Royal Berkshire NHS
NHS Foundation Trust

Diabetes – Use of subcutaneous insulin and oral hypoglycaemics in the Maternity Unit (GL943)

Approval

Approval Group	Job Title, Chair of Committee	Date
Maternity & Children's Services Clinical Governance Committee	Chair, Maternity Clinical Governance Committee	3rd October 2014

Change History

Version	Date	Author, job title	Reason
1.0	March 2014	Deirdre Graham	Clinical requirement

Overview

Insulin, whether naturally produced or given externally, is essential to bring down the blood glucose within the narrow normal range of, approximately, 4 – 6 mmol/L.
Insulin injections are used to provide insulin to those whose production has ceased, to those whose production is insufficient and to supplement those who are highly resistant to their own insulin.
The National Patient Safety Agency and the National Diabetes Inpatient Audit have demonstrated that drug errors commonly occur with the administration of insulin, in some cases leading to death.
Women with insulin dependent diabetes form a very small proportion of our pregnant population causing infrequent practise in the care of these women.

The abbreviation VRII (Variable Rate Insulin Infusion**) will be used in place of the term insulin sliding scale and the abbreviation CSII used for continuous subcutaneous insulin infusion**

Insulin administration

- Insulin is destroyed in the stomach, therefore cannot be taken orally
- Insulin is measured in 'units'
- Insulin is given subcutaneously or intravenously
- Most women on insulin will use a multi-dose pen. The pen contains a cartridge which, when full, contains 300 units of insulin. The pen may be disposable, or, the pen may be reusable, i.e., the pen has a removable insulin cartridge, which is renewed when needed and the pen retained.
- The woman attaches a needle to the pen, which should be renewed for each injection given.
- Due to the risk of sharps injury when changing needles, pens are for patient use only.
- If a woman arrives at the hospital without her insulin and blood glucose meter, **send a relative home to get it immediately**. If a delay is expected, suitable insulin should be obtained immediately from pharmacy or from one of the medical wards.

Self-administration of insulin

- Most women, who are not on intravenous insulin, self-administer subcutaneous doses.
- To protect the woman and the midwives looking after her, the Trust has a Self-administration of Insulin Policy, which must be followed. The full document may be found on the Trust intranet Policy hub in Policies & Protocols>Clinical documents>Diabetes & Endocrinology>Insulin self management protocol. A summary of the procedure, including additional notes for midwives may be found at the end of this document in Appendix 1.

Midwife administration of insulin

- **A midwife must use a 10 ml vial of insulin with an insulin syringe and needle. Non-insulin 1 ml syringes must not be used under any circumstances to draw up insulin.**
- When started, a vial of insulin has a shelf life of six weeks. The date of first use must be marked on the ampoule.

- An insulin cartridge intended for a pen must not be used with a needle and syringe.
- Insulin syringes come in 2 sizes, i.e., 50 units (0.5ml) or 100 units (1ml).
- Care should be taken regarding the size of the syringe used when drawing up insulin.
- Insulin syringes come with a needle attached. Ideally, this should be no longer than 8 mm. Shorter than 8mm are not usually available. Needles of 12.7 mm are sometime seen and their use should be avoided.
- On administering insulin using an 8mm needle a small skin fold should be pinched up to avoid the insulin being injected into the muscle layer. The needle should be passed through the skin at a right-angle.
- On administering insulin using a 12.7 mm needle, a skin fold should be pinched up and the needle introduced through the skin at a 45^0 angle.
- At the end of the injection, the needle should be left in the tissue for 10 seconds to allow all the insulin to leave the syringe and needle.
- It should be noted that the following commonly used insulin's do not come in 10 ml vials,
  - Novomix 30: women can be changed to Humalog Mix 25 until their own pen is available
  - Levemir (Detemir): women can be changed to Lantus (Glargine) until their own pen is available
- The following insulin's are interchangeable, on a temporary basis,
  - Novorapid (insulin Aspart) may be interchanged with Humalog (insulin Lispro) and vice versa in the event that pharmacy does not have 10 ml vials of one of these insulin's

Insulin delivered by Continuous Subcutaneous Insulin Infusion - CSII (Insulin pump)

- The hospital protocol for the management of inpatients on insulin pumps is to be found on the Trust intranet Policy hub in Policies & Protocols>Clinical documents>Diabetes & Endocrinology>Diabetic Inpatient Insulin Pump Therapy Guidelines)
- A CSII delivers a small dose of insulin continuously, via a cannula inserted into the subcutaneous fat, from an infusion pump containing a cartridge of insulin. The dose may vary slightly through the 24 hours. At meal times, the woman also gives a bolus dose of insulin via the pump, with the dose adjusted to the amount of carbohydrate taken.
- The woman will not take any long acting insulin.
- An inpatient should only remain on a CSII providing she is fully able to manage the pump herself. If the pump needs to be discontinued, this must be done in agreement with the woman
- In the event of pump removal or malfunction, women using a CSII can develop diabetic ketoacidosis more quickly than in those using individual insulin injections
- If needed, a VRII** should be commenced before a CSII is removed
- The CSII must be removed for an MRI, CT scan and X-Ray and should be kept safely out of the room. If the procedure is expected to last longer than 1 hour a VRII** should be started promptly

- At the present time, intrapartum women are asked to stop using their CSII and insulin is delivered by a VRII**, or, at Elective Caesarean by a glucose/insulin/potassium regimen
- When a CSII is restarted after a period without use, the VRII** should be continued for at least 60 minutes before the VRII** is stopped
- When a woman has hypoglycaemia on a CSII, the hypo should be corrected according to the Trust policy and the CSII should **not** be stopped
- For women using a CSII admitted with hyperglycaemia, refer to the Trust guidance found on: Trust intranet Policy hub in Policies & Protocols>Clinical documents>Diabetes & Endocrinology> Diabetic Inpatient Insulin Pump Therapy Guidelines>Guidelines for managing adult inpatients on continuous subcutaneous insulin (csii) pump therapy

Sites for injection

- Suitable sites are: in the abdomen around the umbilicus, the outer upper thigh, the upper outer fatty part of the hips or the fatty part of the outer upper arm.
- Insulin is absorbed at different speeds from different injection sites and women will rotate their sites through the day. When a midwife gives a woman insulin, the midwife should ask where the woman would normally inject the dose and that site used.

Prescribing

Insulin must be prescribed on a drug chart and this is, usually, best done using the variable dose medication sections of the drug chart.

Ensure that prescribers always write the word 'units' in full. This must not be abbreviated to 'u' or 'iu.' This may lead to misinterpretation and result in an overdose.

Two common insulin regimens are,

- 2 daily doses of a fixed number of units of rapid/intermediate-acting mixed insulin
- 4 or 5 daily doses consisting of, 3 short or rapid-acting insulin doses with each meal, with 1 or 2 long-acting doses once or twice daily
- The 3 short or rapid-acting doses may be decided in one of the following ways,
  - a fixed number of units per dose
  - a ratio of units to carbohydrates, e.g. 1 unit of insulin to 10 gms carbohydrate, often shortened to 1:10. Thus a 50gm carbohydrate meal would need a 5 unit dose of insulin
- The woman should know her doses but if she is uncertain, check the notes as follows,
  - for antenatal women, the doses written on the most recent antenatal clinic visit will be correct
  - for women immediately postnatal, the doses will be on the Delivery Management page of the Diabetes Care Record
  - if the postnatal woman has delivered prematurely, the postnatal doses may not be on the Delivery Management page, in which case, the pre-pregnancy doses should be used *but reduced by about one quarter to one third*. The pre-pregnancy doses can be found at the top of page 2 of the Diabetes Care Record

A postnatal woman should never continue with her antenatal insulin doses. The insulin requirement rises during pregnancy and doses can increase considerably. The increased requirement ends immediately after delivery of the placenta.
If a woman wants to give insulin outside the normal times of administration, or wants to give a dose greater or lesser than the prescribed doses, this should be questioned and medical advice sought. Do not assume that the woman is right.
Any insulin dose recommended to be given in addition to the regular doses prescribed must be written up on the 'Once Only' medication on the front of the drug chart.

Insulin's commonly used in pregnant women
The list below shows that there are different *types* of insulin and the various *types* have differing actions. The *types* of insulin, below, are colour-coded by their action. There are various reasons for the *type* of insulin used, including, the way the insulin works, the diabetes type and severity, the flexibility it offers for good control and patient preference. Within a *type* there can be several makes of, similarly-acting, insulin's. These insulin's will be made by different companies. The make of insulin used is often down to prescriber preference.

Commonly used insulin's in pregnancy

Name of insulin	Type of insulin	Time to onset of action	Peak of action	Duration of action	Appearance	Time of administration
Novorapid	Rapid acting	5-15 mins	50-120 mins	3 - 5 hrs	Clear	Immediately before or immediately after food
Humalog	Rapid acting	5-15 mins	50-120 mins	3 - 5 hrs	Clear	
Apidra	Rapid acting	5-15 mins	50-120 mins	3 - 5 hrs	Clear	
Actrapid/HumulinS	Short acting	30-40 mins	2 - 4 hours	6 - 8 hrs	Clear	20-30 mins before food
Lantus/Glargine	Long acting	2 hours	No peak	18-24 hrs	Clear	At the same time, once or twice daily
Levemir/Detemir	Long acting	2 hours	No peak	18-24 hrs	Clear	
Insulatard	Intermediate acting isophane	2 hours	6-8 hours	14-18 hrs	Cloudy	Twice daily with food
Humulin I	Intermediate acting isophane	2 hours	6-8 hours	14-18 hrs	Cloudy	
Novomix 30	Rapid/Intermediate acting mix	5-15 mins	Two peaks	12-18 hrs	Cloudy	Immediately before or immediately after food
Humalog Mix 25	Rapid/Intermediate acting mix	5-15 mins	Two peaks	12-18 hrs	Cloudy	

Hypoglycaemia
Insulin injections override the body's normal defence mechanisms against the blood glucose dropping too low (hypoglycaemia) and hypoglycaemia is a common side effect of insulin medication. In pregnancy the target pre-meal blood glucose levels are 3.5 – 5.9 mmol/L but, in an inpatient, a glucose below 4.0 mmol/L should be regarded as hypoglycaemia. Postnatally, to prevent a severe hypoglycaemic episode, the target glucose in the first few days is 5 – 10 mmol/L with gradual tightening to 5 – 7 mmol/L thereafter.

Treatment of Hypoglycaemia:
Orange juice, Coca Cola, Lucozade or Jelly Babies may be products that the woman already has available.
Products to reverse hypoglycaemia are available in the orange coloured Hypoglycaemia Box kept in all areas except Rushey.

For mild hypoglycaemia – give 20 – 30 gms of glucose:
Patient must be conscious, able to swallow and allowed to eat for the following products
Glucogel oral gel; 10 gm tube
GlucoTabs; 4 gm tablets
GlucoJuice; 15 gm bottle

The following products are available to correct severe hypoglycaemia:
20% IV glucose bags in the Emergency Crash Trolley with instructions – give 75 ml
Glucagon Kit (in fridge); 1mg vial of powder to be mixed with water from prefilled syringe; May be given IM of IV; normally only required by severely affected or unconscious woman.

The blood glucose should be rechecked after 20 minutes and the treatment repeated until the blood glucose is above 4.0 mmol/L. Quick-acting carbohydrate to correct a hypo should be followed by slower-acting carbohydrate, such as toast.

Hyperglycaemia
Inadequate insulin can result in diabetic ketoacidosis (DKA). With insufficient insulin the cells become depleted of glucose and the response is the creation of glucose from fat stores, resulting in ketonaemia, which is toxic to mother and fetus. Unlike the non-pregnant diabetic, who will present with high blood glucose readings, the pregnant woman can present with normal or near-normal glucose readings. DKA can only be corrected with rehydration and intravenous insulin and this is managed on the Delivery Suite and has its own protocol.

Oral hypoglycaemic agents
The uses of Metformin and Glibenclamide have been sanctioned for use in pregnancy by NICE since 2008. At the RBFT we only use Metformin antenatally.

Metformin has 3 effects,
- it reduces the glucose released in to the blood stream by the liver
- it reduces the amount of glucose absorbed by the gut
- it enhances the action of the woman's own insulin

It can have side effects and the dose needs to be increased gradually when newly prescribed or recommenced after a break in use. The common side effects are,

- abdominal bloating
- flatulence
- nausea
- less commonly diarrhoea
- if the woman experiences extreme fatigue, vomiting and muscular pain she is advised to contact the diabetes midwives
- side effects are reduced by administering the drug in the middle of, or at the end of a full meal and with a full glass of water
- Metformin should not be prescribed for people with impaired kidney function

For those who have persistent side effects, Metformin modified release can be tried, often with good effect. For antenatal women unable to tolerate Metformin or Metformin modified release, transfer to insulin will be necessary.

Commonly used doses of Metformin in pregnancy

- Metformin 500 mg with evening meal
- Metformin 500mg bd or tds
- Metformin up to 1 gm bd
- Metformin 850 gm tds

Higher doses have been used but only when sanctioned by the consultant obstetrician or endocrinologist.

Cautions

- Metformin should be withheld in women at risk of tissue hypoxia or renal impairment, in maternity patients this would include, severe sepsis, severe pre-eclampsia or eclampsia and possibly major haemorrhage. It should only be recommenced after medical consultation.
- Alternative anti-diabetic therapy may be necessary in the interim.
- Advice should be sought regarding the use of Metformin in cases of hepatic impairment.
- Following surgery normal renal function should be ascertained with a laboratory sample for urea and electrolytes.
- Metformin should be withheld prior to any test using iodine containing contrast media and recommenced not earlier than 48 hours after the test when normal renal function has been ascertained with urea and electrolytes sample.

Inpatients administering their own Metformin should be managed under the Self-administration of Medicines Policy, which can be found on intranet (link please: Policies & Protocols>Clinical documents>0 – General Trust wide>Self Administration of Medicines Policy (CG061)).

Breast feeding

- Postnatal women may take Metformin

- Advice should be sought from the paediatricians whether a woman may resume Glibenclamide
- Other oral and parenteral medication, commonly used with type 2 diabetes, must not be taken and consideration should be given to other anti-diabetic therapies.

Bottle feeding

- All medications may be resumed.

Type 2 diabetic women, intending to become pregnant again in the near future, would be advised not to resume anti-diabetic drugs other than Metformin or Glibenclamide. If these therapies are not suitable, a non-teratogenic alternative should be considered and this may have to be insulin. Advice should be sought from the diabetes medical team.

References:

1. National Patient Safety Agency (2010) Rapid Response Report NPSA/2010/RRR013: Safer administration of insulin
2. BNF September 2013
3. RBFT Policies and protocols: Guidelines for managing adult inpatients on continuous subcutaneous insulin (csii) pump therapy
4. RBFT Policies & Protocols: Clinical documents>Diabetes & Endocrinology>Insulin self management protocol

Appendix 1

Self-administration of insulin

Under the Self-administration of Insulin policy, when safe to do so, women may self-administer insulin without supervision. The procedure is summarised below. ***The midwife in charge of the woman's care per shift is responsible and accountable for the woman self-managing her own insulin injections.***

- Give the woman the Self-administration of insulin information leaflet (available in all areas except Marsh and Rushey).
- Obtain her consent to self-administer her own insulin
- Ensure that the woman knows to keep her insulin pens and needles safely out of sight
- The woman should be given a bedside sharps container
- Complete the self-administration of insulin questionnaire. She must be able to answer 'no' to all these questions in order to self-administer insulin. (Forms are available in all areas, except Marsh and Rushey).
- In addition to the stated reasons, in the policy, to deny self-administration of insulin, midwives should be cautious regarding women who have not slept for several days prior to being allowed to self-administer insulin
- Show the woman how to complete the diabetes chart on the obverse side of the Self-administration of Insulin questionnaire. She must enter the date, time and dose of insulin given. She must also enter her blood glucose result taken prior to the dose of insulin given.
- To demonstrate the procedure has been explained and agreed, at the commencement of self-administration, both the woman and the midwife must date and sign the Self-administration of Insulin diabetes chart
- **Each shift, the midwife in charge of the woman's care must make a basic assessment that she feels the woman is still capable of safely administering her own insulin. She must initial the woman's Self-administration of Insulin diabetes chart to this effect**
- Insulin should be prescribed on the woman's drug chart. It is advisable to use the variable dose sections
- The drug chart must be completed when the woman has given her insulin, noting the dose, date, time and that it was self-administered by marking the chart with no. 5 and commenting on the back of the chart that the dose was self-administered
- If she feels that a woman is no longer capable of self-administering insulin she must initial the 'Stop' column on the Self-administration of insulin diabetes chart
- If it is decided that a woman should not self-administer insulin, her insulin pens should be locked away in the ward drug fridge