

Treating to Targets

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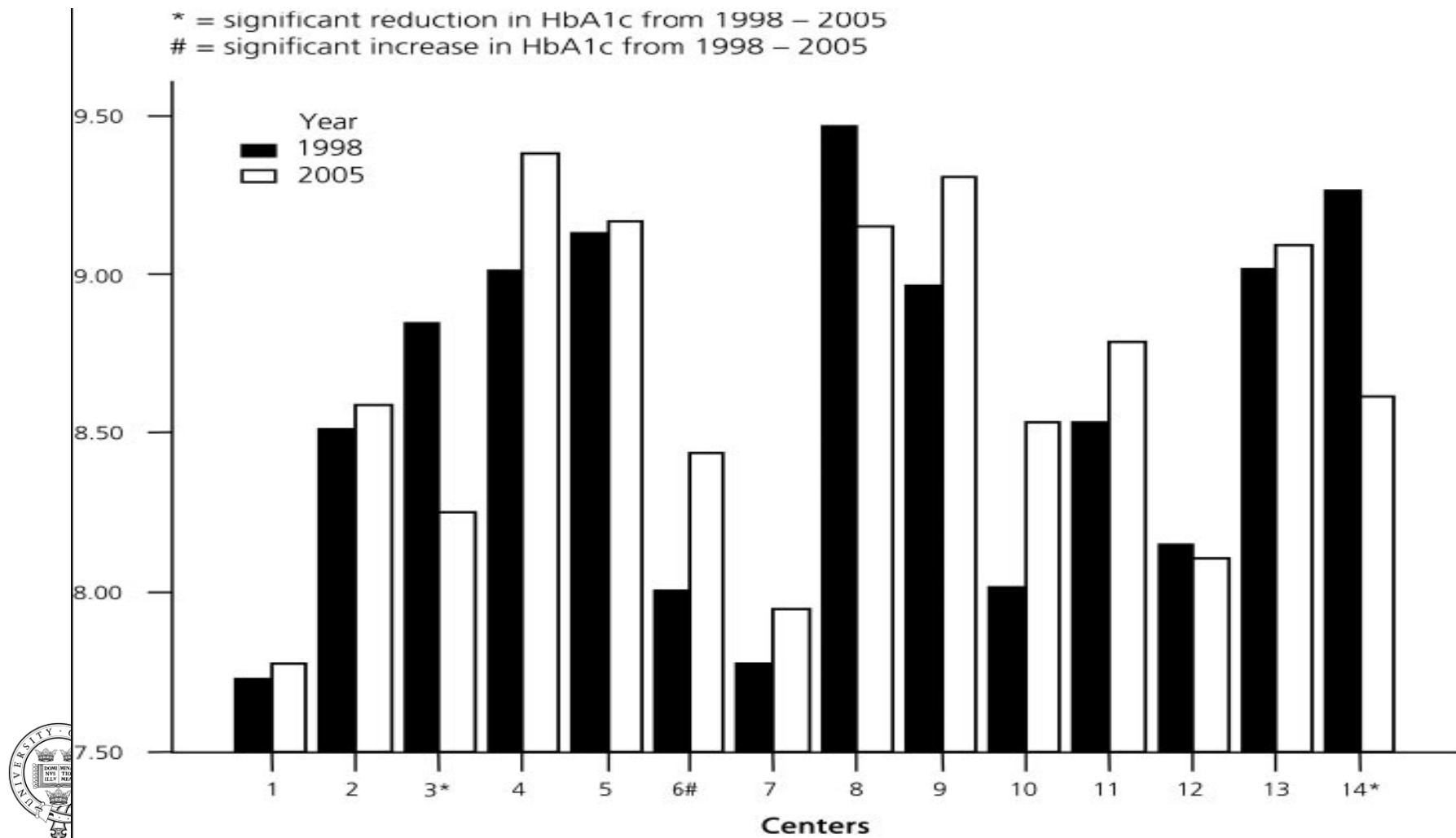


Plan

- targets – why?
- targets – what?
- our service
- intensive insulin at diagnosis
- adjusting insulin doses
- school

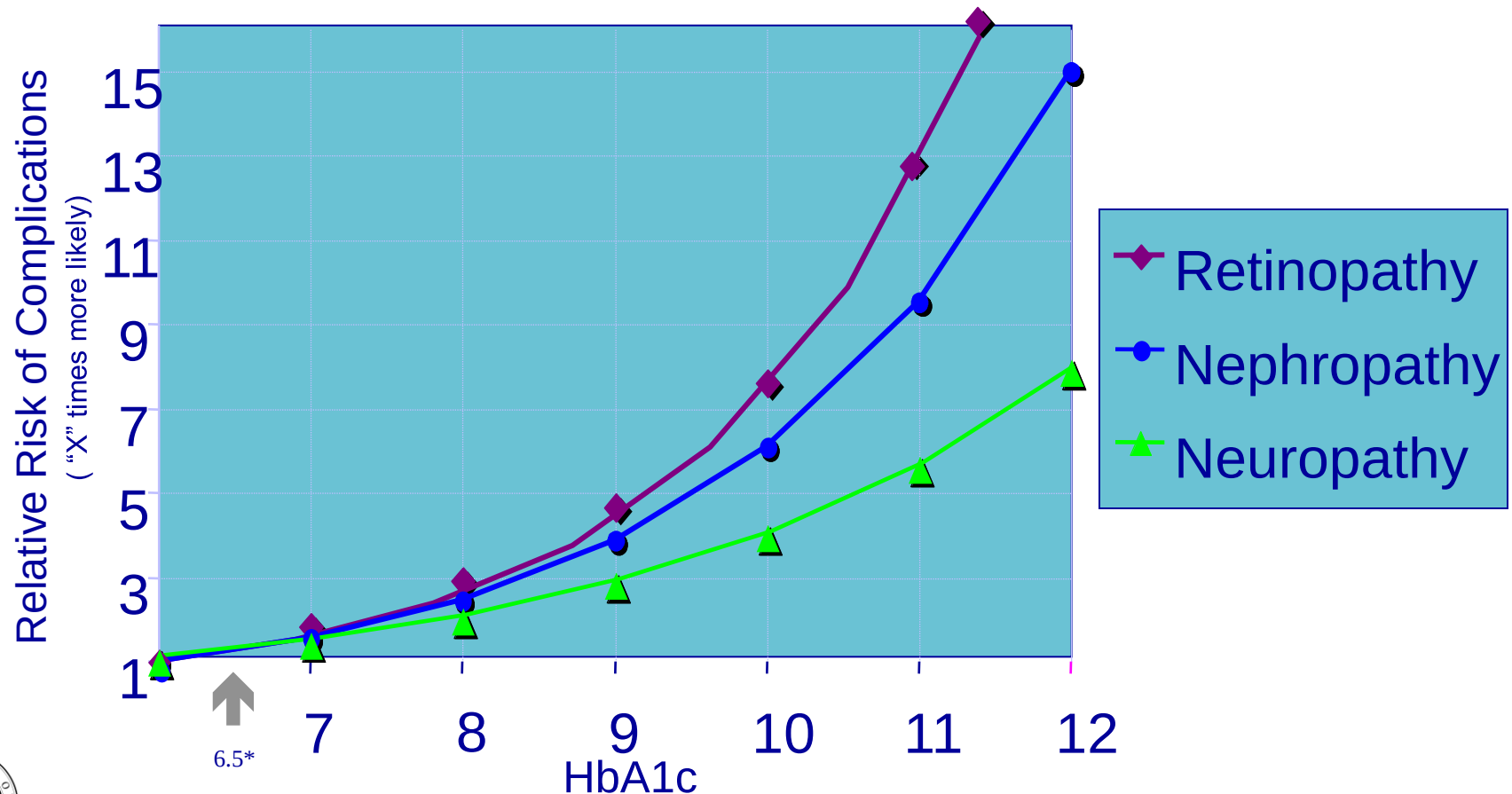


Continuing Stability of Center Differences in Pediatric Diabetes Care: Do Advances in Diabetes Treatment Improve Outcome? The Hvidoere Study Group on Childhood Diabetes



DCCT RESULTS

HbA1c and Relative Risk of Diabetic Complications

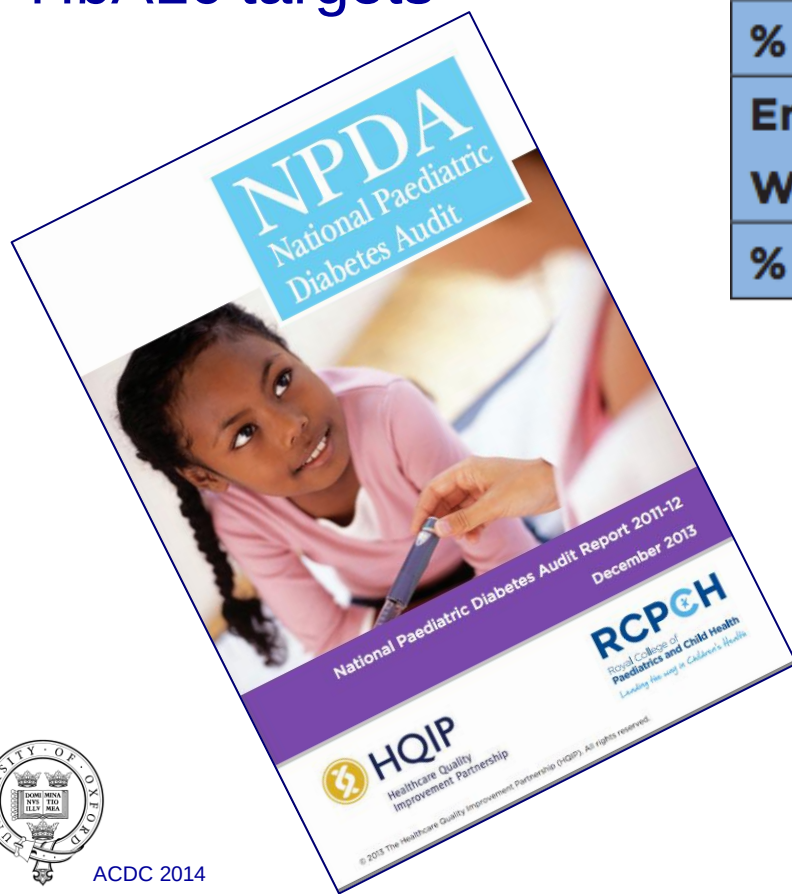


Adapted from DCCT Research Group: N England Journal of Medicine. 1993;329:977-986

ACDC 2014*Endocrine Practice 2002, 8 (supp 1), pg. 7. AACE recommends less than or equal to 6.5 HbA1c.

NDA Paediatric Diabetes Audit 2011-12

Attainment of HbA1c targets



	<58 mmol/mol (7.5%)		
	Boys	Girls	Total
England	1,721	1,444	3,165
%	16.7	18.1	17.4
Wales	109	101	210
%	16.9	17.6	17.3
England and Wales	1,545	1,830	3,375
%	16.7	18.1	17.4

National value 2007-8 = 17.6%

National value 2008-9 = 16.31%

National value 2009-10 = 14.53%



Do HbA1c levels “track”?

- Thus there is some evidence for “tracking” of HbA1c levels over time within **clinics**
- We postulated that HbA1c levels within **individuals** may also show tracking, and that if control can be improved early on after diagnosis, this may persist over several years



Tracking Study

329 children and young people (144 female (44%))

- aged between 0 and 19 years (median 11.1 years).
- follow-up 0 to 17 years (median 6.6 years)

Mean HbA1c levels fell in those at least 6 months after diagnosis from

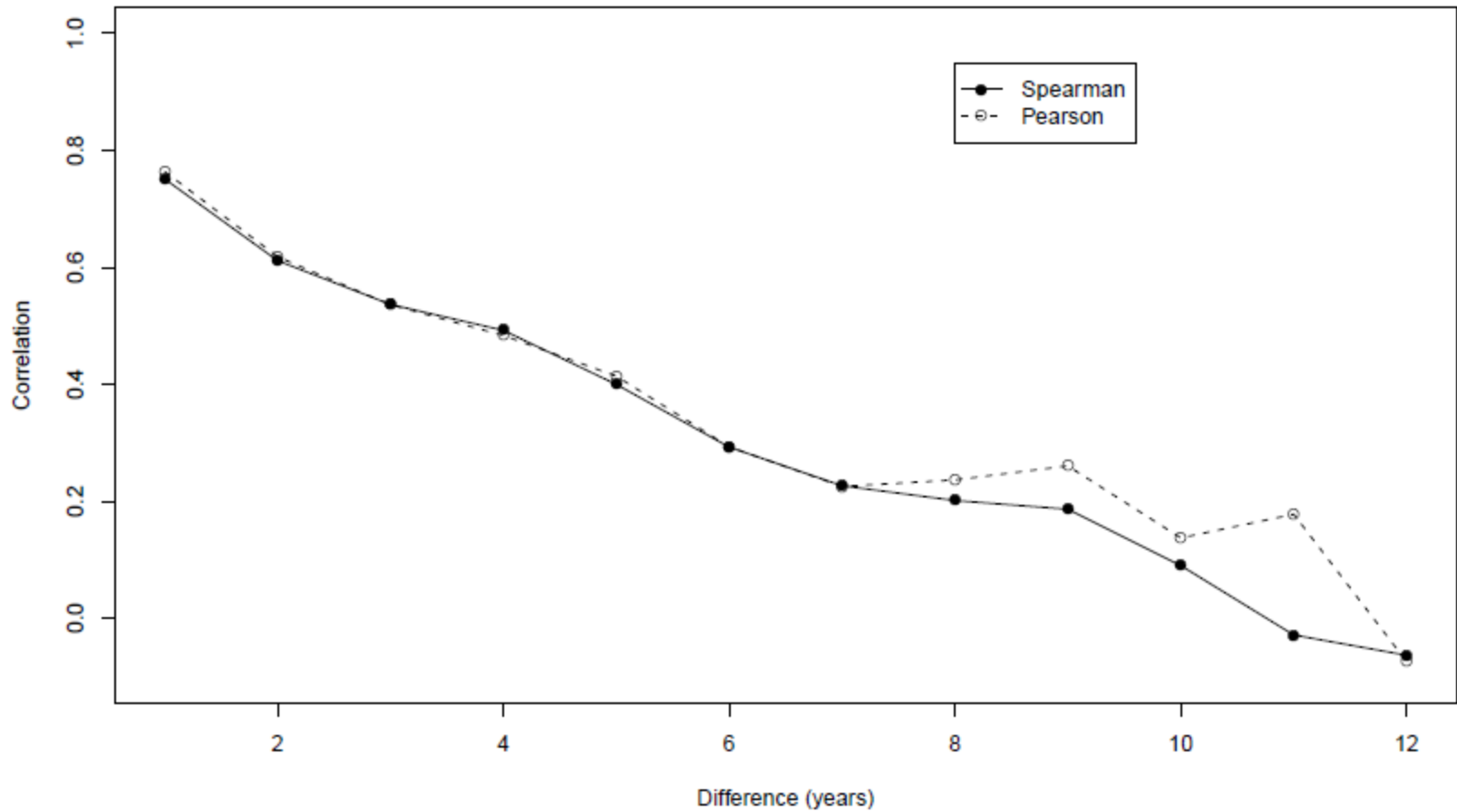
- $9.3 \pm 1.5\%$ in 2001 to
- $8.1 \pm 1.3\%$ in 2008
- by 0.08% per year ($p < 0.0001$).

Mean levels at 6-12 months from diagnosis fell from

- $8.7 \pm 1.4\%$ in 1999 to
- $6.9 \pm 0.94\%$ in 2008 ($p < 0.001$).



Between-year correlations



correlation significant to 9 years



Tracking with time

- In general the correlation is better for adjacent than subsequent years.
- There is a significant correlation up to 9 years.
- Only 2 of 33 children with a 6-month HbA1c level of 9% or more had a long-term (2-5 years) median HbA1c below 8 %.



Tracking

Possible reasons for the tracking

- Shorter remission period in those with high BG levels at diagnosis, especially if in DKA
- Biological variation in glycation phenotypes?
- Psychosocial

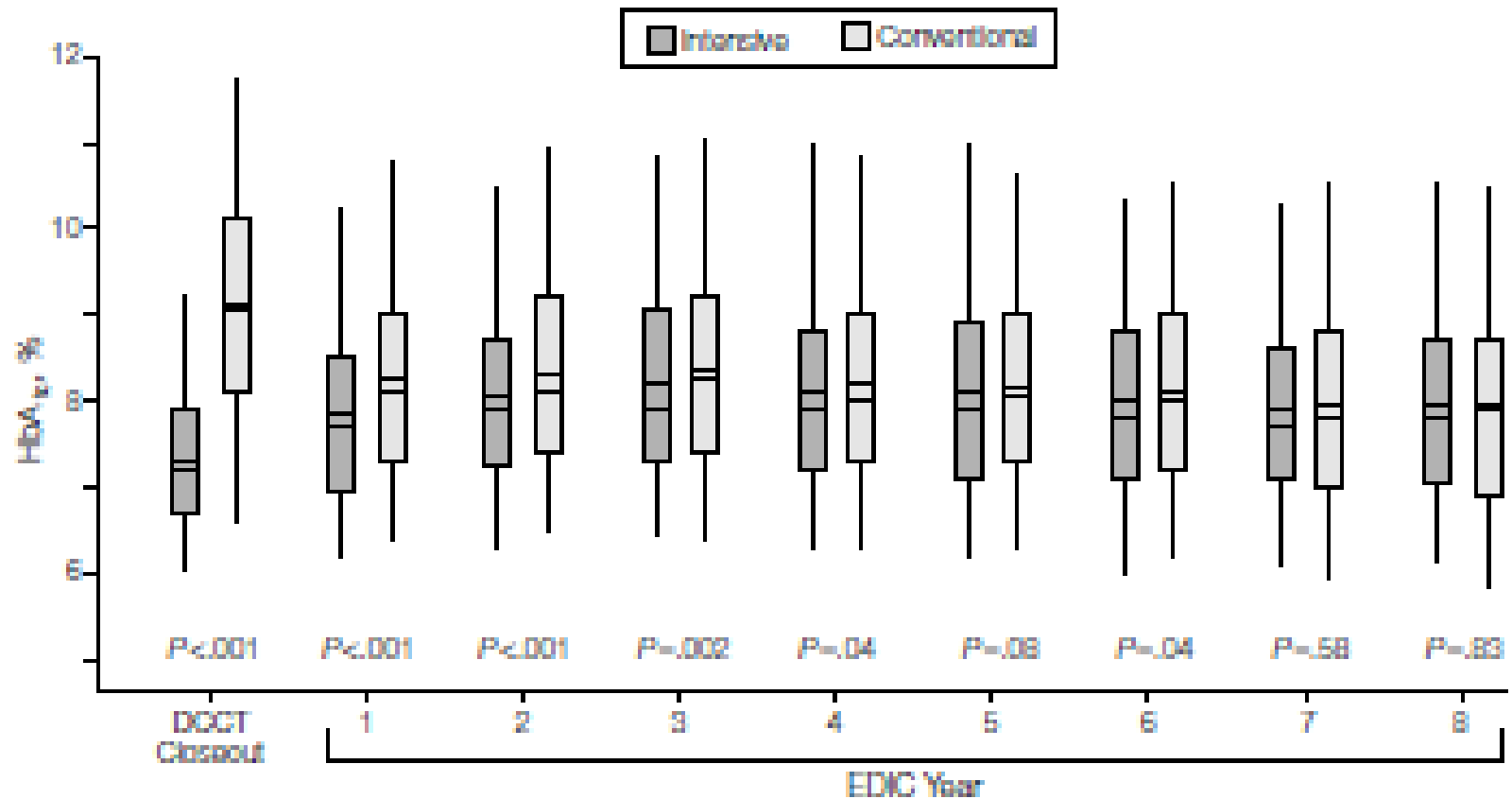
If HbA1c levels can be reduced to low levels within the first 6 months, there is a much greater chance that children will maintain good control in the long term.

Poor control within the first 6 months is particularly indicative of long-term poor control.



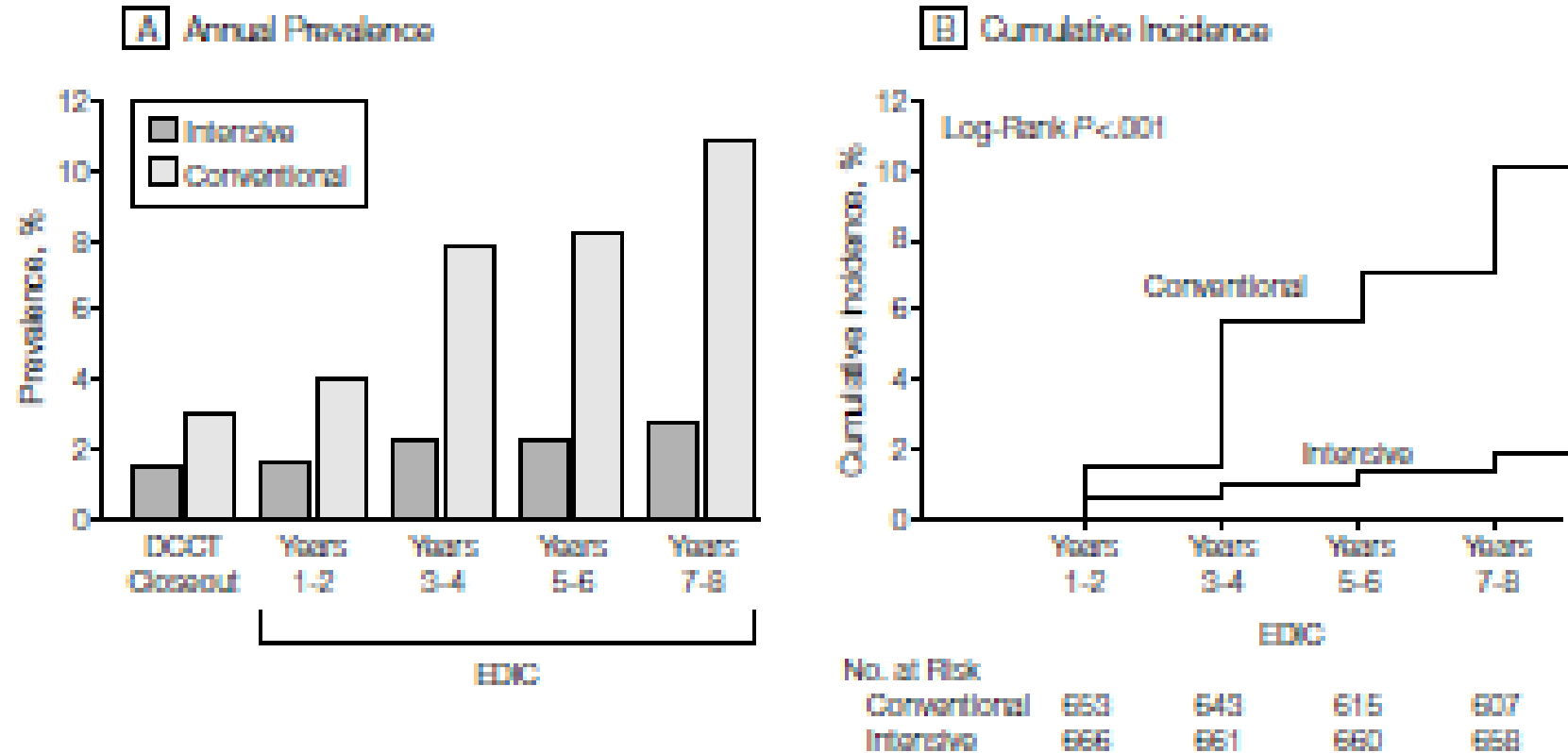
HbA1c levels during EDIC study

Figure 1. Distribution of HbA_{1c} Concentration by Randomized Treatment Group at the End of the DCCT and In Each Year of the EDIC Study



Albumin Excretion

Figure 3. Prevalence and Incidence of Albuminuria





Online article and related content
current as of November 30, 2008.

Sustained Effect of Intensive Treatment of Type 1 Diabetes Mellitus on Development and Progression of Diabetic Nephropathy: The Epidemiology of Diabetes Interventions and Complications (EDIC) Study

Writing Team for the Diabetes Control and Complications Trial/Epidemiology of Diabetes Interventions and Complications Research Group

JAMA. 2003;290(16):2159-2167 (doi:10.1001/jama.290.16.2159)

<http://jama.ama-assn.org/cgi/content/full/290/16/2159>

New cases of microalbuminuria occurred 39 (6.8%) of the participants originally assigned to the intensive-treatment group vs 87 (15.8%) of those assigned to the conventional-treatment group

New cases of clinical albuminuria occurred in 9 (1.4%) of the participants in the original intensive-treatment group vs 59 (9.4%) of those in the original conventional-treatment group

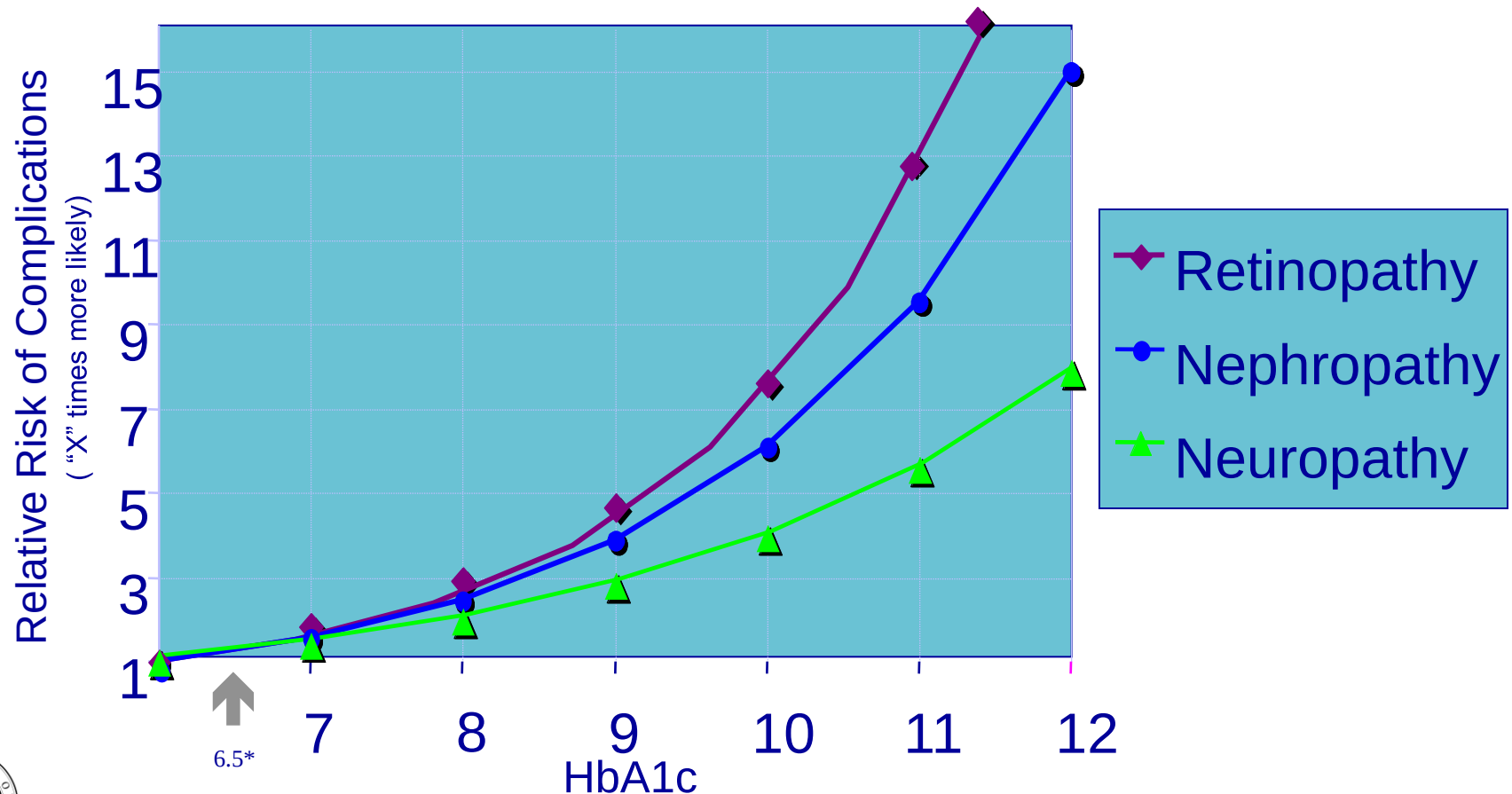
Same true in the adolescent cohort (reductions of 74% and 78%)

Concept of Metabolic Memory



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DCCT targets (1993)

- preprandial blood glucose concentrations between 3.9 mmol/L and 6.7 mmol/L
- postprandial concentrations of less than 10 mmol/L
- weekly 3-am measurement of more than 3.6 mmol/L
- glycated haemoglobin (HbA1c) measured monthly within the normal range (<6.05%)



ISPAD targets (optimal)

● pre-breakfast BG	5-8 mmol/l	4-6
● post-prandial	5-10 mmol/l	5-9
● bed-time BG	6.7-10 mmol/l	5-8
● nocturnal BG	4.5-9 mmol/l	4-8

(frequency of BG testing directly correlates with control)

- HbA1c <58 mmol/mol (7.5%) < 55 mmol/l



Team Member Targets & Glycaemic Control

Hvidore Study Group 2005

<7.0	7-7.4	7.5-7.9	8-9.0	No specific Target	Centre Mean HbA1c
100.0					7.40
100.0					7.58
20.0	40.	40.0			7.68
	100.0				7.74
16.7	83.3				7.80
		57.1	42.9		7.89
52.4	42.9	4.8			8.00
	100.				8.02
	100.0				8.08
	60.0	40.0			8.18
	40.0	40.0	10.0	10.0	8.23
33.3	44.4	22.2			8.24
20.0	60.0		20.0		8.27
	60.0	20.0	20.0		8.36
	80.0	20.0			8.45
	20.0	20.0	60.0		8.59
	33.3	44.4	22.2		8.76
			100.0		8.82
		75.0	25.0		8.83
		60.0	20.0	20.0	8.98
	20.0	60.0	20.0		9.05



Targets – how?

Teamwork

Getting it right from diagnosis

Parent/patient information

Tight insulin dose adjustment

Schools programme



Oxfordshire Children's Diabetes Service

- 335 children in Oxfordshire
 - Oxford and Banbury clinics
 - look after young people to 18-19 years
 - few other types
 - 2 Type 2, 3 cystic fibrosis
 - others – MODY, genetic defects
 - 4.6 PDSN
 - 1.2 dietitians
 - 0.5 psychology



How do we do it?

- Target HbA1c levels <7.5%
- but aim for <6.5% at 3 months
 - consistent messages
 - MDI from diagnosis
 - 28% on pumps
 - clinic organisation
 - structured education sessions every 2 years
 - technology (pumps and CGMS)
 - enjoy adolescents! –
 - parental involvement crucial



ISPAD consensus guidelines 2007

- The insulin (amount and type) should be adapted where possible to the child's eating pattern and appetite.
- Having a child eat consistently without an appetite or with-holding food in an effort to control blood glucose should be discouraged as this may impact adversely on growth and development.

Pediatric Diabetes/www.ispad.org

**Arrange the insulin around the lifestyle,
NOT the lifestyle around the insulin**



Insulin Regimens

	2013	2009	2006	2004	2002
Twice-daily	9	10	46	41	60
Three times daily	20	33	84	95	128
Basal bolus (MDI)	202	209	140	107	36
Insulin Pump	82	30	3	1	1



From Diagnosis.....

- insulin regimen
 - almost always MDI
 - higher doses recently
- dietitian
 - teaches new patients CHO counting within a week
 - at home
- team philosophy
 - low is good, high is bad
 - don't teach about severe lows until 2-3 months
 - aim for 4-6 in morning, not 4-8
- schools



Oxfordshire new patient audit

35 of 43 new patients with data for 3 months during 2013

- age range 1.09 – 16.79 years (mean 9.26yrs)
- weight 7.96 – 60.7kg (mean 33.3kg)

Blood Glucose levels -

	breakfast	lunch	dinner	bed	average
Day 1	10.67	15.63	19.26	20.2	17.6
Day 2	11.67	14.34	15.51	17.34	14.41
Day 5	9.84	14.72	14.40	13.23	13.07
Day 10-14 clinic	7.09	9.07	10.0	10.39	8.65
1 month	6.71	7.31	7.75	7.71	7.25



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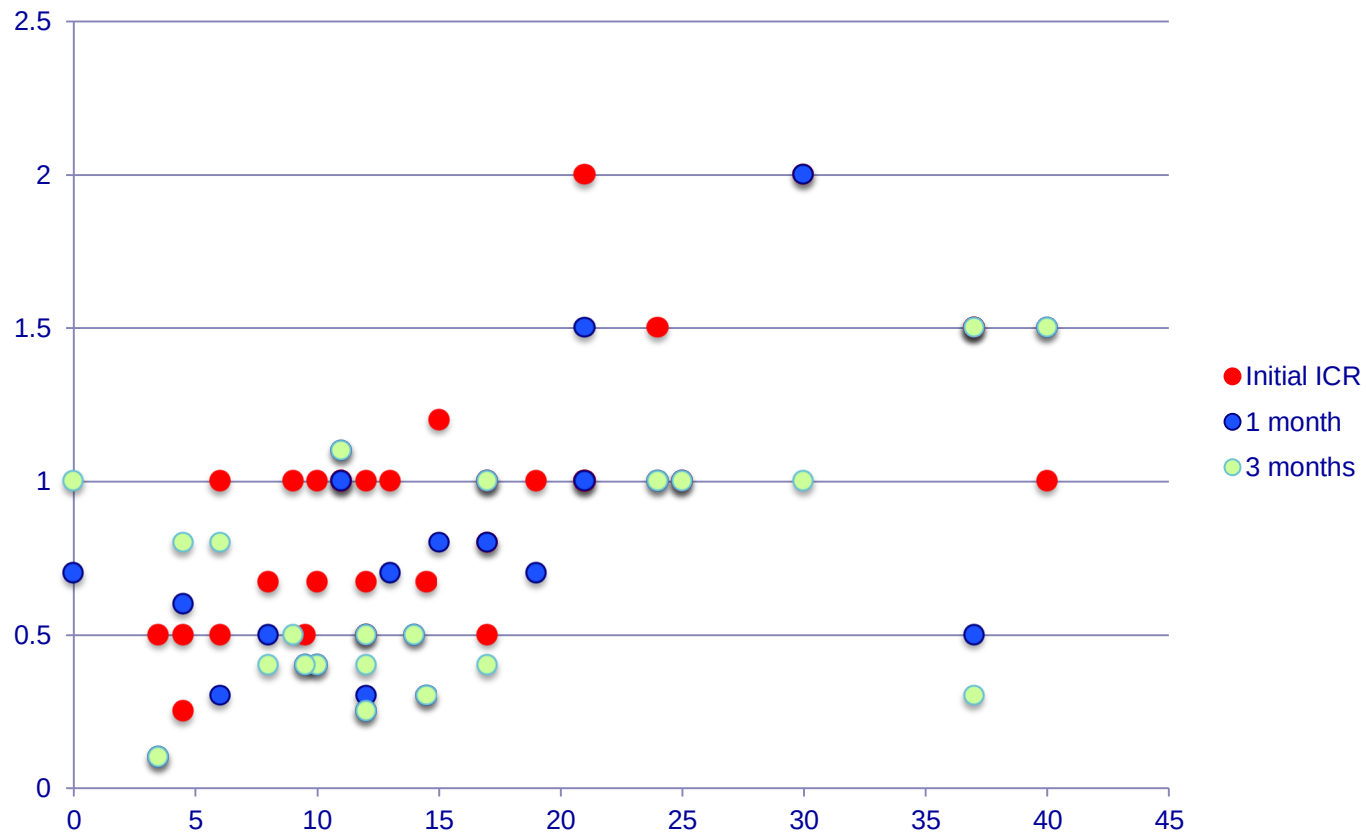
Insulin doses -

	TDD/kg	Lantus/kg	Lantus %
Day 2	0.66	0.31	47.93
Day 5	0.82	0.35	43.18
Day 10-14 clinic	0.97	0.36	37.31
1 month	0.75	0.31	40.36
3 months	0.60	0.26	41.37

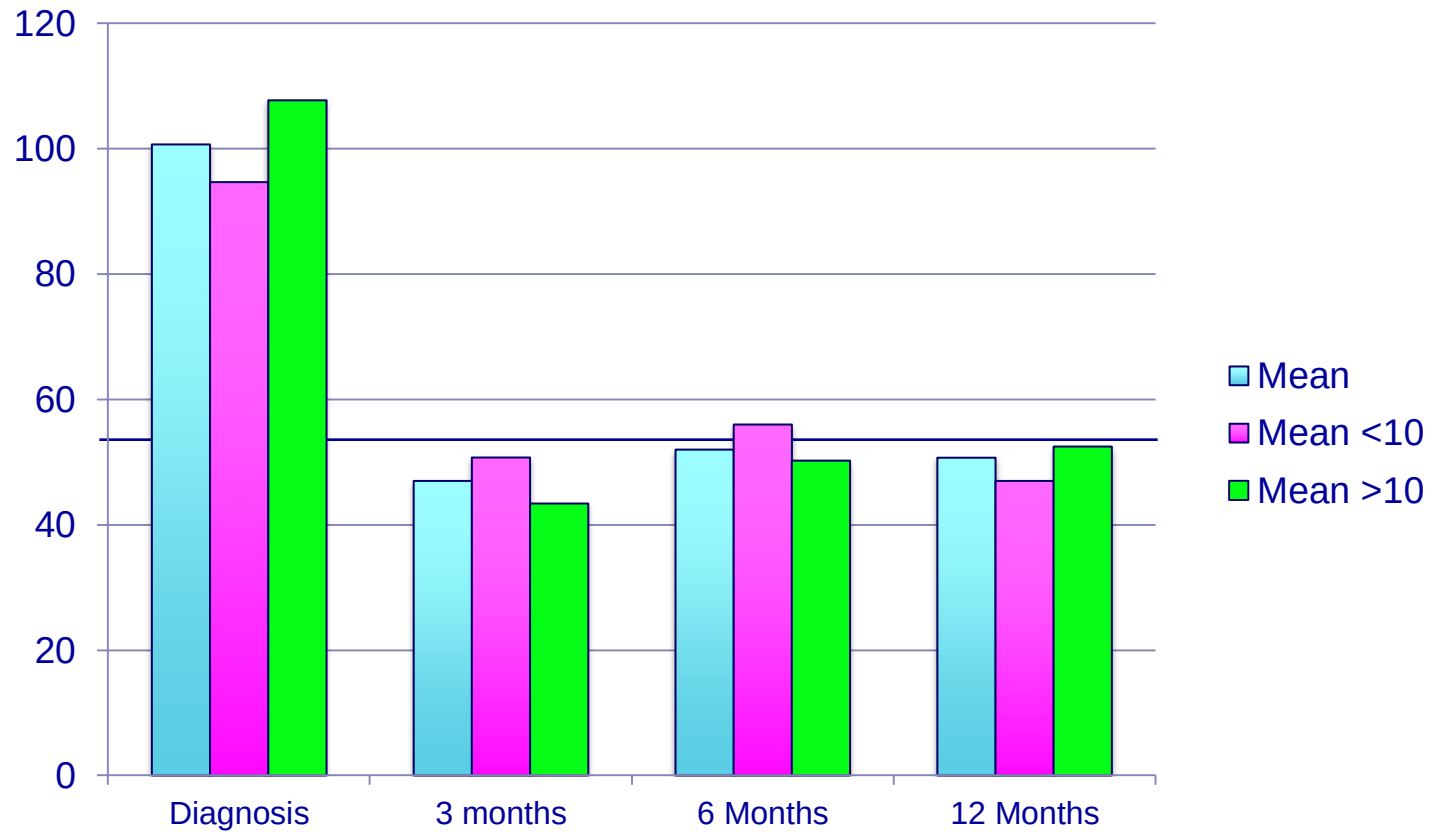


Carbohydrate counting

Insulin Carbohydrate Ratios related to initial NovoRapid dose



HbA1c levels from diagnosis



12 children with levels in 30's.

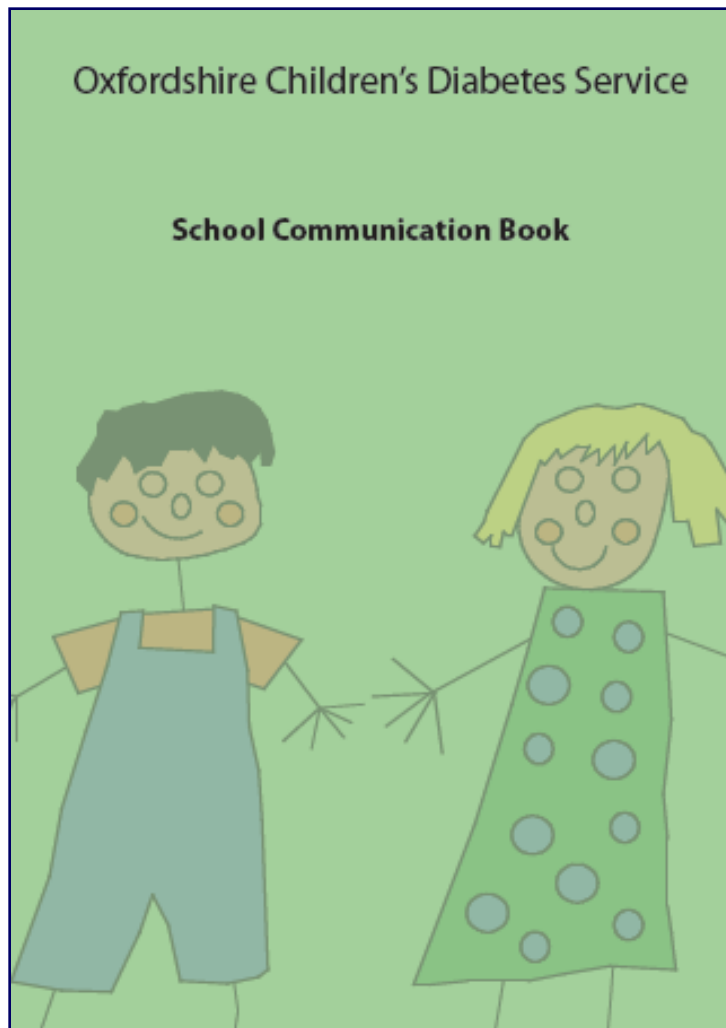


Insulin dose Adjustment

- Crucial – families need to learn BEFORE the end of the honeymoon to do this.
- Ten Top Tips
 - keep a book
 - look at it at least each fortnight
 - information leaflets
 - teaching session
 - know the targets
 - instruction as to how to adjust doses



Communication Book



Date: / /

Lunch Box Item	Expected Dose	Actual Dose
1		
2		
3		
4		
5		
6		

Total meal dose: units

BG: mmol/l

Correction insulin dose: units

Total dose: units

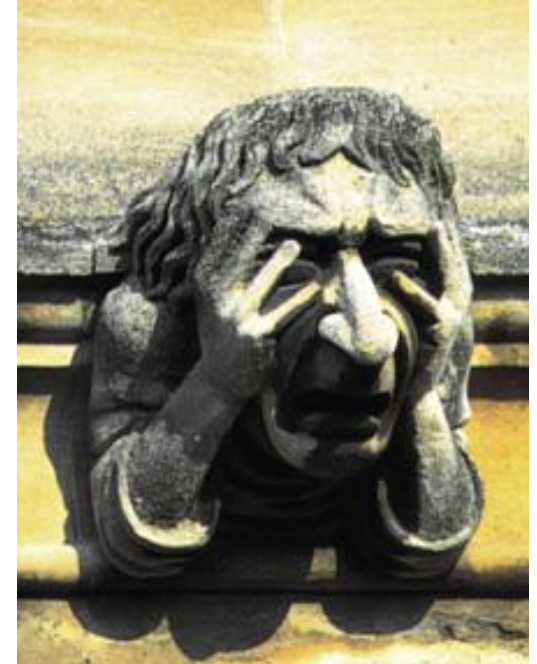
comments

Signature: _____

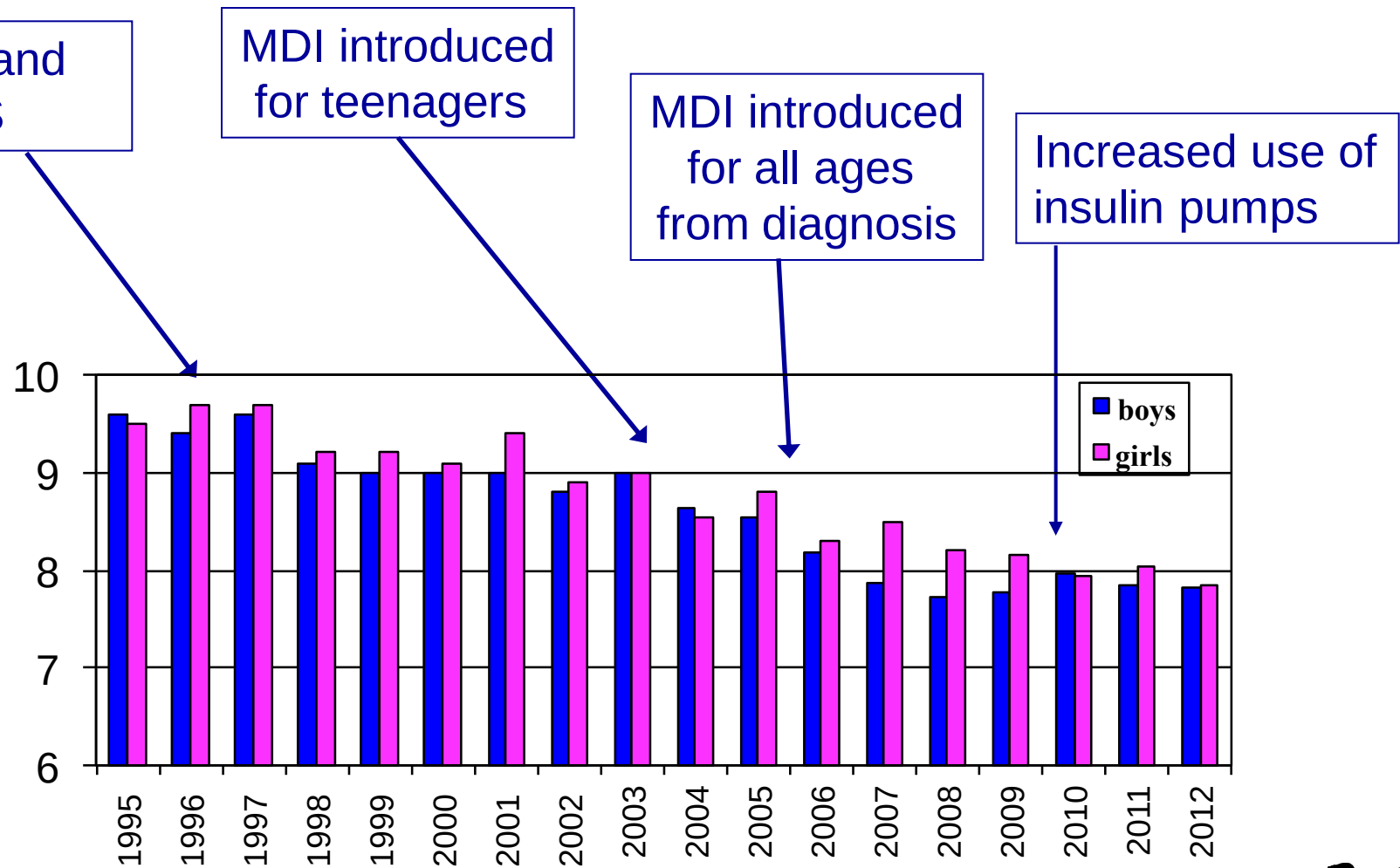


Primary School Outcomes

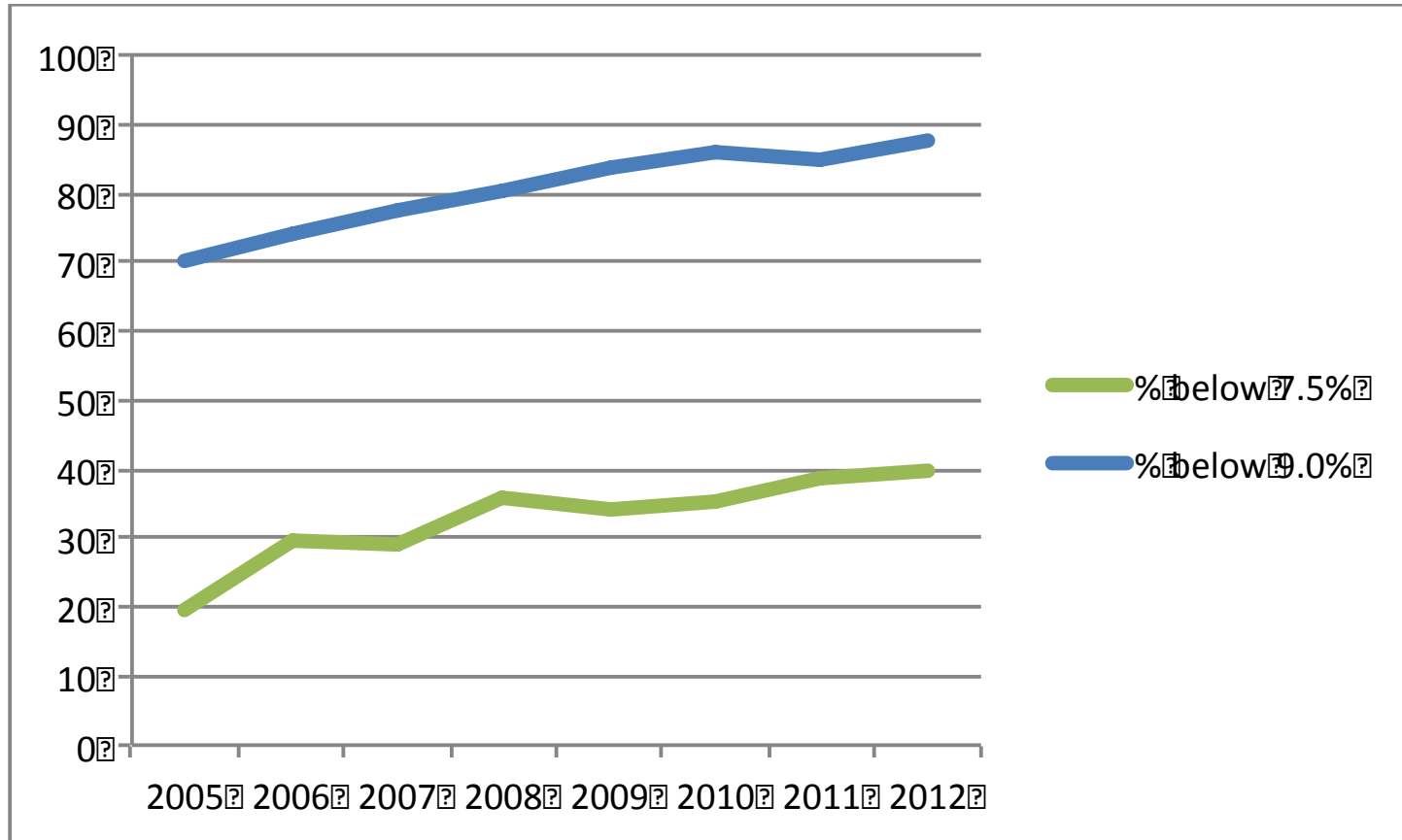
- Children aged 4-11 years –
mean (SD) HbA1c
 - in 2001-4 = 8.38 (1.09)%;
 - in 2005-8 = 7.74 (0.81)%;
 - in 2009-12 = 7.58 (0.69)%;
 - ANOVA $p < 0.001$
- This requires 500-1000 hours of DSN time to train/retrain/problem-solve annually
 - approximately 5-10 days per month



Oxford clinic - Mean HbA1c levels from 1995 - 2012



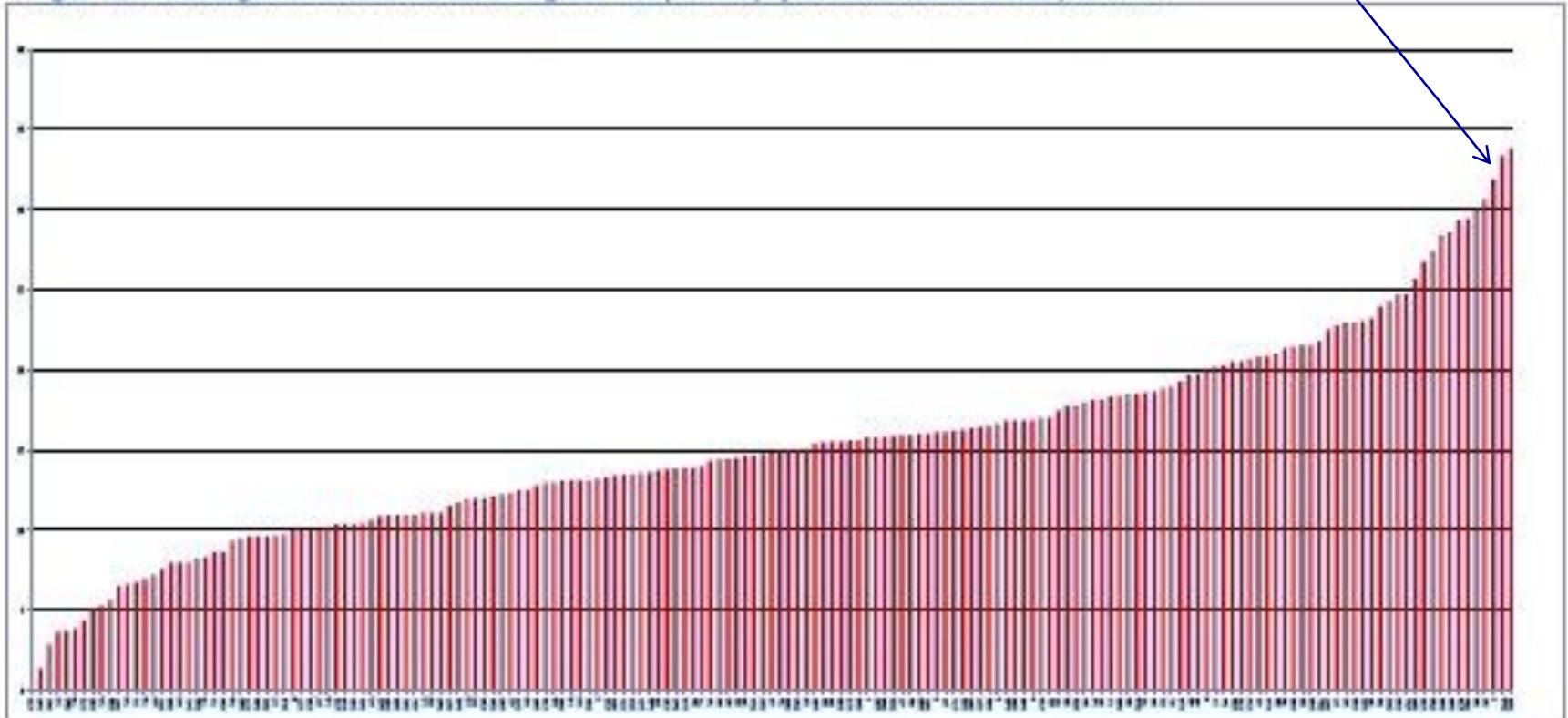
Improvements in HbA1c levels



Percentage with HbA1c levels below 7.5% by centre

Oxford

Figure 12: Percentage achievement of HbA1c target of <7.5 per cent, by Paediatric Diabetes Unit,* 2010-11



*A list of Paediatric Diabetes Unit codes and corresponding names and proportion of infants, children and young people with HbA1c <7.5% can be found in Appendix A.



Summary

- Good control reduces complications
- Team cohesion and target-setting improves HbA1c
- Good control at the start after diagnosis is likely to persist in the medium-term
- Metabolic memory may also have an effect
- “The importance of creating a positive belief that goals are achievable and that interventions will be efficacious should not be dismissed.”
- Technology by contrast has not been shown to have a large effect

