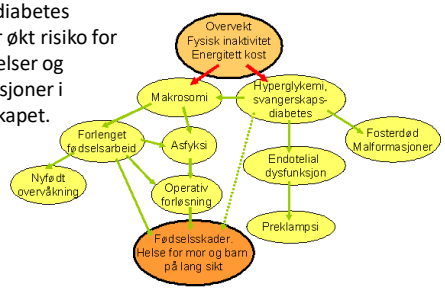
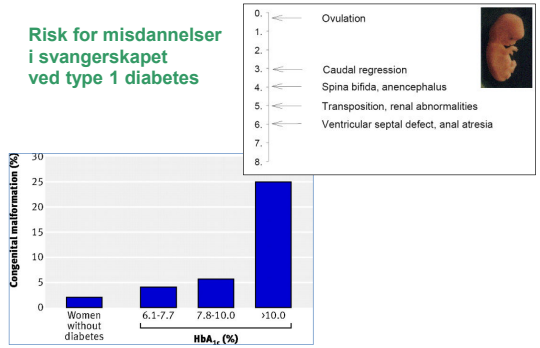
Hvorfor er oppfølging av diabetes i svangerskapet viktig?

Etablert diabetes medfører økt risiko for misdannelser og komplikasjoner i svangerskapet.



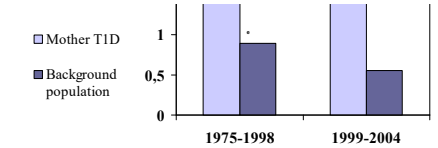
Risk for misdannelser i svangerskapet ved type 1 diabetes



BMJ Rosenn et al, Obstet Gynecol 1994, Taylor, R. et al. BMJ 2007

Nyfødt dødelighet

Så hvorfor virker ikke bedret glykemisk kontroll like bra som vi hadde forventet?



Norwegian Childhood Diabetes Registry
Medical Birth Registry of Norway
Eidem et al. 2011

1975-1998: RR 2,2 (95%CI: 1,4-3,4)
1999-2004: RR 3,1 (95%CI 1,5-6,5)

Er vektøkning/fettdepoter sentralt?

- Også ved T1DM ses økt pregravid BMI, og forekomst av makrosomi er fortsatt høy tross streng bls regulering.
  Føtal veksthemming er sjelden utenom ved nefropati eller preeklampsi.

BMI-appropriate gestational weight gain:
12.5–18.0 kg for underweight,
11.5–16.0 kg for normal weight,
7.0–11.5 kg for overweight,
and 5.0–9.0 kg for obese women
(IOM 2009)

Type 2 diabetes – er sykdommen "snillere"?

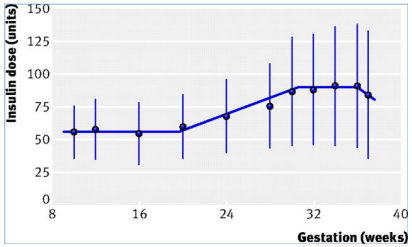
Characteristics	n	Type 2 DM	Type 1 DM
Age (yr)	23	33.9	28.8
BMI (kg/m^2)	12	30.2	24.2
DM duration (yr)	15	5.9	11.9
Chronic hypertension (%)	6	11.2	5.5
Retinopathy (%)	13	6.2	25.3
Micro/macroalbuminuria (%)	10	2.9	6.8
Prepregnancy care (%)	11	18.8	34.8
Gestational age at booking (wk)	12	16.2	15.2
HbA1c (%)			
At booking	9	7.20	8.06
Second trimester	4	5.70	6.23
Third trimester	7	5.69	6.00

n, Number of papers contributing to each characteristic.

Balsells Metaanalysis, JCEM 2009

Gjennomsnittlig insulin dose i svangerskapet

(n=107, mean ± SD)



Taylor, R. et al. BMJ 2007;334:742-745

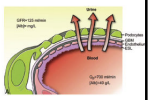
BMJ

Insulinbehandling i svangerskap

- **Behandlingsmål:**
  normoglykemi, også etter mat
  bls 4.0-8.0 mmol/l

1. trimester: kvalme, HCG-effekter, ofte behov for dosereduksjon.
- Viktig med hyppige målinger, ofte 8-10 ganger daglig, vurdér fortløpende sykmeldingsbehov for å oppnå bedret glykemisk kontroll.
- Stigende insulinbehov (resistens) fra uke 18-20, stabilisering ca. uke 30.
- Nærmest umiddelbart fall i insulinresistens ved partus, må måle hyppig!
- Novorapid og Humalog gir mindre hypoglykemier i svangerskapet, for Apidra/Levemir. Lantus anses trygt. Vi bytter ikke tilbake til Insulatard/Humulin i svangerskapet.
- Pumpebruk går fint.

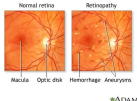
Etablerte mikrovaskulære komplikasjoner
- ofte mer risikable svangerskap



Svangerskap og nefropati

- **5-10%** av gravide med diabetes
- **Risk for preeklampsi ved MA** : 42%, ved proteinuri 64%.
- **Skal ha intensiv BT behandling**:
  men det er ikke vist langtidsskade på nyrefunksjon eller påvirket overlevelse av svangerskap (follow up 16 years)

Progresjon av retinopati hos gravide



- **Uvanlig<5%**, behov for laser terapi 2%
- Oftest forbigående, varer inn i post partum året
- Hyppigere ved diabetes >10 år og moderat/ alvorlig RT

Fraråde/vente med svangerskap?

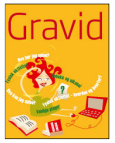
- Nesten ingen !
- Ved alvorlig og ubehandlet øyesykdom
  (meget få)
- Alvorlig nyresykdom med klart påvirket nyrefunksjon (meget få)
- **For alle med diabetes: viktig å planlegge graviditet** (HbA1c< 7.0 %)

reserveslides

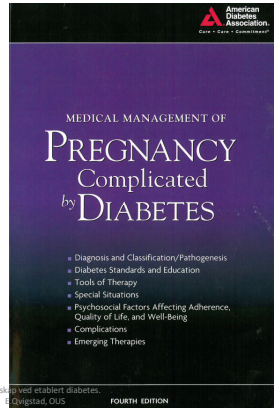
Takk for oppmerksomheten!

Referanser

- Taylor, R. et al. Type 1 diabetes and pregnancy. BMJ 2007
- Mathiesen, E. et al. Therapeutic management of type 1 diabetes during pregnancy, Exp opin pharmacother 2011.
- Textbook of Diabetes and Pregnancy, Taylor&Francis 2003.
- Jovanovič L.: Medical management of pregnancy complicated by diabetes, ADA publications, 4th ed, 2009
- Den norske legeforening: Veileder i fødselshjelp, revidert 2014
- Diabeteshåndboken, 2014
- Uptodate
- Nye retningslinjer for diagnostikk og behandling av diabetes HDir 2016

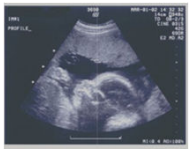


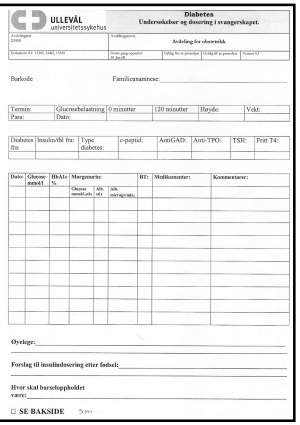
Noe å lære ?



Kontrollskjema

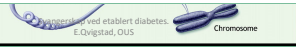
fyll inn:
- øyelegesvar
- planlagte post partum insulin doser
- insulinpumpe doser
- sykmelding
- yrke/arb.giver





Sammendrag

- Det går mye bedre med type 1 diabetes enn tidligere, men det er fremdeles overhyppighet av perinatal dødelighet, svangerskapsforgiftning og misdannelser
- Mer ressurser til kostveiledning og vektbegrensning?
- Vi må ha flere planlagte svangerskap med HbA1c < 7. 0 % før svangerskapet
- Det trengs mer forskning rundt årsakene til diabetes og komplikasjoner i svangerskapet.



Type 2 diabetes svangerskap

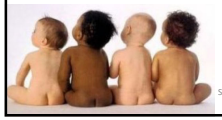
- Perinatal mortalitet 4 x så høy som ved type 1 diabetes
- Alvorlige misdannelser dobbelt så høy som ved type 1 diabetes.
- HbA1c assosiert med alvorlig forløp for fosteret
- To tilfeller av diabetisk ketoacidose ved type 2 !
- Forløpet ved type 2 diabetes er forverret sammenlignet med perioden 1982-90 !

Clausen et al. Diabetes Care 28;323-328,2005

Svangerskapskomplikasjoner

Diabetes sammenliknet med ikke diabetes (OR)

	Immigrants	Ethnic Norwegians
Preeclampsia	3.6	4.7
Low birth weight	2.6	2.1
Macrosomia	5.5	3.8
Preterm birth	3.0	3.8
Shoulder dystocia	2.5	3.4
Cesarean section	3.0	4.6



Vangen S et al Diabetes care, 2003

Hindre for prekonsepsjonell veiledning

- Ble gravid fortere enn ventet
- Bekymret for mulig infertilitet
- Negativ erfaring med helsepersonell
- Ønske om et ”normalt” svangerskap
- Vansker med å komme til kontroll

Murphy HR et al: Diabetic Medicine 2010;27:92-100

Glargine, detemir, aspart og lispro i svangerskap:

- Non-inferiority for maternelle og føtale outcomes, gir i noen studier lavere fbls.
- Langsiktige negative utfall for barna er foreløpig ikke publisert.
- Små studier
- Lite data for glulisine (Apidra).

Lv et al Arch OG: Metaanalyse 2015.

Insulin behandlet diabetes: post partum

- Svært insulin følsomme (særlig ved oppstart av amming)
- Høy risk for hypoglykemi
- Insulin dose ved hjemreise 60-70% av pregravid dose
- Tilbake til normale doser innen 1-3 mnd
- Post partum kontroll: **BT, albuminuri, øyebunn, prevensjon,**

Kvalme – gir store problemer

- - vi har begrensede ressurser for KEF veiledning
- Riget har satser mye sterkere på dette (E.Mathiesen)

Table 12 Tips for Controlling Nausea

- Eat dry crackers or toast before rising
- Eat small meals every 2.5–3 h
- Avoid caffeine
- Avoid fatty and spicy foods
- Drink fluids between meals, not with meals
- Take prenatal vitamins after dinner or at bedtime
- Always carry food

Kostforslag ved kvalme

Table 13 1,800-Calorie Diet to Control Nausea

	Exchanges	Food Source
Before rising	1 Starch	6 crackers or 1 slice bread
Breakfast	1 Meat	1 oz low-fat cheese
	2 Starch	2 slices bread or 1 1/2 cups cereal
	1 Fat	1 tsp margarine
A.M. snack	1 Starch	3/4 cup cereal
	1 Milk	8 oz low-fat milk or plain yogurt
Lunch	2 Meat	1/2 cup tuna or 2 oz turkey or low-fat cheese
	1 Vegetable	1 cup salad or a medium tomato
	2 Starch	2 slices bread, 1 cup pasta, or 2/3 cup rice
	1 Fat	1 tsp mayonnaise or salad dressing
	1 Fruit	1/4 cantaloupe, 1 1/4 cup strawberries, or small nectarine
P.M. snack	1/2 Milk	4 oz low-fat milk
	1 Meat, 1 Starch	1/2 sandwich with 1 oz low-fat meat or cheese or 2 breadsticks with 1 oz low-fat cheese
Dinner	3 Meat	3 oz chicken or lean red meat, baked or broiled
	2 Vegetable	1 cup cooked vegetables (not potatoes, lima beans, peas, or other starch)
	2 Starch	2 slices bread, 1 cup pasta, or 2/3 cup rice
	1 Fat	1 tsp margarine
	1 Fruit	1 small peach
Bedtime snack	1/2 Milk	4 oz low-fat milk
	2 Starch	2 slices bread
	1 Meat	1 Tbsp peanut butter

Insulinpumpe under fødsel:

- Blodsukkermåling: Som ved aktiv fødsel.
- La basaldosen gå under latensfasen (program a).
- **Halv basaldose** ved aktiv fødsel (program b). Evt koble fra pumpen ved full åpning. Følg tabellen for "behandling av blodsukker" som står under "aktiv fødsel". Dersom kvinnen skal ha insulin -kan insulin dosen gis som bolusdose på pumpen av kvinnen selv. Hvis hun ikke er i stand til å administrere pumpen selv, gis insulin s.c. som vanlig.
- Pumpen må absolutt ikke være fjernet mer enn 2 timer!
- Skulle det oppstå komplikasjoner med pumpen under fødsel (feks. at pasienten ikke får insulin fra pumpen) må blodsukkeret måles og behandling iverksettes utifra tabell ovenfor.
  OBS risk for raskt stigende blodsukker med fare for ketoacidose fordi de ikke bruker langsomtvirkende insulin..

Table 5 Prepregnancy Assessment for Diabetic Women

- History and physical examination
- Gynecologic evaluation
- Laboratory evaluation
  - A1C level
  - Urinalysis and culture
  - 24-h urine for creatinine clearance and total protein
  - Thyroid panel: free T4 1.0–1.6 and TSH <2.5 μU/l
- Special studies
  - Electrocardiogram or treadmill
  - Neuropathy testing if indicated

Table 6 Potential Contraindications to Pregnancy

- Ischemic heart disease
- Active proliferative retinopathy, untreated
- Renal insufficiency: creatinine clearance <50 ml/min or serum creatinine >2 mg/dl or heavy proteinuria (>2 g/24 h) or hypertension (blood pressure >130/80 mmHg despite treatment)
- Severe gastroenteropathy: nausea/vomiting, diarrhea

Planlegge
- også for å optimalisere vekt

Table 7 Prepregnancy Diet Calculation

- Determination of daily calorie requirement:
  - 30–34 kcal/kg (2.2 lb) pre-gravid body weight for normal-weight woman (BMI <25)
  - 23–25 kcal/kg (2.2 lb) pre-gravid body weight for obese woman (BMI ≥30)
  - To lose 1 lb/wk, subtract 500 kcal from daily requirement or increase exercise
- Distribution of calories:
  - Variable carbohydrate (consistent amount of daily carbohydrate intake may be beneficial)
  - Saturated fat intake <7% of total calories
  - Intake of trans fat minimized
  - Dietary cholesterol limited to <200 mg/day

Effekter av graviditet

- Endret spisemønster
- Økt insulin behov fra uke 18-28
- Økt betydning av god glykemisk kontroll (ideelt HbA1c <6.1%)
- Økt risiko for alvorlige hypoglykemier
- Risiko for forverring av etablert retinopati
- Risiko for forverring av etablert nefropati
- Lavere nyreterskel for glukosuri

Taylor, R. et al. BMJ 2007

Bedret monitorering?
Closed loop:

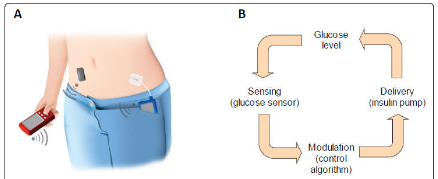


Figure 1 An illustrative representation of a closed-loop insulin delivery system. (A) A sensor (black rectangle) transmits information about interstitial glucose levels to a handheld device about the size of a cellphone (red box) which holds a control algorithm and interacts with the user. An insulin pump (blue box in the pocket) delivers a rapid-acting insulin analog subcutaneously. Insulin delivery is modulated by the control algorithm. The communication between the system components is wireless. The control algorithm can also reside within the insulin pump. (Adapted from Hovorka [12]). **(B)** The closed loop replicates the physiological feedback normally provided by the β-cell.

- Stewart, Murphy et al.
- Data ventes 2017

Elleri *et al. BMC Medicine* 2011, 9:120
http://www.biomedcentral.com/1741-7015/9/120 Page 5 of 9

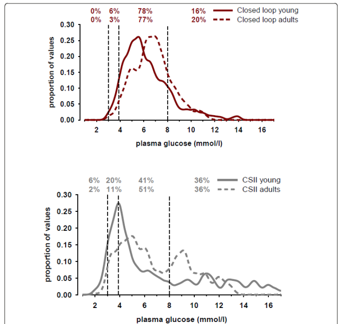
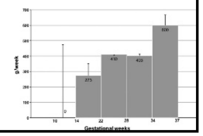


Figure 2 Distribution of plasma glucose levels after midnight in young people and adults during (top panel) closed-loop and (bottom panel) conventional insulin-pump therapy (continuous subcutaneous insulin infusion (CSII)). Vertical dashed lines indicate the threshold of significant hypoglycemia (3.0 mmol/l) and the target glucose range of 3.91 to 8.0 mmol/l. Values at the top denote the percentage of plasma glucose values within the respective glucose ranges (reproduced with permission from Kumareswaran *et al.* [60]).

Begrense vektøkning: viktig for perinatal morbiditet i T2DM svangerskap?

17 women (29%) gained ≤5 kg, and 41 gained >5 kg. Median GWG was 3.7 kg (-4.7 - 5 kg) and 12.1 kg (5.5-25.5 kg), resp. Prepregnancy BMI was 33.5 kg/m^2, (30-53) vs. 36.8 kg/m^2 (30-48), P = 0.037, and median HbA1c 6.7% at first visit in both groups and 5.7 and 6.0%, P = 0.620, in late pregnancy, resp.
GWG ≤5 kg was associated with lower birth weight z score (P = 0.008), lower rates of LGA infants (12 vs. 39%, P = 0.041), delivery closer to term (268 vs. 262 days, P = 0.039), and less perinatal morbidity (35 vs. 71%, P = 0.024) compared with pregnancies with GWG >5 kg.

Asbjørnsdottir 2008, Parellada 2014



Gestational weight gain (GWG)	Excessive (*n* = 62)	Appropriate (*n* = 37)	Insufficient (*n* = 16)	*P* value
EQ: oversette	17.7 (10–30)	13.1 (6–16)	8.5 (−2 to 11)	<0.001
Prepregnancy–8 weeks, g/week	257 (−303 to 2,016)	216 (−335 to 515)	87 (−385 to 463)	0.003
8–21 weeks, g/week	405 (42–818)	293 (−177 to 717)	171 (−692 to 338)	<0.001
21–36 weeks, g/week	640 (271–1,173)	444 (27–771)	350 (−100 to 533)	<0.001

Offspring birth weight decreased across the groups 3,681 [2,374–4,500] vs. 3,395 [2,910–4,322] vs. 3,295 [2,766–4,340] g [*P* = 0.02] resp). In regression analysis, GWG (kg) was associated with offspring birth weight (g) (β = 19; *P* = 0.02) when adjusted for prepregnancy BMI, HbA_{1c} at 36 weeks, smoking, parity, and ethnicity.

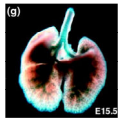
Severe neonatal morbidity was comparable across the GWG groups.

Secher DC 2014

Diabetes og lungemodning

Celeston Chronodose/12mg Betapred 2 doser med 24t intervall.

Øke basal- og måltidsinsulin:



Dag 1 (1. dose Celeston)	Uendret insulindose
Dag 2	Øk med 30% fra utgangsdose
Dag 3	Øk med 40% fra utgangsdose
Dag 4	Øk med 20% fra utgangsdose
Dag 5	Øk med 10% fra utgangsdose
Dag 6	Tilbake til utgangsdose
Bls > 8mmol/l: *4-6 IE ekstra hurtigvirkende*	

Diabetes og forløsning

- Vurder induksjon ved uke 38 (T1DM), bør forløses ved termin
- Latensfase: vanlig insulinregine dersom i form og godt næringsinntak.
- Aktiv fødsel: bls hver time, mål : Glucose goal: 4-6 mmol/l.
- **Start glucose infusjon: 50mg/ml/kg kroppsvekt**

Bls <3,5mmol/l	60kg 180ml/t – 80kg 250 ml/t – 100kg 300ml/t
Bls 3,5-6,0 mmol/l	60kg 90ml/t – 80kg 125 ml/t – 100kg 150ml/t
Bls 6,1-8,0 mmol/l	2IE HV insulin sc, dersom høy etter 2t, gjenta etter protokoll.
Bls 8,1-10,0 mmol/l	4IE HV insulin sc, dersom høy etter 2t, gjenta etter protokoll.
Bls >10,0mmol/l	6IE HV insulin sc, dersom høy etter 2t, gjenta etter protokoll.
Bevisstløs? 200mg/ml 40 ml iv umiddelbart , gjenta etter 10min dersom fortsatt bevisstløs. Stopp infusjon etter fødsel dersom bls b-glc 5,0-12,0 mmol/l.	

Manglende normalisering av fosterets glukose- og oksygen-konsentrasjoner?

EQ: oversette

- **Fetal and placental weights were increased** in GDM compared to normal (N) pregnancies, despite similar gestational age. Placental histology was consistent with **altered villous morphology**.
- GDM fetuses were significantly **more hypoxic** (O_2 saturation: N 63.2 ± 13.9; GDM 53.8 ± 14.6%, P < 0.01; O_2 content: N 5.5 ± 1.4; GDM 4.8 ± 1.2 mmol/l, P < 0.05).
- **Glucose** (N 3.4 ± 0.5, GDM 3.9 ± 1.2 mmol/l, P < 0.05) and **lactate** (N 1.32 ± 0.49; GDM 1.64 ± 0.75 mmol/l, P < 0.05) **concentrations were significantly increased** in the umbilical vein in GDM compared to N fetuses.
- Thus, fetuses from gestational diabetic mothers have increased umbilical glucose concentrations despite normal maternal glucose levels and a reduction in oxygen saturation and O_2 content together with increased lactate concentration, reflecting altered fetal metabolism.
  Suggesting that **'good maternal metabolic control' achieved by currently used methods of monitoring glucose control is not sufficient to ensure a normal oxygenation status and metabolic milieu** for the fetus in GDM pregnancies.

Taricco BJOG 2009

Diabetes og blodtrykksykdom i svangerskapet

- Konsensus:
  behandle BT >160 og/eller >105mmHg)

  Mild hypertensjon: lite evidens/ingen konsensus.
- Behandling er vist nyttig for mild hypertensjon ved T1 og T2 diabetes ,
  vi sikter derfor mot behandlingsmål
  <130 and/or <80mmHg

Sibai Obstet Gynecol 2002/J Mat Fetal Med 2010

Strengere/mer detaljert insulinregime?

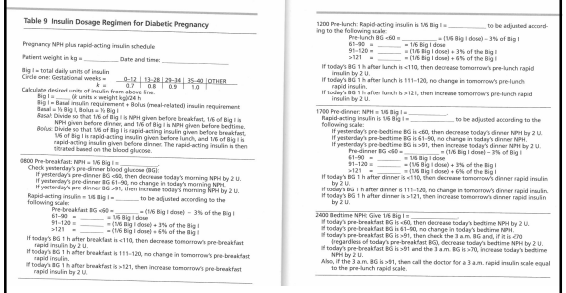


Table 9 Insulin Dosage Regimen for Diabetic Pregnancy

Pregnancy NPH plus rapid-acting insulin schedule

Patient weight in kg = _____ Date and time: _____

Bid = total daily units of insulin
Circle one: Gestational week(s) = 0–12 | 13–28 | 29–34 | 35–40 | OTHER
Factor = 0.7 | 0.8 | 0.9 | 1.0

Calculate desired units of insulin from above line.
Bid = _____ (# units = weight kg/24 h
Basal = ½ Bid; Bolus = ½ Bid

Basal. Divide so that: ⅙ of Bid = ½ NPH given before breakfast, ⅙ of Bid = ½ NPH given before dinner, and ⅓ of Bid = ½ NPH given before bedtime.

Bolus: Divide so that: ⅙ of Bid = ½ rapid-acting insulin given before breakfast, ⅙ of Bid = ½ rapid-acting insulin given before lunch, and ⅙ of Bid = ½ rapid-acting insulin given before dinner. The rapid-acting insulin is then titrated based on the blood glucose.

0800 Pre-breakfast: NPH = ⅙ Bid = _____
Check yesterday's pre-dinner blood glucose (BG):
If yesterday's pre-dinner BG <50, then decrease today's morning NPH by 2 U.
If yesterday's pre-dinner BG 61–90, no change in today's morning NPH.
If yesterday's pre-dinner BG >91, then increase today's morning NPH by 2 U.

Rapid-acting insulin = ⅙ Bid = _____ to be adjusted according to the following scale:

Pre-breakfast BG <60 =	= (⅙ Bid dose) − 3% of Bid
61–90 =	= ⅙ Bid dose
91–120 =	= (⅙ Bid dose) + 3% of the Bid
>121 =	= (⅙ Bid dose) + 6% of the Bid

If today's BG 1 h after breakfast is <110, then decrease tomorrow's pre-breakfast rapid insulin by 2 U.
If today's BG 1 h after breakfast is 111–120, no change in tomorrow's pre-breakfast rapid insulin.
If today's BG 1 h after breakfast is >121, then increase tomorrow's pre-breakfast rapid insulin by 2 U.

1200 Pre-lunch: Rapid-acting insulin is ⅙ Bid = _____ to be adjusted according to the following scale:

Pre-lunch BG <60 =	= (⅙ Bid dose) − 3% of Bid
61–90 =	= ⅙ Bid dose
91–120 =	= (⅙ Bid dose) + 3% of the Bid
>121 =	= (⅙ Bid dose) + 6% of the Bid

If today's BG 1 h after lunch is <110, then decrease tomorrow's pre-lunch rapid insulin by 2 U.
If today's BG 1 h after lunch is 111–120, no change in tomorrow's pre-lunch rapid insulin.
If today's BG 1 h after lunch is >121, then increase tomorrow's pre-lunch rapid insulin by 2 U.

1700 Pre-dinner: NPH = ⅙ Bid = _____
Rapid-acting insulin is ⅙ Bid = _____ to be adjusted according to the following scale:
If yesterday's pre-bedtime BG is <60, then decrease today's dinner NPH by 2 U.
If yesterday's pre-bedtime BG is 61–90, no change in today's dinner NPH.
If yesterday's pre-bedtime BG is >91, then increase today's dinner NPH by 2 U.

Pre-dinner BG <60 =	= (⅙ Bid dose) − 3% of Bid
61–90 =	= ⅙ Bid dose
91–120 =	= (⅙ Bid dose) + 3% of the Bid
>121 =	= (⅙ Bid dose) + 6% of the Bid

If today's BG 1 h after dinner is <110, then decrease tomorrow's dinner rapid insulin by 2 U.
If today's BG 1 h after dinner is 111–120, no change in tomorrow's dinner rapid insulin.
If today's BG 1 h after dinner is >121, then increase tomorrow's dinner rapid insulin by 2 U.

2400 Bedtime NPH: Give ⅙ Bid = _____
If today's pre-breakfast BG is <60. Then decrease today's bedtime NPH by 2 U.
If today's pre-breakfast BG is 61–90, no change in today's bedtime NPH.
If today's pre-breakfast BG is >91, then check the 3 a.m. BG and, if it is <70 (regardless of today's pre-breakfast BG), decrease today's bedtime NPH by 2 U.
If today's pre-breakfast BG is >91 and the 3 a.m. BG is >70, increase today's bedtime NPH by 2 U.
Also, if the 3 a.m. BG is >91, then call the doctor for a 3 a.m. rapid insulin scale equal to the pre-lunch rapid scale.

Svangerskapsplanlegging – er vi gode nok?

■ With proper counseling and management by the primary care physician, the outcome of most pregnancies complicated by diabetes can approach that for the general population.

■ General guidelines for prepregnancy counseling and management of women with preexisting diabetes are:

- Ensure that pregnancy is planned; counsel the woman about contraception methods.
- Clearly identify for the woman and her partner the risks of congenital anomalies and spontaneous abortions and their relation to glucose control.
- Provide realistic information about chronic complications of type 1 diabetes, their potential impact on pregnancy and childbearing, and the effect of pregnancy on chronic complications.
- Assess the woman's fitness for pregnancy, paying special attention to retinopathy, nephropathy, hypertension, neuropathy, and ischemic heart disease.
- Identify any gynecologic abnormalities before conception, and treat infertility as early as possible in view of the risk to pregnancy associated with increasing duration of diabetes and advancing maternal age. Social, financial, and marital factors permitting, pregnancy should be encouraged.
- Provide genetic counseling, including the risks of advanced maternal age, if applicable.
- Provide realistic information about additional medical costs associated with a pregnancy complicated by diabetes, such as extra office visits, possible hospitalization, special tests, and possible intensive neonatal care.
- Achieve optimum control of blood glucose levels before conception. Ideally, A1C should be normal or near normal before discontinuing contraception.
- Encourage good general principles of health, nutrition, and hygiene, including cessation of smoking and alcohol consumption. Prescribe a prenatal vitamin with folate as part of the preconception treatment plan.
- Identify any problems requiring psychosocial consultation.
- Once the decision is made to attempt pregnancy, provide appropriate optimism that careful glycemic control and meticulous obstetric care results in an excellent outcome in the vast majority of patients.
- Diagnose pregnancy as early as

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Table 1—*Primary and secondary outcomes during closed-loop and conventional CSII*

	Closed-loop delivery	CSII	*P*
Primary outcome			
Plasma glucose time in target			
Percentage of time in target (63–140 mg/dL)	81 (59–88)	81 (54–90)	0.75
Secondary outcomes			
Plasma glucose outcomes			
Mean plasma glucose (mg/dL)	108 (99–121)	104 (92–108)	0.35
SD of plasma glucose (mg/dL)	25.2 (23.4–37.8)	28.8 (25.2–41.4)	0.69
Hypoglycemia			
Percentage of time hypoglycemic <63 mg/dL	6.9 (1.3–12)	7.5 (3.6–18)	0.48
Percentage of time hypoglycemic ≤50 mg/dL	0.6 (0.0–2.1)	1.5 (0.0–2.7)	0.17
Percentage of time hypoglycemic ≤45 mg/dL	0.0 (0.0–0.2)	0.3 (0.0–1.5)	0.04
Symptomatic hypoglycemia	8	17	
Episodes >45–54 mg/dL	8	12	
Episodes >36–45 mg/dL	5	5	
Episodes <36 mg/dL	0	3	
LBGI*	2.4 (0.9–3.5)	3.3 (1.9–5.1)	0.03
Hyperglycemia			
Percentage of time hyperglycemic >140 mg/dL	14.0 (6.8–28)	6.7 (3.8–22)	0.75
Percentage of time hyperglycemic ≥180 mg/dL	0.2 (0.0–6.0)	0.0 (0.0–6.2)	0.78
High blood glucose index	0.8 (0.3–1.6)	0.4 (0.3–1.4)	0.81
PAEE (kJ/kg)	23.4 (19.7–27.0)	21.2 (19.0–22.1)	0.09
Insulin			
Insulin infusion (units/h)	0.7 (0.5–0.9)	0.8 (0.5–1.1)	0.35
SD insulin infusion rate	0.9 (0.5–1.0)	0.2 (0.2–0.5)	<0.001
Plasma insulin concentration	120 (101–146)	107 (82–145)	0.88

Data are median (interquartile range), unless otherwise indicated. *LBGI assessed the duration and extent of hypoglycemia.

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Evaluation of screening and progression of diabetic retinopathy during pregnancy in Irish women with pregestational diabetes

- Observational, n=185
- Attendance at prepregnancy care was associated with receiving adequate screening (odds ratio 6.23; CI 3.39-11.46 (P < 0.001)).
- Among those who received adequate evaluations (n = 185), 48 (25.9%) had retinopathy progression.
- Increasing booking systolic blood pressure (OR 1.03, CI 1.01-1.06, P = 0.02) and greater drop in HbA1c between first and third trimesters of pregnancy (OR 2.05, CI 1.09-3.87, P = 0.03) significantly increased the odds of progression.
- **A significant proportion of women continue to demonstrate retinopathy progression during pregnancy.**

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Egan AM J Diab Res 2015

ISRCTN83316328 DOI 10.1186/ISRCTN83316328

Closed-loop in pregnancy day and night home feasibility study (CLIP 24/7)

Condition category
Pregnancy and Childbirth

Prospective/Retrospective
Prospectively registered

Date applied
07/01/2016

Overall trial status
Ongoing

Date assigned
08/01/2016

Recruitment status
Recruiting

Last edited
08/01/2016

Plain English Summary

Background and study aims
Controlling blood sugar levels during pregnancy is very important for the health of the mother and the baby. However, many women with type 1 diabetes find it hard to avoid high blood sugar levels without experiencing low blood sugar levels (hypoglycaemia). Closed-loop systems consist of a continuous glucose monitor (CGM), a computer algorithm (mathematical instructions which calculate the insulin dose) and an insulin pump. During closed-loop, the CGM measures the glucose levels and relays them to the computer. The computer calculates an appropriate insulin dose according to the algorithm. It communicates with the insulin pump to give out the particular dose of insulin every 12 minutes. The closed-loop system has already been tested in women with type 1 diabetes during early, mid and late pregnancy. How it adapts insulin for the changing needs of pregnancy both in hospital and at home overnight has already been studied. In addition, a
study similar in design to this one has tested the use of overnight closed-loop insulin delivery compared with using an insulin pump and continuous glucose monitor alone and found that the technology was safe and worked well.

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Table 3 Goals to improve gradually closed-loop performance

Factor	Desirable improvements
Insulin delivery	Faster absorption
Glucose sensing	Increased accuracy and reliability; reduced false-positive hypoglycemia alarms
Insulin modulation	Adaptive algorithms
Dual-hormone systems	Dual-chamber pumps
Communication between glucose sensor and insulin pump	More reliable connectivity; standardized communication protocol
Human factors	Reduced size of devices; enhanced ease of use; sensing and delivery from a single body port

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Insulinkarakteristika

Table 23 Insulins by Comparative Action

	Onset (h)	Peak (h)	Effective duration (h)
Rapid acting [manufacturer]			
Insulin lispro (analog) [Lilly]	<0.3–0.5	0.5–2.5	3–6.5
Insulin aspart (analog) [Novo Nordisk]	<0.25	0.5–1	3–5
Insulin glulisine (analog) [Sanofi Aventis]	<0.25	1–1.5	3–5
Short acting			
Regular (soluble) [Lilly, Novo Nordisk]	0.5–1	2–3	3–6
Intermediate acting			
NPH (isophane) [Lilly, Novo Nordisk]	2–4	4–10	10–16
Long acting			
Insulin glargine (analog) [Aventis]	2–4	Relatively flat	20–24
Insulin detemir (analog) [Novo Nordisk]	0.8–2 (dose dependent)	Relatively flat	Dose dependent; 12 h for 0.2 U/kg; 20 h for 0.4 U/kg, up to 24 h. Binds to albumin.
Combinations			
50% NPH, 50% regular [Lilly]	0.5–1	Dual	10–16
70% NPH, 30% regular [Lilly]	0.5–1	Dual	10–16
75% NPL, 25% lispro [Lilly]	<0.25	Dual	10–16
50% NPL, 50% lispro [Lilly]	<0.25	Dual	10–16
70% aspart protamine, 30% aspart [Novo Nordisk]	<0.25	Dual	15–18

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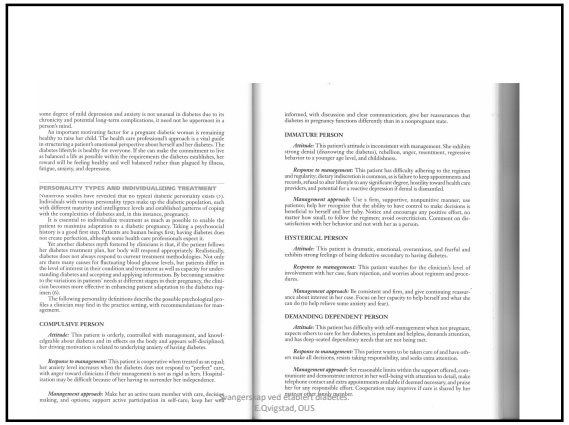
Highlights
Psychological Impact of Diabetes and Pregnancy

- All women go through adjustment stages during their pregnancy, but these are magnified by the diabetes response to the pregnant state.
- The emotional impact of being pregnant and managing diabetes increases stress levels.
- Open communication between patient and clinician requires mutual respect, honesty, and cooperation. Open-ended questions provide more information. Condemning noncompliance will not lead to discovering reasons for it.
- The patient is the final decision-maker in handling her day-to-day management. Get her involved to the best of her ability in problem solving and decision making.
- A psychosocial assessment can provide valuable information about the patient's lifestyle, family, job, and economic situation. This can assist in providing advice that will be followed.
- Emotional support is essential for the patient's well-being, whatever the source—spouse, other family members, health care professionals, peers, or support groups.
- Patients with type 1 diabetes have an increased awareness of complications. Patients with type 2 diabetes focus concern on whether they will have to continue on insulin after delivery.
- Concern about having a normal, healthy child and/or neonatal morbidity is magnified for the pregnant diabetic woman.
- High anxiety and fear affect adherence to the pregnancy regimen for tight blood glucose control and dietary compliance. Discussion is essential to assist the patient.
- Fear tactics do not always improve patient compliance as much as increase denial and communications breakdown. The intensity of following a strict protocol emotionally lengthens the pregnancy time span for even the most cooperative patient.
- Prepregnancy counseling is vital for any diabetic woman of childbearing age, beginning with adolescence.



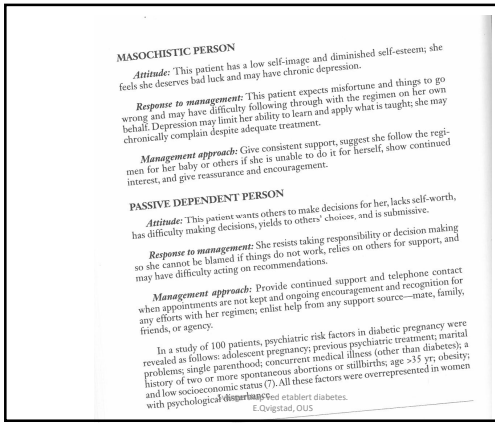
PERSONALITY TYPES AND INDIVIDUALIZING TREATMENT

COMPULSIVE PERSON

IMMATURE PERSON

HYSTERICAL PERSON

DEMANDING DEPENDENT PERSON



MASOCHISTIC PERSON

PASSIVE DEPENDENT PERSON

Vektjustert kaloriinntak i svangerskapet

Table 15 Recommended Daily Caloric Intake

Pregnancy BMI Category	kcal/kg/day	kcal/lb/day
Low (BMI <18.5 kg/m²)	36–40	16.3–18.2
Normal (BMI 18.5–24.9 kg/m²)	30	13.6
High (BMI 25–29.9 kg/m²)	24	10.9
Obese (BMI >29.9 kg/m²)	12	5.4

Kostplan
hos normalvektig kvinne

Table 19 Sample 1,800-kcal Menu With 40% (180 g) Carbohydrate for 60-kg Pregnant Woman

Meal	Carbohydrate (g)	kcal (%)
Breakfast		
1 egg	0	100
1 slice whole-wheat toast	15	80
1 caffeine-free tea or coffee	0	0
		180 (10)
Snack		
1 medium apple	15	60
1 oz cheese	0	100
		160 (10)
Lunch		
2 slices whole-wheat bread	30	160
2 oz water-packed tuna	0	110
Tossed green salad	10	50
2 tsp mayonnaise	0	90
		410 (20)
Snack		
6 whole-wheat crackers	15	80
1 Tbsp sugar-free peanut butter	0	100
Caffeine-free iced tea		0
		180 (10)
Dinner		
4 oz lean meat, fish, or poultry	0	220
1 small baked potato	15	80
1/2 cup steamed broccoli and 1/2 cup carrots	12	53
	15	60
1 piece fruit	12	100
8 oz fat-free milk	15	80
1 whole-wheat roll	0	135
3 tsp margarine		728 (40)
Snack		
8 oz fat-free milk	12	90
1/2 cup high-fiber cereal	15	80
		170 (10)
Total	181	1,828 (100)

Vi blir tykkere - HUNT

	% Diabetes		% Fedme (BMI>30)	
	Menn	Kvinner	Menn	Kvinner
HUNT 2	3,0	3,0	18	21
HUNT 3	5,0	3,8	22	23

Siden 80-tallet har det vært en fordobling i antall fete kvinner i Norge.
På 80-tallet var blant 60-80-åringene man fant den størst andelen fete, i dag er det 40-49-åringene som har prosentvis høyest andel.
20 prosent av alle voksne nordmenn er nå klassifisert som fete (BMI >30).

Vektøkningen er sterkest i de yngste aldersgruppene, så blant de voksne over 20 år, er det de mellom 30 og 50 år som øker mest.

Hypertensjon:

Behandling

- Hvile, saltfattig diett
- KI: ACE-I / ATBR2

- **Hyppigst brukt:**
  Labetalol tabl. 100 mg x 2, opp til 200 mg x 2-3.
  Max plasmakonsentrasjon etter 1-2 t.
- Nifedipin tabl 10 mg x 2, opp til max 40 mg x 2/24t. Effekt etter 45-60 min. Retard preparat: 30 mg x 1 evt. 30 mg x 2
- Metyldopa tabl. 250 mg x 2-3. Opp til 500 mg x 3.
  Effekt etter 3-8 t, full effekt 12 t.
- Vurder kombinasjon for å redusere BV

Veileder i fødselshjelp 2014

Svangerskap ved etablert diabetes.
E.Qvigstad, OUS

Closed loop day and night feasibility study (CLIP 24/7) Cambridge, UK

Primary outcome measures

Time spent in the target glucose range from 3.5-7.8 mmol/L, as recorded by continuous glucose monitoring (CGM) during the 28 day intervention periods.

Secondary outcome measures

1. Time with glucose levels in the hypoglycaemic range, based on continuous glucose monitoring (glucose levels < 2.8 mmol/L)
2. Time with glucose levels in the hyperglycaemic range, based on continuous glucose monitoring (glucose levels > 7.8 mmol/L)
3. Metabolic control assessed by change in HbA1 EQ: oversette system for 28 days, compared with that during continuous glucose monitoring without the closed-loop system for 28 days. HbA1c will be measured before and after each intervention arm
4. CGM data collected during intervention arms will be compared to baseline CGM readings
5. Trends in CGM data collected within intervention arms will also be evaluated on weekly basis (i.e. week 1 versus week 2 versus week 3 versus week 4)
6. CGM data collected after the intervention arms i.e. during pregnancy and up to 6 weeks post-partum will also be compared to baseline and intervention arm readings using CGM summary statistics and functional data analyses

Overall trial start date

01/06/2015

Overall trial end date

31/12/2016

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