturated fatty acid (PUFA)/Monounsaturated fatty acid (MUFA)). In addition, the fibre content in diet must include 12-15gm per 1000 kcal to reduce the glycaemic variability and improve satiety (32).
- ii. Physical activity may be accomplished indoor as well as outdoor as mentioned above.
- iii. Patients should be well aware about hypoglycaemic symptoms and their management, particularly those who are on sulfonylureas and insulin.
- iv. The bolus doses of insulin should be adjusted based on insulin carb ratio (500 / total daily dose of insulin) and insulin sensitivity factor (1500/total daily dose of insulin). Insulin carb ratio can be utilised by modulating the doses of insulin following the estimate of total amount of carbohydrate in a given meal. For example, total daily dose of insulin of a given individual is 50 units then the insulin carb ratio will be 10 which means for every 10 gm of carbohydrate metabolism, 1 additional unit of insulin is required. Suppose a patient consumes 50 gm carbohydrate in the breakfast then the dose of bolus insulin will be 5 units. Insulin sensitivity factor helps to achieve the postprandial glucose in target range based on pre-meal blood glucose and individual insulin sensitivity factor. For example, if pre-meal blood glucose is 190 mg/dl and the total daily dose of insulin is 50 units, then insulin sensitivity factor is 30 and the doses of insulin administered prior to next meal will be existing dose + 2 additional units
- v. Basal insulin doses should be modified according to the fasting plasma glucose with a target of 90-130mg/dl by up titrating the doses by 2 units every alternate day. If fasting plasma glucose falls below 90mg/dl, then down titration is advised.
- vi. In the event of hypoglycaemia insulin doses should be reduced or stopped for time being if the ambient blood glucose is <80 mg/dl.

- vii. Patient should adhere to medications not only for anti-diabetic drugs but also to anti-hypertensive, lipid lowering drugs & other cardiac drugs like Aspirin & Clopidogrel.
- viii. Self-monitoring of blood glucose is recommended at least 2 to 3 times a week in patients who are on oral hypoglycaemic agents, while those who are on stable doses of insulin need to monitor 5 to 7 times a week. However, those patients who are up titrating the doses of insulin, may require 3 to 4 times a day or else blood glucose should be done at any time when symptoms of hypoglycaemia appear. Fasting plasma glucose should be aimed between 90-130 mg/dl and postprandial glucose should be maintained between 140-180 mg/dl. However, it should be customised according to the age, concurrent comorbidities, hypoglycaemic unawareness, and life expectancy of the individual. Glycated haemoglobin should be targeted <7% in younger individuals, while between 7-7.5% in older people.
- ix. Patients on oral hypoglycaemic agents should not modulate their doses unless warranted particularly if hypoglycaemic symptoms appear. Further, self-titration in doses of these medications should only be done after consultation with their physician. Routine observation of ambient high blood glucose can be taken care by accomplishing physical activity, avoiding inter-prandial snacking and reducing the calorie content for the next meal.
- x. The recommended screening for diabetic complications particularly for retinopathy and nephropathy is annual if these complications are not present at first evaluation or they have been stable during follow-up. On the contrary, appearance of new onset of visual symptoms or deterioration in renal function should prompt for immediate and more frequent evaluation (6 months). ECG should be done once in a year or else if symptoms appear.
- xi. Daily examination of foot should be performed and carefully look for nails, interdigital space, foreign body and plantar aspect of foot with self-mirror examination. In addition, any callosity, bunion or corn should also be examined. Never forget to inspect the shoes and slippers and never walk bare foot in the house.
- xii. Development of fever, cough, urinary symptoms, unwarranted abdominal pain and deep skin/ear infections (carbuncle and malignant otitis externa) should alarm the patients to consult their family physician as soon as possible.

- xiii. Urine/blood ketones should be examined if random plasma glucose exceeds >350 mg/dl or unprecedented abdominal pain or during any critical illness. In addition, patients on SGLT2 inhibitors if present to emergency should also have ketone estimation.
- xiv. Some side effects of the medications used in the management of diabetes should be appreciated by the patients themselves including hypoglycaemia, genital mycotic infection, symptoms of urinary tract infection, pedal oedema and unexplained loss of appetite. Those who are administering insulin injections should rotate periodically to avoid insulin lipohypertrophy.
- xv. Blood pressure should be monitored weekly for those who are on stable doses of anti-hypertensive medications with an aim to achieve a target of 130/80 mm/Hg. Those who have uncontrolled blood pressure should monitor daily and modify their doses in consultation with their physician.
- xvi. Patients with diabetes may have visible (foot deformity, amputation, post stroke residual deficit and visual impairment) and invisible disabilities (depression, mood changes, erectile dysfunction, dyspareunia and cost of treatment) which should be counselled, discussed and managed accordingly (33).
- xvii. Sick day guidelines for patients with type 1 diabetes are
- Never skip insulin, but do modify according to blood glucose
 - Frequently monitoring blood glucose every 1-2 hrly
 - Estimation of ketones 6 hrly
 - Drink plenty of fluids with salt
 - Increase short acting insulin doses by 20% if, random plasma glucose exceeds 200mg/dl
 - If not able to take orally then seek for hospital assistance

4.7 Standard procedure for consultation

4.7.1 First consultation

The chronic care of diabetes and related disorders could be facilitated by telemedicine (34). However, telemedicine consultations require time, caution and focus on the part of the diabetes care team. In addition to type 2 diabetes, gestational diabetes and type 1 diabetes management could also be helped by telemedicine (35–37). Whenever a patient is assessed during the first consultation it should be

ascertained that the patient can be managed by teleconsultation. If not, the patient should be advised to visit the nearest hospital for further management.

a) Indications for face to face outpatient consultation- Please see this in section 4.3.

b) Indications for emergency referral-

If any of the above indications are met, the subject should be immediately advised a face-to-face outpatient consultation or visit to the nearest emergency service.

c) Preliminary arrangements to be done by doctor before first consultation, inform about methods and the need for obtaining reports prior to appointment-

1. Before the consultation, appropriate online consultations and disclaimers must be obtained via the relevant platform.
2. Either the doctor or the relevant clinical staff may contact the person with diabetes and provide instructions for using the platform. Particularly results of previous investigations or other medical records may need to be scanned and sent in advance to the doctor.
3. The time of the appointment needs to be confirmed in advance.
4. Sometimes people may ask, which tests need to be done, especially the person visiting their doctor for their first visit. These tests could include one or more of the following (or other tests as needed): Fasting plasma glucose, HbA1c, Kidney function tests, lipid profile, liver function tests, urine test for microalbuminuria.
5. The doctor and team must make sure about a secure and good internet connection.

d) Maintenance of case records-

1. All the prescriptions or consultation notes must be saved on a secure folder in the computer/or appropriate cloud platform.
2. Wherever possible the reports must be integrated with the clinic's electronic medical record system.

e) Most common presenting complaints and methods to evaluate the history by patients-

In cases of diabetes, presenting complaints may include

- High blood glucose
- High HbA1c

- Suspected diabetes related complication as ascertained by symptoms relating to eye, kidney, heart, feet.
- Side effects of medications.
- Abnormal parameters like blood pressure, lipids or other parameters.
- Any other co-existing medical condition

Methods to evaluate history told by the patient

In general, history taking mirrors general history taking in face to face meeting.

Additional points to note during telemedicine assessments include-

- i. Making sure patients are comfortable with the telehealth platform.
 - ii. Adequate questions are asked regarding onset, duration and aggravating/relieving factors of every symptoms.
- f) Significant medical history – past, family, dietary, tobacco/alcohol/any addictions, drug allergies

In general, these evaluations form the basis of a diabetes-related history

- i. Diabetes-related history
 - Date/year of diagnosis
 - Last HbA1c/blood glucose
 - Compliance with diet and exercise
 - Anytime on insulin
 - Occurrence of hypoglycemia
 - Frequency of home blood glucose monitoring
 - ii. Other aspects of medical history
 - Past medical illnesses
 - Addictions to tobacco/alcohol
 - Sleep patterns
 - Mood-related history such as depression
 - Drug allergies
 - Current medical therapy
 - Checklist for diabetes related comorbidities such as neuropathy, nephropathy, retinopathy, hypertension, stroke or heart disease.
- g) Performing possible medical examination through telemedicine: foot examination, simple neurological examination, asking patient to check blood glucose and blood pressure.

1. General assessment: People with diabetes may be at risk of several complications. A quick assessment of whether the patient is in some discomfort or is comfortable, can speak normally and is speaking and communicating clearly would help to assess the general condition.
 2. If a caregiver/relative is present with the patient, it may be important to establish a rapport with the care giver and find out if the activities of daily living are affected or not.
 3. Always ask for important parameters which could be measured at home, such as: weight, blood pressure, pulse and capillary glucose values. Wherever possible appropriate training resources should be shared with the person.
 4. Cardiovascular assessment: ask for pulse rate, presence of chest pain, palpitations or dyspnoea. Further assessment may not be possible.
 5. Neurological assessment: with special regard to diabetes, doctors may ask for neuropathy symptoms such as tingling, burning or numbness. A quick assessment of speech, movements and responses to questions would help the doctor about central functions and motor functions.
 6. Foot examination: Inspection of the feet for ulcers, cellulitis, gangrene, nail changes, deformities seen in neuropathy, as well as interdigital fungal infections are important in people with diabetes.
- h) Treatment advice should be sent in PDF format which should have proper designation and registration number of doctors, mode of teleconsult, timing and ways to take medication and it should be explained to the patient with possible drug side effects and ways to titrate medication.
- Treatment advice should be sent to the patient. The following are the points to note about the format.
- i. Format should be ideally in PDF or easily downloadable format
 - ii. Mode, time and date of teleconsult should be mentioned.
 - iii. Name of drug (both generic and brand)
 - iv. Mode of medicine intake and duration
 - v. Side effects of medication should be documented
 - vi. In case of insulin therapy, contact numbers for dose titration and hypoglycaemia management.
 - vii. Date of follow-up

- viii. Tests to be done at next follow-up should be mentioned.
- ix. Sick day rules and instructions on urine ketone testing
- x. Advanced therapies like insulin devices, pumps and CGMs when utilized, should be accompanied by instructions on their use, either shared on the teleconsultation platform or separately via e-mail or messaging.
- i) Laboratory investigations, Self-monitoring of blood glucose (SMBG), Self-monitoring of blood pressure (SMBP) requested for next consultation should be clearly mentioned in the prescription which should include the following.
 - i. Name of investigations for next visit
 - ii. SMBG or SMBP advice should be structured in terms of time and frequency of testing.
 - iii. If patients are using glucometers that connect with mobile phones, then instructions should be provided about their use and requisite permissions should be taken if the health care team accesses the same.
- j) Significant counselling points for patients and care givers which should include the following
 - i. Prevention of hypoglycaemia
 - ii. Self-monitoring of blood glucose training, including glucometer testing and strengths and limitations of capillary blood glucose.
 - iii. Insulin injection technique, insulin pump therapy (in case patient is on insulin pump), home blood/urine ketone monitoring in type 1 diabetes and dose titration.
 - iv. If needed, doctor/paramedical staff should provide online training, or send pictorial video resources on insulin delivery system training/ capillary blood glucose testing
 - v. Prevention of complications
 - vi. Lifestyle modifications
 - vii. If the patient is stressed or under depression proper referral for psychological counselling should be done
- k) Corresponding timeline for next follow-up consultation
 - i. The date of next consultation should be mentioned.
 - ii. Procedure to obtain appointment for next visit should be mentioned.

- iii. Phone numbers /e-mail addresses for seeking help should be mentioned.

4.7.2 Follow-up consultation

- a) Mode of maintaining continuity in medical records with respect to comparison of different parameters like weight, HbA1C and blood pressure-

It is important to maintain continuity in follow-up reports. For this it is suggested that doctors maintain a small table in the consultation notes mentioning last visit's HbA1c, and weight; or other similar parameters. Certain electronic medical records/laboratory systems also help pull out past records and present data as graphs or line-diagrams.

- b) Evaluating treatment adherence and life style modifications-

Follow-up notes should ascertain

- Compliance to lifestyle modifications
- Adherence to monitoring
- Adherence to medications

- c) Changes to be done in treatment (minor changes can be done but for any major changes patient should be asked to come for face to face consult)-

Change to treatment

- i. Minor changes which would not increase risk of hemodynamic instability may be carried out and documented over telemedicine consultation.
 - ii. Major changes of an acute care type will require hospital visits. However, major treatment changes such as initiating of insulin or a glucagon like peptide receptor agonist may be carried out online.
- d) Next follow-up date and investigations to be done are to be mentioned.
 - e) Patient and care giver education are same as that for first visit mentioned above; at every point, limitations of telemedicine must be mentioned, discussed and documented.
 - f) Special scenario – delayed follow-up by patients-
 - i. Timely follow-up must be encouraged and emphasized
 - ii. Any case of delayed follow-up for chronic care of diabetes, beyond 6 months should be evaluated as a new subject (see section 4.7.1)

4.7.3 Emergency consultation

a) Diabetes conditions requiring emergency care

Emergencies in diabetes can be potentially life threatening and should be recognised immediately for proper referral of patient to healthcare facility. If patient is not able to consult due to the emergency, then the primary care giver should perform the teleconsultation, preferably through video.

1. Diabetic ketoacidosis

- Diabetic ketoacidosis (DKA) or ketosis may be common in diabetic patients with COVID-19 and may modify the clinical outcome.
- DKA is seen primarily with type 1 diabetes but may also be seen with type 2 diabetes.
- Marked decrease or absence of insulin causes hyperglycaemia, metabolic acidosis, dehydration and electrolyte abnormalities.
- Enquire about lack of adherence or missing insulin dose(s). It can be precipitated by stress of any nature (infections, physical or psychological stress).
- Symptoms at presentation may be related to dehydration (giddiness, hypotension, increased heart rate, lethargy, and confusion) and metabolic acidosis (abdominal pain, vomiting, increased respiratory rate, altered mentation).
- Requires hospital admission for management.

2. Hyperglycaemic hyperosmolar nonketotic syndrome

- Seen with type 2 diabetes, more commonly in older individuals living alone and have lack of access or intake of adequate fluids.
- Insulin levels in body are sufficient so that ketoacidosis does not usually occur.
- Profound hyperglycaemia, dehydration, increased thirst and altered mentation are usually the presenting symptoms.
- Requires hospital admission for management.

3. Hypoglycaemia

- It can be symptomatic or asymptomatic.
- Causes include irregular meal timings, inadequate food intake, inappropriate dosages of anti-diabetic medications.

- More frequent in patients taking insulin and in patients with type 1 diabetes.
- Can be more severe and prolonged in patients taking oral hypoglycaemic agents, particularly sulfonylureas.
- Classification of hypoglycaemia(8)
 - i. Level 1: blood glucose level between ≥ 54 and < 70 mg/dL
 - ii. Level 2: blood glucose < 54 mg/dL
 - iii. Level 3: a severe event characterised by altered physical or mental status requiring assistance for treatment
- Symptoms include adrenergic (palpitations, sweating, tachycardia, increased hunger) and neuroglycopenic (confusion, syncope, coma)
- Symptoms occur in between meals or after physical activity
- Hypoglycaemia unawareness i.e. absence of symptoms of hypoglycaemia in the presence of blood glucose < 70 mg/dL may occur if patient has recurrent episodes of hypoglycaemia.
- Severe hypoglycaemia or recurrent episodes of symptomatic hypoglycaemia requires hospital admission for management.

4. Acute coronary syndrome

- Can present as an emergency in diabetic patients.
- Triggered by other complications such as hypoglycaemia, profound hyperglycaemia, coexisting infections and any other physical or psychological stress.
- Spectrum ranges from silent ischemia, typical symptoms of myocardial infarction and symptoms suggestive of cardiac failure.
- Myocardial ischemia may present with non-cardiac symptoms such as nausea, vomiting, abdominal pain, dyspepsia like symptoms, shortness of breath, easy fatigability and weakness. Therefore, high index of suspicion to be maintained.
- Requires evaluation and hospital admission for management.

5. Infections including skin and soft tissue infections

- Uncontrolled hyperglycaemia predisposes to these infections.
- Most common infections include bacterial infections of eyelid, boils, folliculitis, deep seated infections of skin, urinary tract infections.

- Presence of peripheral neuropathy increases the risk of severe infections which can be life threatening.
- Infection which is progressing rapidly, is deep seated, associated with tissue necrosis is an emergency.
- Mild infections may be treated with topical and systemic antimicrobials. Severe infections require hospital admission for parenteral antimicrobial administration and surgical intervention if required (33).

6. Ophthalmologic emergencies

- Acute decrease in vision may be due to retinal detachment or vitreous haemorrhage in the presence of severe proliferative diabetic retinopathy.
- Acute central retinal artery or retinal vein occlusion
- Ocular infections including bacterial endophthalmitis and orbital rhinocerebral mucormycosis (mostly with diabetic ketoacidosis)
- Herpes zoster affecting the trigeminal nerve may cause anterior uveitis or keratitis

b) Methods to identify emergency conditions through signs and symptoms

- i. Teleconsultation should include the enquiry about the glycaemic control as well as presence of any symptoms suggestive of acute complications.
- ii. Video consultation with the patient or the caregiver/healthcare provider is preferable for better understanding of the signs and symptoms and to assess the present condition of the patient, based on which referral to hospital may be considered.
- iii. Presence of fever indicates infection. However, infections in diabetic patients may present without fever. Any new onset respiratory, gastrointestinal, urinary and neurological symptom should warrant investigation to rule out infection.
- iv. For symptoms of infection of skin and soft tissues video consultation or sharing of photographs of the lesion should be considered. If in the physician's opinion the video consultation is not enough then face-to-face visit or a referral to healthcare facility should be considered.
- v. Adrenergic symptoms like palpitations, sweating, tachycardia, increased hunger or symptoms like confusion, syncope, unconsciousness occurring

in between meals, at midnight, after exertion or early morning headache may suggest episodes of hypoglycaemia.

- vi. Symptoms of abdominal pain, vomiting, tachypnoea and fever should arouse the suspicion of diabetic ketoacidosis.
- vii. Any new onset symptom, including change in sensorium, in elderly individuals should be taken seriously.

c) Treatment decisions – home management / re-assurance / referral

- i. In the presence of the following conditions, the patient should be referred to a secondary or tertiary centre for appropriate evaluation and management
 - Diabetic ketoacidosis, Hyperosmolar hyperglycemic state (HHS) severe hypoglycaemia, acute coronary syndrome, severe acute/extensive infections.
 - Patient appearing toxic, distressed or in altered sensorium.
 - Severe uncontrolled hyperglycaemia despite appropriate dosages of hypoglycaemic agents (including insulin).
 - Presence of urinary ketones with/without symptoms suggestive of DKA (in a patient not on SGLT2 inhibitors).
 - Presence of symptoms suggestive of HHS.
 - History of one episode of severe hypoglycaemia or recurrent episodes of moderate hypoglycaemia.
 - Symptoms suggestive of severe infection (high grade fever, moderate to severe respiratory symptoms, severe urinary symptoms, severe gastrointestinal symptoms with decreased oral intake, large area of skin and soft tissue infection, presence of necrosis, presence of blackish nasal discharge).
 - Acute ophthalmological symptoms.
- ii. The following may be managed at home itself
 - Mild to moderate hypoglycaemia may be managed at home with modification of dosages of hypoglycaemic medications with good SMBG. If patient does not have facility of SMBG or is non-compliant, then may be referred for hospitalisation and stabilisation of the dose of medications.

- In presence of hypoglycaemia unawareness, the dosage of medications may be modified that aims towards a less strict glycaemic control for some period.
- Mild to moderate infections may be treated at home with appropriate topical and systemic antimicrobials.
- Appropriate control of blood pressure by modification of anti-hypertensive medications.

d) Mechanism for referral

- i. Patients with uncontrolled severe hyperglycaemia, hyperglycaemic emergencies, severe hypoglycaemia, acute cardiovascular manifestations and infectious emergencies should be referred to a health care facility capable of managing such emergencies.
- ii. This can be done by providing appropriate prescription to the patient/care giver mentioning the salient clinical features and the suspected complication.
- iii. For moderate complications face-to-face consultation may be undertaken for proper assessment of the clinical condition and the need of in-patient treatment.
- iv. For mild complications, teleconsultation may be sufficient for management.

4.8 Experiences on specific challenges faced in delivering care for diabetes through telemedicine

- i. Lack of ownership and/or knowledge of use of digital platforms (smart phones etc.) for video consultation or transmitting images/records by significant proportion of patients.
- ii. Poor internet connectivity at several locations resulting in call drops/poor quality of audio/video.
- iii. Lack of awareness by patients about the names and doses of the ongoing medications. This makes it difficult to assess the treatment by audio only consultations.
- iv. Hearing or vision impairments, particularly in elderly may hamper appropriate use of the communication device (smart phone) and in understating the instructions given.