East and North Hertfordshire NHS
NHS Trust
ENHIDE
East and North Herts Institute of Diabetes and Endocrinology

Diabetes in Children and Young People

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Scope

- Discuss challenges in Diagnosing Diabetes in children and young people (CYP)
- Increase awareness of symptoms, especially in very young children
- Reduce risk of presentation in Diabetes Ketoacidosis (DKA) at diagnosis

Outline

1. Data on Type 1 diabetes
2. Making a diagnosis from primary care perspective
3. Clinical cases
4. Future directions
5. Discussion

National Paediatric Diabetes Audit (NPDA)Data

- 28,439 CYP with diabetes in the UK
- 95% Type 1 Diabetes (T1D)
- Prevalence T1D 0-15 years ~1:500
- Incidence 25.4/100,000/year in general population
- Increasing by 3.4%/year in children

  6.3%/year <5 year old

Diabetes

- Autoimmune destruction of ß-cells in the pancreas
- Lack of insulin
- Mortality higher than general population
- Leading cause of death in children is diabetic ketoacidosis (DKA)
- Overall leading cause of death in Type 1 DM is Cardiovascular Disease (CVD)

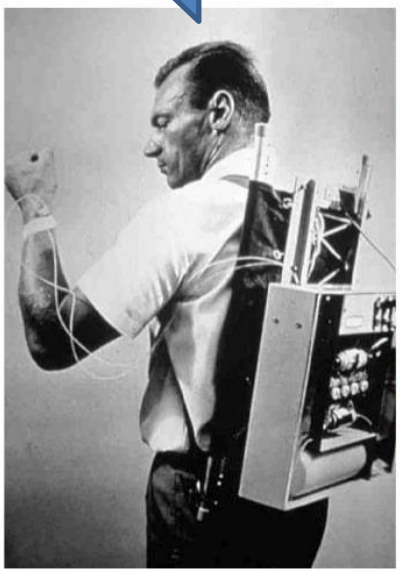
- ~25% DKA at first presentation in UK(not changed for 20 years); worldwide variation 13-80% cases presentation in DKA[1]

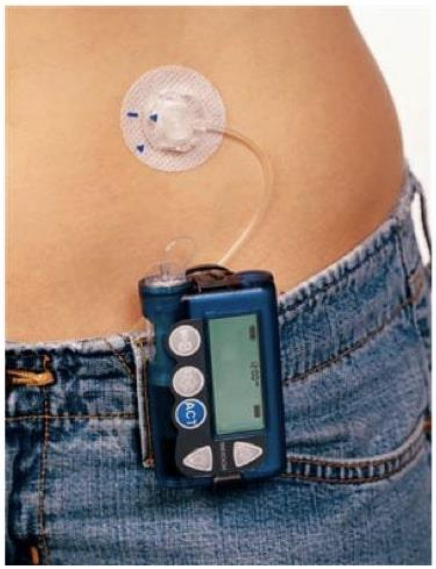
Banting and Best – Canada 1921

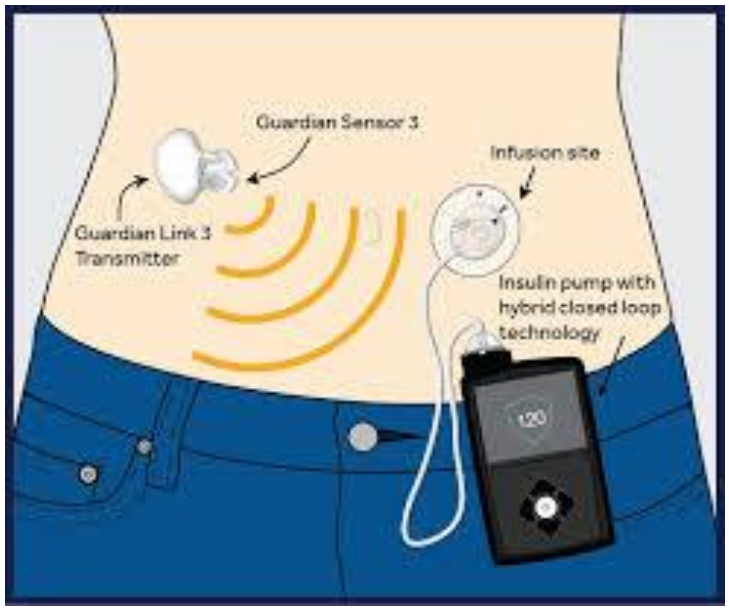
Risk factors for presentation in DKA

- Younger age, ethnic minority, diagnostic error, delayed treatment
- Multiple HCP contact prior to diagnosis – delayed referral, lower pH on admission and increased need for iv insulin

- Protective factors: higher caregiver education, FH of T1DM, higher background incidence of T1DM, higher gross domestic product
- Fewer children present in DKA if parents consider diagnosis (more likely if polyuria/polydipsia are present)
- Fatigue, weight loss more frequently reported in children presenting in DKA[2]






Guardian Sensor 3
Infusion site
Guardian Link 3
Transmitter
Insulin pump with
hybrid closed loop
technology

Education, increased awareness! New diagnosis Diabetes

Primary care physician- Type 1 CYP

- Central role in diagnosing Type 1 diabetes in CYP
- 80% of children who develop diabetes seen in primary care prior to diagnosis
- Children diagnosed at their first visit have a 3 fold reduced risk to develop DKA
- Recognizing DKA when already developed and refer promptly – reduce complications
- Most important is to consider the diagnosis (often non specific presentation)
- Relatively rare (primary care physician looking after 2000 patients can see child with type 1 once every 10 years, 3-4 times during their career)[3]

Primary care physician- Type 1 CYP

- Making a diagnosis - Point of care testing – Hyperglycaemia, ketonemia, glycosuria, ketonuria
- Please test in SURGERY!

- Polyuria/polydipsia – 66-99%
- Wt. loss – up to 95%
- Fatigue 10-70%
- Polyphagia 30%
- Abdo pain 25%
- Constipation secondary to dehydration 10%
- Secondary enuresis in previously toilet trained – up to 90% - earliest symptom in children>4 years [3]

Often polyuria can be interpreted as UTI
Exclusively treating concomitant disease (otitis media, pneumonia)

Primary care - DKA at diagnosis

- Toddlers present in DKA 53-85%
- More challenging – non specific symptoms –fever with vomiting, often viral URTI
- Febrile illness, abdominal pain, difficulty breathing, vomiting

(can be misdiagnosed as acute abdomen, pneumonia, gastroenteritis)

- Signs of dehydration (poor skin turgor, sunken eyes, dry mucous membranes, prolonged CRT, oliguria, shock)

- Euglycaemic DKA – can occur! If concern of unwell child please refer!

DKA at diagnosis: sustained negative effect on glycaemic control

- Severe inflammation – further depletes functional pancreatic islets
- 3.364 residents Colorado, Type 1 diabetes (0-17 years)
- Monitored for 15 years
- 39% had DKA at diagnosis, 1/3 of them severe
- HbA1c tracked 1.4% higher in those with severe DKA and
- 0.9% in those with mild/moderate DKA ($p<0.0001$)
- Independent of ethnic minority, health insurance
- Future studies are needed (measure C-peptide 1 month after diagnosis)

Case 1 RM

- 13 year old boy
- 1 week of polyuria, polydipsia, weight loss
- Presented to GP on Monday 8/05/17
- Fasting bloods organised for next day
- 9/05 started vomiting, came to hospital early hours 10/05
- Wt. 43 kg
- On arrival: HR139/', RR 24/', BP 144/89, CRT 3-4 sec, GCS 14
- Blood glucose 31.7mmol/l, Blood ketones High
- VBG: pH 7.059, pCO2 2.26, BE -23.8, HCO3 4.7
- Managed according to DKA ICP
- Made full recovery
- Discharged home 12/05 on Multiple Daily Injections (MDI)

Case 2 JG

- 15 year old girl presented 12/04/17
- Known with Obesity, Acanthosis Nigricans
- Insulin resistance
- Metformin – poor compliance
- Polyuria, polydipsia, abdominal pain, constipation
- Vomiting
- Breathing deteriorated, mum brought to hospital
- Om arrival: HR 132/’ RR 28/’, CRT 2 sec, GCS 15
- Glucose 15.4 mmol/l, ketones High,
- pH 7.12, PCO2 1.0, BE- 24, HCO3 2.6
- Weight 124 kg
- Manged as DKA – challenging fluid calculations
- Currently Metformin/insulin – referred for Bariatric surgery

REFERRAL TO THE PAEDIATRIC TEAM

- Immediate referral to Paediatric on call team at local hospital (medical team if over 16yrs old)
- Diagnosis confirmed (Capillary Blood Glucose)
- Investigations requested
- Treatment commenced as per care pathway
- CYP Diabetes Team informed - will see the patient on the same or next working day

Diabetes Diagnosis Criteria

- Symptomatic – Polyuria, Polydipsia, Weight loss, Tiredness
- and Blood glucose ≥ 11.1 mmol/L (Random)
- or Blood glucose ≥ 7.0 mmol/L (fasting)
- But Do Not send for Fasting bloods please!

- DO NOT USE HbA1c in diagnosing Diabetes in children!

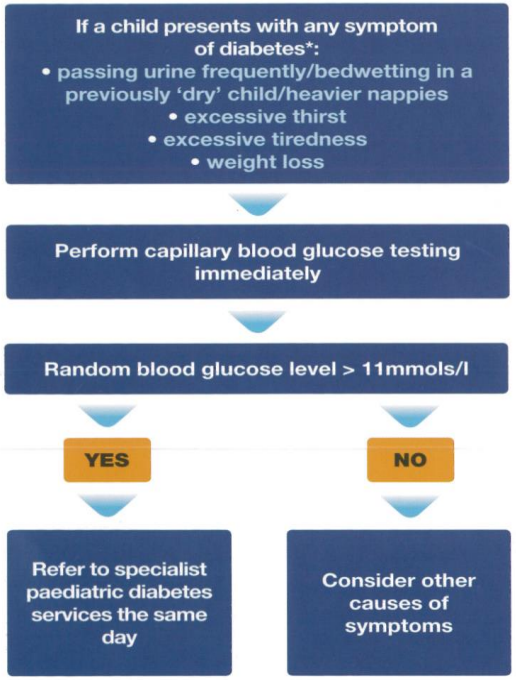
- Autoantibodies (GAD, Islet Cell, IA2) - support T1 DM
- Obesity, Family History of Type 2 – suggests possible T2DM
- Family history and very early onset can suggest MODY

- All cases need to be seen same day in Hospital and are started on Insulin Treatment

PATHWAY FOR DIAGNOSING TYPE 1 DIABETES IN CHILDREN

DIABETES UK
CARE. CONNECT. CAMPAIGN.

500 children every year become seriously ill with diabetic ketoacidosis because the early signs of Type 1 diabetes are missed.



*Less common symptoms may also indicate diabetes:
- constipation
- oral/vulval thrush

Note: In children under the age of two, symptoms may not be immediately obvious and the child may appear to be unwell with less specific symptoms. If in doubt, perform capillary blood testing immediately.

Type 1 diabetes in children and young people – the facts

- There are approximately 26,500 children with Type 1 diabetes in the UK.
- Approximately 2,000 children are diagnosed each year.
- 25% of children are not diagnosed until they are in diabetic ketoacidosis (DKA) because the early symptoms of diabetes are missed. This rises to 35% in the under 5s.
- The peak age for diagnosing Type 1 diabetes is 10–14, but it is the under 5s age group which has seen the steepest rise in recent years.
- DKA requires intensive medical intervention and is not only extremely traumatic for the child and family but also very costly to the NHS.

Help us raise awareness of the 4 Ts of diabetes

Diabetes UK is raising awareness of the most common signs and symptoms to look out for – what we're referring to as the **4 Ts** of diabetes **(Toilet, Thirsty, Tired, Thinner)**. We believe that everyone who knows a child, of any age, should be aware of the **4 Ts** of diabetes, remember them and know what to do if they spot them.

We have produced posters and flyers which outline the **4 Ts**, and are available for healthcare professionals to use locally. To order these, and for more information on our campaign, visit **www.diabetes.org.uk/The4Ts** or call **0800 585 088** (Monday to Friday, 8am to 6pm).

9892/1012/a

Our Data

- ~280 patients (0-19)

- 3 - Type 2 Diabetes
- 1 post partial pancreatectomy
- MODY – Service provided and close links with Exeter

- 2016-2017 – 26 NDD – 4 DKA (15%)

- 2017-2018 Quarter 1 – 12 NDD – 8 DKA (66%) – v. unusual!

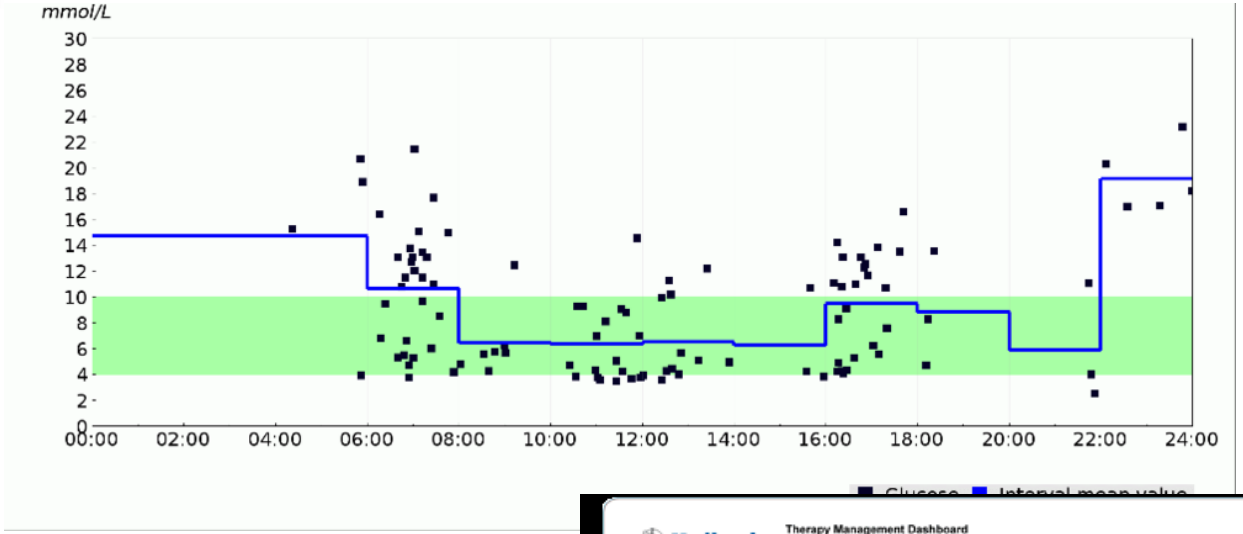
At Diagnosis

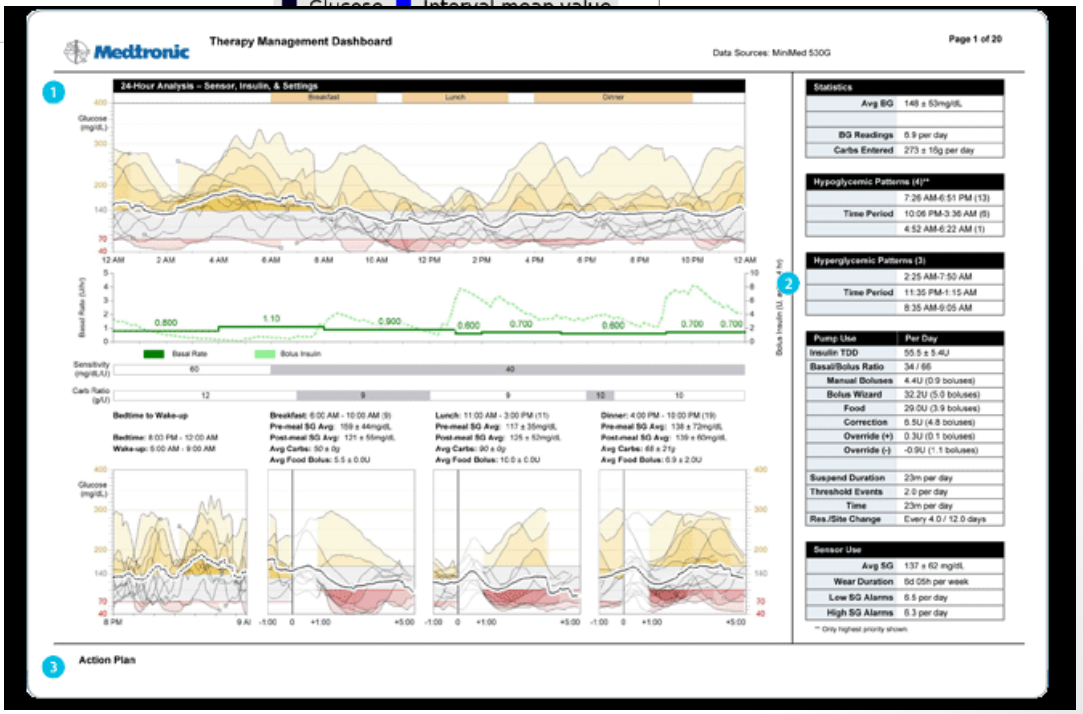
- Commenced on Multiple Daily Injections (MDI) with basal long acting insulin and analogue short acting insulin at mealtimes
- Advice regarding – checking blood glucose – at least 5 times/day
- Introducing Carbohydrate counting
- Education regarding “Hypo”, Sick Day rules
- Need to test for Ketones
- School Education
- 24/7 access to telephone advice to families (up to 19 years)
- Access to Insulin Pumps and Continuous Glucose Monitoring (CGMS) according to NICE guidelines

Targets – more challenging

- Diabetes Control and Complications Trial (DCCT)
- NICE UK HbA1c<6.5% (48 mmol/mol)
- International Society for Paediatric and Adolescent Diabetes (ISPAD) < 7.5% (58mmol/mol)
- American Diabetes Association (ADA) < 8.5% (69 mmol/mol)in < 6 years old
- Developing brain more susceptible to hypoglycaemia – risk to develop cognitive dysfunction
- Hypoglycaemia
- Fear of Hypoglycaemia
- Nocturnal Hypoglycaemia (reported 14-47%)

Diasend vs CGMS - large amount of data



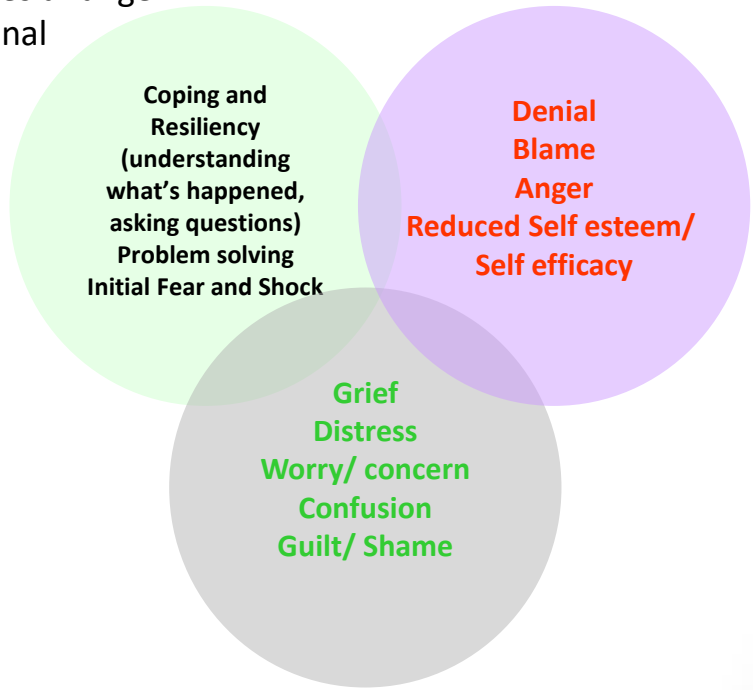


Challenges – young children

- Period of development – cognitive, behavioural, emotional
- Growth
- Reduced “honey moon period”
- Parents responsible for whole management – burden and stress related to long term complications
- Structural MRI showed decreased grey matter volume in children with significant hyperglycaemia compared to healthy controls - regions associated with cognitive capacities
- Hypoglycaemia – unable to communicate
- Eating behaviour, unpredictable intake
- “constant vigilance”
- Parents report isolation, depression, post-traumatic stress, work affected

Common Reactions to Diagnosis

Research indicates that *common* parental and or child reactions to a diagnosis of diabetes demonstrates a range of emotions (Smith & Kaye, 2012). Initial emotional distress typically subsides over time.



Challenges – adolescence

- Biological - Puberty – increased insulin resistance (GH)
- Psychosocial - Reduced insulin adherence
- Increased need for independence
- Risk taking
- Body Image
- Increasing cardiovascular risks – context of obesity

- Locally – Transition service up to 19 years
- TELE-HEALTH Project

When to Consider Psychology Input

- DKA presentations
- Persisting Emotional Distress; Health Anxiety, Adjustment.
- Co- occurring Mental Health Conditions
- Social factors

Diabetes Psychology Service Provision

Focus on Distress related to Diabetes

Referral Pathway

- Via CYPD Team or Self referral
- Annual Screening and follow up
- Routinely Present in some clinics
- Individual work
- Onward referral to specialist mental health pathways.

Future directions

- Increasing overweight and obesity
- Type 2 diabetes (at younger age)
- Type 1 patients – overweight/obese
- Adjuvant therapies – Metformin - type 2
- ? Benefit in Type 1 (Cochrane review 2009 benefit in adolescence with poor control)
- GLP-1 receptor agonists (Liraglutide) – research showed benefit, but not yet in practice
- Development of new technologies – Closed loop – soon

- Immunotherapies in antibody positive CYP
- Stem cell

Conclusion

- Very important partnership between primary and secondary care to ensure prompt diagnosis/referral of Type 1 Diabetes
- DKA – should be seen as preventable risk factor for poor control and long-term diabetic complications
- Team work – essential for consistency and continuity of care, especially in order to ensure smooth transition into young adult period

E&N HERTS NHS TRUST CYP DIABETES TEAM

- Paediatric Consultants – Drs Raffles, Matei and Jain
- Adult Diabetologists- Drs Winocour and George
- Lead PDSN – Jackie Angelo-Gizzi & Sue Courtman
- PDSN and ADSN- Avril, Sharon, Michelle, Vikki, Beth, Anne & Sarah
- Paediatric Diabetes Dietitian – Liz Kyriacos & Louise Carrington
- Clinical Psychologist – Rebecca Windmill & Deborah Gale
- Administrator- Sarah
- Data coordinator - Denise

Contact Details

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Children's A& E: 01438 284333

Psychological Service Provision

- Single Point of Access
- Tel: 0300 7770707
- Fax: 03007770808

- Local Service Provision – See Handouts on stand for East and North Hertfordshire and West Hertfordshire.

Thanks

- OUR PATIENTS - inspire, challenge but always give an example and reminder of why we have to continue this job!

“ Go confidently in the direction of your dreams;
dare to live the life you have imagined…”
Thoreau

That's the Future!

Thank you for Listening!

Bibliography

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