Nutrition Guidelines for Preschoolers with Type 1 Diabetes: An International Perspective

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Presenter Disclosure

No Conflict of Interest to Disclose

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Objectives

- Discuss management of eating behaviors in preschool children with type 1 diabetes
- Highlight key recommendations from new International Society of Pediatric and Adolescent Diabetes Preschool Guidelines 2017
- Translate guidelines into clinical practice: an Australian experience

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Common toddler feeding behaviors

Common food issues:

1. variable appetite
2. transient food preferences
3. food refusal

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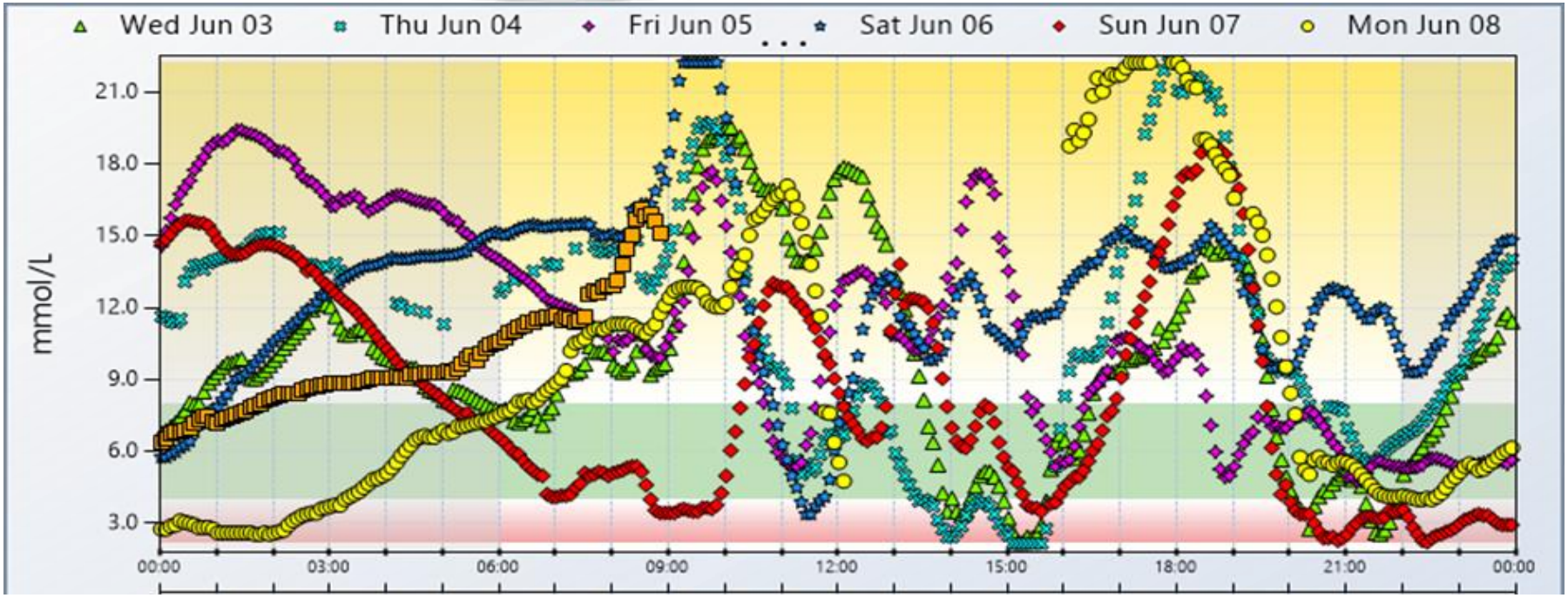
Additional meal-time considerations in toddler with diabetes

- Common food issues: variable appetite, transient food preferences and food refusal
- Predict carbohydrate intake before meal
- Parent and caregiver fear of hypoglycemia
- Increased emphasis on fruit and vegetable intake to protect against cardiovascular risk

CGM trace - bolusing after meals, feeding up before bed, large corrections then low



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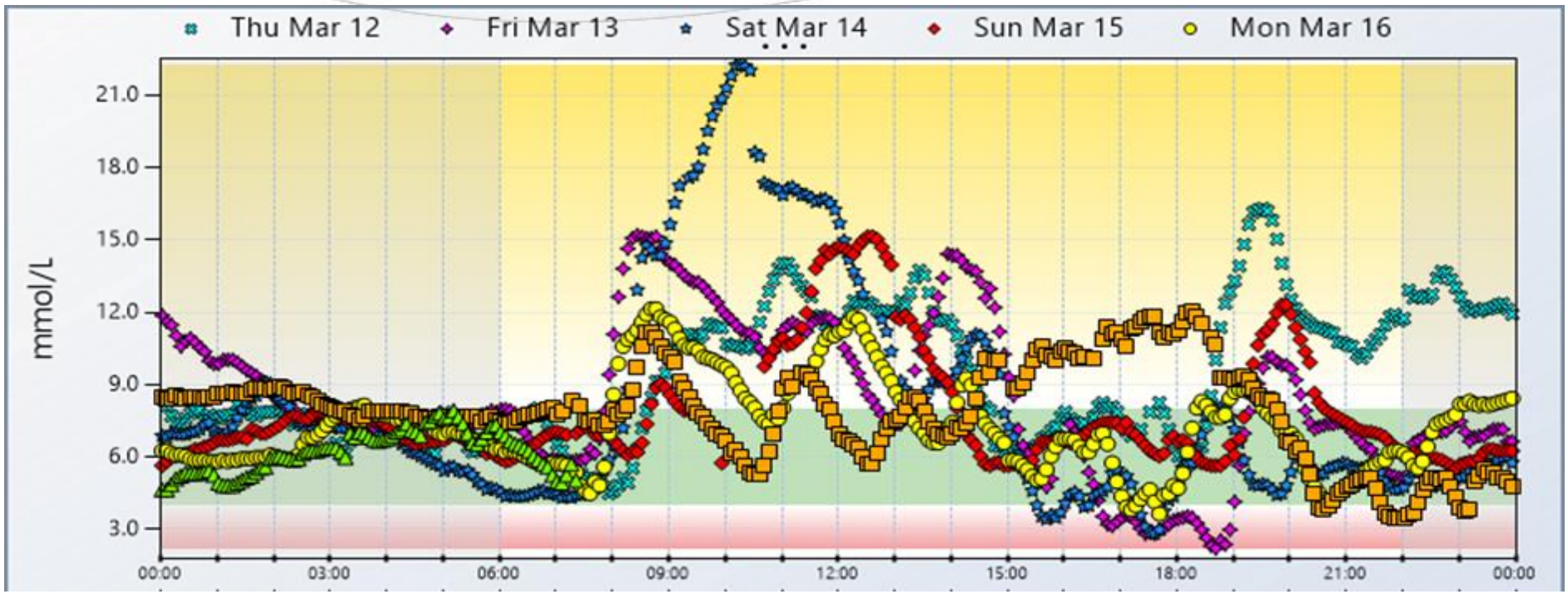
CGM trace - bolusing before meals, no supper, small meals and snacks



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Why are meal-time behaviors important in diabetes management?

- Children with more frequent disruptive meal-time behaviours have poorer glycemic control

  (Patton et al Diab Care 2006; Monaghan et al Health Psychol 2015)

- Greater diet quality is associated with more optimal glycemic control

  (Nansel et al American J Clinical Nutr 2016)

- Food behaviors and choices track into adulthood

  (Mikkila et al British J Nutr 2005)

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Basic principles of dealing with meal-time behaviors

- Child needs to be motivated to eat = hungry *(Brug et al B J Nutr 2008)*
- Healthy food available at home and day-care *(Lipsky et al Appetite 2012)*
- Authoritarian parenting style: warmth but expectation *(Blissett J Appetite 2011)*
- Parental modelling and family based meals *(Edelson et al Appetite 2016)*

PEDIATRICDIABETES ISPAD

Managing diabetes in preschool children. ISPAD Clinical Practice Consensus Guidelines.

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Manuscripts

Managing diabetes in preschool children

ISPAD Clinical Practice Consensus Guidelines

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This article is a new chapter in the ISPAD Clinical Practice Consensus Guidelines Compendium. The complete set of guidelines can be found for free download at www.ispad.org. The evidence grading system used in the ISPAD Guidelines is the same as that used by the American Diabetes Association. See page 3 in ISPAD Clinical Practice Consensus Guidelines 2014 Compendium: Pediatric Diabetes 2014; 15 (Suppl. 20):1-3)

Recommendations

- The target HbA1c for all children with type 1 diabetes, including preschool children, is recommended to be <7.5% (<58 mmol/mol) (B).

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Kaleidoscope
HUNTER CHILDREN'S HEALTH NETWORK

Cornerstone of treatment: Dietary approach in the young child

- **Routine meals** based on healthy food
- Establish **firm boundaries** and consistency around meals *(Patton J Paed Psych 2008)*
- **Discourage continuous snacking** (grazing)
- **Pre-prandial insulin** *(Bell et al Diab Care 2015)*
- **Encourage participation** in family meals to promote parent modelling and **dietary quality** *(Sunberg et al Acta Paed 2014)*

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Glycemic Control of ≤ 6 years

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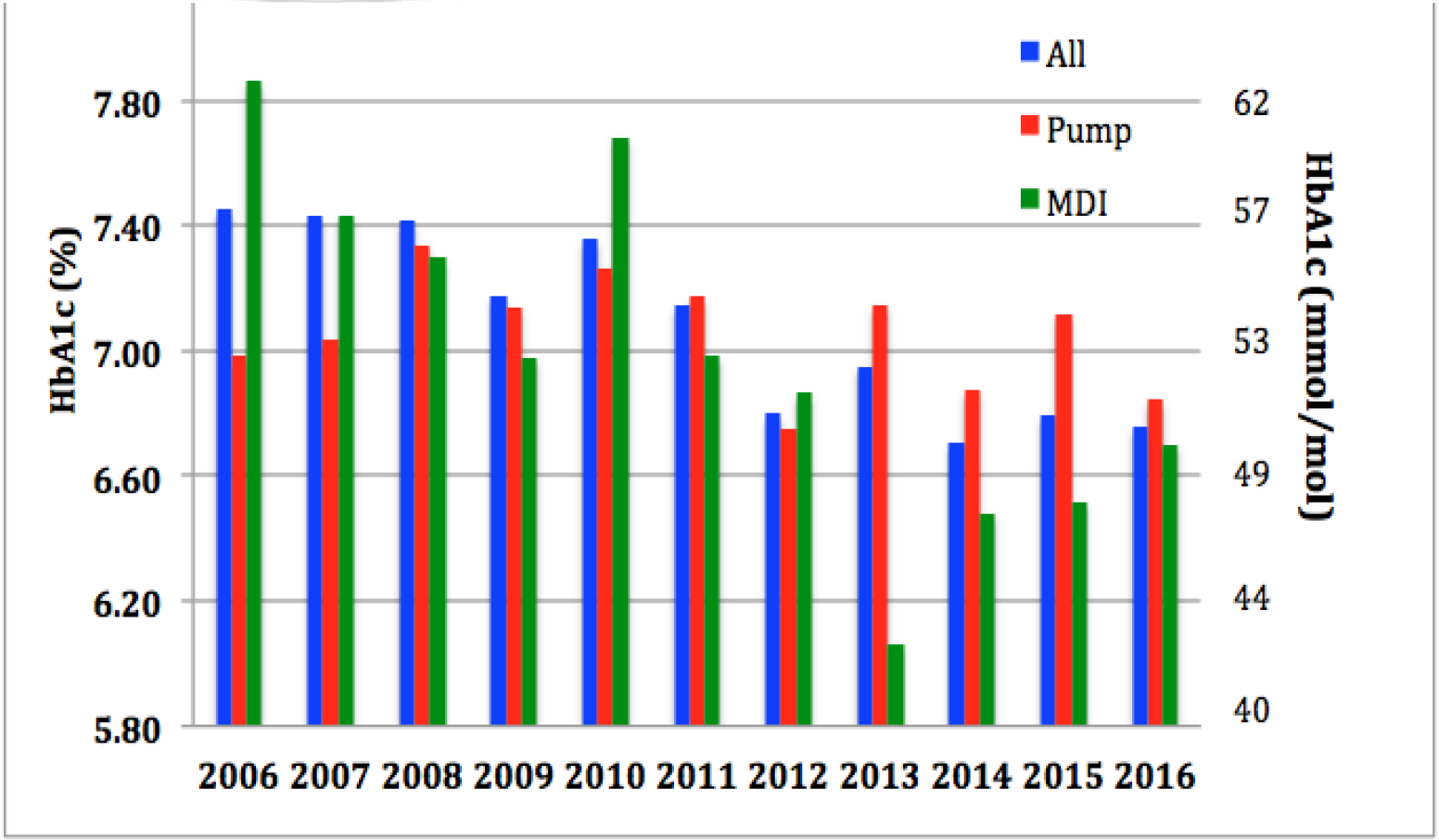

Glycemic Control of ≤ 6 years

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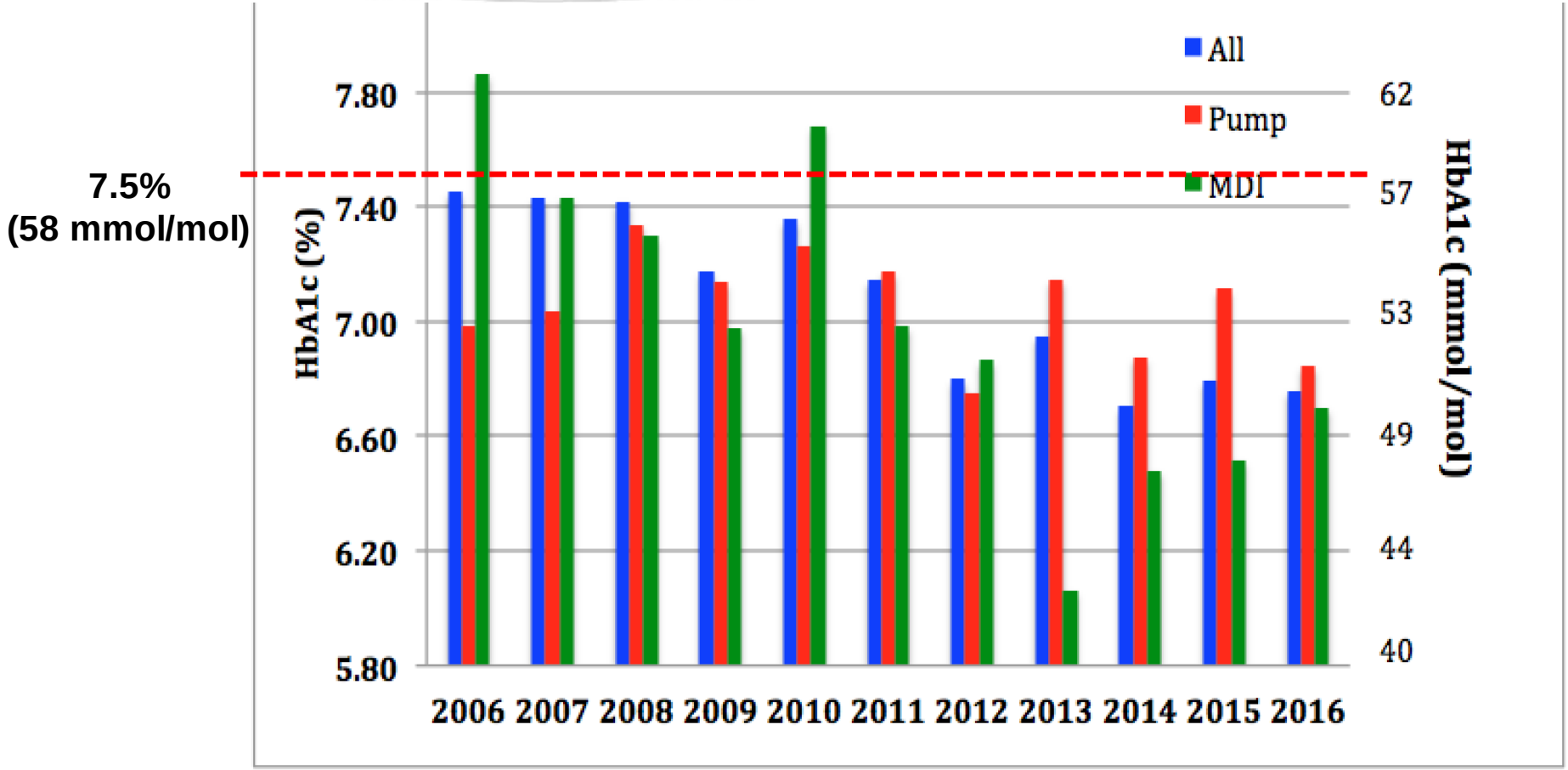

Intensive Insulin Therapy

Intensive insulin therapy with pre-prandial insulin doses should be used with meal-adjusted insulin regimens (C)

Managing Diabetes In Preschool Children
ISPAD Clinical Practice Consensus Guidelines (Ped Diab in press) 2017

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Preschool Children with T1D - 2016
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- 40% insulin pumps, 60% multiple daily injections (MDI)
- Mean HbA1c for ≤ 6 years is 6.7% (50 mmol/mmol)
- 71% of children ≤ 6 years have HbA1c < 7% (53 mmol/mol)
- Mean BMI SDS 0.6

Australasian Diabetes Data Network (ADDN) Report Sept 2016

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Carbohydrate Counting

Carbohydrate counting is best introduced at onset of diabetes (E)

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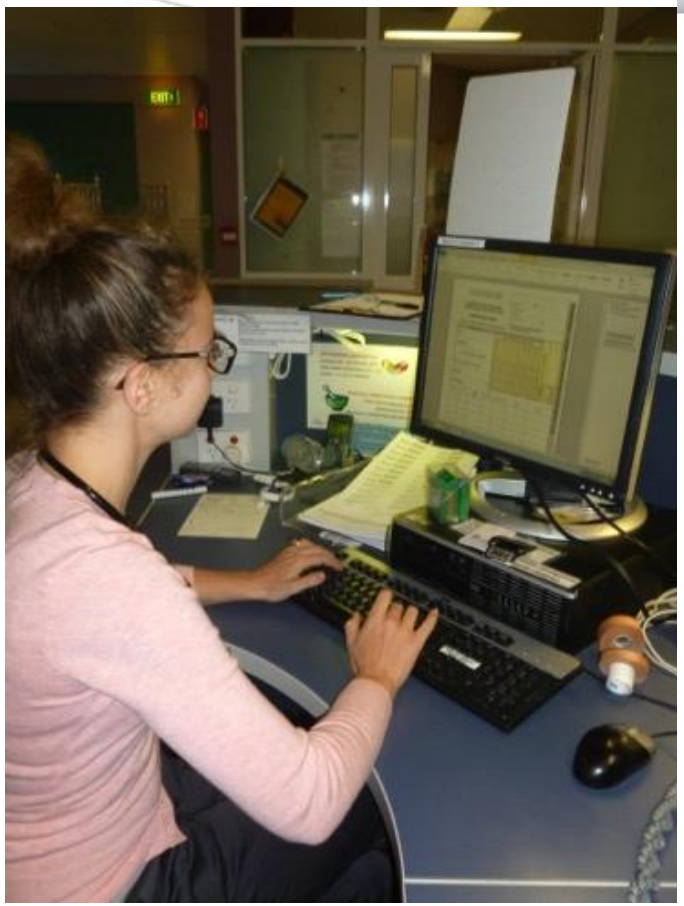
Use of insulin to carbohydrate ratios from diagnosis



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Paediatric Patient-Specific Bolus Insulin Injection Chart

BREAKFAST DOSE

This Record is INDIVIDUALISED for ONE patient only

Affix patient label or complete ID details
SURNAME . MRN .....
OTHER NAMES
ADDRESS .....
DATE OF BIRTH ..... AMO .....

1st Prescriber to Print Patient Name & Check Label Correct:

Insulin Order
Date:
Insulin type:
Give Insulin Before Breakfast
Route: Subcutaneous Injection
MO Name:
MO Signature:

1	2	3	4	5	6	7	8	9	Prescriber use only >	
Give the following dose of insulin										
0	2	4	6	8	10	12	14	16		
0	2	4	6	8	10	12	14	16		
0	2	4	6	8	10	12	14	16		
2	4	6	8	10	12	14	16	18		
2	4	6	8	10	12	14	16	18		
2	4	6	8	10	12	14	16	18		
2	4	6	8	10	12	14	16	18		
2.5	4.5	6.5	8.5	10.5	12.5	14.5	16.5	18.5		
2.5	4.5	6.5	8.5	10.5	12.5	14.5	16.5	18.5		
3	5	7	9	11	13	15	17	19		
3.5	5.5	7.5	9.5	11.5	13.5	15.5	17.5	19.5		
3.5	5.5	7.5	9.5	11.5	13.5	15.5	17.5	19.5		
4	6	8	10	12	14	16	18	20	2.00	U/Exchange
4	6	8	10	12	14	16	18	20	0.30	U/mmol
4.5	6.5	8.5	10.5	12.5	14.5	16.5	18.5	20.5	6.00	Target
5	7	9	11	13	15	17	19	21	4.00	Low BGL
5	7	9	11	13	15	17	19	21	1	Non-Bolus
5.5	7.5	9.5	11.5	13.5	15.5	17.5	19.5	21.5	0.5	rounding

Date	Time	BGL (mmol/L)	Exchanges	Insulin Units	Nurse 1	Nurse 2

Breakfast Dose – Paediatric Patient-Specific Bolus Insulin Injection Chart

8 YEARS & UNDER

H1 / J1 CARBOHYDRATE EXCHANGE GUIDE

Food Item	Standard Serve	CHO Exchange
MAINS STARCHY CARBOHYDRATE		
Penne Pasta	45g	0.5
Hokkien Noodles	50g	1
Steamed Rice	45g	1
Fried Rice (contains corn)	45g	0.5
Mashed Potato (full serve)	90g	1
Steamed Potato	45g	0.5
Roast Potato	45g	0.5
Potato Wedges	45g	0.5
Potato Bake	58g	0.5
Sweet Potato Mash	35g	0
Mashed Pumpkin	45g	0
Peas & Corn Combo	70g	0.5
Vegetable Panache (broccoli, carrot, red capsicum, baby **corn**, sugar snap peas)	50g	0
Vegetable Melange (broccoli, carrot, cauliflower, green beans, yellow beans, red capsicum)	50g	0
Soft Veg combination	140g	0
All other vegetables on menu are "FREE" in CHO		

Food Item	Standard Serve	CHO Exchange
DESSERTS		
Banana Custard PC	120g	1
Chocolate Crème PC	110g	1.5
Coconut Cake	75g	1.5
Creamy Rice	120g	1.5
Crème Caramel PC	110g	1.5
Custard Vanilla	100g	1
Fruit Snack Pack	120g	1
Honeycomb Buzz PC	110g	1
Ice Cream Low Fat	50g	1
Jelly Diet	120g	0
Lemon Dessert	120g	1
Mango Mousse PC	75g	1
Plain Cheesecake	90g	2
Snack Pack (flavoured custard)	140g	1.5
Vanilla Pannacotta	110g	1

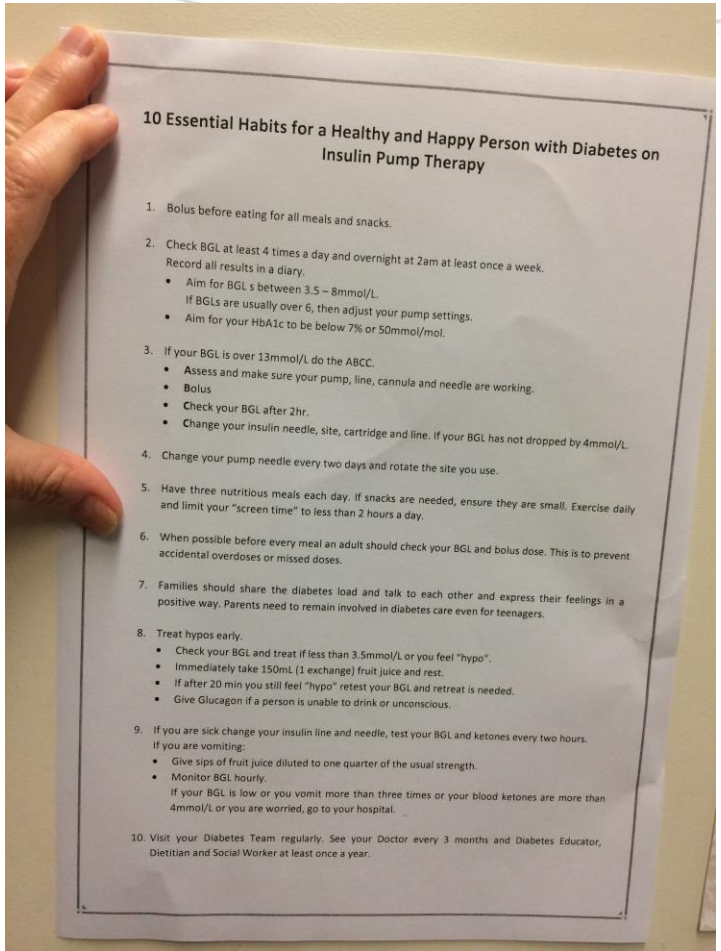
SALADS & SANDWICHES		
Chicken & Pasta	440g	2.5
Egg & Bean	400g	2
Lamb & Potato	440g	2
Pork & Potato	440g	2
Roast Beef & Rice	440g	3.5
Salmon & Pasta	430g	2.5
Silverside & Rice	440g	2
Sandwich (all fillings)	2 bread	2

BISCUITS & CAKES		
Water crackers	3 x PC (6 crackers)	1
Oz dry cracker	2 x PC (6 crackers)	1
Gluten Free Biscuit	2 x PC (4 biscuits)	1
Sweet Biscuit (gumnuts, Nice, Milk Coffee, Scotch Finger, Oatmeal)	1 PC (2 biscuits)	1
Chocolate Crème & Shortbread biscuit	1 PC (2 biscuits)	1.5
Rice Cake (x 1)	10g	0.5
Muffin	45g	1.5
Madeira Cake	40g	1
Pikelet	40g	1
Fruit Cake	40g	1.5

CARBOHYDRATE EXCHANGE KEY*	
Carbohydrate	**Exchange**
7-11g	**½**
12-18g	**1**
19-26g	**1 ½**
27-33g	**2**
34-41g	**2 ½**
42-48g	**3**
49-56g	**3 ½**
57-63g	**4**
64-71g	**4 ½**
72-78g	**5**

*** The Traffic Light Guide to Food Carbohydrate Counter**

Team Approach - Caregivers and Health Professionals



10 Essential Habits for a Healthy and Happy Person with Diabetes on Insulin Pump Therapy

1. Bolus before eating for all meals and snacks.
2. Check BGL at least 4 times a day and overnight at 2am at least once a week. Record all results in a diary.
   - Aim for BGL s between 3.5 – 8mmol/L. If BGLs are usually over 6, then adjust your pump settings.
   - Aim for your HbA1c to be below 7% or 50mmol/mol.
3. If your BGL is over 13mmol/L do the ABCC.
   - **A**ssess and make sure your pump, line, cannula and needle are working.
   - **B**olus
   - **C**heck your BGL after 2hr.
   - **C**hange your insulin needle, site, cartridge and line. If your BGL has not dropped by 4mmol/L.
4. Change your pump needle every two days and rotate the site you use.
5. Have three nutritious meals each day. If snacks are needed, ensure they are small. Exercise daily and limit your "screen time" to less than 2 hours a day.
6. When possible before every meal an adult should check your BGL and bolus dose. This is to prevent accidental overdoses or missed doses.
7. Families should share the diabetes load and talk to each other and express their feelings in a positive way. Parents need to remain involved in diabetes care even for teenagers.
8. Treat hypos early.
   - Check your BGL and treat if less than 3.5mmol/L or you feel "hypo".
   - Immediately take 150mL (1 exchange) fruit juice and rest.
   - If after 20 min you still feel "hypo" retest your BGL and retreat is needed.
   - Give Glucagon if a person is unable to drink or unconscious.
9. If you are sick change your insulin line and needle, test your BGL and ketones every two hours. If you are vomiting:
   - Give sips of fruit juice diluted to one quarter of the usual strength.
   - Monitor BGL hourly.
     If your BGL is low or you vomit more than three times or your blood ketones are more than 4mmol/L or you are worried, go to your hospital.
10. Visit your Diabetes Team regularly. See your Doctor every 3 months and Diabetes Educator, Dietitian and Social Worker at least once a year.

10 Essential Habits for a Healthy and Happy Person on Insulin Pump Therapy

1. Bolus before eating for all meals and snacks.

2. Check BGL at least 4 times a day and overnight at 2am at least once a week.
   Record all results in a diary.
   - Aim for BGL s between 3.5 – 8mmol/L.
     If BGLs are usually over 6, then adjust your pump settings.
   - Aim for your HbA1c to be normal that is below 48 mmol/mol.

3. If your BGL is over 10mmol/L do the ABCC.
   - **A**ssess and make sure your pump, line, cannula and needle are working.
   - **B**olus
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4. Change your pump needle every two days and rotate the site you use.

5. Have three healthy meals each day. If snacks are needed, ensure they are small. Exercise daily and limit your "screen time" to less than 2 hours a day.

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10 Essential Habits for a Healthy and Happy Person on Insulin Pump Therapy

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2. Check BGL at least 4 times a day and overnight at 2am at least once a week.
   Record all results in a diary.
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     If BGLs are usually over 6, then adjust your pump settings.
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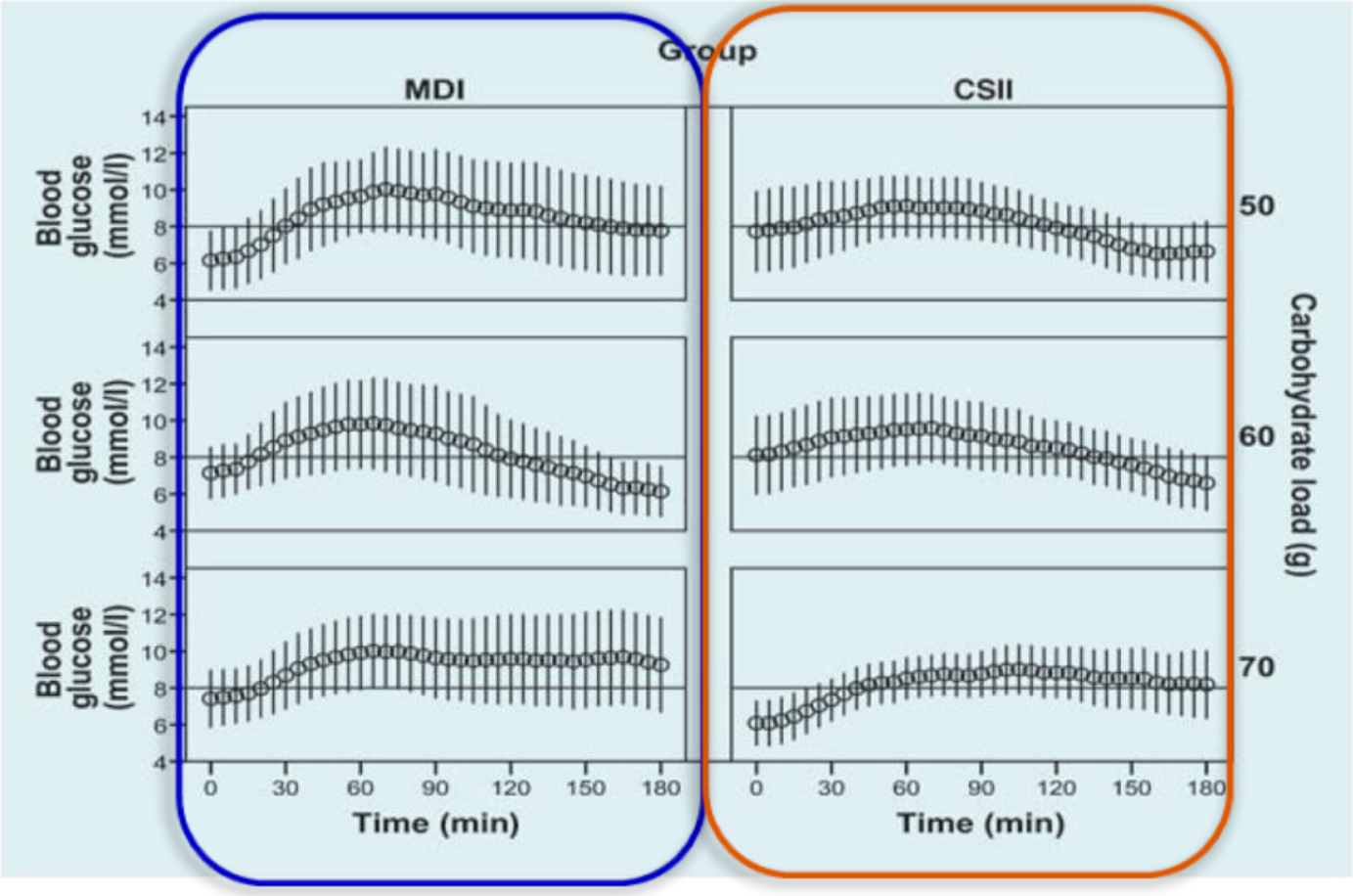
10. Visit your Diabetes Team regularly. See your Doctor every 3 months and Diabetes Educator, Dietitian and Social Worker at least once a year.

When does under-eating after an insulin bolus become an issue?

A single meal time insulin dose covers a ± 10g range in CHO quantity



Smart et al, Diab Med 2009; 26:279-85

Little people Big needs
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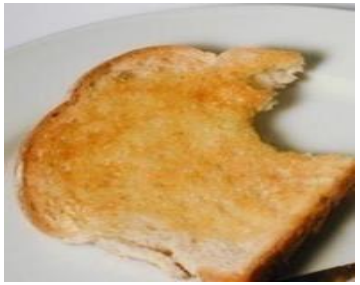
Clinical Translation

"Small inaccuracies in calculation of up to 5-7 grams of carbohydrate will usually not be problematic"



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Little people Big needs
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Inaccuracy of 20g CHO causes Hypoglycemia and Hyperglycemia

<u>Insulin dose given for CHO Test Meal</u>

- Under-eat test meal by 20g CHO
  - 1 in 3 children (31%) had hypoglycemia ($p<0.003$)
- Over-eat test meal by 20g CHO
  - More likely to cause BGLs ≥ 12mmol/l ($p<0.001$)

Smart et al Diab Med 2012;29:21-4

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Clinical Translation

"Larger (carbohydrate) inaccuracies may result in possible hypoglycemia or hyperglycemia 2-3 hours after eating, but not immediately. These can be anticipated and treated with additional carbohydrate or a small correction dose of insulin"

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How can you ensure predictability in food intake?

Structured Meal-times

Family-centered meal routines with restrictions on grazing are important to ensure dietary quality and optimize glycemic control in preschool children (C)

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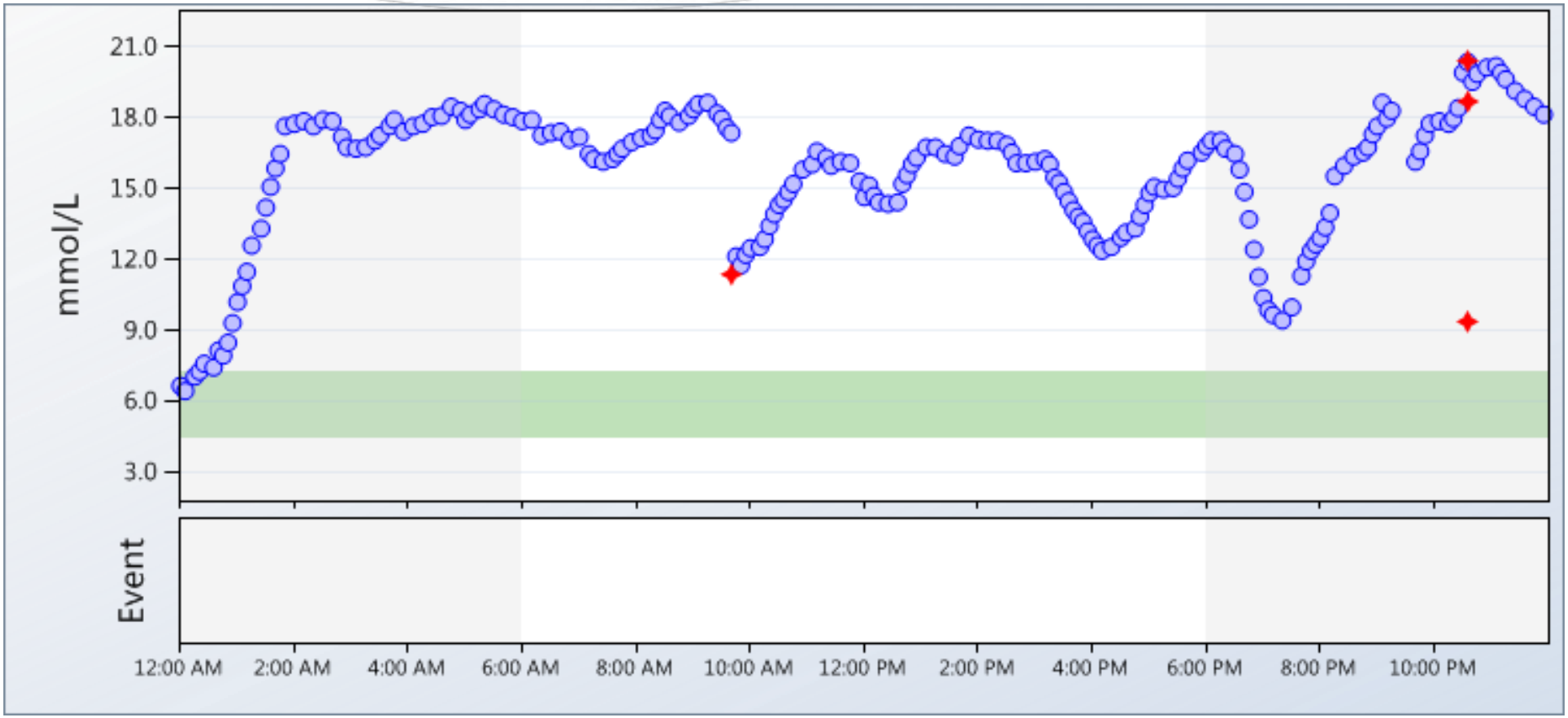
Meal-time Routines

3 meals and two small mid-meal snacks

An upper and lower limit of age appropriate carbohydrate amounts should be recommended based on growth, activity and previous intake

Continuous eaters (Grazers)



Why does grazing <u>not</u> work?

- Makes insulin adjustments difficult. Bolus doses may be omitted as child does not eat sufficient amounts.
- Child never hungry so will not eat a full size meal
  - Parent cannot give insulin as intake is unpredictable
- Child will only eat what appeals to them
- Child is in a state of post-prandial high BGLs, so large correction doses then can make child hypo

Question

In your clinical practice, when do you ask usually ask caregivers of preschool children to bolus for the meal?

A. Before meal

B. After the meal

C. During the meal

Bolus before meals

Pre-prandial bolus insulin is preferable to insulin administered during or after the meal for all preschool children, including those using multiple daily injections.

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Strategies to minimise food refusal

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- Structured meal-times
- Avoidance of continuous eating habits
- Small snacks including limits on low carbohydrate foods
- Limits on time spent at table
- Avoidance of force feeding
- Reassurance by all team members
- Realistic expectation of food quantity
  - Minimum and maximum carbohydrate amounts

Food Servings for 2-3 Year Olds

Milk, yoghurt, cheese and/or alternatives (mostly reduced-fat)	Vegetables and legumes/beans	Fruit	Grains	Lean meats, poultry, fish, eggs, tofu, nuts & seeds
SERVES				
1.5	**2.5**	**1**	**4**	**1**
ONE SERVE LOOKS LIKE				
1 cup milk or ¾ cup yoghurt or 2 slices of hard cheese	½ cup cooked broccoli or ½ cup canned beans or 1 medium tomato	1 medium banana or 1 medium apple or 2 small apricots	1 slice of bread or ½ cup cooked porridge or 1 crumpet	65g cooked lean red meat or 2 large eggs or 170g tofu
1 cup UHT long life, reconstituted powdered milk or buttermilk — ½ cup evaporated milk — ½ cup ricotta cheese — 1 cup soy or rice milk*	½ cup cooked spinach, carrots or pumpkin — ½ cup peas or lentils — 1 cup green leafy salad — ½ cup sweet corn — ½ medium potato	1 medium orange or pear — 2 small kiwi fruits or plums — 1 cup diced or canned fruit (no added sugar) — Occasionally ½ cup of fruit juice (no added sugar) — Occasionally 30g dried fruit (eg. 4 dried apricot halves)	½ medium roll or flat bread — ½ cup cooked rice, pasta, noodles or polenta — ⅔ cup wheat cereal flakes — ¼ cup muesli — 3 crispbreads — 1 small English muffin or scone	80g cooked lean poultry such as chicken or turkey — 100g cooked fish fillet or one small can of fish — 1 cup cooked legumes or beans such as lentils & chickpeas — 30g nuts or seeds

Dietary Survey of Preschoolers with T1D

- Children aged 1-5 years attending John Hunter Children's Hospital
- 3 day food diary and food behavior questionnaire
- 24 children (57% male, BMI z score: 0.54 ± 1.0)
- Met dairy and cereal recommendations; <u>inadequate fruit and vegetables</u>
- 48% CHO; 16% Protein and 33% Fat (15% sat fat)
- 23 children gave insulin before meals, even for novel foods. All had meal time routines: breakfast, lunch, dinner, 2 small snacks.

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Are pre-school children with T1D eating enough fruit and vegetables?

- Inadequate fruit and vegetable intake
- Excessive saturated fat intake

  - *Rovner et al Diab Educ 2009*
  - *Mehta et al Nutr Research 2014*
  - *Sunberg et al Acta Paed 2014*
  - *Patton et al J Acad Nutr Diet 2013*

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Healthy eating interventions

Life-style interventions designed to reduce the risk of cardiovascular disease in children with T1D are needed and should be directed towards the entire family (C)

Managing Diabetes In Preschool Children
ISPAD Clinical Practice Consensus Guidelines (Ped Diab in press) 2017

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Novel foods require repeated exposures

Practice does make perfect. A longitudinal look at repeated taste exposure

Keith E. Williams *, Candace Paul, Bianca Pizzo, Katherine Riegel

Appetite 51 (2008) 739–742

Key message:

Keep trying! Multiple exposures to a new food <u>will increase</u> liking and consumption

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Clinical translation: Carb Counting

Efforts to improve carbohydrate counting accuracy should focus on unlabelled core foods – fruit and vegetables

Smart et al Diab Med 2012;29:21-4

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Summary of key points in ISPAD Preschool Guidelines

1. Consistent meal routines are important to promote hunger and acceptance of a range of foods
2. Pre-prandial administration of insulin
3. Specific interventions, including repeated exposures with parental modelling, are needed to encourage fruit and vegetable intake.

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