Gestational Diabetes:

Impact of the new criteria for diagnosis

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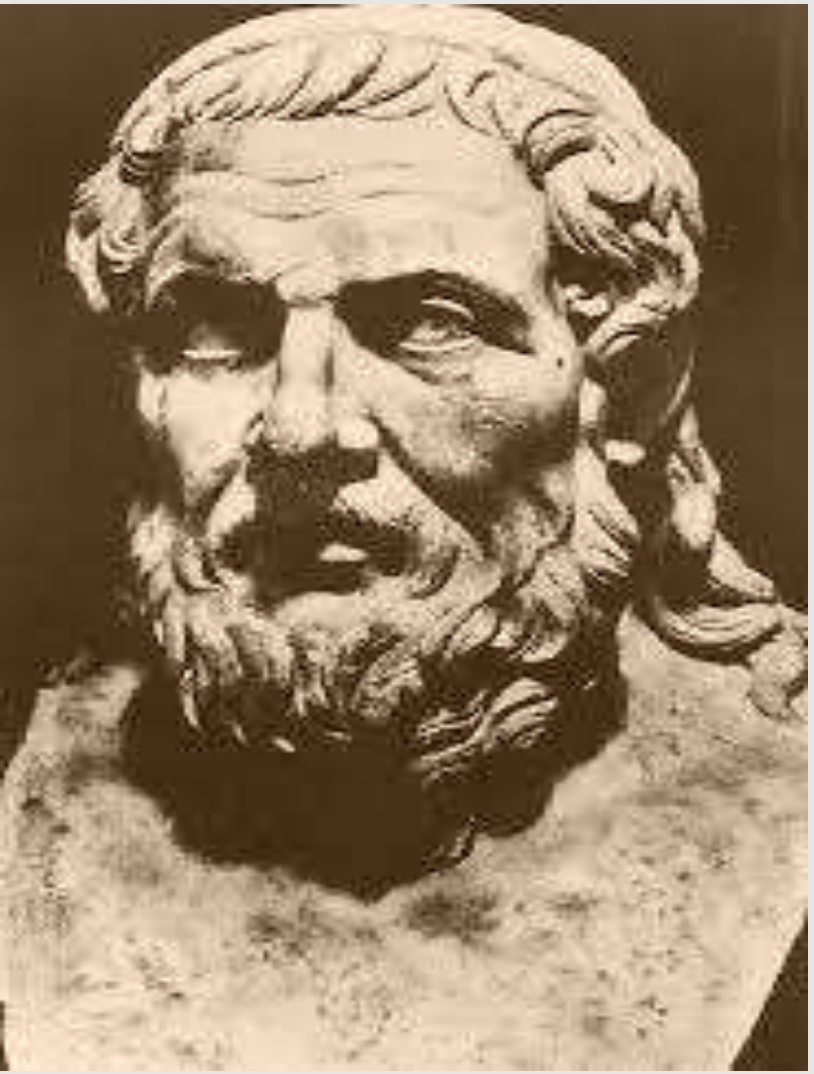
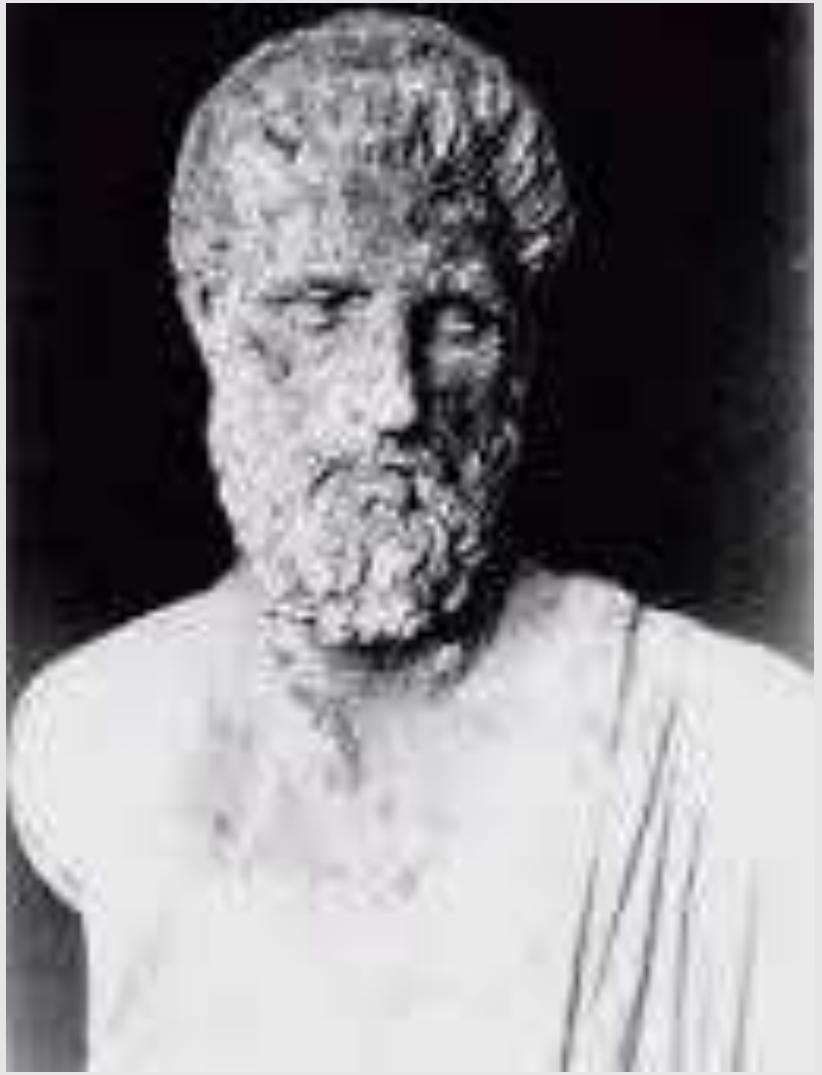
Talk Overview

- Salient literature
- GDM pre and post HAPO
  - Burden of care
  - Health outcomes
- Cost implications
- Case examples





Criteria for the Oral Glucose Tolerance Test in Pregnancy

John B. O'Sullivan, M.D., and Clare M. Mahan, A.B., Boston

DIABETES, VOL. 13, NO. 3

SUMMARY

A group of 752 women were given 100 gm. oral glucose tolerance tests (GTT) in pregnancy. Distribution of the resulting Somogyi-Nelson venous blood glucose values proved satisfactory for use in setting up three test criteria of graded severity.

The derived criteria were then applied to the gestational tests of 1,013 women selected for periodic GTT's on a long-term basis. A strong correlation was found between the severity of the three original graded classifications and the percentages within each group subsequently developing diabetes (Test Level I only, 6.9 per cent; Test Level II only, 16.1 per cent; Test Level III only, 40.3 per cent). Application of the life table technic re-emphasized this result, with the corresponding 17.2, 29.0, and 60.1 percentages respectively.

The ability to identify future diabetics was in no way diminished by a test of lower positivity in a subsequent pregnancy. Maintaining the initial level of positivity with Test Level II in a repeat pregnancy, on the other hand, doubled this risk.

The impressive worth of the oral glucose tolerance test in pregnancy is demonstrated. The criterion considered suitable for routine application consisted of any two or more of the following values being met or exceeded: Fasting, 90 mg. per 100 ml.; one hour, 165 mg. per 100 ml.; two hours, 145 mg. per 100 ml.; three hours, 125 mg. per 100 ml.

ADIPS (Australian Diabetes in Pregnancy Society)

- Formed in 1986
- Consensus statement in 1991
  - Clinical risk factors not reliable
  - Some form of laboratory screening offered to all women
  - Non-fasting GCT of 50g or 75g with ≥ 7.8 or 8.0 mmol/L considered positive
  - Then require full fasting GTT
  - Levels of ≥ 5.5 mmol/L or 8.0 mmol/L (fasting and 2 hours) considered positive
  - Reiterated in 1998 with a higher 2-hour level (9.0 mmol/L) recommended in NZ
  - Consensus/expert opinion based
  - Acknowledgment that much evidence was around avoidance of T2DM rather than decreasing perinatal morbidity

ACHOIS (RCT #1)[1]

- Published June 2005
- To determine whether "doing something" better than routine care
- Selected a cohort diagnosed with GDM
  - Criteria different to that used to diagnose GDM now
- Randomised to intensive antenatal vs routine care
- Primary fetal outcomes: composite, or admission to SCN or jaundice requiring phototherapy
- Primary maternal outcomes: induction of labour, LUSCS, mental health questionnaires

1. Crowther CA, Hiller JE, Moss JR, McPhee AJ, Jeffries WS, Robinson JS, et al. **Effect of treatment of gestational diabetes mellitus on pregnancy outcomes**. N Engl J Med. 2005;352:2477-86

ACHOIS (RCT #1)

- Findings in intervention group:
  - Statistically significant **reduction** in composite perinatal outcome
  - **Increase** in SCN admissions
  - **No change** in LUSCS rates
  - **Increase** in induction of labour
  - Trend to **better** mental health
  - Smaller babies
- Conclusions
  - Intensive treatment decreases serious perinatal morbidity and may improve mother's quality of life

Landon et al. (RCT #2)[1]

- Published 2008
- Similar methodology to ACHOIS – in response to 2008 USPSTF statement concluding insufficient evidence to screen for GDM
- Different criteria for diagnosing GDM
  - More "stringent"
  - Also different to what is used today in Australia
- Primary fetal outcome: composite
- Secondary fetal outcomes: size, admission to SCN, respiratory distress
- Secondary maternal outcomes: weight gain, LUSCS, PET, IOL, shoulder dystocia

1. Landon MB, Spong CY, Thom E, Carpenter MW, Ramin SM, Casey B, et al. **A multicenter, randomized trial of treatment for mild gestational diabetes**. N Engl J Med. 2009;361:1339-48

Landon et al. (RCT #2)

- Findings in intervention group
  - **No difference** in composite perinatal outcome
  - **No** perinatal deaths in either group
  - **No difference** in any individual component of composite outcome
  - **Reduced** size of babies
  - **No difference** in SGA or admission to SCN
  - **No difference** in induction of labour
  - **Decreased** LUSCS rates
  - **Decreased** shoulder dystocia
  - **Decreased** pre-eclampsia/hypertensive disorder
- Conclusions
  - Treatment of GDM does not significantly reduce serious perinatal outcomes but reduces fetal overgrowth, shoulder dystocia, LUSCS and hypertensive disorders

HAPO[1]

- Published 2008
- Large prospective cohort study
- Data supporting treatment of GDM accumulating
  - Aim to define pregnancy-specific level of intervention
- Low risk population, given GTT at 24-32 weeks
- Followed up for a range of outcomes:
  - Primary: fetal macrosomia, clinical fetal hypogycaemia, LUSCS rates, fetal cord C-peptide >90th%.
- Continuous and categorical analysis of glucose levels

1. HAPO Study Cooperative Research Group MB, Lowe LP, Dyer AR, Trimble ER, Chaovarindr U, Coustan DR, Hadden DR, McCance DR, Hod M, McIntyre HD, Oats JJ, Persson B, Rogers MS, Sacks DA. **Hyperglycemia and adverse outcomes**. N Engl J Med. 2008;358:1991-2002

HAPO

- Strong continuous association of maternal glucose with increased birth weight and C-peptide. More modest associations with hypoglycaemia and LUSCS rates
- Sub-analysis gave values we use today (endorsed WHO/IADPSG)
  - Odds ratio of 1.75 for macrosomia, fat distribution and C-peptide at each glucose level (calculated above the mean)
  - Secondary analysis of values derived from this: RR of approx 2 for these outcomes and PET, RR of approx 1.45 for LUSCS and pre-term birth
- Things to note:
  - Not a prevalence study
  - Risk is in an untreated population (i.e. if you did nothing)
  - No clear threshold for risk increasing

International Guidelines

Country	Initial screen	Final diagnosis	BGL Levels
Australia	75g fasting 2-hour GTT	N/A	Any of fasting ≥ 5.1, 1-hour ≥ 10.0, 2-hour ≥8.5
U.K.	Clinical risk factors	75g 2-hour fasting GTT	Fasting ≥ 5.6, 2-hour ≥ 7.8
U.S.A	1. 50g non-fasting GCT **OR** 2. Clinical risk factors **OR** 3. 75g fasting 2-hour GTT	1. 100g fasting 3-hour GTT **OR** 2. 75g fasting 2-hour GTT	1. Two or more of fasting ≥ 5.3, 1-hour ≥ 10.0, 2-hour ≥ 8.6, 3-hour ≥ 7.8 **OR** 2. Two or more of fasting ≥ 5.8, 1-hour ≥ 10.6, 2-hour ≥ 9.2, 3-hour ≥ 8.1 **OR** 3. Same as Australia
Canada	1. 50g non-fasting GCT **OR** 2. 75g fasting 2-hour GTT	75g 2-hour fasting GTT	1. Fasting ≥ 5.3, 1-hour ≥ 10.6, 2-hour ≥ 9.0 **OR** 2. Same as Australia

Current Meta-Analyses

- 2015 Cochrane [1]
  - Insufficient evidence to comment on which criteria is best
  - Too few studies examining the new IADPSG/WHO criteria
- 2017 Cochrane (update)[2]
  - Seven "small" trials
  - Insufficient evidence to recommend any specific method for diagnosis

1. Farrar D, Duley L, Medley N, Lawlor DA. Different strategies for diagnosing gestational diabetes to improve maternal and infant health. Cochrane Database Syst Rev. 2015;1:CD007122
2. Farrar D, Duley L, Dowswell T, Lawlor DA. Different strategies for diagnosing gestational diabetes to improve maternal and infant health. Cochrane Database Syst Rev. 2017;8:CD007122

Literature Take-Home Messages

- Treating (rather than ignoring) GDM results in improved non-catastrophic outcomes
- HAPO criteria only have evidence for use between 24-32 weeks and are designed to prevent large babies and their complications
- No randomised evidence this criteria is superior to previous ADIPS criteria
- Lack of international acceptance on which criteria are best
- Limited focus on absolute risk (compared with relative risk reduction) of potential adverse outcomes
- No focus on whether treated cohort have an increase in risk above non-diabetic controls

Pre- and post-HAPO Outcomes

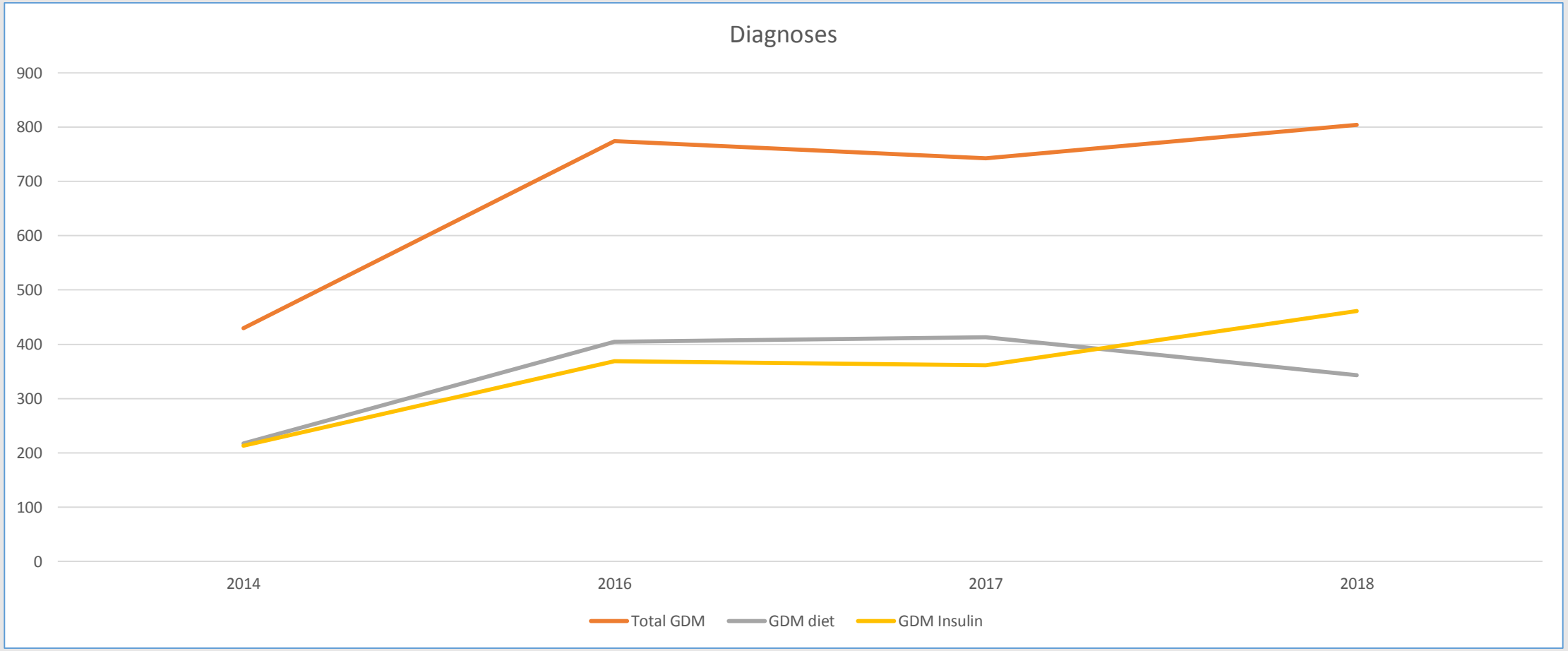
- Large analysis at RWH
- Increase in annual incidence by 100%
  - Prev 5% now > 10%
  - In some areas of Sydney, GDM incidence is now 25%
- No overall decrease in CS rates, large babies, other complications
- GDM cohorts remain slightly higher risk than non-GDM controls
  - GDM diet-controlled have **no** increase in risk of any adverse outcome compared to matched non-diabetic controls
- GDM cohort post-HAPO mildly lower risk than GDM pre-HAPO

Pre- and post-HAPO Costs

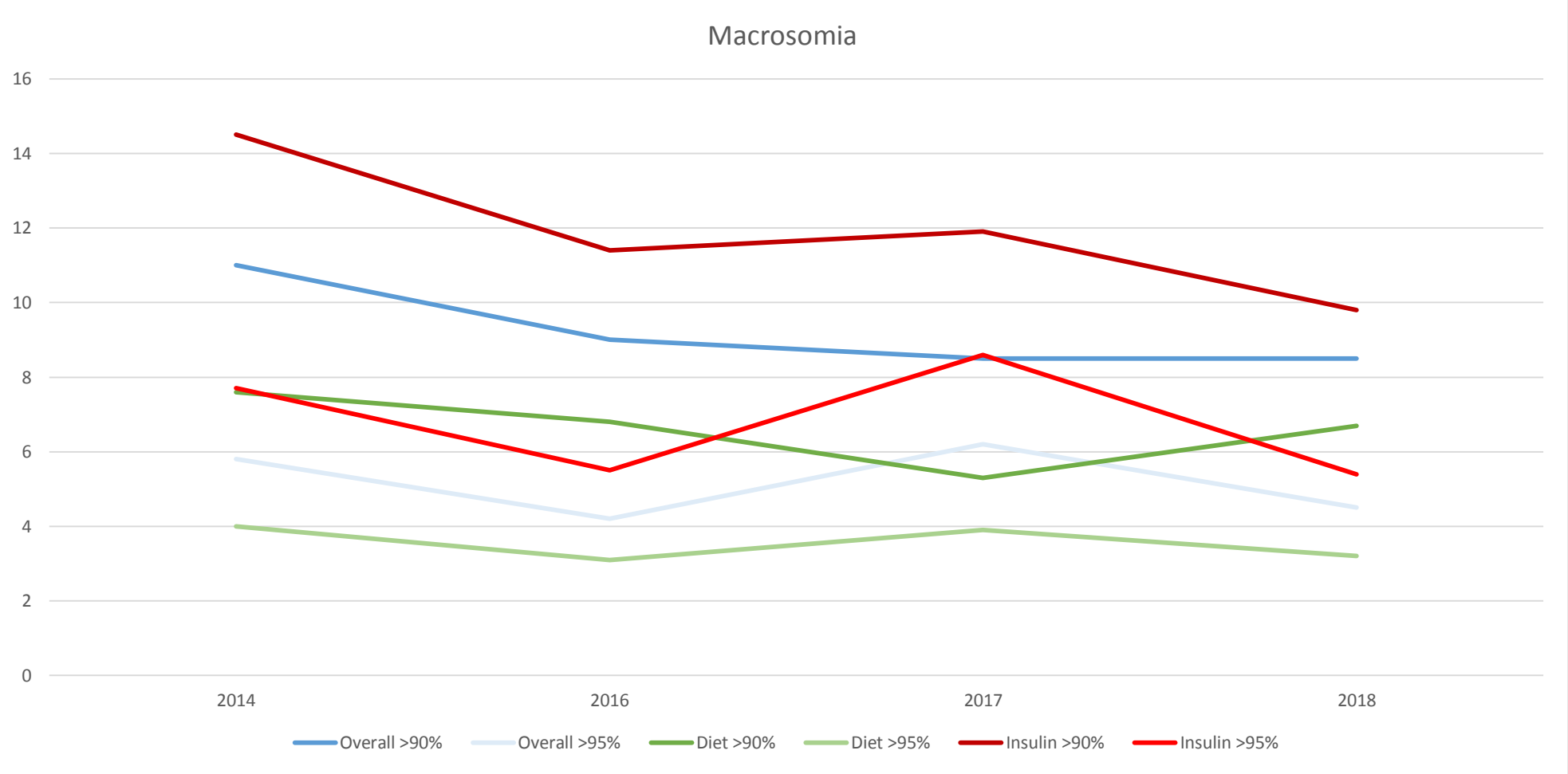
- Overall increase in hospital costs of $500 000[1]
- Subsequent analysis of failure to introduce lower risk models of care
  - $1.4 million of "wasted" money
- If analysing potential "missed" cases of GDM under the older system of diagnosis
  - No way of accounting for $500 000 even if every single missed case incurred an admission to SCN for the mean bed-stay
- Possible unquantified longer term health economic advantage
  - Change in maternal lifestyle habits
  - Minimising childhood obesity/diabetes

1. Cade T, Polyakov A, Brennecke S. **Implications of the introduction of new criteria for the diagnosis of gestational diabetes: a health outcome and cost-of-care analysis** BMJ Open 2019

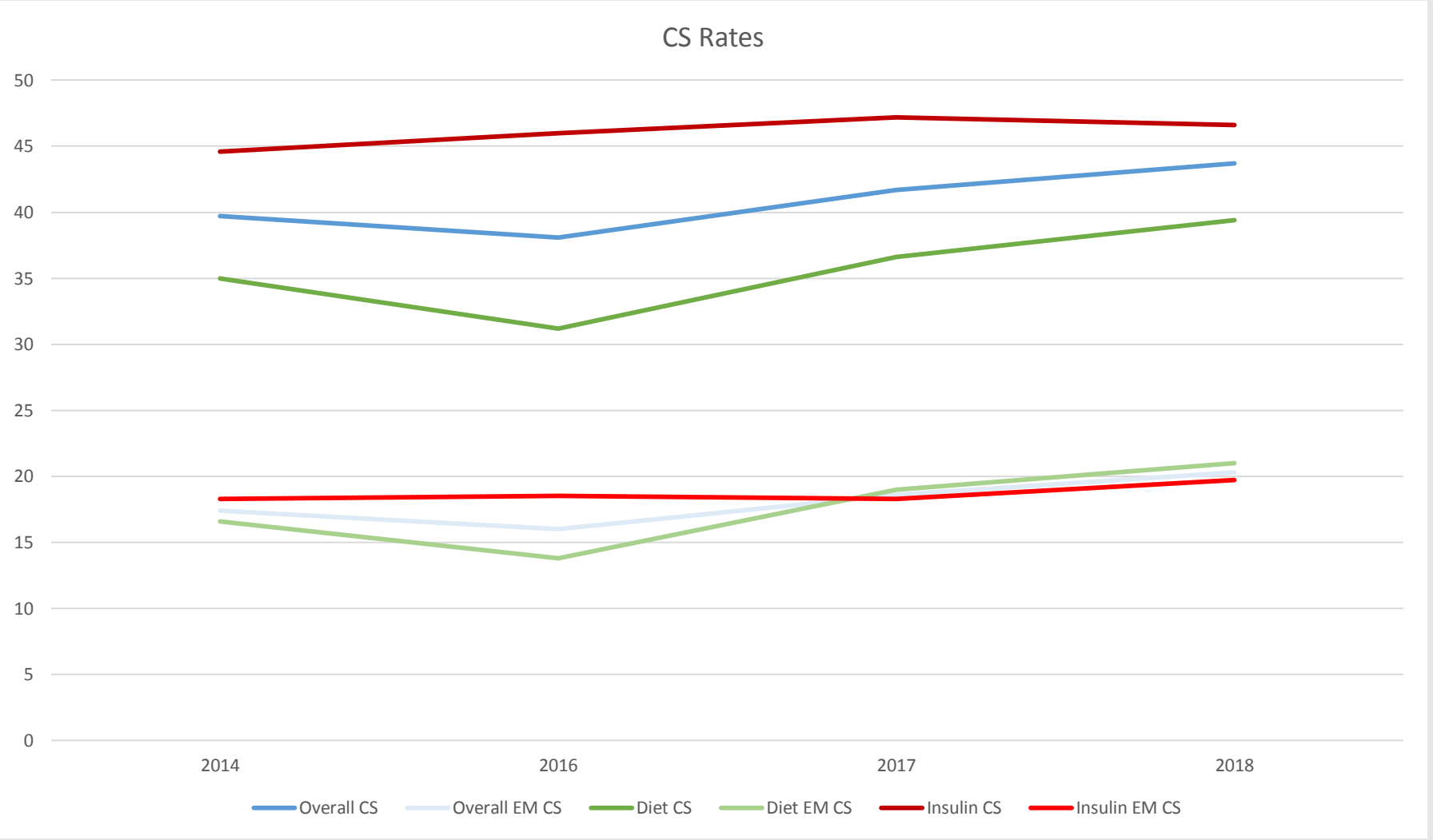
Pre- and post-HAPO



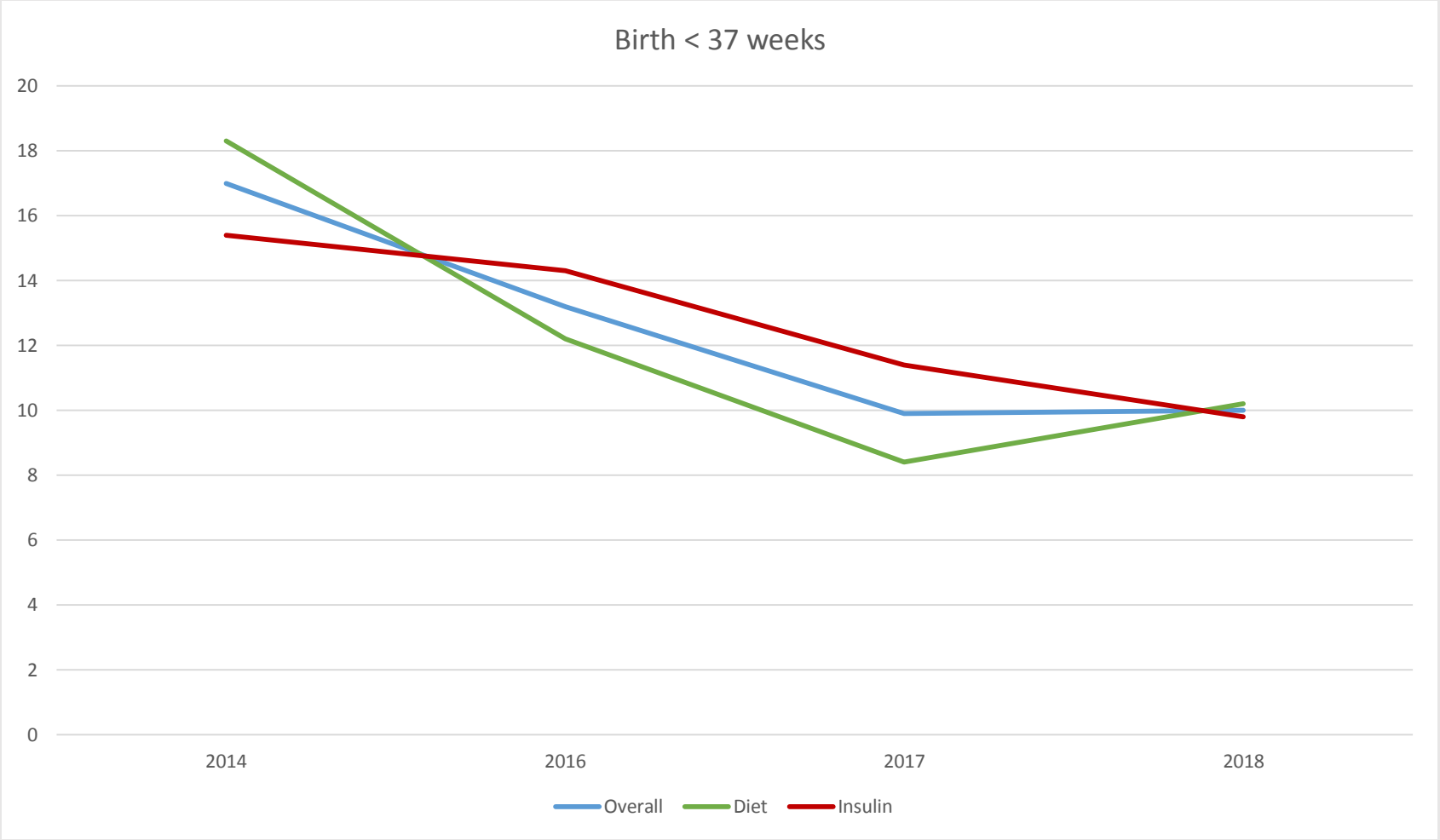
Pre- and post-HAPO



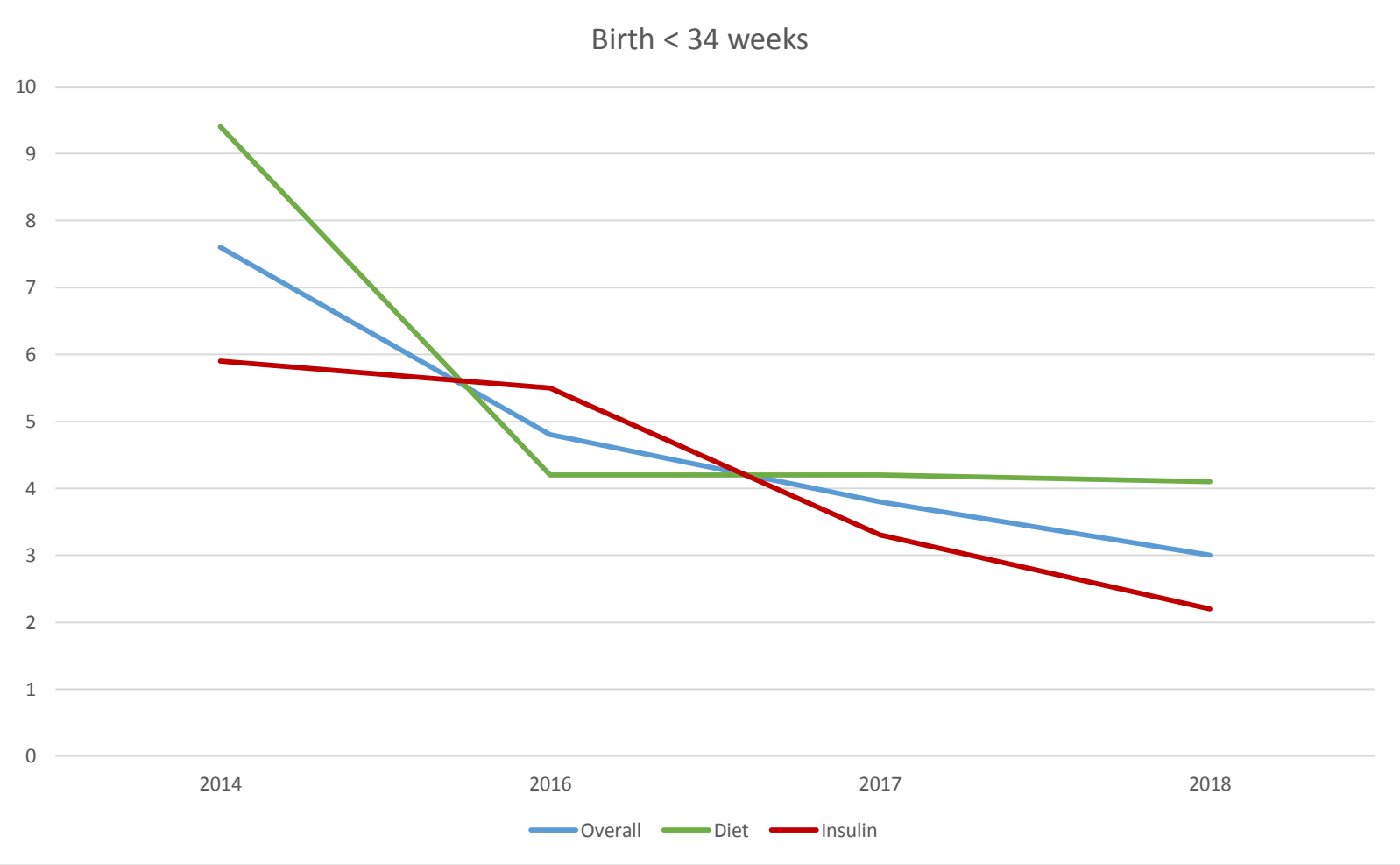
Pre- and post-HAPO



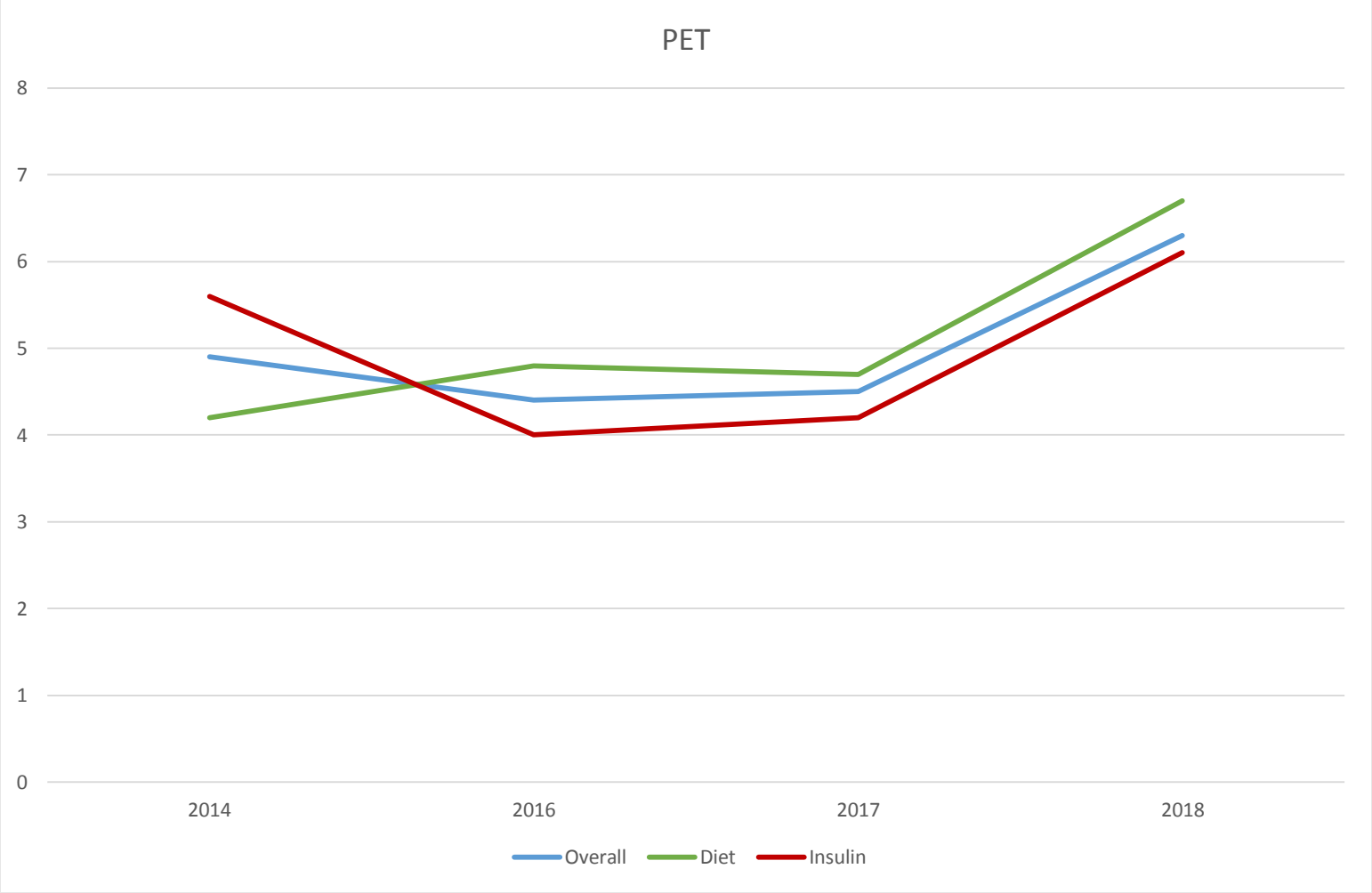
Pre- and post-HAPO



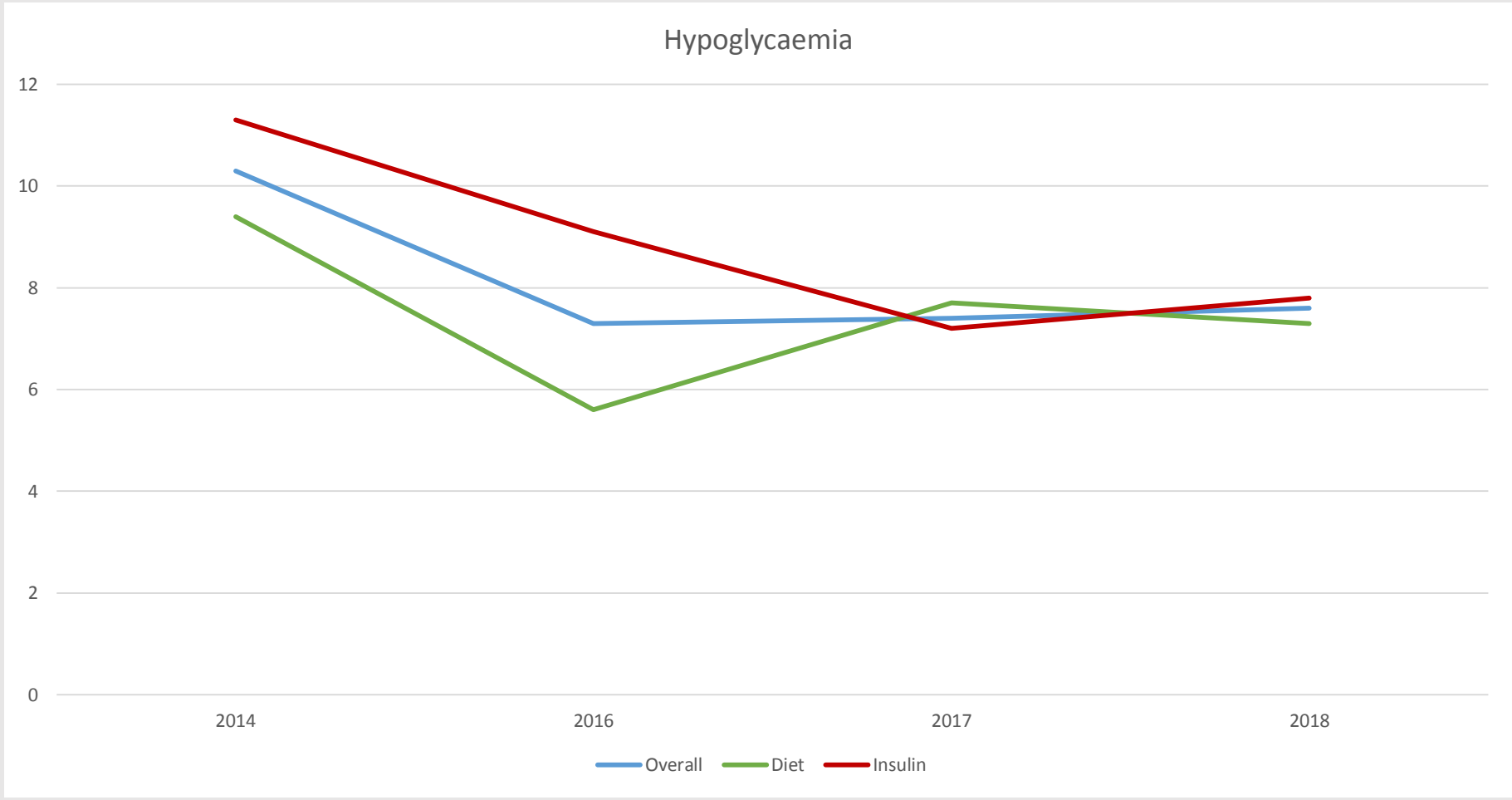
Pre- and post-HAPO



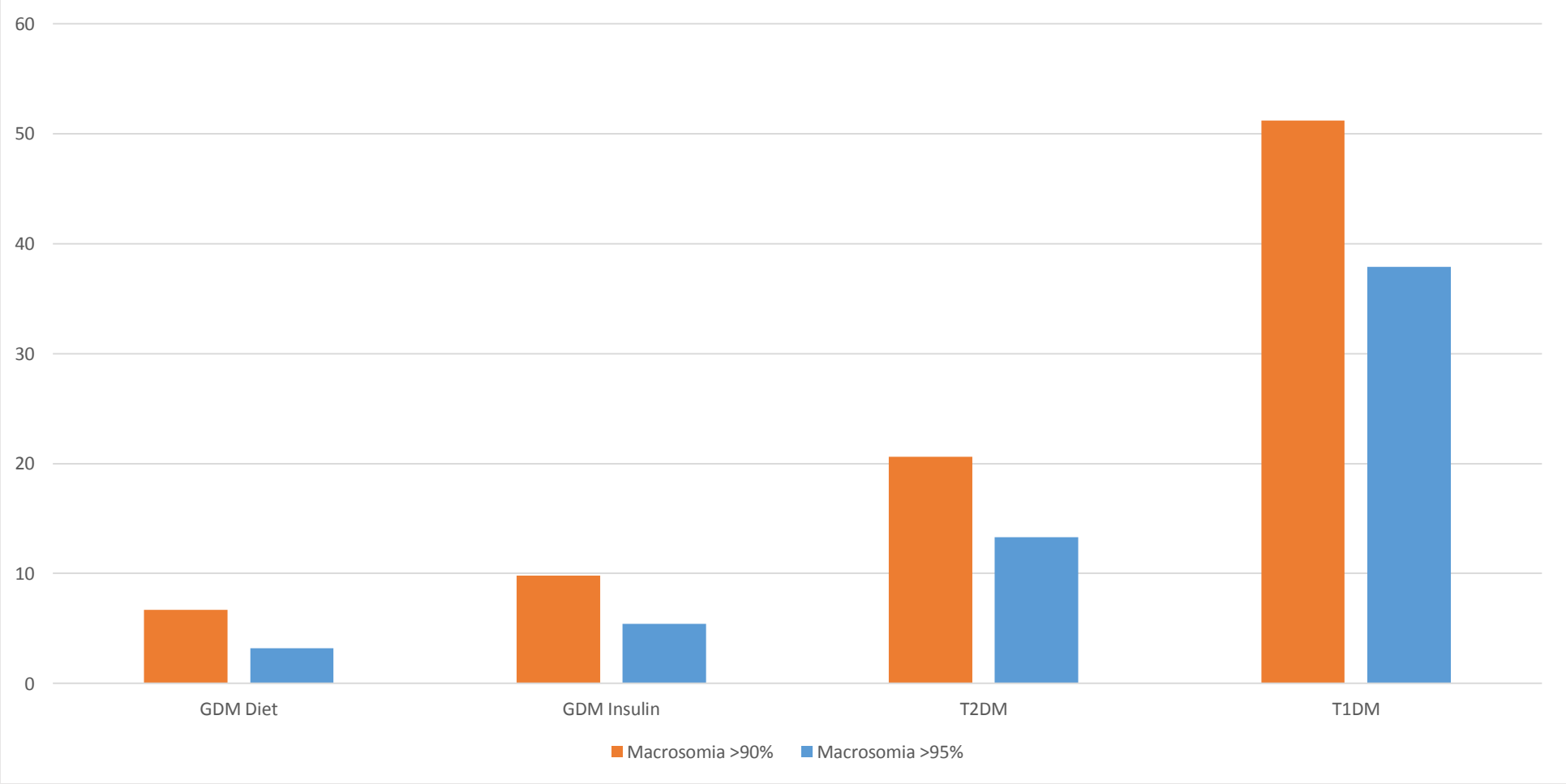
Pre- and post-HAPO



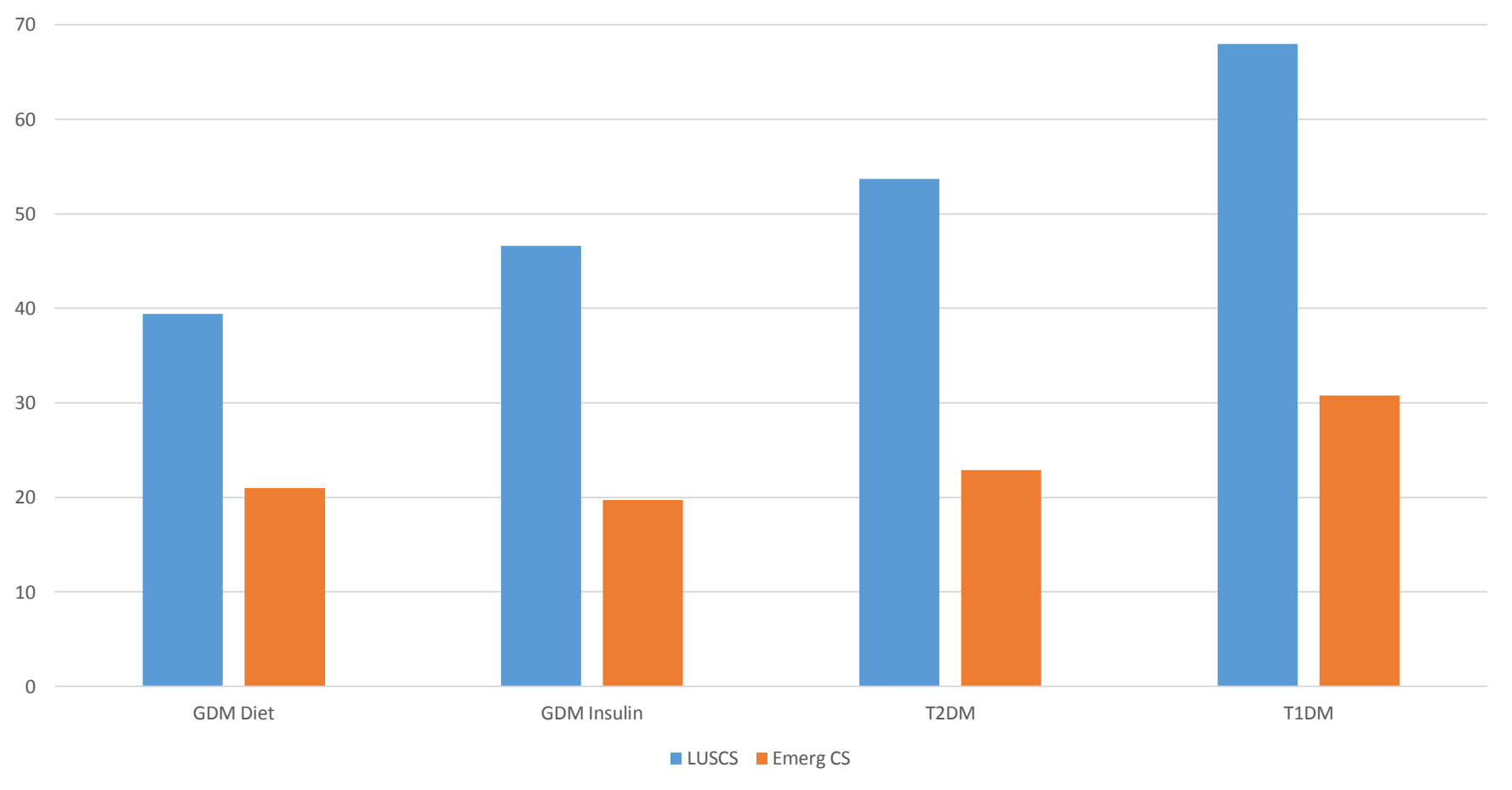
Pre- and post-HAPO



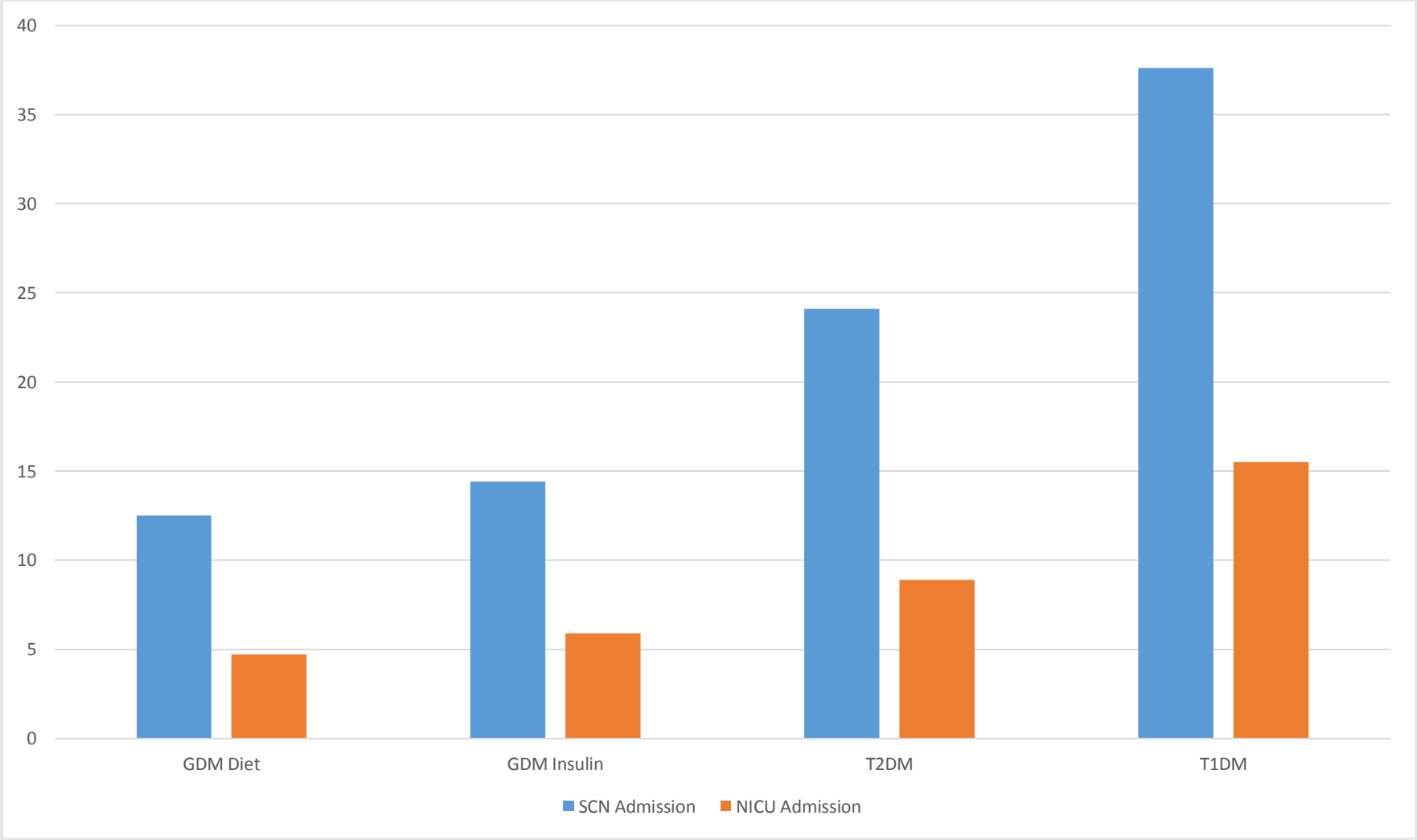
Pre-existing DM versus GDM: Macrosomia



Pre-existing DM versus GDM: CS rates



Pre-existing DM versus GDM: SCN/NICU



Simple Take-Home Messages

- Treating GDM better than ignoring it
- If you did ignore or miss it, you would increase the risk of CS, large babies, pre-eclampsia and birth < 37 weeks but not stillbirth/other catastrophic outcome
- New criteria have at least doubled annual incidence with a large spike in costs of care
- The "lower risk" GDM group have no increase risk in any adverse outcome compared to those without GDM
- Treatment may be as simple as dietary modification and recording and reporting BGLS with upward triage
- Crucial to examine lower risk pathways (midwifery led, shared care) to appropriately allocated the public health purse

Case Examples (1)

- 32 yo G1P0, uncomplicated pregnancy
- No risk factors GDM
- GTT at 28 weeks 4.3/**10.5**/7.9 (GDM)
- Repeated it with another provider: 4.7/9.6/8.0 (normal)
- Which do you believe?
- What should her treatment be?
- What options could be presented to her?

Case Examples (2)

- 32 yo G1P0, uncomplicated pregnancy
- GTT at 28 weeks 4.3…..incomplete after vomit
- No risk factors for GDM
- What are her options?
- Would her care be different if she was in the UK?

Case Examples (3)

- 36 yo G2P1, previous GDM requiring insulin, BMI 34
- When should she have her first GTT?
- If she had a first trimester GTT of 4.8/**10.2**/7.8, what should her treatment be?
- If she had a 18 week GTT of **5.3/**9.8/**8.8**, are her risks greater than someone diagnosed at 28 weeks?

Case Examples (4)

- 31 yo G3P2, never GDM, delivered vaginally, normal size babies
- “Too difficult to attend GTT”
- How should she be counselled?
- What could an alternative screening strategy be?
- What risk increase would she have if she had GDM and it was undiagnosed?

Case Examples (5)

- 31 yo G1P0, GDM diagnosed, meticulously recording BGLS, all normal
- Previously in "Caseload" midwifery at a tertiary hospital.
- Wants to continue with her 1-1 midwife.
- Should this be OK?
- She is undelivered at 40 weeks, does she need induction?
- Should it be OK to continue shared care if she was under that model?