You are a supplementary prescriber working in a diabetes clinic when John Stephens A 54-year-old insulin-dependent diabetic man has come to see you. He is still overweight despite being on the maximum dose of metformin and gliclazide. His HbA1c is 9.0% and on examination he has neuropathy developing in his feet. He is also on ramipril 10 mg, simvastatin 40 mg and aspirin 75 mg daily. His blood pressure was 130/80 mmHg and his total cholesterol was 4.0 mmol/L (reading from three months ago). There is no microalbuminuria present.

**1. What are the clinical issues for this patient? What leads you to this conclusion?**

His diabetes is not well controlled as he has neuropathy and high blood sugar levels. His weight must be controlled by diet and exercise otherwise he will develop insulin resistance and require injections.

**2. What are the macrovascular and microvascular complications of the condition, and which of them is he exhibiting?**

Macrovascular complications are related to the cardiovascular system. His blood pressure and cholesterol are being controlled. Microvascular complications will arise from prolonged high levels of glucose in the blood as signified by the high HbA1c reading. These will include neuropathy, nephropathy and retinopathy. He is starting to demonstrate neuropathy, which could lead to amputation if not controlled.

**3. What is HbA1c and what does this result mean?**

Red blood cells are composed of haemoglobin. Glucose sticks to the haemoglobin to make a glycosylated haemoglobin molecule (HbA1c). The more glucose present in the blood, the more HbA1c will be present. Red blood cells live for 8–12 weeks before they are replaced. HbA1c indicates how high a patient’s blood glucose has been on average over the previous 8–12 weeks. A normal non-diabetic HbA1c is 3.5–5.5%. In diabetes about 6.5% is good. Glucose levels averaging 6.5 mmol/L is equivalent to 7% HbA1c. John’s reading of 9% is equivalent to average blood glucose of 13 mmol/L which indicates poor control.

**4. Assuming the cardiovascular complications are controlled critically appraise the treatment options available.**

The aim of treatment is for the patient to attain the target HbA1c level of 6.5%, but not below this, to reduce the risk of suffering with microvascular complications. All patients should be given structured education (such as diet and exercise) and self-monitor their plasma glucose to ensure that they attain their individually agreed target. All choices are based on patient acceptability and cost-effectiveness. The following steps are recommended if HbA1c is not maintained below 7.5%: If metformin alone does not control the HbA1c, then metformin and a sulfonylurea should be given. A thiazolidinedione can be substituted for either agent if unacceptable side effects occur, such as nausea or hypoglycaemia. A rapid-acting insulin secretagogue may be added for people with erratic lifestyles, as it can be given once daily. Add insulin or a thiazolidinedione (only if insulin is likely to be unacceptable or ineffective). Exenatide may be considered if the criteria are met, such as a BMI of > 35 kg/m2, on a cost effectiveness basis. Increase insulin dose and intensify regimen over time. May consider pioglitazone in combination with insulin if thiazolidinedione has been effective previously or high dose insulin is providing inadequate control.

**5. How should insulin therapy be introduced and give examples of suitable regimens?**

If fasting glucose >6 mmol/L add intermediate-acting insulin 6–10 units at bedtime. Increase dose by 1–2 units every 3 days until blood glucose target is reached. If fasting glucose is normal but daytime glucose levels are above target level, add intermediate acting insulin, 6–10 units at breakfast time. Increase by 1–2 units every 3 days until target is reached.

**6. What insulin administration devices are there and what different types of insulin are available?**

Devices include: vial + syringe, penfill cartridge + injection device, Flexpen (ready filled) – InnoLet device has a large dial on it continuous subcutaneous infusion.

***Types of insulin:***

1. short acting – soluble/aspart/glulisine/lispro
2. intermediate acting – isophane/biphasic aspart/biphasic lispro/biphasic isophane
3. long acting – protamine zinc/detemir/glargine.

Most come in highly purified animal and human sequence versions. Animal versions are used in patients with large titres of antibodies to human insulin.

**7. Produce a pharmaceutical care plan for this patient and include the goals of therapy.**

***Goals include:***

1. lifestyle – smoking cessation, weight loss and increased exercise levels
2. blood glucose control – HbA1c <7.0%
3. blood pressure <135/75 mmHg
4. lipids – total cholesterol maintain <5.00 mmol/L
5. antiplatelet treatment.

**8. What monitoring does John require?**

***Monitoring should include:***

1. twice daily blood glucose levels at different times of the day
2. six monthly HbA1c and blood pressure
3. annual lipid, U&Es, microalbuminuria and review with clinician.