The Practical Management of Childhood Obesity

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FRACP MRCPCH(UK) PhD

Consultant in Paediatric Endocrinology, Diabetes and Obesity
NHMRC Postdoctoral Research Fellow
I reduced a huge fat fellow to a moderate size in a short time, by making him run every morning until he fell into a profuse sweat; I then had him rubbed hard, and put into a warm bath...Some hours after, I permitted him to eat freely of food, which afforded but little nourishment; and lastly, set him to some work.


Ask, assess, advise, assist, arrange
Extreme paediatric obesity affects more children than those affected by cancer, cystic fibrosis, HIV and type 1 diabetes – all combined

Approximately 1.8 million Australian youth are overweight, with ½ a million being clinically obese

It is associated with a range of health problems, including heightened risks of heart disease, type 2 diabetes and cancer

It is predominantly related to our obesogenic environment with varying genetic susceptibility to effective weight gain

Recent evidence for epigenetic regulation

Obesity costs the Australian economy $21 billion/year

*Inge et al. IJO 2007; 31(1):1
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1. Who's overweight or obese?
2. What are the common causes?
3. What are the major consequences?
4. How should we investigate and treat?
5. Does treatment make a difference?
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1. Who’s overweight or obese?
Body mass index-for-age percentiles: Boys, 2 to 20 years

A 10-year-old boy with a BMI of 23 would be in the overweight category (85th percentile or greater).

A 10-year-old boy with a BMI of 21 would be in the at-risk-of-overweight category (85th to less than 95th percentile).

A 10-year-old boy with a BMI of 18 would be in the healthy weight category (5th percentile to less than 85th percentile).

A 10-year-old boy with a BMI of 13 would be in the underweight category (less than 5th percentile).

A 15-year-old boy with a BMI of 23 would be in the healthy weight category (5th percentile to less than 85th percentile).

A 15-year-old boy with a BMI of 23 would be in the overweight category (95th percentile or greater).
Where should we measure waist circumference in clinically overweight and obese youth?

Matthew A Sabin¹², MD PhD, Nicole Wong¹, Penny Campbell³, Katherine J Lee²,³, PhD, Zoë McCallum²,³, MD, George A Werther²,³ MD.  

127 overweight and obese youth with repeated measures of WC and bioelectrical impedance measures.

<table>
<thead>
<tr>
<th></th>
<th>Unadjusted Estimate (95% CI)</th>
<th>r²</th>
<th>Adjusted* Estimate (95% CI)</th>
<th>r²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard waist circumference</td>
<td>0.51 (0.18, 0.83)</td>
<td>0.25</td>
<td>0.46 (0.14, 0.78)</td>
<td>0.29</td>
</tr>
<tr>
<td>Panniculus circumference</td>
<td>0.55 (0.23, 0.88)</td>
<td>0.28</td>
<td>0.52 (0.20, 0.83)</td>
<td>0.32</td>
</tr>
</tbody>
</table>
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2. What are the common causes?
Decreased exercise

Decreased physical activity
and increased sedentary activities

Energy-dense foods

Increased portion sizes
Medical causes

Hypothyroidism
Cushing’s syndrome
Growth Hormone deficiency
Steroid excess
Polycystic ovary syndrome
... even diabetes insipidus

Genetic causes


On the importance of remaining alert...

Fast food ++
Fish & Chips
Ltrs Fizzy Drinks
Sweets

Difficult social situation
with DHS involved
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3. What are the major consequences?
• **Tracking of obesity**

• **Endocrine**
  – Insulin resistance + Type 2 diabetes
  – Pubertal advancement
  – Menstrual abnormalities
  – ↓GH secretion ↑GH clearance

• **Cardiovascular**
  – Metabolic Syndrome
  – Hypertension
  – Dyslipidaemia

• **Gastroenterological**
  – NAFLD

• **Pulmonary**
  – Asthma
  – Sleep abnormalities

• **Orthopaedic**
  – SUFE

• **Neurological**
  – Idiopathic intracranial hypertension

• **Socio-economic**
  – Low self esteem
  – Poor school performance

• **Cancer**
Approximately one in four children/adolescents in Australia are now either overweight or obese.

These data indicate:
- 1.4m children/adolescents are overweight
- 333,000 being clinically obese
- 40% dyslipidaemia
- 40% hypertension
- 25% metabolic syndrome
- 11% 'prediabetes'

The incidence of CVD in those who had MS as a child was 19.4% vs. 1.9% in those without MS.
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4. How should we investigate and treat?
Presumably we just single out the largest?

Child 1. 10.9yrs
- Blood Pressure: 120/70
- FBC & U&E normal
- Thyroid function normal
- OGGT normal
- Fasting insulin raised 37.3 mUI/L
- Liver function – raised ALT and NAFLD
- Cholesterol normal but LDL high and HDL low
- FH of T2DM, Peri-pubertal, Learning difficulties + Caucasian

Child 2. 10.9yrs
- Blood Pressure: 112/84
- FBC & U&E normal
- Thyroid function normal
- OGGT normal
- Fasting insulin normal
- Liver function normal
- Cholesterol and lipids normal
- FH of T2DM, Peri-pubertal, Catch-up growth + Filipino

Wt 73kg
WC 97cm

Wt 142kg
WC 158cm
**Investigations**

- Fasting glucose/insulin or OGTT
- Lipid profile
- LFTs
- TFTs
  - FBC and iron studies
  - HbA1c
  - Vitamin D
  - B12 and folate
  - Mg/Ca/PO4 +/- PTH
  +/- Bone age
  +/- PCOS work-up,
  +/- genetic studies (microarray, PWS, complex off-site)
  +/- Sleep studies

Not everything for everyone...
Conclusions: Given the current childhood obesity epidemic, insulin resistance in children is an important issue confronting health care professionals. There are no clear criteria to define insulin resistance in children, and surrogate markers such as fasting insulin are poor measures of insulin sensitivity. Based on current screening criteria and methodology, there is no justification for screening children for insulin resistance. Lifestyle interventions including diet and exercise can improve insulin sensitivity, whereas drugs should be implemented only in selected cases. (*J Clin Endocrinol Metab* 95: 5189–5198, 2010)
95th percentile limits for pre-, peri- and post-pubertal individuals:

- **males** - 13.0IU/L, 19.0IU/L, and 21.5IU/L
- **females** - 13.5IU/L, 25.5IU/L and 23.5IU/L

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**Longitudinal Study on Pubertal Insulin Resistance**

Michael I. Goran¹ and Barbara A. Gower²

*Diabetes* 50:2444–2450, 2001

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**Assessment of childhood obesity in secondary care: OSCA consensus statement**

Russell M Viner,¹ Billy White,¹ Timothy Barrett,² David C A Candy,³ Penny Gibson,⁴ John W Gregory,⁵ Krystyna Matyka,⁶ Kenneth Ong,⁷ Edna Roche,⁸ Mary C J Rudolf,⁹ Guftar Shaikh,¹⁰ J P Shield,¹¹ J K Wales¹²


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**Table 3** Thresholds for hyperinsulinaemia in obesity by pubertal stage

<table>
<thead>
<tr>
<th>Pubertal stage (tanner stage)</th>
<th>Fasting insulin level (mU/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 and 2</td>
<td>&gt;15</td>
</tr>
<tr>
<td>3 and 4</td>
<td>&gt;30</td>
</tr>
<tr>
<td>5</td>
<td>&gt;20</td>
</tr>
</tbody>
</table>
Treatment

Explain the risks and potential benefits

Set realistic treatment goals – aimed at change in lifestyle not weight

Provide education and support – verbal and written

Involve the whole family, with an MDT approach if possible

Ask parents or the adolescent to make time – prioritise the problem

Dietetic information – regular meals, healthy snacks

Prescribe ‘fun-based’ exercise

Aim for weight stabilisation when setting out

Advise re TV, gaming, sleep routines etc

Organise necessary referrals
At the age of 7, Peter is obese and at risk of diabetes and early heart disease.

At the age of 18, Peter is now a healthy weight.
<table>
<thead>
<tr>
<th>Intervention</th>
<th>Effect on weight</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very low-energy diet</td>
<td>May produce rapid weight loss but no evidence for long-term benefit&lt;br&gt;After cessation of a very low-energy diet, there should be a continuing weight management plan</td>
<td>Tsai &amp; Wadden 2006</td>
</tr>
<tr>
<td>Orlistat(^a)</td>
<td>Slight improvements in weight loss compared to lifestyle change alone&lt;br&gt;Increase in adverse events&lt;br&gt;Insufficient evidence to assess effects on cardiovascular or diabetes risk factors</td>
<td>Czernichow et al. 2010; Viner et al. 2010; Whitlock et al. 2010</td>
</tr>
<tr>
<td>Metformin</td>
<td>May cause a small but statistically significant decrease in BMI when used for insulin resistance and abnormal glucose metabolism</td>
<td>Wilson et al. 2010</td>
</tr>
<tr>
<td>Surgery</td>
<td>Mean weight losses of 34.6 kg with LAGB compared with 3.0 kg from lifestyle intervention&lt;br&gt;Emerging evidence that other procedures may also be effective</td>
<td>O’Brien et al. 2010</td>
</tr>
<tr>
<td></td>
<td>Harms vary by procedure, with short-term severe complications reported in about 5% of procedures&lt;br&gt;Limited data to determine either beneficial or harmful consequences more than 12 months after surgery</td>
<td>Whitlock et al. 2010</td>
</tr>
</tbody>
</table>

LAGB = laparoscopic adjustable gastric banding

\(^a\) The manufacturer advises against giving orlistat to people younger than 18 years as the safety and effectiveness have not been established. If orlistat is prescribed, adolescents should be advised to take a multivitamin last thing at night and be aware of side effects (see Section 6.2.2).
... and significant reduction in prevalence of metabolic syndrome
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5. Does treatment make a difference?
6328 children

Mean age 11.4 +/- 4.0 years at baseline

Mean duration of follow-up 23.1 +/- 3.3 years
### Table 3. Relative Risks of High-Risk Outcomes in Adulthood According to Adiposity Group in Childhood and Adulthood.*

<table>
<thead>
<tr>
<th>Outcome and Adiposity Group</th>
<th>Male Subjects</th>
<th>Female Subjects</th>
<th>All Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>Relative Risk (95% CI)</td>
<td>P Value†</td>
</tr>
<tr>
<td>Type 2 diabetes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group I</td>
<td>0.5</td>
<td>Reference</td>
<td>1.3</td>
</tr>
<tr>
<td>Group II</td>
<td>1.8</td>
<td>3.6 (0.8–16.3)</td>
<td>0.10</td>
</tr>
<tr>
<td>Group III</td>
<td>6.9</td>
<td>10.3 (4.7–22.7)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Group IV</td>
<td>4.6</td>
<td>7.5 (3.5–16.1)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Hypertension</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group I</td>
<td>15.3</td>
<td>Reference</td>
<td>6.9</td>
</tr>
<tr>
<td>Group II</td>
<td>16.0</td>
<td>1.1 (0.7–1.8)</td>
<td>0.61</td>
</tr>
<tr>
<td>Group III</td>
<td>37.0</td>
<td>2.5 (2.0–3.2)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Group IV</td>
<td>30.0</td>
<td>1.8 (1.4–2.2)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>High-risk LDL cholesterol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group I</td>
<td>12.7</td>
<td>Reference</td>
<td>5.9</td>
</tr>
<tr>
<td>Group II</td>
<td>13.6</td>
<td>1.1 (0.7–1.9)</td>
<td>0.61</td>
</tr>
<tr>
<td>Group III</td>
<td>19.0</td>
<td>1.5 (1.1–2.0)</td>
<td>0.02</td>
</tr>
<tr>
<td>Group IV</td>
<td>22.3</td>
<td>1.7 (1.3–2.2)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>High-risk HDL cholesterol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group I</td>
<td>23.9</td>
<td>Reference</td>
<td>7.2</td>
</tr>
<tr>
<td>Group II</td>
<td>21.9</td>
<td>0.9 (0.6–1.3)</td>
<td>0.58</td>
</tr>
<tr>
<td>Group III</td>
<td>47.2</td>
<td>1.7 (1.4–2.1)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Group IV</td>
<td>51.7</td>
<td>2.0 (1.7–2.3)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>High-risk triglycerides</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group I</td>
<td>11.0</td>
<td>Reference</td>
<td>4.2</td>
</tr>
<tr>
<td>Group II</td>
<td>5.9</td>
<td>0.6 (0.3–1.2)</td>
<td>0.13</td>
</tr>
<tr>
<td>Group III</td>
<td>34.0</td>
<td>3.0 (2.4–3.9)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Group IV</td>
<td>35.7</td>
<td>3.2 (2.6–3.9)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>High-risk carotid-artery intima-media thickness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group I</td>
<td>12.5</td>
<td>Reference</td>
<td>12.7</td>
</tr>
<tr>
<td>Group II</td>
<td>15.2</td>
<td>1.2 (0.7–1.9)</td>
<td>0.49</td>
</tr>
<tr>
<td>Group III</td>
<td>18.1</td>
<td>1.5 (1.1–2.2)</td>
<td>0.01</td>
</tr>
<tr>
<td>Group IV</td>
<td>17.5</td>
<td>1.5 (1.1–1.9)</td>
<td>0.007</td>
</tr>
</tbody>
</table>

- I = N/N
- II = O/N
- III = O/O
- IV = N/O
In summary

- Use BMI charts to diagnose and track obesity
- Look for underlying causes - other than just diet and exercise
- Investigate for consequences, and not just in the most obese
- Think carefully about investigations and interpret results in setting of age, sex and pubertal stage
- Use the NHMRC guidelines as a basis for provision of a spectrum of care
- Remember that small efforts at a young age can have large effects on BMI and therefore long-term health
Nutrition Goals

- Step 1 – Get organised
- Step 2 – Eat regular meals
- Step 3 – A healthy lunch box
- Step 4 – Portion size
- Step 5 – Cut out sugary drinks
Step 1 – get organised

Advice for families:

• Know what’s in your pantry
• Plan meals ahead of time
• Take a shopping list to the supermarket
• Prepare for the unexpected
Step 2 – Eat regular meals

**Timing, people and place**

Aim to:

– offer 3 main meals per day
– have snacks in-between *if hungry*
– have regular family meal times
– sit at the dinner table with the TV off and all distractions away
Step 2 – Eat regular meals

A higher frequency of family meals is associated with:

- Increased consumption of fruit, vegetables and whole grains
- Better psychosocial health
- Reduced weight control behaviours (‘dieting’)
- *Significantly reduced risk of obesity at 10-year follow up*

Step 3 – A healthy lunch box

Aim for a ‘nude food’ lunch box

- Include whole foods that are free from packaging, i.e. reduced the amount of pre-packed, high energy/kilojoule, processed foods

Get back to basics

- A healthy lunch box should have 1 serve of fruit, 1 serve of vegetables and 1 serve of dairy as snacks as well as a main lunch item such as a sandwich, wrap or salad.
Step 4 – Portion Size
### Step 4 – Portion Size

<table>
<thead>
<tr>
<th>Example</th>
<th>Portion</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Protein</strong></td>
<td>The size of the palm of your hand</td>
</tr>
<tr>
<td>Meat (beef, lamb, chicken, fish, eggs, etc.)</td>
<td></td>
</tr>
<tr>
<td><strong>Carbohydrate</strong></td>
<td>The size of your fist</td>
</tr>
<tr>
<td>Rice, pasta, bread, potato</td>
<td></td>
</tr>
<tr>
<td><strong>Vegetables</strong></td>
<td>Unlimited if they are steamed, boiled or raw</td>
</tr>
<tr>
<td>Capsicum, zucchini, cauliflower, broccoli,</td>
<td></td>
</tr>
<tr>
<td>lettuce, tomato, cucumber, pumpkin,</td>
<td></td>
</tr>
<tr>
<td>asparagus, carrot, swede, green beans,</td>
<td></td>
</tr>
<tr>
<td>cabbage, celery, eggplant, spinach, AND</td>
<td></td>
</tr>
<tr>
<td>MANY MORE!</td>
<td></td>
</tr>
</tbody>
</table>
Step 5 – Cut out sugary drinks

- Soft drink, cordial, fruit drink, sports drink, ice tea, flavoured milk, flavoured/vitamin water & energy drinks
- Sugar sweetened beverages are associated with obesity, tooth erosion and decay and reduced bone density

![Graph showing contribution to energy intake (%) in children by age group]
### Current recommendations for physical activity

<table>
<thead>
<tr>
<th>Age</th>
<th>Time</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth to one years</td>
<td>N/A</td>
<td>Supervised floor play</td>
</tr>
<tr>
<td>1 to 5 years</td>
<td>Three hours per day</td>
<td>Active play</td>
</tr>
<tr>
<td>5 to 12 years</td>
<td>One hour per day</td>
<td>Moderate to vigorous physical activity each day e.g. dancing, netball, soccer, swimming</td>
</tr>
<tr>
<td></td>
<td></td>
<td>In addition to this children should aim for several hours of active play each day</td>
</tr>
<tr>
<td>13 to 17 years</td>
<td>One hour per day</td>
<td>Moderate to vigorous physical activity each day e.g. dancing, netball, soccer, swimming</td>
</tr>
<tr>
<td>18+ years</td>
<td>150+ minutes per week</td>
<td>Moderate to vigorous physical activity each day e.g. dancing, netball, soccer, swimming</td>
</tr>
</tbody>
</table>

### Maximum screen time recommendations

(e.g. TV, computer games, iPhone or iPad)

<table>
<thead>
<tr>
<th>Age</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than two years</td>
<td>No screen time</td>
</tr>
<tr>
<td>2 to 5 years</td>
<td>One hour per day</td>
</tr>
<tr>
<td>5 to 12 years</td>
<td>Two hours per day</td>
</tr>
<tr>
<td>13 to 17 years</td>
<td>Two hours per day</td>
</tr>
<tr>
<td>18+ years</td>
<td>Minimise the amount of time spent in prolonged sitting</td>
</tr>
</tbody>
</table>
SMART Goals

- Specific
- Measurable
- Attainable
- Relevant
- Time-bound
Weight Management Service Team:

- Dr Matt Sabin – Consultant Endocrinologist
- Dr Zoe McCallum – General Paediatrician
- Dr Jeff Kao – Advanced Trainee, Paediatric Endocrinology
- Erin Alexander – Clinical Nurse Coordinator
- Danni Tassoni – Dietitian
- Bonnita Travers – Social Worker
- Dr Sarah Haberle – Psychologist
- Luke Vella – Exercise Physiologist (volunteer)
Increased slots to see new patients

2 Consultants: Paediatrician + Endocrinologist to see 4 new patients per week, and 2-3 reviews

Advanced Trainee to see 2 new patients per week, and 4 reviews

TOTAL: 10 NEW and 10 Reviews per week

Non-complex reviews to be seen at longer intervals of 6, 9 or 12 months + transition to AH-Clinic or shared care with GP and or Community provider

Allied-Health Clinic on Thursday afternoon with Weight Management Specialist Nurse in conjunction with or as well as appointments with Dietitian, Social Worker, and Clinical Psychologist.
New RCH
Weight Management Service

• RCH Foundation has provided 2 years of funding. A third year of funding is available on preparation and submission of a report to DoHA showing outcomes of the new model.

• Outcomes:
  • Effective wait-list management and ‘reverse patient flow’ appointments.
  • Shared care with GP’s/general pediatricians.
  • Implementation of telephone and telehealth consultations where appropriate.
  • Development of specialized patient materials.
  • Networking with community providers.

• Research
  • Education and training to state and within the hospital.
  • Development of expert working groups with clinical ethics surrounding suitability and referral for bariatric surgery and other difficult cases.
New Weight Management Resource:

Weight management
A guide to managing overweight and obesity in children and teenagers

Introduction

How do I know if my child is overweight?

It can be difficult to recognize if your child is overweight or obese, and it usually requires assessment by a healthcare professional.

Body mass index (BMI) is a measure that helps to compare a child's weight with their height. It is calculated by dividing the child's weight in kilograms by the square of their height in meters. A BMI greater than 85th percentile indicates overweight. This can be a warning sign for health problems and requires intervention. If you are concerned about your child's weight, it is important to speak with a healthcare professional for a proper assessment.

Is being overweight in childhood a problem?

Being overweight in childhood can be dangerous to a child's health. Overweight children are more likely to develop health problems such as type 2 diabetes, heart disease, and some cancers in adulthood. It is important to identify and address childhood obesity early to prevent long-term health issues.

What health issues are associated with being overweight in childhood?

Children who are overweight are at risk of developing health problems such as type 2 diabetes, heart disease, high blood pressure, and some cancers. It is important to identify and address childhood obesity early to prevent long-term health issues.

Step 2 – Eat regular meals

Healthy meals don't have to be boring. Add a fruit salad to your lunch box and include more vegetables in your diet.

Step 3 – A Healthy Lunch Box

Healthy lunch boxes don't have to be boring. Add a fruit salad to your lunch box and include more vegetables in your diet.

Some healthy snack ideas:

- Fresh fruit
- Vegetable sticks with low-fat dip
- Water
- Baked chips
- A cup of homemade vegetable soup
- Whole-grain oatmeal
- Water
Send your referral to:
Fax (03) 9345 5034

Email clinics@rch.org.au

Confirming receipt of referral
phone:
(03) 9345-6789

Not sure whether to refer or not,
please contact the
Weight Management Service
team:

Phone: (03) 9345 4765

or Erin.Alexander@rch.org.au

Referral form accessed via: http://www.rch.org.au/uploadedFiles/Main/Content/outpatient/ExternalRefFormPDF.pdf
Questions