Management of Williams Syndrome

A Clinical Guideline

Williams Syndrome Guideline Development Group
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Introduction...

... to Williams Syndrome (WS)
Williams Syndrome is a rare condition, that occurs in 1 in 20,000 births. The current definition of WS was agreed by the Williams Syndrome Guideline Development Committee at the Williams Syndrome Management Consensus Meeting held in Manchester in May 2009;

“Williams syndrome is a sporadic genetic disorder due to deletion of a small part of chromosome 7. Features may include a distinctive facial appearance, congenital heart defects and high levels of calcium in infancy. Early feeding problems are common and development is delayed. People with WS have sociable personalities, characteristic behavioural traits and variable degrees of learning disability.”

... to the Williams Syndrome Guideline Development Project
The guidelines have been developed using a robust methodology based on the one utilised by the Scottish Intercollegiate Guidelines Network (SIGN). The method has been adapted to suit rare conditions where the evidence base is limited, and where expert consensus plays a greater role. The papers selected for review and consideration in formulating management recommendations for Williams Syndrome, are listed by clinical sign in the bibliography from page 31. Evidence from these papers was considered, and complemented by consensus on good practice, by the members of the guideline development group, who are listed on page 42.

... to the Williams Syndrome Clinical Management Guidelines
What are the aims of the guidelines?
The existing guidelines for the medical supervision of people with WS were published in 2001 by the American Academy of Pediatrics Committee on Genetics (AAPCG). Whilst a valued addition to the available guidance these are not entirely transferable to the UK. Therefore, in order to optimise the medical management of people with WS, the aim of the guidelines is to provide clear evidence-based management recommendations applicable to UK patients.

Who are they aimed at?
As WS is so rare, it is unlikely that the primary care clinicians usually responsible for coordinating the care of people with the condition will have had much prior experience of the syndrome. As it is a multisystem disorder, people with WS require various tests, screenings, assessments, referrals and multidisciplinary interventions at different stages of their lives. These guidelines lay out these requirements in a clear format that are accessible to anybody who is involved in the care of an individual with WS.

How are they used?
The guidelines are divided into recommendations for four age groups:

- Infancy: 0—1 year old
- Adolescence: 11—18 years old
- Childhood: 1—11 years old
- Adulthood: 18 years old +

On page 4, recommended baseline investigations are listed, to be consulted alongside the age group-specific recommendations at the time of diagnosis. For each age group, the recommended tests/screenings are listed, and follow-up options depending on the outcome of the test or screening are indicated.

On pages 39-40, a Summary of Investigations for Children with Williams Syndrome summarises when, and how often, specific tests and screening should take place for children with Williams Syndrome.

NB. ABNL = Abnormal
### Clinical Features and Recommended Baseline Investigations in Williams Syndrome

**Clinical Features of Williams Syndrome**

- Congenital heart defects (especially supravalvular aortic stenosis (SVAS) and peripheral pulmonary artery stenosis)
- Raised blood/urine calcium levels
- Nephrocalcinosis, bladder and renal tract abnormalities
- Endocrine abnormalities
- Failure to thrive/slow growth rate/feeding problems
- Hypertension
- Scoliosis and other musculoskeletal problems
- Gastrointestinal problems
- Distinctive facial features
- Dental anomalies
- Distinctive behavioural characteristics including irritability, anxiety, overfriendliness
- Hypersensitivity to noise

**Baseline Investigations**

(Where investigation not indicated for a specific clinical feature, please refer to the relevant age group-specific page for management recommendations)

- Full cardiovascular assessment including scans and BP (blood pressure) measurement in both upper limbs.
- Serum Ca and Urine Ca: Creatinine Ratio
- Renal tract ultrasound to include kidneys and bladder
- Thyroid Function Tests (TFTs)
- Plot growth on appropriate Williams Syndrome growth chart (see page 14)

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*Fluorescence in situ hybridisation (FISH) is the most common, but not the only available test for confirming a diagnosis of Williams Syndrome. Some laboratories may use other DNA-based diagnostic techniques.*
# Recommendations for the management of Williams Syndrome

## in neonates & infancy (1)

### Recommended Testing/Screening

- **Serum Ca and Urine Ca: creatinine ratio**
  - If normal and under 1 year old, repeat test at 12 months.

- **Thyroid Function Tests (TFTs)**
  - If elevated, consider thyroid scanning.

- **Renal tract screening to include kidneys and bladder**
  - Refer to nephrologist for 6 monthly screening.

- **Hypertension screening**
  - Annual monitoring of blood pressure in both upper limbs and left leg.

- **Cardiac screening**
  - Full cardiac assessment including scans before one year old if diagnosis made in neonatal period.
  - Annual cardiac examination until 4 years old.
  - Follow up by cardiologist.

### Clinical Management Recommendations

#### Management of Hypercalcaemia

- Calcium intake should be equal to or less than half of the recommended nutrient intake (RNI) for the patient's age group.
- Stop use of supplements containing calcium.
- Ensure that infant feeds are prepared using 'soft' water.
- Ensure adequate rehydration.
- Locasol formula milk (SHS Nutrition)
- Steroids (Prenisone) orally as necessary.
- Monitor blood pressure.

- Take sunblock if travelling/in sunny conditions.
- 3 monthly follow up.
- If serum PTH starts to rise, relax calcium intake but monitor blood and urine calcium levels.
- Consider referral to paediatric metabolic bone disorder specialist.
- In rare cases, where hypercalcaemia is refractory to hydration and low-calcium diet, intravenous Pamidronate may be necessary.

#### Ensure baseline test undertaken.

- Repeat thyroid function test if patient symptomatic.
- Measure TSH levels and if elevated, consider thyroid scanning.

- If nephrocalcinosis refer to nephrologist for 6 monthly screening.
- If structural abnormalities, management or referral as necessary.

- Annual monitoring of blood pressure in both upper limbs and left leg.

- If associated with renal artery stenosis (RAS), refer to nephrologist.
- Surgical treatment where necessary.

**NB.** If RAS is present, angioplasty is not recommended due to elastinopathy.

- If essential hypertension, manage with calcium channel blockers where medical management is required (and RAS has been ruled out).
### Williams Syndrome Clinical Management Guidelines

#### AGE 0–1

### Recommendations for the management of Williams Syndrome

**in neonates & infancy (2)**

<table>
<thead>
<tr>
<th>Recommended Testing/Screening</th>
<th>Clinical Management Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Feeding &amp; Gastrointestinal issues</strong></td>
<td>Take feeding history.</td>
</tr>
<tr>
<td></td>
<td>Enquire about bowel habit.</td>
</tr>
<tr>
<td></td>
<td>If problems, refer for appropriate support and treat constipation.</td>
</tr>
<tr>
<td><strong>Growth</strong></td>
<td>Measure height, weight and occipitofrontal circumference (OFC) at birth and 1-3 monthly.</td>
</tr>
<tr>
<td><strong>Hearing screening</strong></td>
<td>Routine paediatric investigations for failure to thrive and reduced growth velocity.</td>
</tr>
<tr>
<td><strong>Vision screening</strong></td>
<td>NHS newborn hearing screening programmes throughout UK (NHSP) - screening within the first few weeks.</td>
</tr>
<tr>
<td><strong>Screening for dental anomalies</strong></td>
<td>Visual screening should take place between 6 and 12 months.</td>
</tr>
<tr>
<td></td>
<td>Parents to report any concerns.</td>
</tr>
<tr>
<td></td>
<td>Refer to community optometric/orthoptic service (via GP) if abnormality found.</td>
</tr>
<tr>
<td><strong>Multidisciplinary developmental assessment</strong></td>
<td>Enrol patient in an individualised preventative oral healthcare programme from an early age.</td>
</tr>
<tr>
<td></td>
<td>Routine follow up and regular dental examinations by a family dentist or local community dental services are essential.</td>
</tr>
<tr>
<td></td>
<td>Missing teeth/malocclusion/other dental anomalies: refer to a consultant in paediatric dentistry for multidisciplinary management.</td>
</tr>
<tr>
<td></td>
<td>Between 0-3 years old. Coordinated by hospital or community paediatrician. Note that an assessment based on language skills may overestimate general ability.</td>
</tr>
</tbody>
</table>

**† Anaesthesia**

*A paediatric anaesthetist should be involved in the pre-op care of children up to 3-4 years old.*

*Unless there are existing cardiac problems, cardiac assessment within 12 months prior to a general anaesthetic is sufficient.*

*Pre-op assessment should take place 1-2 weeks prior to planned surgery, to assess cardiac, airway, joints, renal and emotional status.*
**Recommended Testing/Screening**

- Serum creatinine

- Serum Ca and Urine Ca: creatinine ratio

- Thyroid Function Tests (TFTs)

- Renal screening

- Hypertension screening

**Clinical Management Recommendations**

In all WS children, test serum creatinine every 2—4 years.

Investigate/referral as appropriate—check for infection, exclude obstructive lesion(s), undertake detailed renal function tests and/or refer to a nephrologist.

If normal when under 1 year old, repeat test at 12 months.

Management of Hypercalcaemia

- Calcium intake should be equal to or less than half of the recommended nutrient intake (RNI) for the patient’s age group.
- Stop use of supplements containing calcium.
- Ensure that infant feeds are prepared using ‘soft’ water.
- Ensure adequate rehydration.
- Locasol formula milk (SHS Nutrition)
- Steroids (Prenisolone), orally as necessary.
- Monitor blood pressure

- Take sunblock if travelling/in sunny conditions.
- 3 monthly follow up.
- If serum PTH starts to rise, relax calcium intake but monitor blood and urine calcium levels.
- Consider referral to paediatric metabolic bone disorder specialist.
- In rare cases, where hypercalcaemia is refractory to hydration and low-calcium diet, intravenous Pamidronate may be necessary.

Monitor for 1—2 years after hypercalcaemia has resolved.

Test if patient is symptomatic.

Measure TSH levels and if elevated, consider thyroid scanning, consider referral to endocrinologist for treatment with L-Thyroxine if patient has overt hypothyroidism, or progressive deterioration of thyroid function.

Renal tract ultrasound to include kidneys and bladder if symptomatic.

If nephrocalcinosis refer to nephrologist for 6 monthly screening.

Annual monitoring of blood pressure in both upper limbs and left leg.

If associated with renal artery stenosis (RAS), refer to nephrologist.

Surgical treatment where necessary.

**NB.** If RAS is present, angioplasty is not recommended due to elastinopathy.

If essential hypertension, manage with calcium channel blockers where medical management is required (and RAS has been ruled out).
### Recommendations for the management of Williams Syndrome

#### in childhood (2)

<table>
<thead>
<tr>
<th>Recommended Testing/Screening</th>
<th>Clinical Management Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac screening</td>
<td><strong>Annual</strong> cardiac examination until 4 years old, and once between 5-13 years old. Full cardiac assessment including scans every 5 years.</td>
</tr>
<tr>
<td>Feeding &amp; Gastrointestinal issues</td>
<td>Enquire about feeding problems annually. Enquire about bowel habit annually. Treat constipation.</td>
</tr>
<tr>
<td>Screen for coeliac disease</td>
<td>Once, after 3 years of age, with low threshold to repeat if suggestive symptoms.</td>
</tr>
<tr>
<td>Growth &amp; Puberty</td>
<td>Height, weight and OFC measurements 1-3 monthly until 2 years of age. Annually thereafter (use WS growth charts). Mid parental height centile should be estimated. Check spine clinically for kypho/scoliosis at puberty and x-ray/refer to orthopaedic team as indicated. Routine paediatric investigations for abnormal growth velocity and precocious puberty (&lt; 8 years). Where necessary, consider gonadotropin releasing hormone (GnRH) therapy.</td>
</tr>
<tr>
<td>Hearing screening</td>
<td>18 months: screen for otitis media with effusion (OME) &amp; hyperacusis 3 years: screen for OME &amp; language development 5-10 years: screen for hyperacusis &amp; hearing loss 11-18 years: screen for hyperacusis &amp; high frequency hearing loss If hyperacusis, implement a programme of desensitisation (plus maskers if necessary).</td>
</tr>
<tr>
<td>Vision screening</td>
<td>Visual screening should take place between 6 and 12 months. Parents to report any concerns. Refer to community optometric/orthoptic service (via GP) if abnormality found.</td>
</tr>
</tbody>
</table>
### Recommendations for the management of Williams Syndrome

#### in childhood (3)

<table>
<thead>
<tr>
<th>Recommended Testing/Screening</th>
<th>Clinical Management Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Screening for dental anomalies</td>
<td>Enrol patient in an individualised preventative oral healthcare programme from an early age. Routine follow up and regular dental examinations by a family dentist or local community dental services are essential. Missing teeth/malocclusion/other dental anomalies: refer to a consultant in paediatric dentistry for multidisciplinary management. With some cardiac defects, antibiotic prophylaxis might be advised for dental procedures – check with your cardiologist.</td>
</tr>
<tr>
<td>• Multidisciplinary developmental assessment</td>
<td>Between 0-3 years old. Should involve local Child Development/ Learning Difficulties (LD) Teams. Note that an assessment based on language skills may overestimate general ability. Involve Child and Adolescent Mental Health Services (CAMHS) if necessary. Ongoing review and support of learning and development with further assessment of special educational needs as required.</td>
</tr>
<tr>
<td>• Behavioural &amp; Mental Health issues</td>
<td>Behavioural management advice and support to family as required. Refer for psychological intervention for anxiety, and when major life events.</td>
</tr>
</tbody>
</table>

**! Anaesthesia**  
A paediatric anaesthetist should be involved in the pre-op care of children up to 3-4 years old. Unless there are existing cardiac problems, cardiac assessment within 12 months prior to a general anaesthetic is sufficient.  
Pre-op assessment should take place 1-2 weeks prior to planned surgery, to assess cardiac, airway, joints, renal and emotional status.
## Recommendations for the management of Williams Syndrome ~ in adolescence (1) ~

### Recommended Testing/Screening

<table>
<thead>
<tr>
<th>Category</th>
<th>Clinical Management Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum creatinine</td>
<td>In all WS adolescents, test serum creatinine every 2—4 years.</td>
</tr>
<tr>
<td></td>
<td>Investigate/refer as appropriate—check for infection, exclude obstructive lesion(s), undertake detailed renal function tests and/or refer to a nephrologist.</td>
</tr>
<tr>
<td>Serum Ca and Urine Ca: creatinine ratio</td>
<td>Test if symptomatic of hypercalcaemia.</td>
</tr>
<tr>
<td>Thyroid Function Tests (TFTs)</td>
<td>If abnormal, investigate and manage as appropriate.</td>
</tr>
<tr>
<td></td>
<td>Test if patient is symptomatic.</td>
</tr>
<tr>
<td>Renal screening</td>
<td>Measure TSH levels and if elevated, consider thyroid scanning, Consider referral to endocrinologist for treatment with L-Thyroxine if patient has overt hypothyroidism, or progressive deterioration of thyroid function.</td>
</tr>
<tr>
<td></td>
<td>Renal tract ultrasound at puberty, before leaving paediatric care, and 5 yearly thereafter, or if symptomatic.</td>
</tr>
<tr>
<td></td>
<td>If nephrocalcinosis refer to nephrologist for 6 monthly screening.</td>
</tr>
<tr>
<td>Hypertension screening</td>
<td>Annual monitoring of blood pressure.</td>
</tr>
<tr>
<td></td>
<td>If associated with renal artery stenosis (RAS), refer to nephrologist. Surgical treatment where necessary.</td>
</tr>
<tr>
<td></td>
<td><strong>NB.</strong> If RAS is present, angioplasty is not recommended due to elastinopathy.</td>
</tr>
<tr>
<td></td>
<td>If essential hypertension, manage with calcium channel blockers where medical management is required (and RAS has been ruled out).</td>
</tr>
<tr>
<td>Cardiac screening</td>
<td>Cardiac examination once between 5-13 years old and 13-21 years old (follow up if symptomatic). Full cardiac assessment including scans every 5 years.</td>
</tr>
<tr>
<td>Gastrointestinal issues</td>
<td>Enquire about bowel habit annually.</td>
</tr>
<tr>
<td>Screen for coeliac disease</td>
<td>Treat constipation and consider investigating for diverticular disease.</td>
</tr>
<tr>
<td></td>
<td>If patient symptomatic.</td>
</tr>
</tbody>
</table>
Recommendations for the management of Williams Syndrome

~ in adolescence (2) ~

**Recommended Testing/Screening**

- **Growth & Sexual Health**
  - Check spine clinically for kypho/scoliosis at puberty and x-ray/refer to orthopaedic team as indicated.
  - Weigh annually, and avoid excessive weight gain.
  - Offer contraceptive advice/contact details of organisations who can advise on contraception for people with learning disabilities.
  - Consider GnRH therapy for precocious puberty.

- **Hearing screening**
  - 11-18 years: screen for hyperacusis & high frequency hearing loss
  - If hyperacusis, implement a programme of desensitisation (plus maskers if necessary).

- **Screening for dental anomalies**
  - Ensure patient enrolled in an individualised preventative oral healthcare programme.
  - Routine follow up and regular dental examinations by a family dentist or local community dental services are essential.
  - Missing teeth/malocclusion/other dental anomalies: refer to a consultant in paediatric dentistry for multidisciplinary management.
  - With some cardiac defects, antibiotic prophylaxis might be advised for dental procedures – check with your cardiologist.

- **Multidisciplinary developmental assessment**
  - Should involve local Child Development/ Learning Difficulties (LD) Teams.
  - Involve Child and Adolescent Mental Health Services (CAMHS) if necessary.
  - Ongoing review and support of learning and development with further assessment of special educational needs as required.
  - Referral to local Connexions service may be appropriate/helpful.

- **Behavioural & Mental Health issues**
  - Behavioural management advice/support for family as required.
  - Access to social skills training, and programmes to teach basic self help and daily living skills.
  - Refer for psychological intervention for anxiety, and when major life events.
  - **NB.** Apparent friendliness and sociability can mask depression and anxiety.

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**Clinical Management Recommendations**

**Anaesthesia**

*Unless there are existing cardiac problems, cardiac assessment within 12 months prior to a general anaesthetic is sufficient.*

*Pre-op assessment should take place 1-2 weeks prior to planned surgery, to assess cardiac, airway, joints, renal and emotional status.*
### Recommendations for the management of Williams Syndrome

#### in adulthood (1)

<table>
<thead>
<tr>
<th>Recommended Testing/Screening</th>
<th>Clinical Management Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Serum creatinine</strong></td>
<td>In all WS adults, test serum creatinine every 2—4 years.</td>
</tr>
<tr>
<td><strong>Serum Ca and Urine Ca: creatinine ratio</strong></td>
<td>Investigate/refer as appropriate—check for infection, exclude obstructive lesion(s), undertake detailed renal function tests and/or refer to a nephrologist.</td>
</tr>
<tr>
<td><strong>Thyroid Function Tests (TFTs)</strong></td>
<td>Test if symptomatic of hypercalcaemia.</td>
</tr>
<tr>
<td><strong>Renal screening</strong></td>
<td>If abnormal, investigate and manage as appropriate.</td>
</tr>
<tr>
<td><strong>Hypertension screening</strong></td>
<td>Test if/when patient is symptomatic, and check for anti-thyroid antibodies.</td>
</tr>
<tr>
<td><strong>Cardiac screening</strong></td>
<td>Measure TSH levels and if elevated, consider thyroid scanning,</td>
</tr>
<tr>
<td><strong>Gastrointestinal issues</strong></td>
<td>If compensated hypothyroidism present, refer to endocrinologist and monitor TFT and TSH annually.</td>
</tr>
<tr>
<td></td>
<td>If TSH level significantly low, consider thyroid replacement therapy.</td>
</tr>
<tr>
<td></td>
<td>Bladder &amp; kidney ultrasonography every 5 years and if/when symptomatic.</td>
</tr>
<tr>
<td></td>
<td>If nephrocalcinosis refer to nephrologist for 6 monthly screening.</td>
</tr>
<tr>
<td></td>
<td>Annual monitoring of blood pressure.</td>
</tr>
<tr>
<td></td>
<td>If associated with renal artery stenosis (RAS), refer to nephrologist. Surgical treatment where necessary.</td>
</tr>
<tr>
<td></td>
<td><strong>NB.</strong> If RAS is present, angioplasty is not recommended due to elastinopathy.</td>
</tr>
<tr>
<td></td>
<td>If essential hypertension, manage with calcium channel blockers where medical management is required (and RAS has been ruled out).</td>
</tr>
<tr>
<td></td>
<td>Consider referral to renal specialist for care of adults with hypertension.</td>
</tr>
<tr>
<td></td>
<td>Full assessment including scans, every 5 years throughout life.</td>
</tr>
<tr>
<td></td>
<td>Enquire about bowel habit annually.</td>
</tr>
<tr>
<td></td>
<td>Treat constipation and consider investigating for diverticular disease.</td>
</tr>
</tbody>
</table>
## Recommendations for the management of Williams Syndrome

### ~ in adulthood (2) ~

<table>
<thead>
<tr>
<th>Recommended Testing/Screening</th>
<th>Clinical Management Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Screen for coeliac disease</td>
<td>If patient symptomatic.</td>
</tr>
<tr>
<td>• Screening for diabetes</td>
<td>At 30 years old: Oral Glucose Tolerance Test (OGTT), (or fasting insulin if considered more appropriate). Repeat OGTT if rapid weight gain. NB/ Do not use haemoglobin A1C as a screening tool. Control impaired glucose tolerance with exercise &amp; diet. Avoid large glucose loads over a short time period. Avoid diabetogenic drugs. Manage clinical diabetes in WS in the same way as in general population.</td>
</tr>
</tbody>
</table>

| Growth & Sexual Health         | Weigh annually, and avoid excessive weight gain—encourage an ‘active’ lifestyle. Offer contraceptive advice/contact details of organisations who can advise on contraception for people with learning disabilities. |

| Hearing screening              | Every 10 years (for hearing loss and wax build-up). |

| Screening for dental anomalies | Routine follow up and regular dental examinations by a family dentist or local community dental services are essential. Missing teeth/malocclusion/other dental anomalies: refer to a consultant in Adult Restorative Dentistry or Special Care for multidisciplinary management. With some cardiac defects, antibiotic prophylaxis might be advised for dental procedures – check with your cardiologist. |

| Behavioural & Mental Health issues | Access to support for employment, self help and independent living. Social skills intervention as needed. Refer for psychological intervention/support for anxiety, and when major life events. NB. Apparent friendliness and sociability can mask depression and anxiety. |

### † Anaesthesia

Unless there are existing cardiac problems, cardiac assessment within 12 months prior to a general anaesthetic is sufficient. Pre-op assessment should take place 1-2 weeks prior to planned surgery, to assess cardiac, airway, joints, renal and emotional status.
### Williams Syndrome Growth Charts

**For Girls**

<table>
<thead>
<tr>
<th>Weight Age</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–1 years old</td>
<td>15</td>
</tr>
<tr>
<td>1–5 years old</td>
<td>16</td>
</tr>
<tr>
<td>5–18 years old</td>
<td>17</td>
</tr>
<tr>
<td>Length Age</td>
<td>Page</td>
</tr>
<tr>
<td>0–1 years old</td>
<td>18</td>
</tr>
<tr>
<td>1–5 years old</td>
<td>19</td>
</tr>
<tr>
<td>5–18 years old</td>
<td>20</td>
</tr>
<tr>
<td>OFC Age</td>
<td>Page</td>
</tr>
<tr>
<td>0–1 years old</td>
<td>21</td>
</tr>
<tr>
<td>1–5 years old</td>
<td>22</td>
</tr>
</tbody>
</table>

**For Boys**

<table>
<thead>
<tr>
<th>Weight Age</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–1 years old</td>
<td>23</td>
</tr>
<tr>
<td>1–5 years old</td>
<td>24</td>
</tr>
<tr>
<td>5–18 years old</td>
<td>25</td>
</tr>
<tr>
<td>Length Age</td>
<td>Page</td>
</tr>
<tr>
<td>0–1 years old</td>
<td>26</td>
</tr>
<tr>
<td>1–5 years old</td>
<td>27</td>
</tr>
<tr>
<td>5–18 years old</td>
<td>28</td>
</tr>
<tr>
<td>OFC Age</td>
<td>Page</td>
</tr>
<tr>
<td>0–1 years old</td>
<td>29</td>
</tr>
<tr>
<td>1–5 years old</td>
<td>30</td>
</tr>
</tbody>
</table>

All growth charts are reproduced with the kind permissions of Harlow Printing Limited and Dr Neil Martin.

GIRL’S WEIGHT: (kg)
BIRTH - 1yr

NAME: ............................................
D.O.B. ........../........./ .........
Williams Syndrome Clinical Management Guidelines

**GIRL'S WEIGHT: (kg)**

1 - 5yrs

**NAME:**

---

[Graph showing weight percentiles for girls aged 1 to 5 years.]
GIRL’S WEIGHT: (kg)
5 - 18yrs
With provision for school reception class
NAME: ..............................................
D.O.B. ........../........../........

Williams Syndrome Clinical Management Guidelines
GIRL’S LENGTH: (cm)
BIRTH - 1yr

NAME: .................................................................
D.O.B. ........../........../.........

weeks/months
GIRL’S HEIGHT: (cm)
1 - 5yrs
NAME: ________________________________
GIRL’S HEIGHT: (cm)  
5 - 18yrs 
With provision for school reception class
NAME: ...........................................
D.O.B. ......../......../........
BOY'S WEIGHT: (kg)

BIRTH - 1yr

NAME:..................................................

D.O.B. ........../........../.........

---

2nd

50th

75th

91st

0th

25th

5th

8th

10th

90th

11th
BOY’S WEIGHT: (kg)
1 - 5yrs
NAME: ..................................................
BOY’S HEIGHT: (cm)
5 - 18yrs
With provision for school reception class
NAME: ........................................
D.O.B. ......../....../........
Bibliography
(papers selected for review by the Williams Syndrome Guideline Development Group, and considered in the formulation of management recommendations)

<table>
<thead>
<tr>
<th>General papers &amp; Guidelines</th>
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<table>
<thead>
<tr>
<th>Anaesthesia</th>
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<table>
<thead>
<tr>
<th>Calcium metabolism</th>
</tr>
</thead>
</table>
Calcium metabolism continued...


Cardiovascular

Cardiovascular continued...


Dental

- Fearne, J. "Dental Advice for Children with Williams Syndrome." UNPUBLISHED - from Williams Syndrome Foundation website: www.williams-syndrome.org.uk
Bibliography continued...
(papers selected for review by the Williams Syndrome Guideline Development Group, and considered in the formulation of management recommendations)

Dental continued...

Development, Behaviour and Mental Health

Endocrine & Thyroid
Bibliography continued...
(papers selected for review by the Williams Syndrome Guideline Development Group, and considered in the formulation of management recommendations)

Endocrine & Thyroid continued...

Gastrointestinal & Feeding

Growth, Puberty and Sexual Health
Growth, Puberty and Sexual Health continued...

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Hearing

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Orthopaedic


Renal & Hypertension

60.
Renal & Hypertension continued...

## Bibliography continued...
(papers selected for review by the Williams Syndrome Guideline Development Group, and considered in the formulation of management recommendations)

### Vision

## Summary of Investigations for Children with Williams Syndrome

The table below lists the tests and screening which should be carried out in children with Williams Syndrome, and specifies at what age and how often they should be undertaken. For clinical management and follow-up recommendations, please see the full set of UK Clinical Management Guidelines for Williams Syndrome, available from the Williams Syndrome Foundation website: www.williams-syndrome.org.uk.

<table>
<thead>
<tr>
<th>Test/Screening</th>
<th>Age/Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>At diagnosis</td>
</tr>
<tr>
<td></td>
<td>Neonates &amp; Infants (0–1)</td>
</tr>
<tr>
<td></td>
<td>Children (1–11)</td>
</tr>
<tr>
<td></td>
<td>Adolescents (11–18)</td>
</tr>
<tr>
<td>Cardiac screening</td>
<td>Full assessment including scans.</td>
</tr>
<tr>
<td></td>
<td>Full assessment including scans, before 12 months.</td>
</tr>
<tr>
<td></td>
<td>Annual cardiac examination until 4 years old and once between 5–13 years old.</td>
</tr>
<tr>
<td></td>
<td>Cardiac assessment including scans every 5 years.</td>
</tr>
<tr>
<td></td>
<td>One cardiac examination between 13–21.</td>
</tr>
<tr>
<td></td>
<td>Cardiac assessment including scans every 5 years.</td>
</tr>
<tr>
<td>Hypertension screening</td>
<td>BP in both upper limbs.</td>
</tr>
<tr>
<td></td>
<td>Annual BP monitoring in both upper limbs and left leg.</td>
</tr>
<tr>
<td></td>
<td>Annual BP monitoring in both upper limbs and left leg.</td>
</tr>
<tr>
<td></td>
<td>Annual BP monitoring in both upper limbs and left leg.</td>
</tr>
<tr>
<td>Serum Ca and Urine Ca: creatinine ratio</td>
<td>Repeat at 12 months if baseline results normal.</td>
</tr>
<tr>
<td></td>
<td>Repeat at 12 months if baseline results normal.</td>
</tr>
<tr>
<td></td>
<td>Test if symptomatic of Hypercalcaemia.</td>
</tr>
<tr>
<td>Renal screening</td>
<td>Renal tract USS to include kidneys and bladder (at diagnosis).</td>
</tr>
<tr>
<td></td>
<td>Renal tract USS to include kidneys and bladder if Symptomatic.</td>
</tr>
<tr>
<td></td>
<td>Renal tract USS at puberty, before leaving paediatric care and 5 yearly thereafter, or if symptomatic.</td>
</tr>
<tr>
<td>Thyroid Function Tests (TFTs)</td>
<td>If symptomatic.</td>
</tr>
<tr>
<td></td>
<td>If symptomatic.</td>
</tr>
<tr>
<td></td>
<td>If symptomatic.</td>
</tr>
<tr>
<td>Growth</td>
<td>Plot growth on appropriate growth chart.</td>
</tr>
<tr>
<td></td>
<td>Measure height, weight and OFC 1–3 monthly.</td>
</tr>
<tr>
<td></td>
<td>Measure height, weight and OFC 1–3 monthly until 2 years old.</td>
</tr>
<tr>
<td></td>
<td>Annually thereafter.</td>
</tr>
<tr>
<td></td>
<td>Check for kypho/scoliosis at puberty.</td>
</tr>
<tr>
<td></td>
<td>Weigh annually.</td>
</tr>
<tr>
<td>Gastrointestinal issues</td>
<td>Take feeding history and enquire about bowel habit.</td>
</tr>
<tr>
<td></td>
<td>Enquire about feeding problems, and bowel habit annually.</td>
</tr>
<tr>
<td></td>
<td>Enquire about bowel habit annually.</td>
</tr>
</tbody>
</table>
## Summary of Investigations for Children with Williams Syndrome continued...

The table below lists the tests and screening which should be carried out in children with Williams Syndrome, and specifies at what age and how often they should be undertaken.

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<td><strong>Neonates &amp; Infants (0—1)</strong></td>
</tr>
<tr>
<td>Hearing screening</td>
<td>NHSP—screening within first few weeks.</td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Vision screening</td>
<td>Between 6-12 months.</td>
</tr>
<tr>
<td>Screening for dental anomalies</td>
<td>Ensure dental checks carried out from an early age.</td>
</tr>
<tr>
<td>Multidisciplinary developmental assessment</td>
<td>Between 0—3 years old.</td>
</tr>
<tr>
<td>Serum creatinine</td>
<td>Test every 2—4 years.</td>
</tr>
<tr>
<td>Screening for coeliac disease</td>
<td>Once, after 3 years old (with low threshold to repeat).</td>
</tr>
<tr>
<td>Behavioural &amp; Mental Health issues</td>
<td>Offer contraceptive advice/details of relevant Organisations.</td>
</tr>
<tr>
<td>Sexual health</td>
<td></td>
</tr>
</tbody>
</table>
Other Resources

- **Williams Syndrome Checklist for Carers**
  This has been developed as part of the same project as this guideline document, and is aimed at care staff who work with adults with Williams Syndrome in assisted living arrangements. It contains clear instructions on how often adults with WS should see their GP, and what tests or screening should be carried out at each appointment, as well as signposting symptoms that may need to be investigated in between GP appointments. The Checklist is available from the Williams Syndrome Foundation (www.williams-syndrome.org.uk).

- **Orphanet (www.orpha.net)**
  Orphanet is an online database of rare diseases and related services provided throughout Europe. It contains information on over 5,000 conditions, including Williams Syndrome, and lists specialised clinics, diagnostic tests, patient organisations, research projects, clinical trials and patient registries relating specifically to Williams Syndrome.

Resources for Patients

- **Personal Health Record for Williams Syndrome (Blue Book)**
  All babies in the UK are issued with a red book to record their health, growth and development. We have previously designed similar Blue Books for several rare conditions requiring multi-disciplinary management, including 22q11 Deletion Syndrome, Achondroplasia and Neurofibromatosis Type 1. As part of this project a Blue Book has been designed for people with Williams Syndrome. The primary aim of the Blue Book is to empower patients and their families, giving them more information about and ultimately more control over their health. It will also benefit the healthcare professionals involved in managing these patients, by facilitating inter-speciality communication, educating non-specialists and allied healthcare professionals, providing a readily accessible summary "snapshot" of a patient’s condition, and they can also be used as a tool for clinical audit and research. They are available from the Williams Syndrome Foundation patient support group (see below).

- **The Williams Syndrome Foundation UK (www.williams-syndrome.org.uk)**
  The Williams Syndrome Foundation is run for parents by parents. They aim to be the first point of contact for individuals with Williams Syndrome, their families, and professionals needing support and information regarding the Syndrome. The Foundation actively supports research into the educational, behavioural, social, scientific and medical aspects of the Syndrome, and seeks to organise their financial and personnel resources so as to achieve their mission on a sustainable basis.
Acknowledgements

- The Williams Syndrome Guideline Development Group
  Dr Jane Ashworth, Dr Susmito Biswas, Professor Bruno Dallapiccola, Dr Mark Dalzell, Dr Jane Deal, Professor Dian Donnai, Pam Griffiths, Dr Kay Hood, Professor Pat Howlin, Dr Ed Ladusans, Dr Ralph MacKinnon, Dr Josephine Marriage, Dr Neil Martin, Dr Kay Metcalfe, Dr Zulf Mughal, Dr Ramanlal Patel, Dr Alison Pike, Dr Christopher Stinton, Kate Strong, Dr Rajat Verma, Dr Mike Wolfman

- The Williams Syndrome Foundation (www.williams-syndrome.org.uk)

- DYSERNE: A Network of Centres of Expertise in Dysmorphology, funded by the European Commission Public Health Executive Agency (DG Sanco) Project: 2006122 (www.dyscerne.org)

- Nowgen—A Centre for Genetics in Healthcare (www.nowgen.org.uk)

This project was funded by the Williams Syndrome Foundation (UK)

Registered Office:
The Williams Syndrome Foundation (UK)
161 High Street
Tonbridge
Kent
TN9 1BX
Tel: 01732 365 152
Fax: 01732 360 178

Email: john.nelson@williams-syndrome.org.uk
Website: www.williams-syndrome.org.uk