Diabetic protocols

Pennine acute Trust

INDEX

SECTION ONE:

Screening for diabetes
Diagnosis of Diabetes
Targets for people with Diabetes

SCREENING FOR DIABETES

Lifestyle Modification	All people with diabetes should be screened for depression and offered appropriate therapy.
Children and Young People	Screening for pre-Type 1 diabetes is not recommended in either the general population or in high-risk subjects. Patients with cystic fibrosis should be screened annually for diabetes from 10 years of age. All people with diabetes should be screened for the following annually from the age of 12 years: for retinopathy, urine macroalbuminuria and blood pressure. Young people should be screened for thyroid and coeliac disease at onset of diabetes and at intervals throughout their lives.
Renal	Patients with diabetes should have their urinary albumin concentration and serum creatinine measured at diagnosis and annually.
Visual Impairment	Systematic screening for diabetic retinal disease should be provided for all people with diabetes. Patients with type 2 diabetes should be screened from diagnosis. Patients with type 1 diabetes should be screened at age 12 years or at onset of puberty whichever is first. Retinal photography or slit lamp bio microscopes used by trained individuals should be used in a programme of systematic screening. Dilated direct ophthalmoscopy should be used for opportunistic screening.
Foot Disease	All patients with diabetes should be screened for foot disease.

DIAGNOSIS OF DIABETES

World Health Organisation Criteria

	Osmotic symptoms	Fasting plasma glucose Mmol/l	Random plasma glucose	2hours post 75G OGTT
DM	Yes	> / =7.0	> / =11.1	
	No	2 samples > / =7.0	2 samples > / =11.1	1 sample >11.1
IFG		6.1-7.0		
IGT		< / =7.0		7.8-11.1
GDM				

TARGETS FOR PATIENTS WITH DIABETES

Parameter	Target
HbA1c	<7% without DM complications <6.5% with DM complications
BP	<140/80 mmHg without proteinuria <135/75 mmHg with proteinuria <125/70 mmHg in young people with T1DM
BMI	<27 kg/m2
Total cholesterol	< 5 mmol/l or 30% reduction from baseline
LDL-C	<2.6mmol/l
TG	<2.0mmol/l
HDL-C	>1.2mmol/l

SECTION TWO:

LIFESTYLE MANAGEMENT

HEALTHY EATING

- Encourage **overweight** individuals and those at risk of developing diabetes to reduce their risk of developing diabetes by lifestyle changes.

- Clinical interventions aimed at dietary change are more likely to be successful if a psychological approach based on a theoretical framework is included.

- Patients with diabetes may drink up to **3 units of alcohol per day** with a minimal effect on blood glucose. If exercise and consumption of alcohol are combined, there may be a greater lowering of blood glucose.

- All patients with diabetes should be seen by State Registered Dietician within 4 weeks of diagnosis and reviewed annually, resources permitting.

Basic messages for patients:

- Eat 3 regular meals every day.

- Include a starchy food at every meal—bread, cereal, potatoes, pasta, rice, and chapatti.

- Aim to eat 5 portions of fruit and vegetables every day

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- Avoid sugar and sugary foods.

- Avoid special diabetic foods.

- Restrict fat and salt

EXERCISE AND PHYSICAL ACTIVITY

- A rate of perceived exertion scale is useful for estimating exercise intensity.
- In people with T2DM physical activity or exercise should be performed at least every second or third day to maintain improvements in glycaemic control.
- In view of insulin adjustments etc. it may be easier for people with type 1 diabetes to perform physical activity or exercise every day.
- Exercise with normal insulin dose and no additional carbohydrate significantly increase the risk of hypoglycaemia during and after exercise.
- Intramuscular insulin injection and injection of insulin into exercising areas increases the absorption of insulin and the risk of hypoglycaemia and should therefore be avoided.
- Access to PCT funded exercise programmes should be offered.

SMOKING CESSATION

- Smokers should be advised to stop smoking. Nicotine replacement therapy is recommended for up to 8 weeks for smokers of >15 cpd
- Group therapy is more effective than simple advice by one person

ALCOHOL

- 3 units of alcohol per day is unlikely to have an effect on blood glucose levels, but if taken regularly may cause hypertension and weight gain
- Men may have up to 3 units of alcohol per day. Women may have up to 2 units of alcohol per day.
- Try to have 2 alcohol free days per week
- I unit of alcohol = a half pint of beer or lager, one standard glass of wine, one 'pub' measure of spirits
- Choose 'dry' drinks i.e. wine, not sweet
- Avoid low alcohol (<5%)beers / lagers and avoid strong lagers
- Dilute shorts by 50% using diet mixers ie slimline tonic
- Do not drink on an empty stomach

DELIVERY OF LIFESTYLE INTERVENTIONS

A variety of types of lifestyle intervention have been shown to improve self-management, metabolic and psychological outcomes. These include:

- Education which is supplemented by additional support / follow up and behaviour modification. Patients with diabetes should be offered lifestyle interventions based on a valid theoretical framework

- Computer assisted programmes, which provide education and trigger self-management. Education programmes, computer assisted packages and telephones prompting should be considered as part of a multidisciplinary lifestyle intervention programme

- Psychological interventions that are varied and include behaviour modification, motivational interviewing, patient empowerment and activation.

- Useful contact numbers can be found as Appendage X

QUALITY OF LIFE AND DEPRESSION

- Depression is more common in people with diabetes than in the general population.

- The presence of micro and macrovascular complications is associated with a higher prevalence of depression and lower quality of life. Remission of depression is often associated with an improvement in glycaemic control

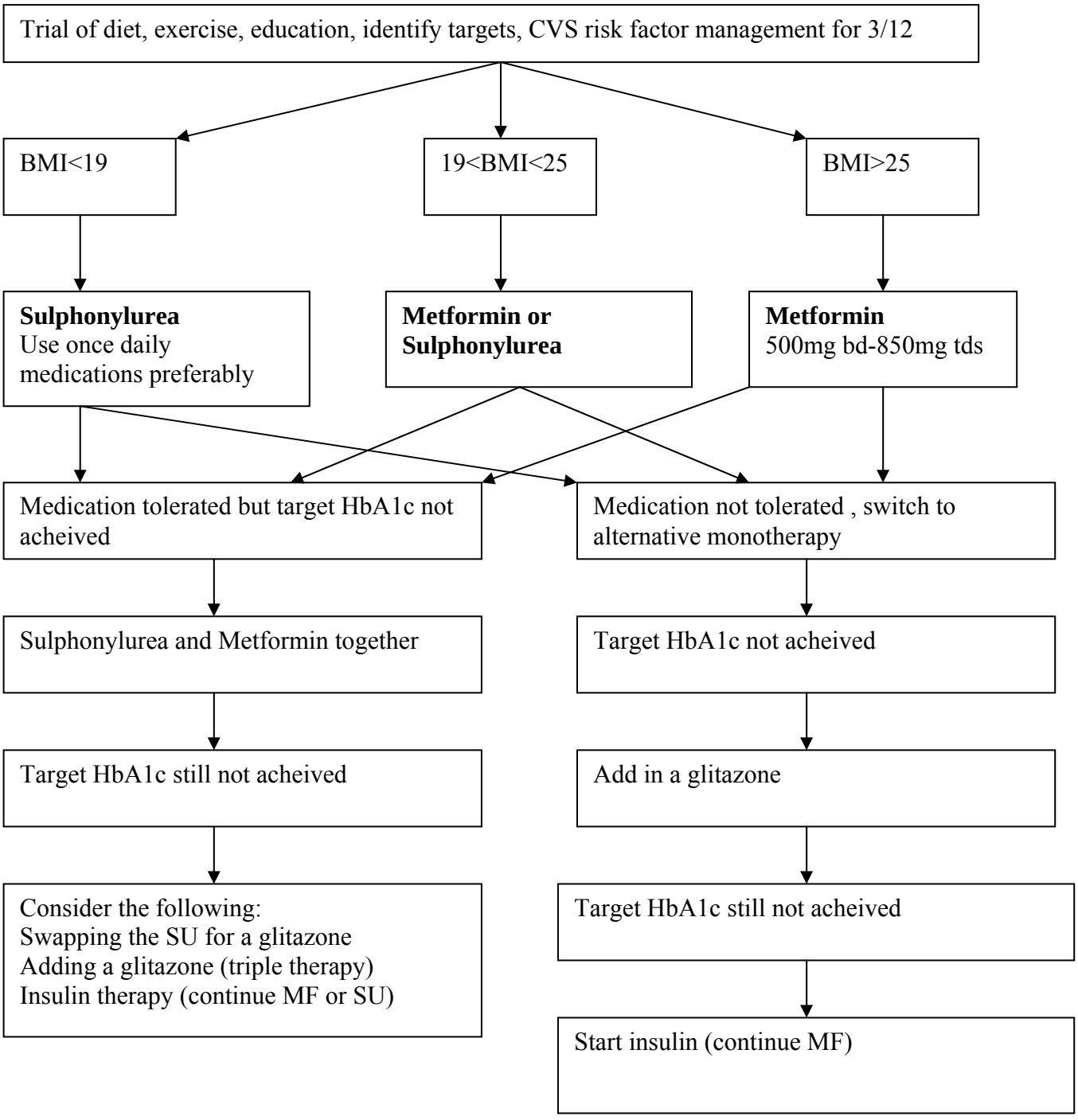
- Pharmacological (antidepressant therapy with a SSRI) and non-pharmacological treatments (e.g. cognitive behavioural therapy, psychotherapy programmes and coping skills training) have been shown to be effective in diabetic patients with depression and may also improve glycaemic control.

- Consider using an ‘expert patient’ to provide support

SECTION THREE:

Management of hyperglycaemia

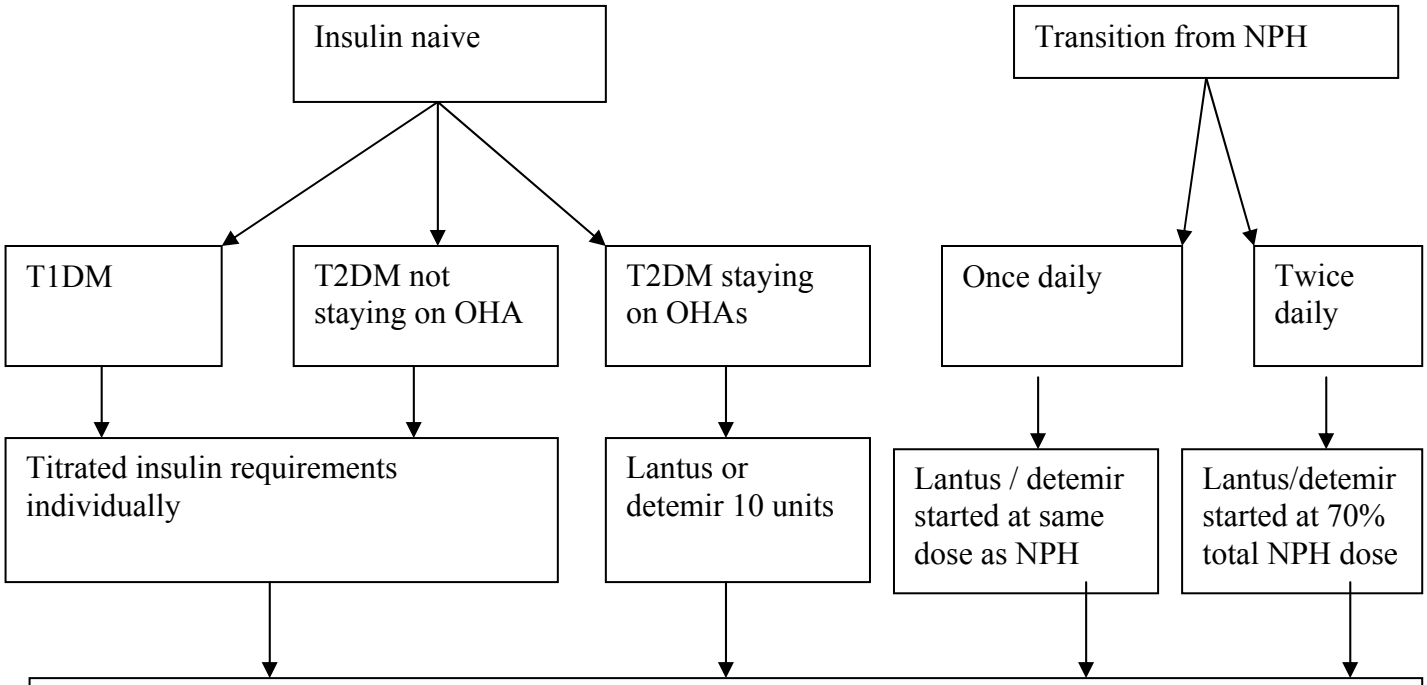
MANAGEMENT OF T2DM WITH OHA



Consider alternative agents ie Acarbose, repaglinide, nateglinide, orlistat, sibutramine

Note: NICE guidelines do not advocate the used of triple therapy (sulphonylurea, metformin and a glitazones, but this pathway reflects local practice

PROTOCOL FOR ADJUSTING ONCE DAILY INSULIN (GLARGINE / DETEMIR) BASED ON LOCAL PRACTICE



Titrate 2 weekly until target is achieved

Average of 3 fasting glucose readings	Increment in Lantus / detemir (IU/D)
5.5-6.7	2
6.7-7.8	4
7.8-10	6
>10	8

PROTOCOL FOR ADJUSTING PRE-MIXED TWICE DAILY INSULIN

- Insulin adjustments are generally based on the recognition of blood glucose patterns over several days

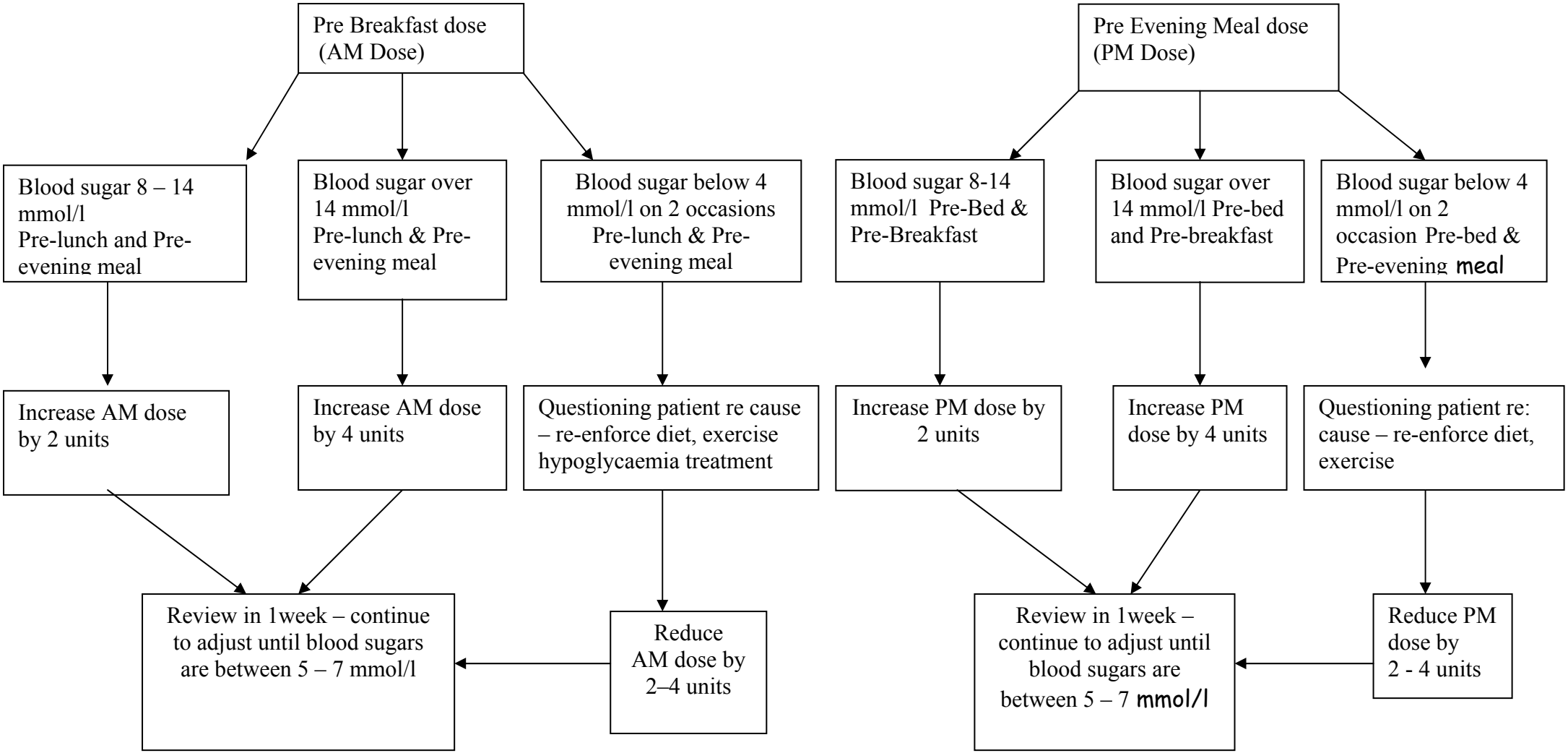
- Cautious adjustments in steps are made in insulin doses until blood glucose levels are in the target range re reached.

- Unexplained hypoglycaemia requires thinking about insulin doses without delay, and adjustment without waiting for a pattern to emerge may be justified.

- When, adjusting, it is usually unwise to make changes to insulin doses every day, or to change too many doses at once, since this can lead to more instability and confusion.

- Adjust on a basis of 2 – 3 days results.

PROTOCOL FOR ADJUSTING PRE-MIXED TWICE DAILY INSULIN



PROTOCOL FOR INITIATION AND ADJUSTMENT OF QDS REGIMENS

● Insulin adjustments are generally based on the recognition of blood glucose patterns over several days

● Cautious adjustments in steps are made in insulin doses until blood glucose levels in the target range are reached.

● Unexplained hypoglycaemia requires thinking about insulin doses without delay, and adjustment without waiting for a pattern to emerge may be justified.

● When adjusting, it is usually unwise to make changes to insulin doses every day, or to change too many doses at once, since this can lead to more instability and confusion.

Insulin Dose Adjustment – Basal Bolus Regimen (4 injections daily)

Blood Testing Times	Blood Glucose <4mmol/l or hypo	Blood Glucose 4 – 8 mmol/l	Blood Glucose 9 – 14 mmol/l	Blood Glucose ≥ 15 mmol/l
Before Bed Breakfast	Reduce bedtime intermediate insulin by 4 units	OPTIMAL	Increase bedtime intermediate insulin by 2 units	Increase bedtime intermediate insulin by 4 units
Before Lunch Lunch	Reduce morning short-acting insulin by 2 - 4 units	OPTIMAL	Increase morning short-acting Insulin by 2 units	Increase morning short-acting insulin by 4 units
Before Evening Meal	Reduce morning short-acting Insulin by 2 - 4 units	OPTIMAL	Increase lunchtime short-acting Insulin by 2 units	Increase lunchtime short-acting insulin by 2 units
Before Supper / Bedtime	Reduce evening meal short-acting insulin by 2 – 4 units	OPTIMAL	Increase evening meal short acting insulin by 2 units	Increase evening meal short acting insulin by 4 units

SECTION FOUR:

Management of CVS risk factors

PRIMARY PREVENTION OF CVS DISEASE

We advocate aggressive management of

Smoking
Hypertension
Hyperglycaemia
Lipid levels
Ensure on antiplatelet therapy
Weight

MANAGEMENT OF ESTABLISHED CVS DISEASE

Evidence level	Treatment
B	Insulin therapy peri and post-MI
A	Thrombolytic therapy
C	Consider primary angioplasty
B	Long term statin and antiplatelet therapy
B	ACEI and Beta-blocker therapy
A	Stenting at angioplasty and give adjuvant abciximab

MANAGEMENT OF OBESITY

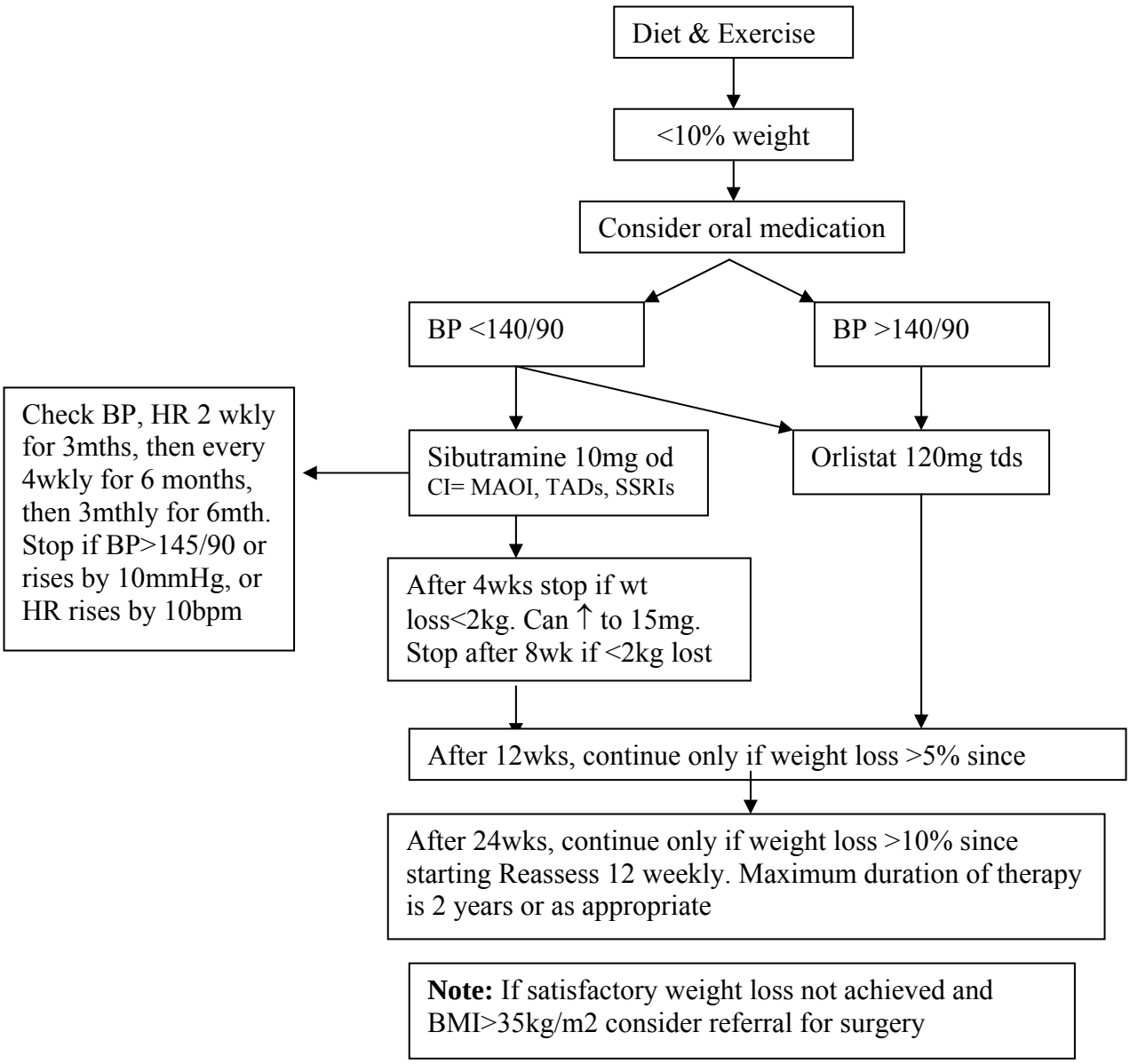
Inclusion criterion.

For consideration of orlistat therapy:
BMI >30 kg/m2
BMI >28 kg/m2 plus other cardiac risk factors (including diabetes)
Age 18-75y for orlistat

For consideration of sibutramine therapy:
BMI >30 kg/m2
BMI >27 kg/m2 plus other cardiac risk factors (including diabetes)
Age 18-65y for orlistat

Protocol.

Based on NICE guidelines, although recent evidence suggests that the 2.5kg weight loss is not a pre-requisite of commencing orlistat therapy*



MANAGEMENT OF HYPERTENSION IN DIABETES.

Measuring BP.

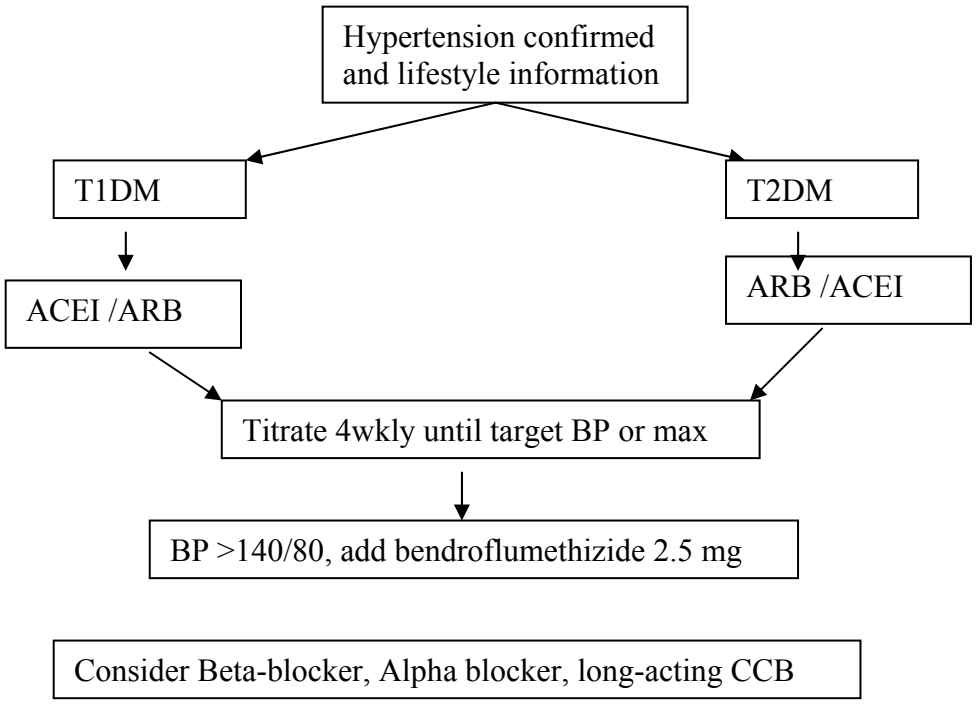
The mean of three blood pressure recordings taken using appropriate tool at rest in the supine or recumbent position should be recorded as the correct blood pressure.

Assessing CVS risk.

CVS risk should be assessed using the UKPDS risk engine. 'High risk' refers to those with previous evidence of atherosclerosis, those with T2DM and those with a 10yr CVS risk of greater than 15%. 'Low risk' refers to those with a 10yr CVS risk of less than 30%.

Protocol.

Mean blood pressure	CVS risk	Micro/macroalbuminuria	Action
140/80 < BP < 160/100	Low	No	Monitor BP 6mthly
140/80 < BP < 160/100	High	No	Treat until BP<140/80
BP >160/100	Either	No	Treat until BP<140/80
BP >140/80	Either	Yes	Treat until BP <135/75



There are many hypotensive agents available, some of which are also licensed for the prevention of diabetic nephropathy. We would advocate the use of once daily medication to improve compliance. The agents most commonly used in our practice are detailed in the table below.

Drug group	CI	Drug	Dose
ARBS	RAS, AS, MS, HOCM, pregnancy breastfeeding, hepatic and renal impairment	Irbesartan* Losartan* Candesartan	150-300mg od 50-100mg od 4-8mg od
ACEI	RAS, angioedema, pregnant breastfeeding, hepatic and renal impairment, porphyria	Lisinopril* Trandolapril Captopril* Ramipril Perindopril	2.5-40mg od 1-8mg od 12.5-50mg bd 1.25-10mg od 4-8mg od
Alpha blockers	Hepatic and heart failure pregnant breastfeeding,	Doxazosin	2-16mg od
Betablockers	Hepatic and heart failure pregnant breastfeeding, heart block, bradycardia,COPD, asthma, PVD,myaesthenia gravis	Atenolol Bisoprolol Carvedilol Metoprolol	50mg od 10-20mg od 12.5-50mg od 100-200mg od
CCB	Hepatic, renal and heart failure pregnant breastfeeding, heart block,	Amlodipine Diltiazem xl Nifedipine MR	5-10mg 240-300mg od 20-30mg od
Diuretics	Severe hepatic & renal impairment, low K & Na, high Calcium	Indapamide Bendrofluamethazide	2.5mg od 2.5mg od

***Licensed for diabetic nephropathy in addition to hypertension**

Once daily medication is preferred as it aids compliance

ANTIPLATELET THERAPIES.

Inclusion criterion.

Consider antiplatelet therapy for all high-risk patients i.e. all patients with evidence of previous atherosclerosis (CVA, TIA, MI, PVD) or those with a 10-year CVS risk of greater than 15%. Diabetes UK suggests that all people with DM over the age of 30 should take aspirin. In those requiring primary prevention ensure that the systolic blood pressure is reduced to below 145mmHg before commencing antiplatelet therapy.

Guidance (reflects local practice)

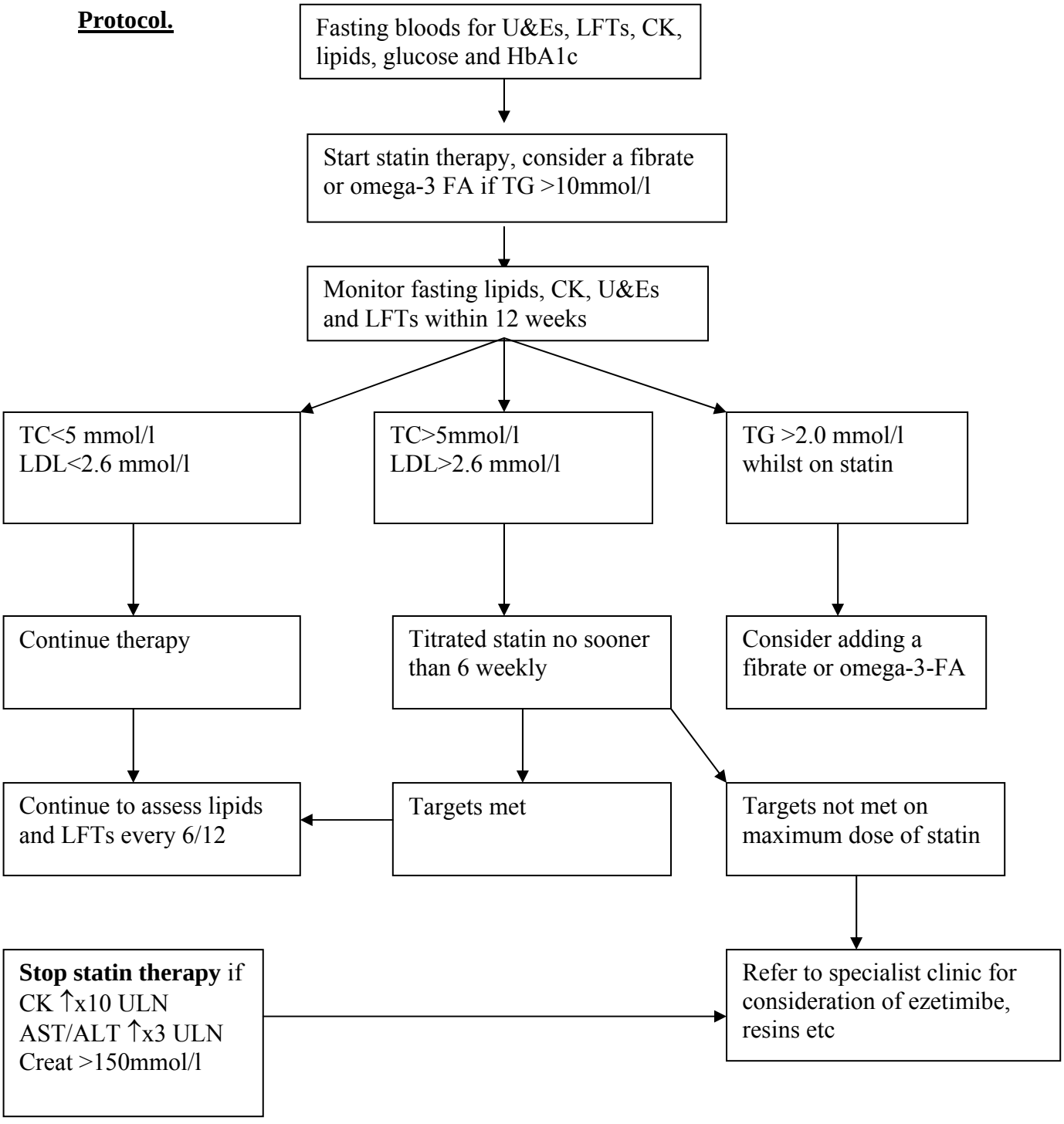
As first line therapy give Aspirin 75mg OD. In those with PVD or in those who have had an atherosclerotic event whilst on aspirin, consider adding clopidogrel 75mg OD. In those unable to tolerate Aspirin because of allergy, consider Clopidogrel 75mg alone. In those intolerant of Aspirin because of GI bleeding, consider aspirin 75mg od plus omeprazole 75mg od or Clopidogrel 75mg OD plus Lansoprazole 30mg OD.

MANAGEMENT OF HYPERLIPIDAEMIA.

Inclusion criterion

This protocol should be applied to all patients with diabetes.

Protocol.



SECTION FIVE:

Management of Diabetic Complications

MANAGEMENT OF DIABETIC NEPHROPATHY

Identify risk factors

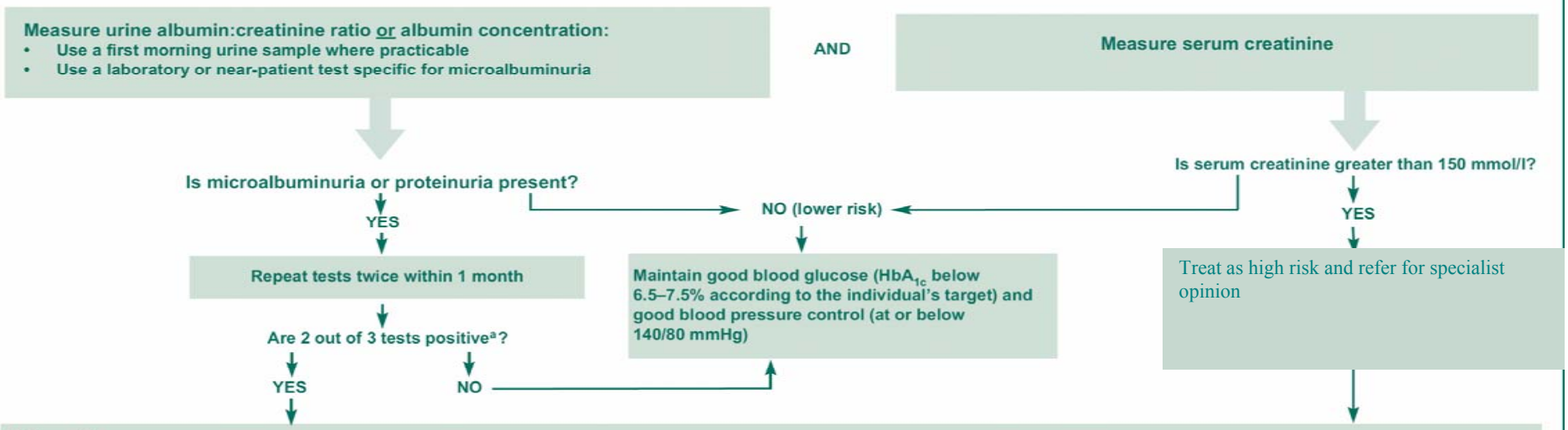
Hyperglycaemia
Increasing age
Smoking
Presence of retinopathy
Hyperlipidaemia
Duration of Diabetes
Baseline urinary albumen excretion rate
Hypertension
High homocysteine levels
Male gender
Ethnicity

Definitions

	Urinary albumin loss (mg/d)	UACR (mg/mmol)	Urinary albumin concentration Mg/l
microalbuminuria	30-300	>2.5 in men >3.5 in women	>20
Dm nephropathy	>300	>30	

Algorithm for the prevention and management of renal disease in type 2 diabetes

Review complications and risk factors for renal disease on diagnosis of type 2 diabetes, and at least on an annual basis, as follows:



Higher risk

- If retinopathy is not present, look for a non-diabetic cause of renal disease (full history and examination, urinalysis, renal ultrasound, other investigations as appropriate)
- Begin therapy with appropriate ACE inhibitor for cardiovascular/renal protection[b]
- Ensure tight blood glucose control (HbA_{1c} below 6.5–7.5%, according to the individual's target)
- Maintain blood pressure below 135/75 mmHg
- ACE inhibitors are first choice, but combination therapy is likely in most patients
- Measure urine albumin and serum creatinine levels at each visit
- Measure, assess and manage cardiovascular risk factors aggressively

[a]Definition of higher-risk urine albumin excretion

Microalbuminuria
Albumin:creatinine ratio ≥ 2.5 mg/mmol (men) or ≥ 3.5 mg/mmol (women)
or
albumin concentration ≥ 20 mg/l

Proteinuria
Albumin:creatinine ratio ≥ 30 mg/mmol
or
albumin concentration ≥ 200 mg/l

[b]Starting ACE inhibitor therapy

- Caution in patients with peripheral vascular disease/renovascular disease
- Caution in patients with raised serum creatinine

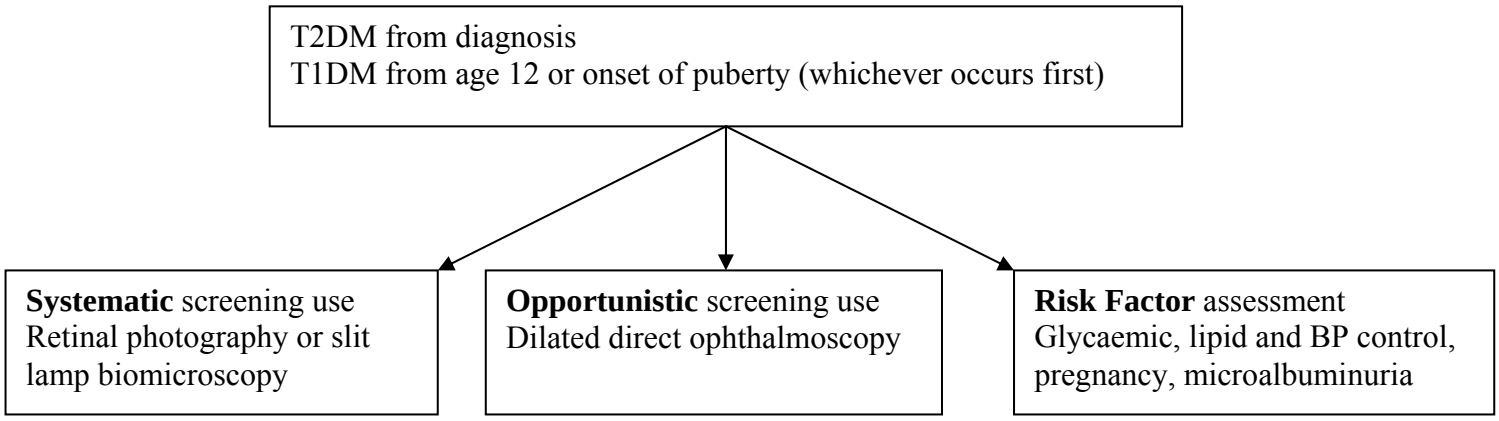
Some ACE inhibitors are not licensed for use at the blood pressure levels recommended in this guideline

In all patients, measure serum creatinine and electrolytes 1 week after:

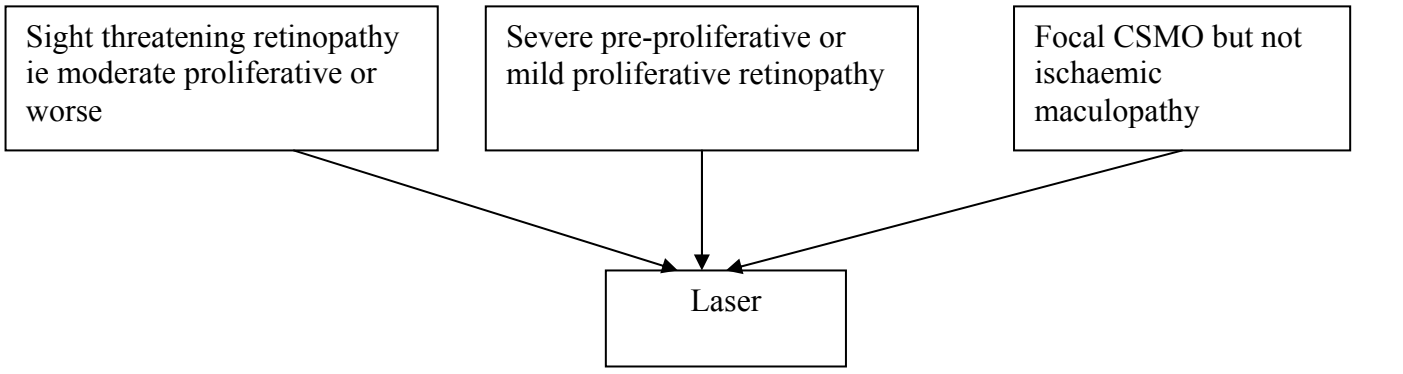
- initiating ACE inhibitor therapy
- each increase in dose

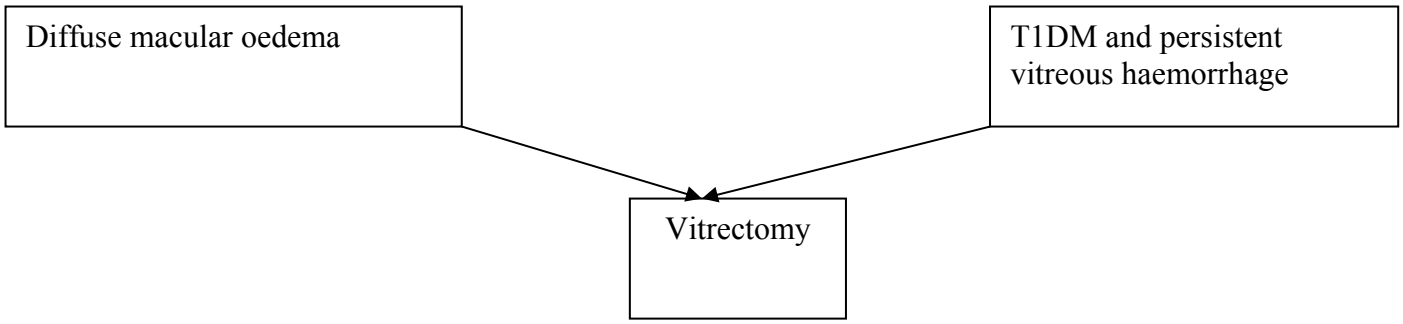
PREVENTION AND TREATMENT OF DM RETINOPATHY

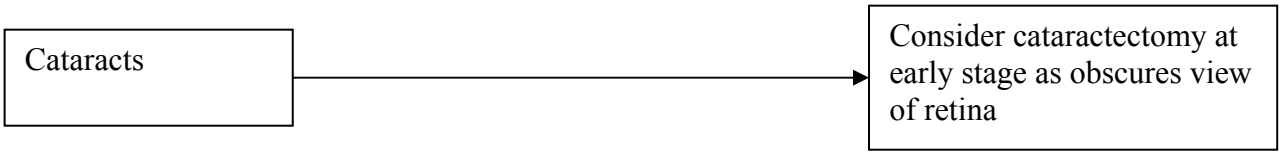
Screening for retinal disease



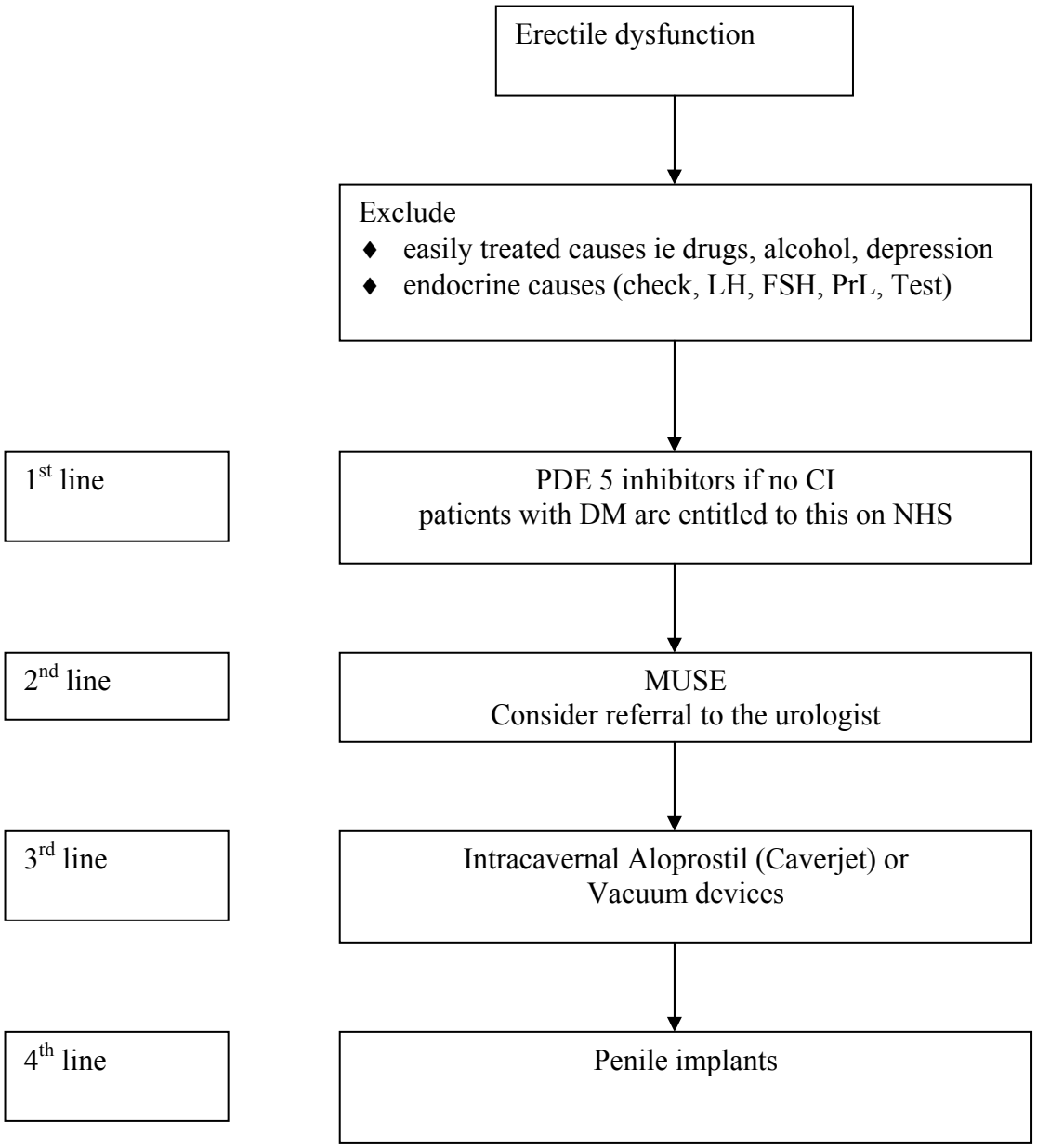
Treatment of retinal disease







MANAGEMENT OF ERECTILE DYSFUNCTION



MANAGEMENT OF DIABETIC FOOT DISEASE

General points

- Risk factors for foot ulceration include smoking, PVD, peripheral neuropathy, ill-fitting footwear, previous amputation or ulceration, presence of callus, joint deformity, visual/vasomotor problems and male gender
- All people with DM should be screened for foot disease and should have access to structured foot care
- Foot care education should be a normal part of a multidisciplinary approach
- Optimise diabetic control, reduce oedema with diuretics

Footwear and Orthoses

- Plantar pressure using ordinary shoes is similar to barefoot
- Advise patients with diabetic foot disease to wear properly fitted, high quality, cushion soled trainers rather than ordinary shoes.
- Stock or custom built footwear or orthotic insoles should be used to reduce callus severity and ulcer reoccurrence.

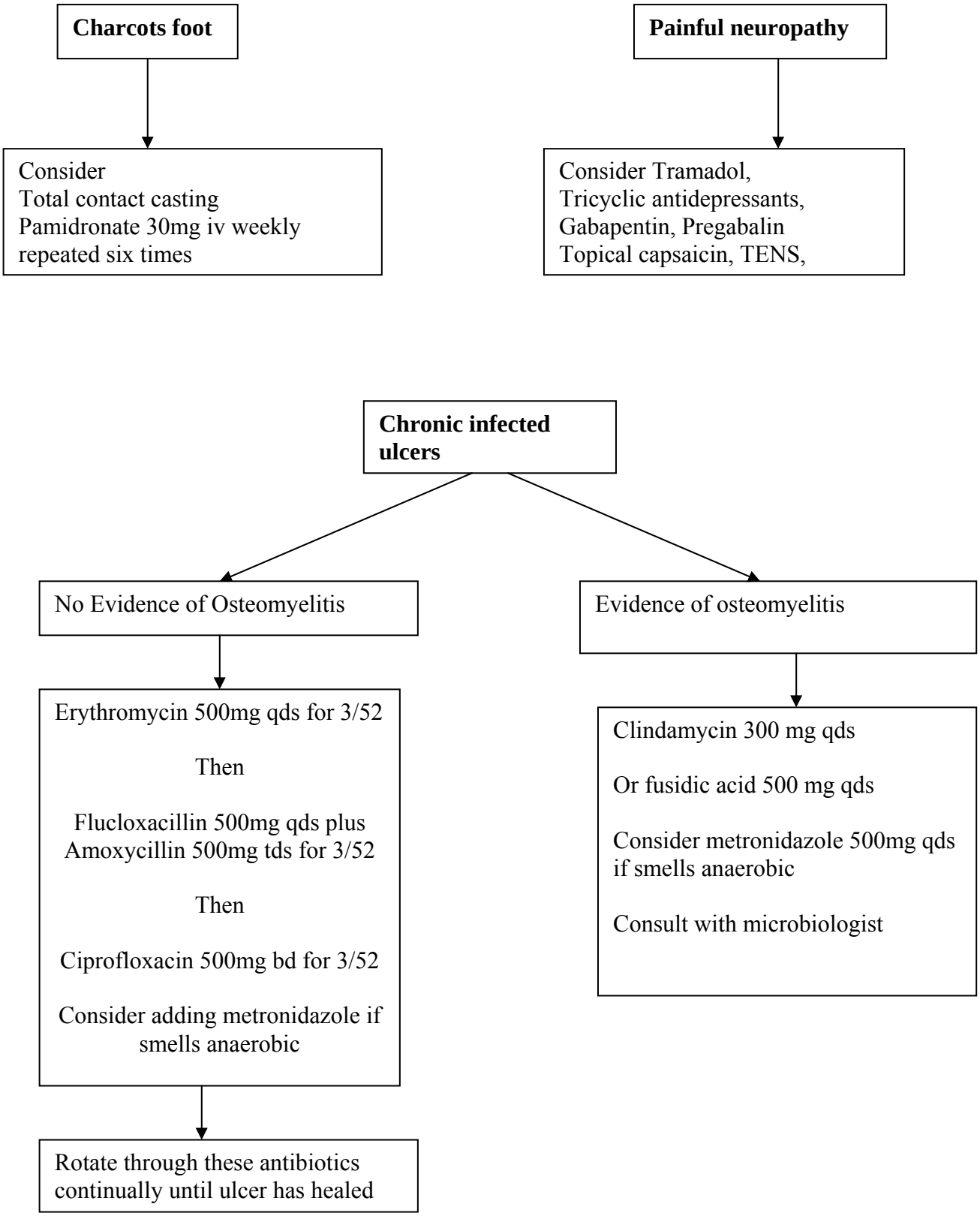
Total Contact casting

- Patients with unilateral plantar ulcers should be treated using total contact casting to optimise the healing rate of ulcers. Open wounds should not be encased in the plaster. A hole can be formed around the ulcer if necessary
- Always use together with crutches or partial weight bearing walker.
- Watch out for change in colour, temperature, fever, swelling, and odour of foot.
- Remove first cast after one week; second cast is usually applied for 2 weeks

Arterial reconstruction

- All patients with tissue loss and arterial disease should be considered for arterial reconstruction

Pharmacological therapy



Referral and Management pathway of feet in people with diabetes

Annual screening undertaken by:
1-Practic nurses
2-General Practitioners
3-Podiatrist

Self referral to Podiatrist outside the annual screening as needed

All of the following: No loss of sensation; No previous ulcer; No callus; No deformity No ischaemia	**Neuropathy only** Loss of sensation	**Any one of the following**: Callus; deformity; previous ulcer OR Ischemia; absent pulse, rest pain, intermittent claudication	Cellulitis, suspected osteomyelitis, gangrene, painful neuropathy, ulcers, critical foot ischaemia
Low Risk category	**Medium risk category**	**High risk category**	**Complicated foot problem**

1 -Basic foot care advice
2-Attention to Diabetes Control
3-Advice on the dangers of smoking
4-Check foot wear

Review:
Continue annual review and basic foot

Refer to Community Diabetic

1-Inform patient of risk.
2-Specific Foot Education.
3- see patient handout on risky feet
4-Foot wear advice.
5-Advice on the dangers of smoking.
6-Diabetes control.
7. *Consider aspirin, statin and ACEI*

Review:
1-Diabetic Podiatry 1-3 monthly
-Foot assessment
3-Repeat education
4-Diabetes control
5-Footwear check

Fast track referral to specialist diabetes foot service if problems arise:

1-any foot ulcer
2-Cellulitis or purulent discharge
3-Suspected osteomyelitis
4-Gangrene
5-Critical foot ischaemia
6-Inability to tolerate antibiotics
7-Need for orthotics/special footwear
8.Rest pain
9-Uncontrolled neuropathic pain.
10- Charcot arthropathy

- **Vascular or orthopaedic assessment as appropriate.**
- **Where appropriate discharge patient back to the general diabetic podiatrist with a copy of the specialist service notes provided.**

Table 2. Clinical criteria for classification of diabetic foot infections

Mild infection
Localized cellulitis
Superficial ulceration
Minimal purulence
No systemic signs or symptoms
Moderate infection
Cellulitis of foot or ankle
Deep or penetrating ulceration
Plantar abscess
Acute osteomyelitis
Systemic signs or symptoms
Severe infection
Proximal cellulitis, lymphangitis
Gangrene, necrotizing fasciitis
Clinical septicaemia

Adapted from Joseph (6).

SECTION SIX:

Patient education issues

GROUP TEACHING OF BLOOD SUGAR MONITORING.

Issues to be discussed include:

Why monitor – advantages and disadvantages of blood cf. urine monitoring
Finger lancing technique
Use of meter including calibration, cleaning, checking function
Obtaining sample
Target glucose readings
Safe disposal of strips and lancets
Contact numbers in case of problems

GROUP EDUCATION SESSIONS

Issues to be discussed include:

Introduction to team
What is diabetes?
Treatments for diabetes (diet/OHA/insulin)
Aims of good control
BP, glycaemic and cholesterol targets
DM complications
Assessing DM control
What tests are required and what do they mean
Driving
Sick day rules
Identity cards
What to expect from DM services
Contact numbers
Details re: Diabetes UK
Coping with travel
Pregnancy

SECTION SEVEN:

Diabetes Specialist Nurse guidelines

GUIDELINES FOR COMMENCING INSULIN THERAPY

- Confirmation of insulin regimen must be written in notes or on the prescription sheet and a start date must be agreed.
- Ensure self-monitoring has been taught prior to starting insulin.
- The script must complies with the trust protocols and policies and with the UKCC standards for administration of Medicines 1992

GUIDELINES FOR THE ADJUSTMENT OF OHAS

- Prior to altering medication, DSNs should review the following:
    - Patients' dietary compliance
    - Glucose monitoring and results
    - Other factors ie illness or pregnancy
- OHA must be prescribed and altered in accordance with Trust policies and protocols

GUIDELINES FOR TEACHING SELF-ADJUSTMENT OF INSULIN

- Patient must be willing to adjust own insulin dose and this willingness must be documented
- DSN must be satisfied that the patient has a good understanding of the way in which insulin works and the factors affecting it.
- Patient must be able to monitor sugars
- Patient must be aware that the insulin dose is not adjusted on the basis of a single reading and that at least 2 days must elapse between each adjustment

Patient must monitor and understand response to change

SECTION EIGHT:

Management of diabetes during pregnancy and labour

Pre-pregnancy care

Planned pregnancy
Screen for complication
Optimise DM control (BMs 4-7mmol/l)
Review medical, obstetric and gynae history
Multidisciplinary approach preferable
Folic acid 5mg od until 12 wks gestation
Stop ACEI

Dietary advice

High complex CHOs, high soluble fibre,
Vitamins, reduced saturated fat recommended
Ensure adequate iron and calcium intake

During pregnancy

Refer early to the multidisciplinary diabetes team
Refer for digital retinal screening
Fundal examination each trimester
If high BP, use labetolol, methyldopa or nifedipine
Give advice re: driving

Delivery

Women on insulin should be assessed at 38/40 and to ensure delivery by 40/40

Delivery should be in consultant lead units with senior obstetrician, physician and neonatologist available

Monitor progress of labour as for other high-risk deliveries.

Management of glycaemia as indicated in protocols

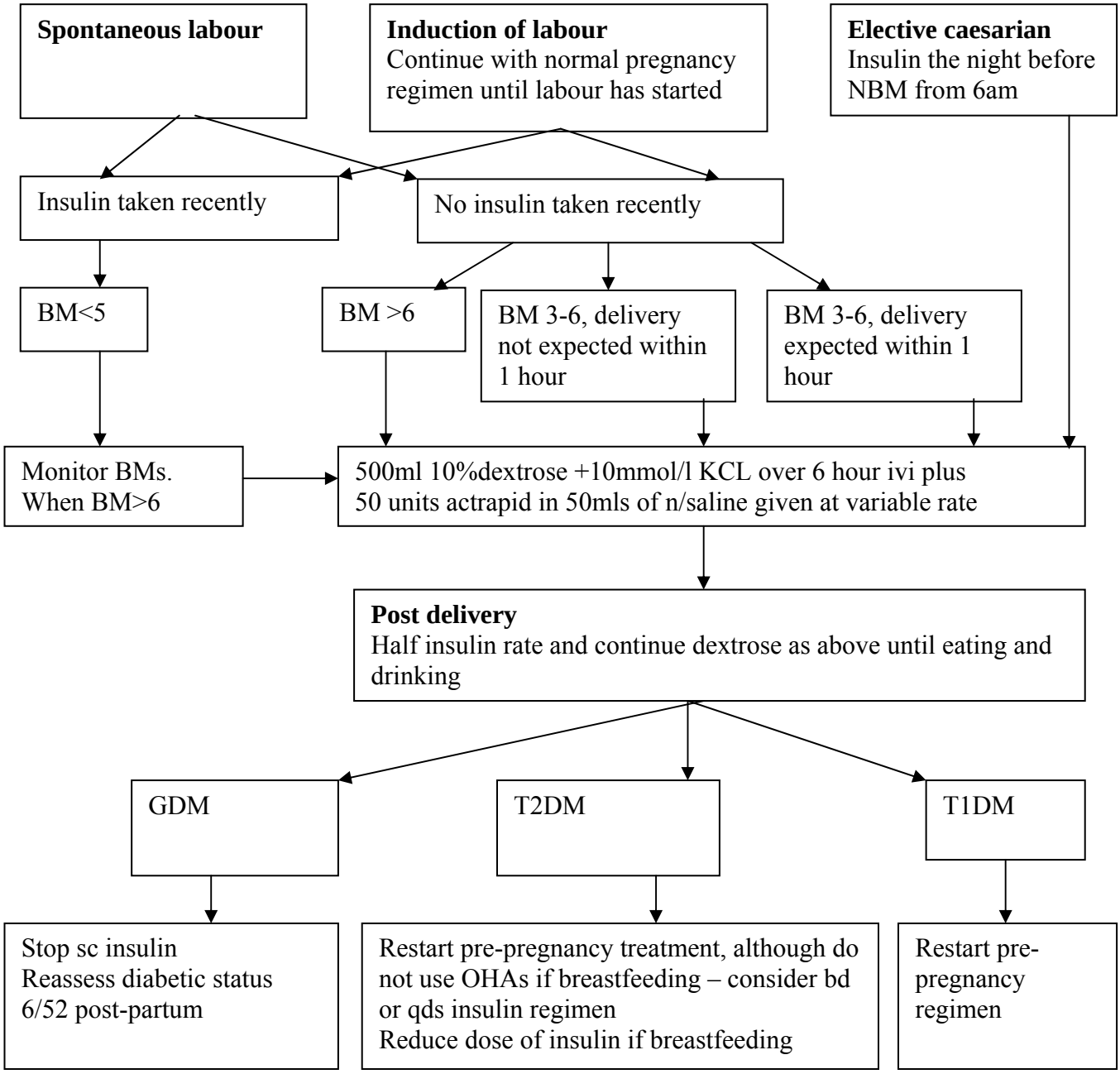
Post-delivery

Early feeding recommended, preferably breast-feeding

Management of patients with diet controlled diabetes in labour

No need to monitor BMs throughout labour. Most cases do not require iv dextrose and sliding scale insulin, unless particularly prolonged or complicated, thus proceed with labour as with non-diabetic patients

Management of patients with insulin treated diabetes during labour



CALCULATION OF SLIDING SCALE FOR USE IN LABOUR

For use in emergency situations when the insulin regime has not been written up prior to delivery.

The formula below can be used to derive insulin infusion rate according to capillary blood glucose monitoring.

1. 500 ml of 10% Dextrose with 10 mmols KCL to run over 6 hours via a Baxter pump.

2. 50 units of Actrapid in 50ml Normal Saline via the syringe driver (i.e. 1 unit/ml)

INSULIN SLIDING SCALE (UNITS/HOUR)

Total daily insulin dose = *X*
24 hours

Where *X* is	1	2	3	4	6	8
Blood Glucose 0 – 2.9	0.5	0.5	1	1	1	1
3 – 4.9	1	2	3	4	6	8
5 – 7	2	3	5	6	9	12
> 7	3	4	7	8	12	16

)ml/hr

BLOOD GLUCOSE CONTROL MUST BE TIGHT. AIM FOR BG BETWEEN 3-6 MMOLS/L

SECTION NINE:

Management of DM during special in-patient circumstances

MANAGEMENT OF DIABETIC PATIENTS PERI-MI

NAME: DATE OF M.I.:

HOSPITAL NUMBER: KNOWN DIABETIC

PREVIOUS TREATMENT: DIET TABLETS INSULIN

TREATMENT RECEIVED.

THROMBOLYSIS: STREP. rTPA

ASPIRIN: Y / N DOSE:

INSULIN: Y / N S.C / I.V. DURATION:

OTHER:

SECONDARY PREVENTION.

PATIENT HAS BEEN DISCHARGED ON:

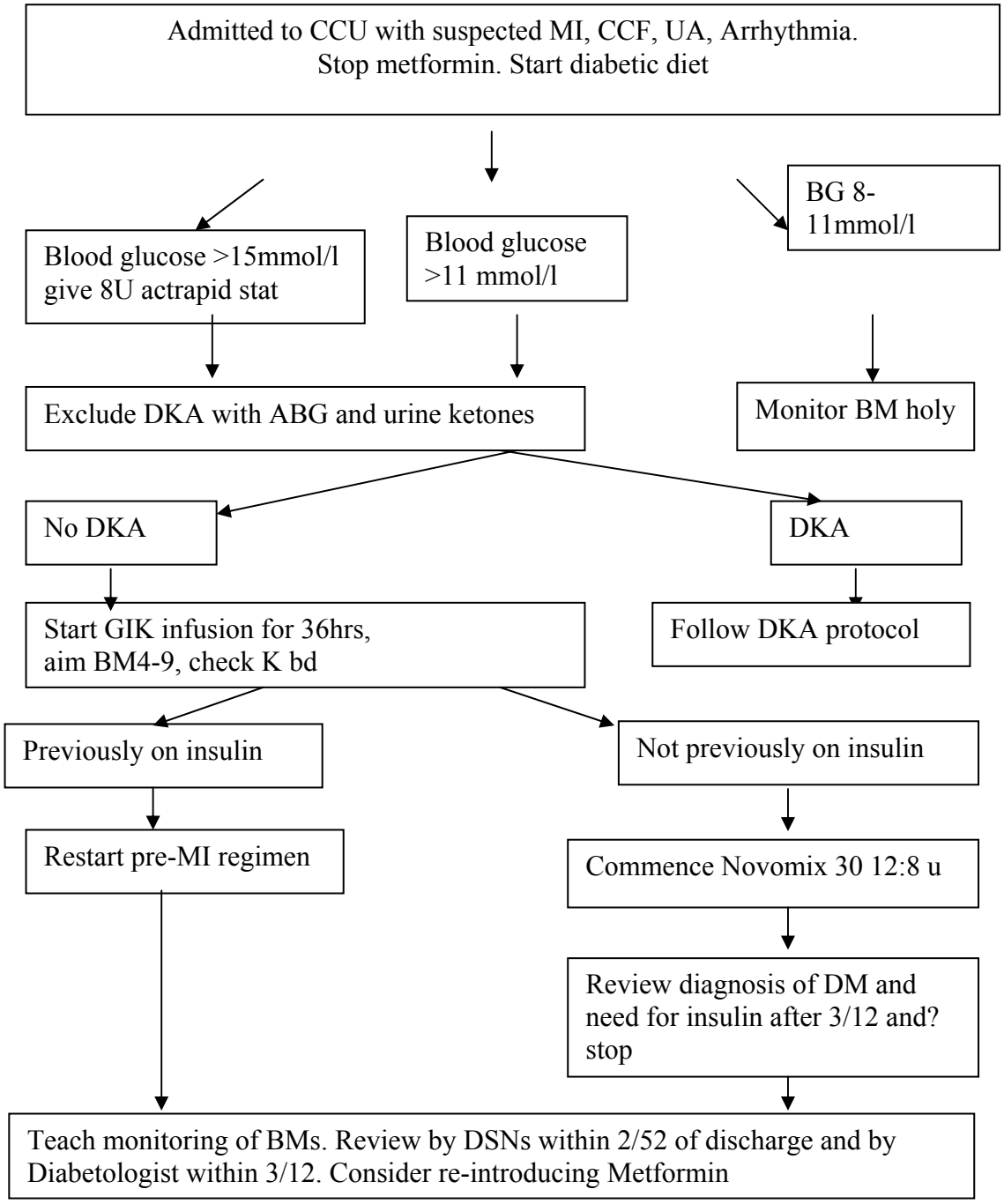
DIABETIC Rx: DIET TABLETS INSULIN

LIPID LOWERING Rx: STATIN FIBRATE OTHER

CARDIAC TREATMENT: ACE-I □BLOCKER OTHER

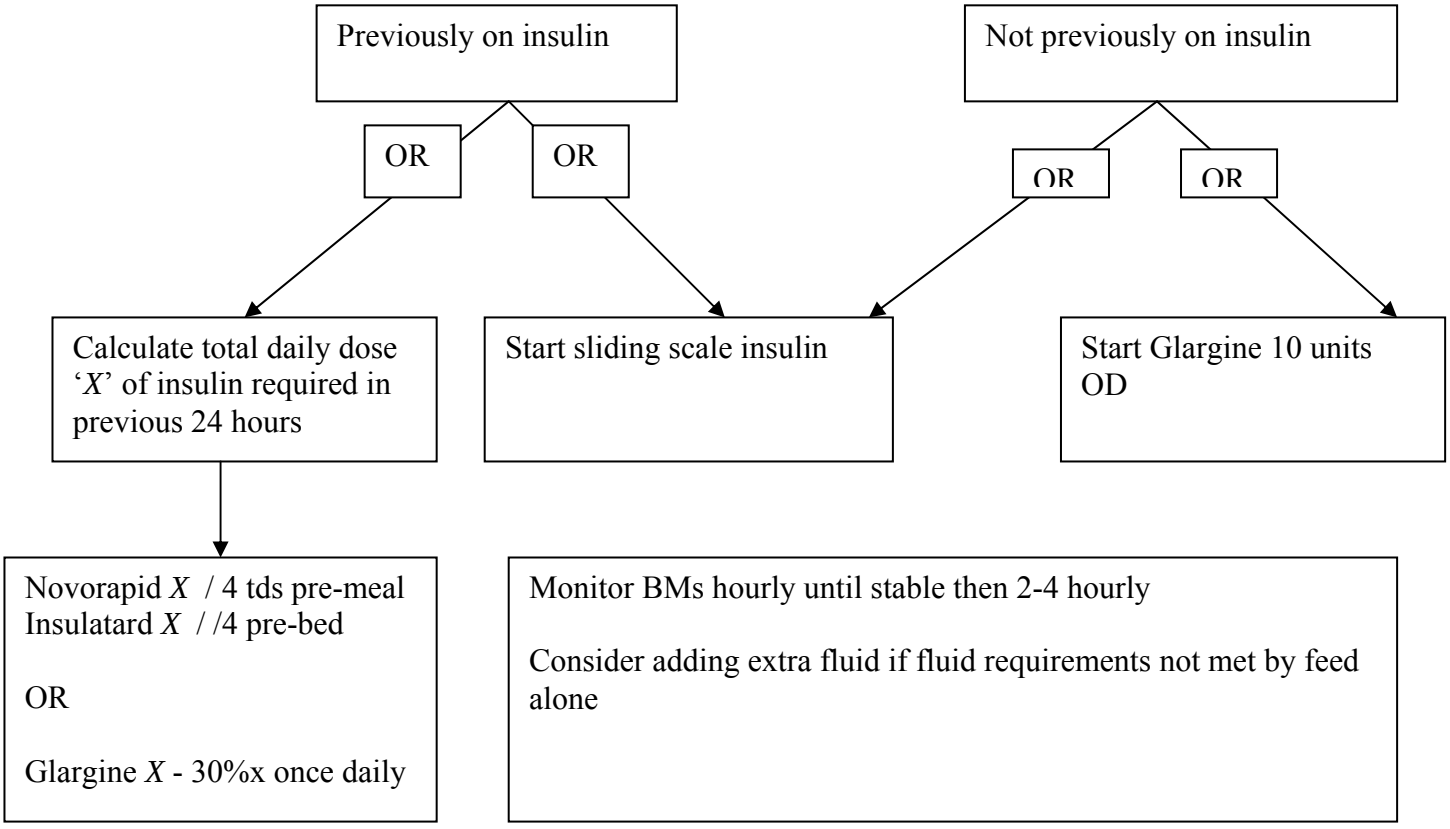
REFERRALS.

The patient has been referred to:
Diabetes team y / n Diabetic nurse y / n Dietitian y/n Cardiac rehabilitation y/n
Date of appointment with diabetes team

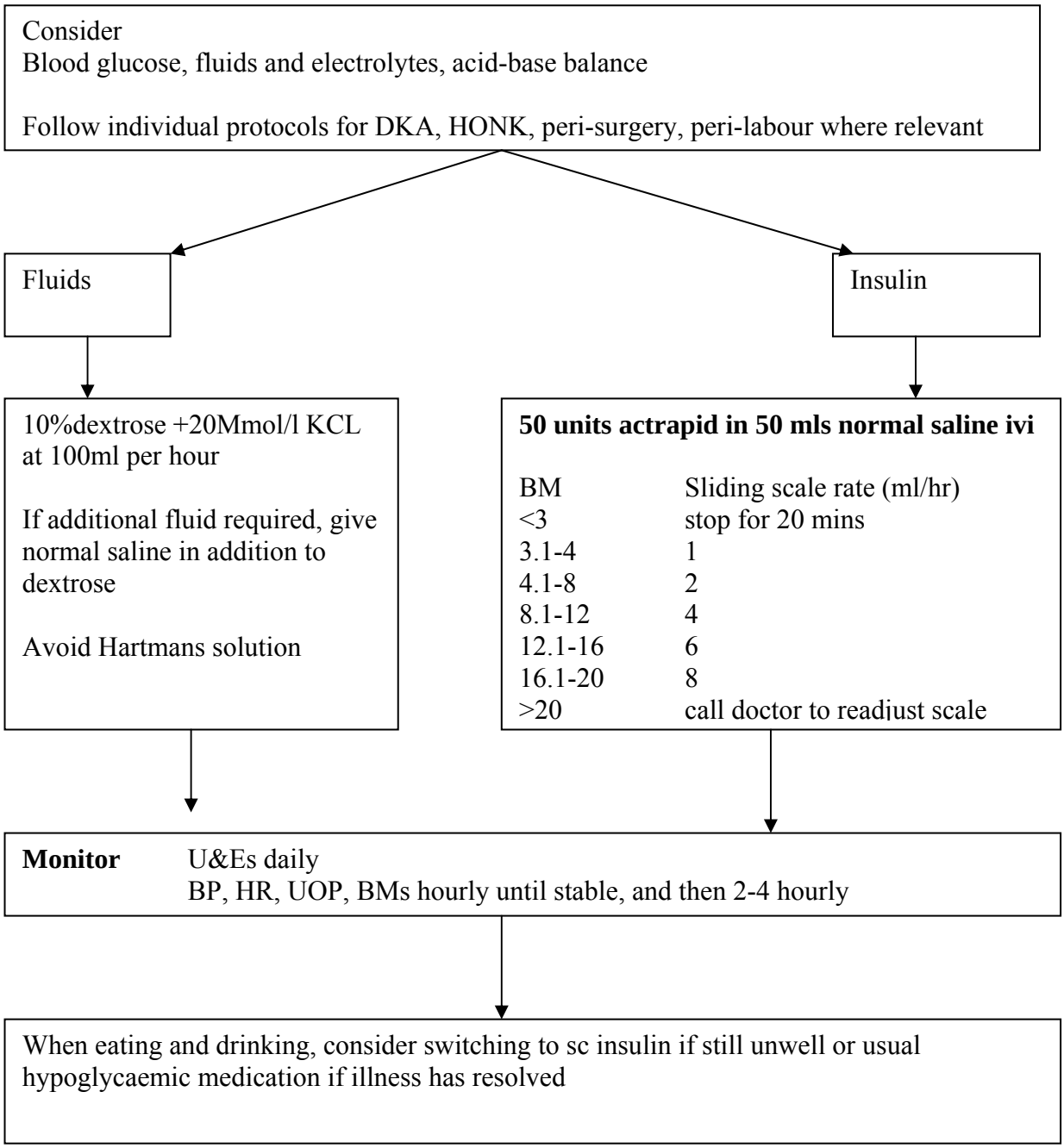


GIK iv infusion Glucose/K infusion =1 litre 10% dextrose + 40mmol KCL run at 40 ml/hour) Insulin infusion = 50 units actrapid in 50mls N/Saline run as detailed below Aim fro capillary glucose readings of 4 - 9mmol/l	
Blood glucose mmol/l	Iv insulin infusion rate
<4	0.5 ml/hour
4.1-6.9	2 ml/hour
7.0-10.9	4ml/hour
11-14.9	6ml/hour
15-18.9	8ml/hour
>19	Call Dr to reassess sliding scale

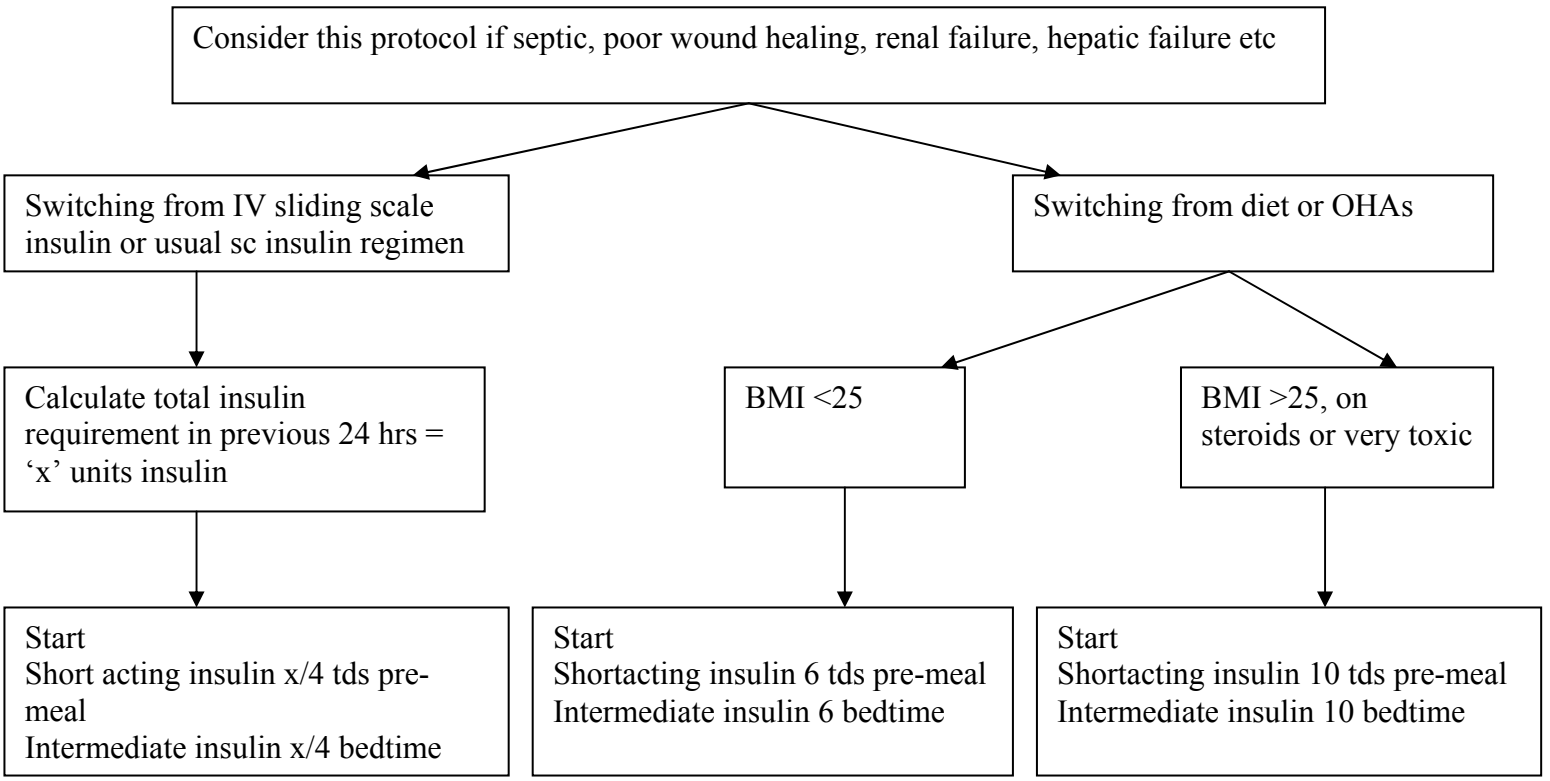
MANAGEMENT OF DIABETES DURING PARENTERAL FEEDING



MANAGEMENT OF DIABETES WHEN ACUTELY UNWELL AND NIL BY MOUTH



MANAGEMENT OF DIABETES WHEN ACUTELY UNWELL BUT ABLE TO EAT AND DRINK



In addition to this, consider writing up additional insulin ie

If BM >15mmol/l, give an additional 4 units of shortacting insulin pre-meal and 4 units of intermediate acting insulin pre-bed

If BM >20mmol/l, give an additional 6units of shortacting insulin pre-meal and 6 units of intermediate acting insulin pre-bed

Write up glucagon 1mg im to be given in the case of hypoglycaemia

MANAGEMENT OF DM DURING SURGERY

Pre-operative assessment.

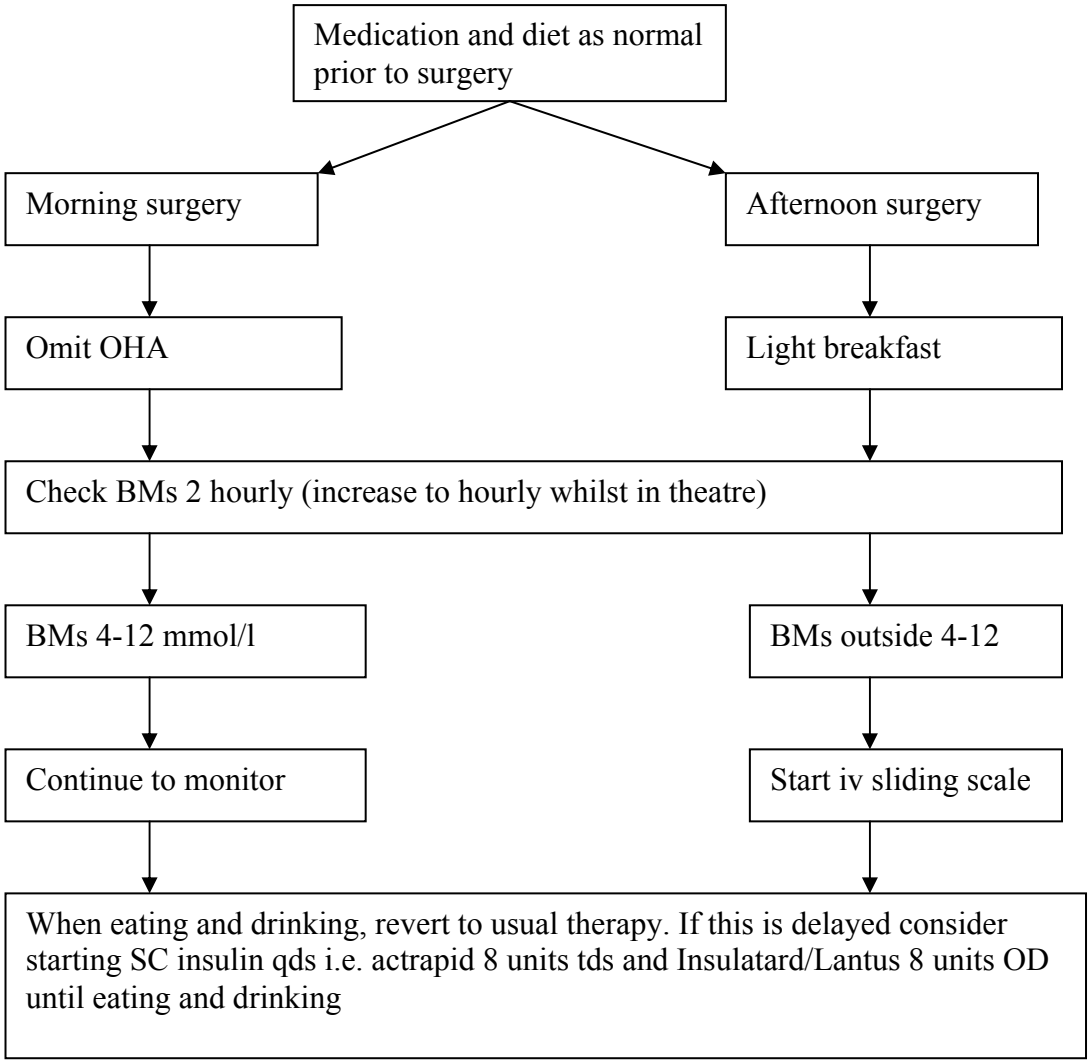
- Refer poorly controlled diabetic patients to the diabetes centre to optimise control prior to operation
- Try to list patient for first operation of the day
- Avoid long acting therapies ie Insulatard, Lantus, Chorpropamide in days leading up to operation. Ask Diabetologist re: alternative therapies.

General points during surgery.

- Avoid the use of Hartman's solution as fluid replacement
- Maintain BM between 4-9mmol/l at all times
- Use peri-operative BM charts
- Note risk of hypoglycaemia when NBM

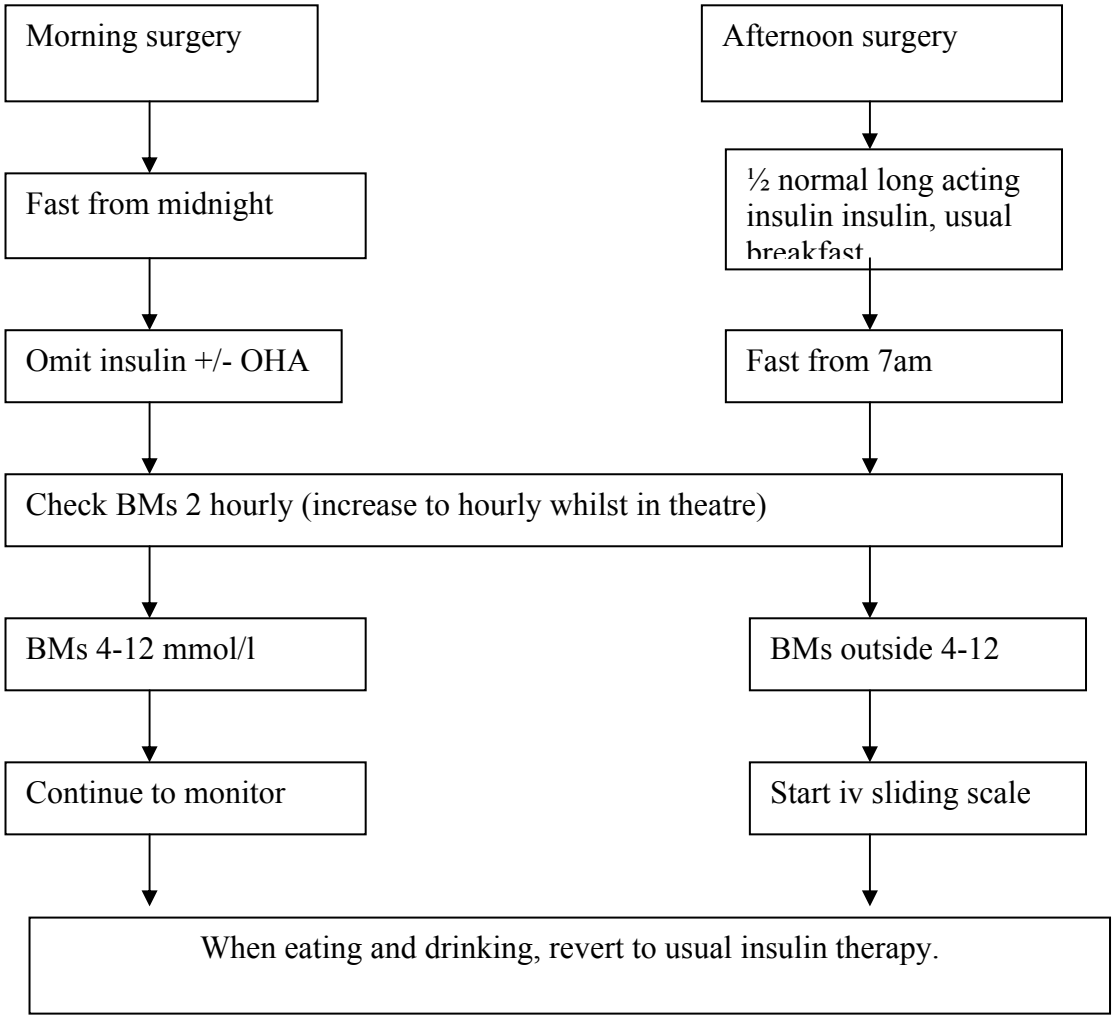
Management of T2DM during minor surgery

Ie pt needs to miss one meal and will return to eating within 4 hours of surgery



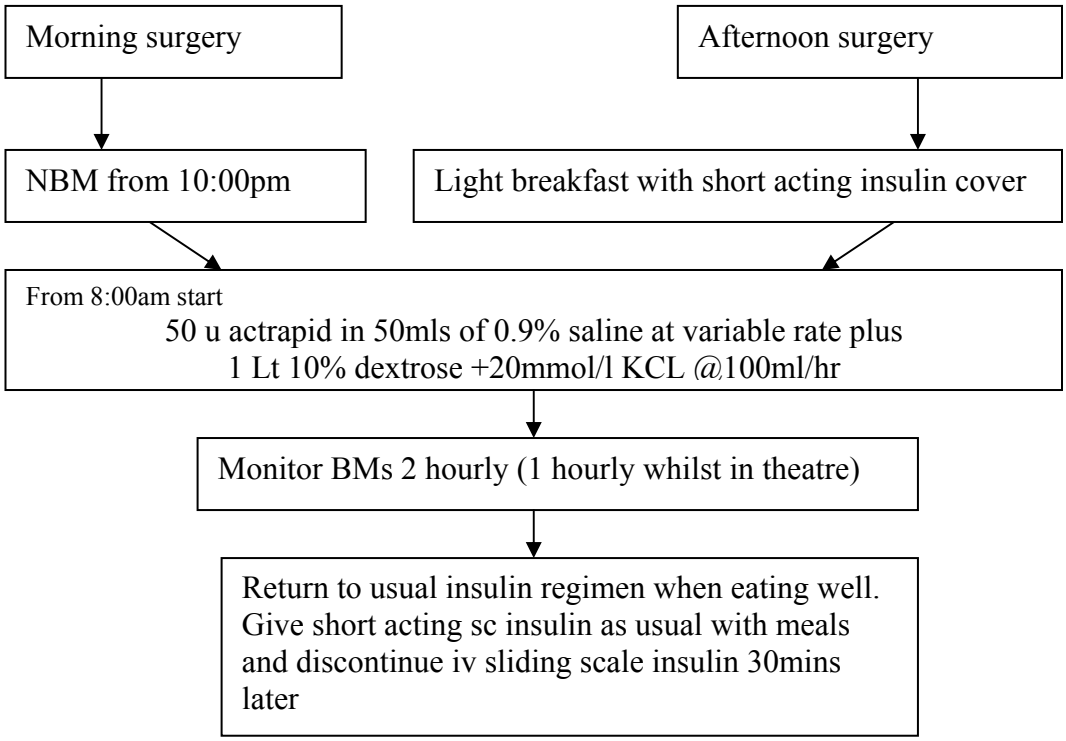
Management of T1DM or ITDM during minor surgery

Ie pt needs to miss one meal and will return to eating within 4 hours of surgery

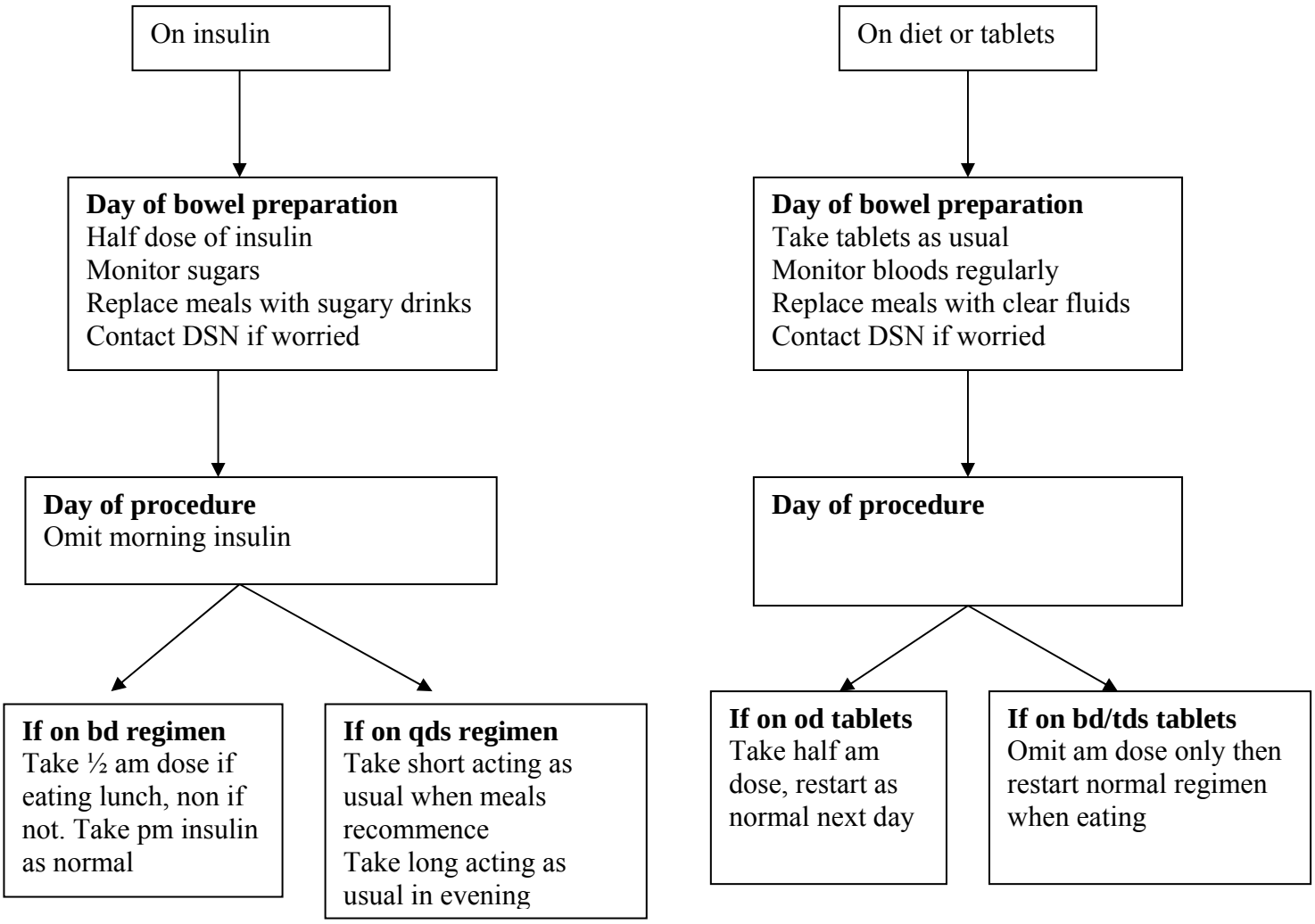


Management of T1DM during all elective surgery and ITDM during major surgery

(Ie not likely to recommence eating within 4 hours of surgery)



MANAGEMENT OF PATIENTS UNDERGOING BOWEL PREPARATION



Instructions For Preparation For Colonoscopy and Sigmoidoscopy

For Insulin Treated Diabetes Patients

For 1 day prior to the examination, it is necessary for you to have a fluid only diet. To enable you to have an adequate carbohydrate intake, maintain good blood glucose levels and take your normal doses of insulin, you require to take Polycal as follows:

Breakfast	**65ml**	**Polycal**
Mid-morning	**35ml**	**Polycal**
Lunch	**80ml**	**Polycal**
Mid-afternoon	**35ml**	**Polycal**
Evening Meal	**80ml**	**Polycal**
Supper	**35ml**	**Polycal**

You may dilute the Polycal with water, as you would a squash drink. In addition, you may freely drink the following fluids chosen from the list below:

Tea with lemon (sweetened if necessary with artificial sweetener)
Black coffee (sweetened if necessary with artificial sweetener)
Water, Soda Water, Slim Line tonic water. Sugar free fruit squash diluted
Sugar free lemonade
Consommé soup
Sugar free Jelly

You must not have **MILK** or any drink containing **MILK.**

The day before your appointment:

Fluid only diet, no solid food.

At 3pm take 1st sachet of Picolax

The contents of this should be added to a glass of water. This will heat up. Allow to cool before drinking. Repeat this with the 2nd sachet of Piclolax at 7pm the same evening. Inject your normal doses of insulin at your normal times, taking Polycal as instructed at meal times, plus free fluids as desired.

On the morning of your examination

Take short acting insulin only. Have Polycal at breakfast and free fluids. For mid-morning snack take Polycal again, **THEN NOTHING MORE TO DRINK** until after your test.

For patients who normally take a pre-mixed insulin i.e. Mixtard or Novomix, it will be necessary for you to be prescribed a dose of soluble insulin for the morning of your appointment only. Your blood sugar may well be checked prior to during and after the examination.

If you experience hypoglycaemia whilst preparing for this examination, please treat your hypoglycaemia by taking Lucozade 50ml and if necessary a further 50ml Lucozade. **DO NOT** take **MILK** and glucose.

INSTRUCTIONS FOR NON INSULIN TREATED PEOPLE WITH DIABETES MELLITUS ATTEDING THE DAY SERVICES UNIT FOR COLONOSCOPY OR SIGMOIDOSCOPY

For one day prior to this examination you will be required to have a fluid only diet. This means no solid food and no milk, although you are encouraged to drink at least two litres of fluid a day from the list below:

Tea with lemon (sweetened with sweeteners if required)
Black coffee
Water, soda, slimline tonic, diluted sugar free squash
Bovril, Oxo, Marmite, stock cubes
Sugar free lemonade
Consommé (clear soup)
Sugar free jelly

In order to do this safely you need to take your usual medications and monitor your blood glucose closely. You also need to take the Polycal you have been given as follows:

Breakfast	**70mls**
Lunch	**70mls**
Evening Meal	**70mls**
Supper	**20mls**

If you experience hypoglycaemia you should take 50mls of Lucozade (or similar) and a further 50mls at a time until normal blood glucose level is reached**. DO NOT TAKE MILK AND SUGAR.**

At 3pm take the first sachet of Picolax mixed with a glass of water (allow to cool before drinking). **Repeat this at 7pm** with the second sachet.

On the morning of surgery do not take any diabetes medications. Have **Polycal 70mls** again at breakfast and **free fluids** until admission. Lucozade (or similar) may be taken again if hypoglycaemia occurs. Monitor blood glucose frequently.

Once your procedure is finished, you will be encouraged to eat and drink. Sandwiches are provided but if you are on any special diet (e.g. low fat, coeliac etc.) it is advisable to bring your own. Your medication should be recommenced once your next dose is due. **Please bring your medication** with you.

SECTION TEN:

Management of diabetic emergencies

MANAGEMENT OF DIABETIC KETOACIDOSIS

Diabetic ketoacidosis (DKA) is still associated with up to a 10% mortality. Age and conscious level are most closely associated with poor prognosis. The main causes of death are:

- hypokalaemia
- aspiration of gastric contents (due to gastroparesis)
- cerebral oedema (particularly in young adults and children)

ESTABLISH THE DIAGNOSIS

- Newly diagnosed Type 1 DM or known cases of Type 1 DM
- Hyperglycaemia (beware of euglycaemic DKA)
- Presence of ketones in the urine and ketonaemia
- Acidosis (pH <7.1 or HCO_3^- <16 mmol/l)
- ± Decreased conscious level

CONSIDER PRECIPITATING EVENT

- Usually underlying infection
- Newly presenting patient
- Acute abdomen (pancreatitis is often present in patients with DKA)
- In older patients consider silent MI

INITIAL INVESTIGATIONS

- Glucose
- U and Es (HCO_3^- if possible), amylase
- Infection screen (include CXR), and consider blood cultures
- Arterial blood gases (in some circumstances venous HCO_3^- is adequate)
- Urinalysis (check for ketones)
- Dipstick ketostix into serum (clotted blood sample)

INITIAL MANAGEMENT

- Site nasogastric tube (consider in all subjects mandatory if GCS <8)
- Intravenous access
- Insulin and fluid replacement
- Consider antibiotics
- Low molecular weight heparin
- Insert a urinary catheter if no urine output in first 3 - 4 hours of treatment, or if the patient is clinically shocked and/or has a reduced conscious level
- CVP line considered in the elderly and those with IHD
- Monitor U and Es, HCO_3^- and Glucose after 2 hours, and then at least 4 hourly until the patient is stable.

DEFICITS TO REPLACE IN AVERAGE 70 KG PATIENTS

- 200 - 600 mmol of K^+
- 6 - 12 litres of fluid
- consider Phosphate (average loss 25 mmol)

INSULIN REPLACEMENT

- give 10 units of actrapid iv or im stat
- Commence IV infusion (50 units of Human Actrapid in 50 mls of N/Saline)

Suggested insulin infusion:

BM up to 4 mmol/l	0.5 units per hr
BM up to 4.1 - 7 mmol/l	1 unit per hr
BM up to 7.1 - 9 mmol/l	2 units per hr
BM up to 9.1 - 11 mmol/l	3 units per hr
BM up to 11.1 - 17 mmol/l	4 units per hr
BM up to > 17 mmol/l	6 units per hr

- If the blood glucose falls by less than 10% in the first 2 hours, increase the insulin infusion

BM up to 11.1 - 17 mmol/l	6 units per hr
BM up to > 17 mmol/L	8 units per h

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- Caution is required in patients who remain ketotic, and if urinalysis shows >++ ketones, then intravenous insulin should be continued a further 24 hours, and the patient should not be discharged home

WATER AND SALT REPLACEMENT

- Rapid replacement with hypotonic fluids precipitates cerebral oedema.
- Average deficit 6 - 12 litres
- Aim to replace half the fluid deficit in the first 12 hours, the rest over the next 24 hours.
- Change to 5% dextrose once blood sugar to less than 13 mmol/l
- The fluid advice applies to average size young adults: beware in children and the elderly, particularly those with IHD, and consider a CVP line.

Suggested fluid regimen
500 ml N/Saline an hour for the first 4 hours
500 ml N/Saline 2 hourly for the next 4 hours
500 ml N/Saline 4 hourly for the next 4 hours = 3½ litres in 12 hours

POTASSIUM REPLACEMENT

- Initial blood potassium levels are often high
- Insulin and fluid replacement often causes acute drop in potassium, particularly within the first one to two hours (Hypokalaemia is a significant cause of death)
- Need to replace at least 200 mmol potassium in the first 24 - 36 hours
- If blood potassium is > 6 mmol/l, do not replace potassium in the first bag of N/Saline, but otherwise 20 mmol/l in first six 500 ml bags (i.e., 10 mmol), then in alternate bags of fluid.
- Check the blood potassium level after two hours of treatment.

PHOSPHATE REPLACEMENT

- 15% of patients develop a phosphate less than 0.5 mmol/l, which can drop once insulin is started
- Hypophosphataemia can cause reduced consciousness and reduced respiratory effort.
- Replace phosphate if < 0.5 mmol/l, check daily until patient stable.

BICARBONATE REPLACEMENT

- Should be avoided unless in extreme circumstances i.e. if pH<6.9mmol/l
- give 75 mmol/l with 20 mmol/l K^+ over 30 mins (Give as isotonic 1.26% Sodium Bicarbonate, 500 mls contains 75 mmol/l)
- repeat arterial blood gases after 30 minutes.

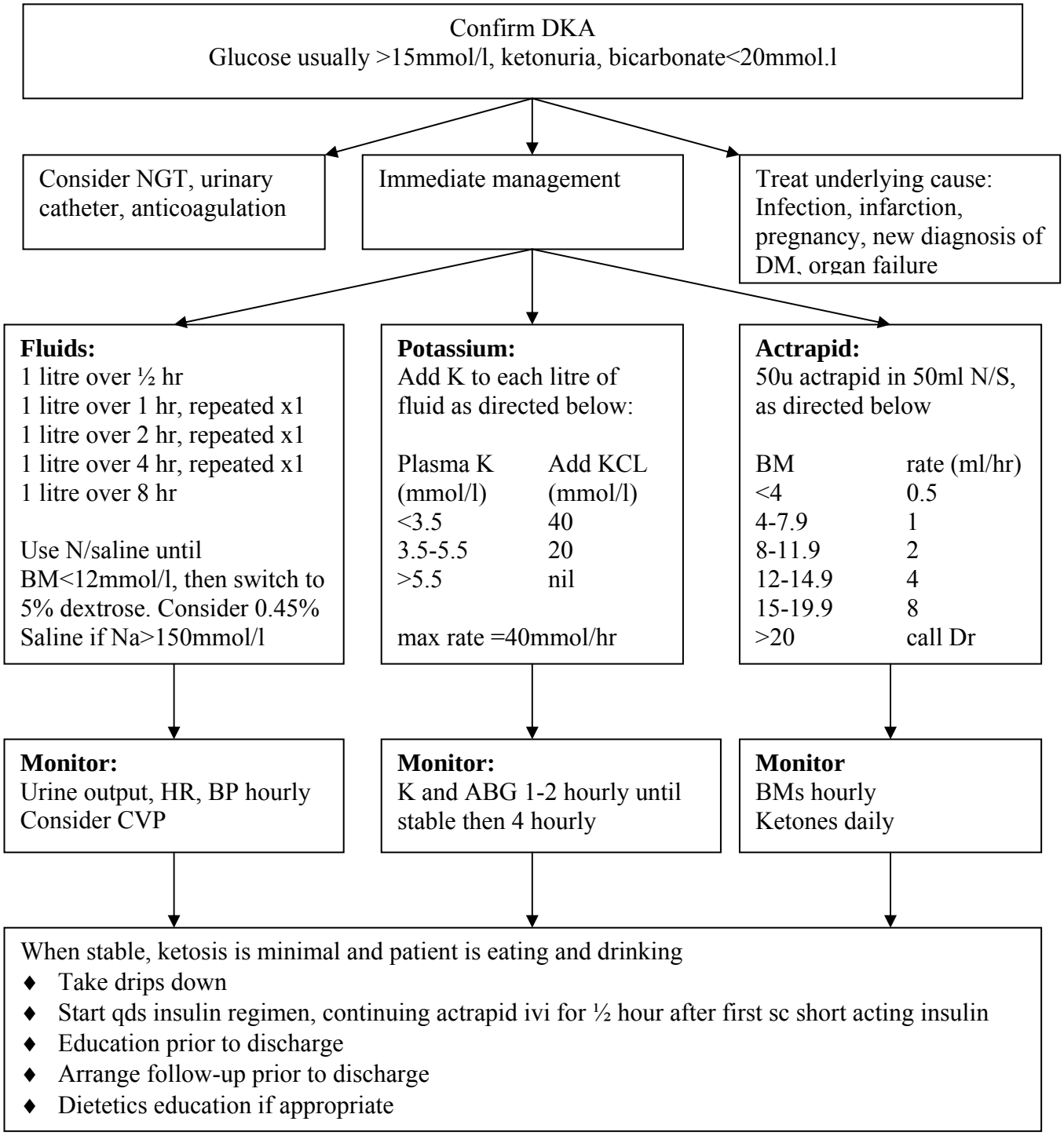
TRANSFER TO SUBCUTANEOUS INSULIN

When the patient is able to eat and drink, transfer back to subcutaneous (s/c) insulin, using 90% of the previous day's intravenous requirements in two equally split doses in patients not previously receiving insulin. The starting insulin regimen can be a twice-daily 30/70 fixed mixture, rarely once daily basal insulin, or a basal-bolus regimen. Patients should be referred to a Diabetes Nurse Specialist. Patients with pre-existing Type 1 DM should usually be transferred back to their usual insulin and doses, although the Diabetes Team may consider making changes.

Nursing Interventions:

♦ Assess	Airway, breathing and circulation
♦ Observations	1 hourly then 2 – 4 hourly once clinically indicated BP, HR, Temp, respiratory rate, Sats, Glucose Neuro Obs if reduced conscious level – hourly
♦ Urinalysis	Dipstick urine for ketones, MSU if clinically indicated
♦ Patient may be confused	Maintain safety, cot sides required, reassure, orientate
♦ Strict fluid balance chart	Catheterise as prescribed by medics
♦ Medication	Administration of insulin, heparin and Iv fluids
♦ Referral to Diabetic team	

ALGORITHM FOR MANAGEMENT OF DKA



MANAGEMENT OF HYEROSMOLAR NON-KETOTIC DIABETIC STATE (HONK)

Management is largely the same as for diabetic ketoacidosis, but is associated with up to a 50% mortality. The patients are usually elderly and the condition is usually secondary to an underlying primary pathology. The main causes of death are:

- aspiration of gastric contents (due to gastroparesis)
- cerebral oedema
- thromboembolic complications
- the underlying primary pathology

ESTABLISH THE DIAGNOSIS

- Undiagnosed Type 2 DM or known cases of Type 2 DM
- Hyperglycaemia (blood glucose often > 28 mmol/l)
- Usually no ketones in the urine, although may be present in patient with vomiting (Particularly trace or 1+)
- No severe acidosis (pH >7.2 and HCO_3^- often normal)
- Hyperosmolality (serum osmolality >350 mosm/l)
- 50% of patients are hypernatraemic
- ± decreased conscious level and mental confusion

CONSIDER PRECIPITATING EVENT

- In elderly patients, consider MI, chest infection, etc
- Usually underlying infection (URTI, diarrhoea and vomiting, UTI, etc, while temp and WCC unhelpful)
- Newly presenting patient
- Acute abdomen

INITIAL INVESTIGATIONS

- Glucose
- U and Es, (HCO_3^- if possible), amylase
- Infection screen (including CXR and blood cultures)
- Arterial blood gases
- Calculation of serum osmolality {= $2(K^+ + Na^+)$ + urea + glucose (all in mmol/l)}, and measurement by the laboratory
- Urinalysis
- CXR and ECG

INITIAL MANAGEMENT

- Site nasogastric tube (consider in all subjects mandatory if GCS <8)
- Intravenous access
- Insulin regime (see below)
- Fluid replacement (see below)
- Consider antibiotics
- Stop Metformin
- Low molecular weight heparin (or equivalent), and consider full heparinisation if serum osmolality >350 mosmol/l
- Catheterise if no urine output in first 3 - 4 hours of treatment, or if the patient is clinically shocked and/or has a reduced conscious level
- CVP line often required, particularly in those with IHD
- Monitor U and Es and glucose after 2 hours, and then at least 4 hourly until the patient is stable
- Protection of pressure areas, particularly heels (Spenco boots should be considered)

AVERAGE DEFICIT TO REPLACE IN 70 KG PATIENT

- 200 - 300 mmol of K^+ (often smaller amounts of K^+ are required than in DKA)
- 6 - 12 litres of fluid (fluid requirements are likely to be greater than DKA but risks of cardiac failure are also greater)

INSULIN REPLACEMENT

- Give 10 units of Human Actrapid stat (IV or IM)
- Commence IV infusion (50 units of soluble insulin in 50 mls of N/Saline)
- Check the insulin infusion if there is any doubt (eg, has the cannula tissued?)
- For the first 12 hours, the BM should be done 1 hourly
- Capillary blood glucose testing can be unreliable and laboratory blood glucose is important as a cross reference
- When stopping insulin infusion overlap with s/c insulin or oral hypoglycaemic agents by at least 30 mins

BM up to 4 mmol/l	0.5 units per hr
BM up to 4.1 - 7 mmol/l	1 unit per hr
BM up to 7.1 - 9 mmol/l	2 units per hr
BM up to 9.1 - 11 mmol/l	3 units per hr
BM up to 11.1 - 17 mmol/l	4 units per hr
BM up to > 17 mmol/l	6 units per hr

SALT AND WATER REPLACEMENT

- Rapid replacement with hypotonic fluids precipitates cerebral oedema
- Average deficit 6 - 12 litres
- Aim to replace half the fluid deficit in the first 12 hours, the rest over the next 24 hours.
- Change to 5% dextrose once blood sugar around 15 mmol/l
- If the sodium concentration is >150 mmol/l, use 0.45% Saline (½ N/Saline)

e.g. to replace 7 litres of fluid
500 ml N/Saline an hour for the first 4 hours
500 ml N/Saline 2 hourly for the next 4 hours
500 ml N/Saline 4 hourly for the next 4 hours = 3½ litres in 12 hours

POTASSIUM REPLACEMENT

- Initial potassium often high
- Insulin and fluid replacement often causes acute drop in K^+, particularly within first 1 - 2 hours
- Need to replace about 200 mmol K^+ in first 24 - 36 hours, usually at rate of 10 mmol/l per hour
- Check K^+ after 2 hours of treatment

TRANSFER TO S.C. INSULIN OR ORAL HYPOGLYCAEMIC AGENTS

When the patient is able to eat and drink, transfer to subcutaneous (s/c) insulin, using 90% of the previous day's intravenous requirements in two equally split doses in patients not previously receiving insulin. The starting insulin can be either a 30/70 fixed mixture or background insulin alone. Refer the patient to the Diabetes Nurse Specialist. Patients with pre-existing insulin-treated DM should usually be transferred back to their usual insulin and doses, although the Diabetes Team may consider making changes. Some patients with HONK may be treated with oral hypoglycaemic therapy on recovery.

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Nursing Interventions:

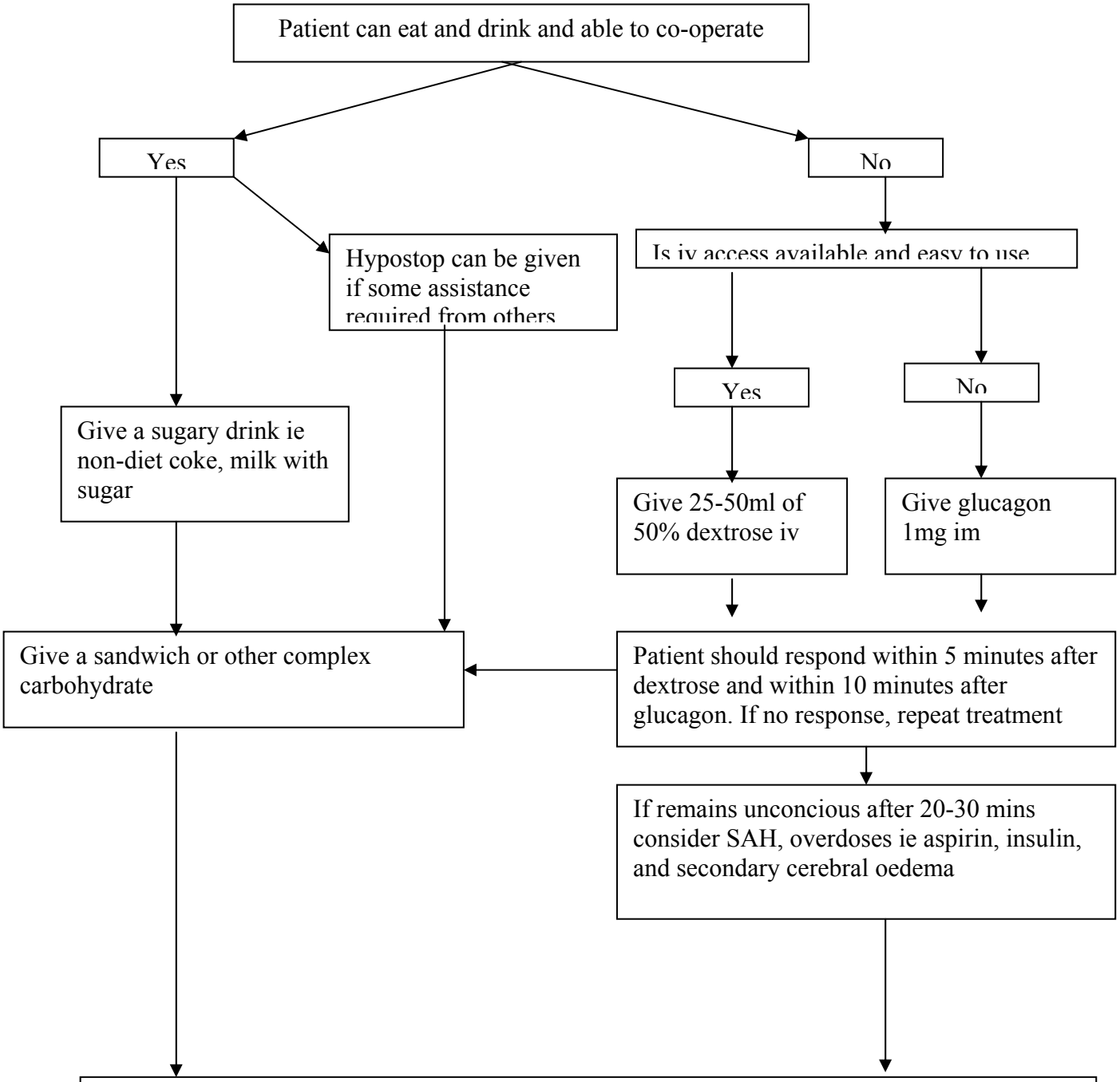
♦ Assess	Airway, breathing and circulation
♦ Observations	1 hourly then 2 – 4 hourly once clinically indicated BP, HR, Temp, respiratory rate, Sats, Glucose Neuro Obs if reduced conscious level – hourly
♦ Urinalysis	Dipstick urine for ketones, MSU if clinically indicated
♦ Patient may be confused	Maintain safety, cot sides required, reassure, orientate
♦ Strict fluid balance chart	Catheterise as prescribed by medics
♦ Medication	Administration of insulin, heparin and Iv fluids
♦ Referral to Diabetic team	

MANAGEMENT OF HYPOGLYCAEMIA

ESTABLISH THE DIAGNOSIS

Hypoglycaemia is defined as a laboratory blood glucose sample of <2.2mmol/l.
Capillary glucose reading will normally be less than 4 mmol/l

INITIAL MANAGEMENT



SECTION ELEVEN:

Local Contact numbers