# CONSIDERATIONS

## RECOMMENDATIONS

## 1. HEENT (HEAD, EYES, EARS, NOSE, THROAT)

- **Children and Adults:**
  - ~ 15% have strabismus in addition to other ocular issues (e.g., cataracts, retinal problems).
  - Conductive and/or sensorineural hearing loss (often unilateral) occur in ~ 45% and ~ 10% respectively.
  - Most have chronic otitis media.
  - There is an increased frequency of velopharyngeal insufficiency (VPI) that is often associated with hyper-nasal speech, some of whom have submucosal cleft palate, and a small minority have overt cleft palate which can lead to nasal regurgitation.

- Refer to an ophthalmologist for assessment at diagnosis and during preschool years.
- Refer to an audiologist for evaluation in infancy (or when diagnosed) and every 6 months up to 8 years of age, then annually until adulthood, then according to DD Guideline 11.
- Examine the palate in infancy and evaluate for feeding problems and/or nasal regurgitation and, if warranted by clinical findings, refer to a cleft palate team.
- Refer to a speech and language pathologist for assessment by 1 year of age, sooner if warranted or when diagnosis is made.
- Evaluate nasal speech quality.
- Often need regular ear cleaning to remove cerumen.

## 2. DENTAL

- **Children and Adults:** Retrognathia (overbite) is common and may cause dental malocclusion.

- Significant dental issues are a recognized part of the syndrome.

- Refer to a dentist in early childhood.
- Advocate and ensure for appropriate dental care.

## 3. CARDIOVASCULAR

- **Children and Adults:** ~ 40% have congenital heart defects, most commonly of the conotruncal type (e.g., Tetralogy of Fallot, Interrupted Aortic Arch, Ventricular Septal Defect).

- At the time of diagnosis, complete a cardiovascular assessment, including EKG and echocardiogram.
- Refer to a cardiologist as warranted by clinical findings.

## 4. RESPIRATORY

- **Children:** Congenital malformations may lead to upper and/or lower airway obstructions and obstructive sleep apnea (OSA).
  - Most airway concerns resolve spontaneously with time but some require surgical intervention (e.g., Robin sequence).

- **Adults:** In order of prevalence, there is an increased frequency of recurrent pneumonia, atelectasis, asthma, and chronic obstructive pulmonary disease.
  - Those with uncorrected congenital malformations remain at risk for OSA.

- Refer to an ENT surgeon for evaluation as warranted by clinical findings.
- Undertake a sleep study in infancy and then as warranted by clinical findings after 3 years of age.
- Consider a pre-op anesthesia consultation regarding narrow airways prior to the first surgery.

- Consider periodic pulmonary function studies and referral to a respiriologist as warranted by clinical findings.
- Undertake sleep study as warranted by clinical findings.
<table>
<thead>
<tr>
<th>CONSIDERATIONS</th>
<th>RECOMMENDATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>5. GASTROINTESTINAL</strong></td>
<td></td>
</tr>
<tr>
<td>Children and Adults: Feeding difficulties, related to pharyngeal and gastrointestinal tract hypotonia, commonly lead to failure to thrive</td>
<td>□ Refer to a gastroenterologist and feeding specialist (e.g., speech-language pathologist).</td>
</tr>
<tr>
<td>Dysphagia and constipation are common</td>
<td>□ Treat constipation.</td>
</tr>
<tr>
<td>~ 20% develop gallstones</td>
<td>□ If difficulty swallowing pills, adapt medication regime (e.g., provide with liquid medication, crush pills).</td>
</tr>
<tr>
<td></td>
<td>□ Consider obtaining an abdominal ultrasound in adults to assess for gallstones.</td>
</tr>
<tr>
<td></td>
<td>□ Follow DD Guideline 15 for recommendations for managing constipation and Gastroesophageal reflux disease (GERD).</td>
</tr>
<tr>
<td><strong>6. GENITOURINARY</strong></td>
<td></td>
</tr>
<tr>
<td>Children and Adults: Up to ~ 33% may have renal tract anomalies</td>
<td>□ Undertake a renal ultrasound at the time of diagnosis.</td>
</tr>
<tr>
<td>~ 10% may develop renal failure in adulthood</td>
<td>□ Maintain surveillance for urinary tract infections (UTIs).</td>
</tr>
<tr>
<td></td>
<td>□ Determine creatinine levels at diagnosis and annually thereafter.</td>
</tr>
<tr>
<td><strong>7. SEXUAL FUNCTION</strong></td>
<td></td>
</tr>
<tr>
<td>Children and Adults: People with the 22q11.2 deletion syndrome are fertile and have a 50% chance of transmitting the 22q11.2 deletion to children</td>
<td>□ Referral for genetic counseling may be appropriate.</td>
</tr>
<tr>
<td><strong>8. MUSCULOSKELETAL (MSK)</strong></td>
<td></td>
</tr>
<tr>
<td>Children and Adults: Many have skeletal abnormalities, most commonly vertebral or rib anomalies</td>
<td>□ Undertake cervical spine X-rays after age 4 years to assess for vertebral anomalies and instability on flexion/extension (five views: flexion, extension, AP, lateral, and open mouth).</td>
</tr>
<tr>
<td>A minority have short stature during childhood which improves by adulthood</td>
<td>□ Arrange chest X-ray to evaluate for thoracic vertebral anomalies.</td>
</tr>
<tr>
<td></td>
<td>□ Provide clinical evaluation for scoliosis at diagnosis, during preschool, and periodically thereafter.</td>
</tr>
<tr>
<td><strong>9. NEUROLOGICAL</strong></td>
<td></td>
</tr>
<tr>
<td>Children and Adults: Impairments due to reduced muscle tone and motor delay are common in children</td>
<td>□ Undertake a neuro-developmental assessment of infants with particular attention to reduced muscle tone and motor delay.</td>
</tr>
<tr>
<td>Seizures are frequently associated with hypocalcemia</td>
<td>□ Refer to a physiotherapist (PT) and/or occupational therapist (OT), as needed.</td>
</tr>
<tr>
<td>~ 40% of adults have recurrent (often hypocalcemic) seizures</td>
<td>□ Ascertain history with attention to seizures.</td>
</tr>
<tr>
<td>Cord compression may occur related to skeletal anomalies</td>
<td>□ Following every seizure, check serum ionized calcium and magnesium.</td>
</tr>
<tr>
<td></td>
<td>□ Include EEG examination in evaluation if indicated.</td>
</tr>
<tr>
<td></td>
<td>□ Symptoms of cord compression are an indication for an emergent referral to a neurologist or neurosurgeon.</td>
</tr>
<tr>
<td><strong>10. BEHAVIOURAL/MENTAL HEALTH</strong></td>
<td></td>
</tr>
<tr>
<td>Children and Adults: Conditions such as Autism Spectrum Disorder (ASD), Attention Deficit Disorder (ADD), Attention Deficit Hyperactivity Disorder (ADHD), and Obsessive-Compulsive Disorder (OCD) are common</td>
<td>□ Ascertain comprehensive behavioural and mental health history.</td>
</tr>
<tr>
<td>Treatable anxiety disorders are common</td>
<td>□ Refer to a psychiatrist if evidence of ASD, ADD, ADHD, or OCD occurs.</td>
</tr>
<tr>
<td></td>
<td>□ Assess for psychiatric illness with attention to changes in behaviour, emotional state and thinking, including hallucinations or delusions and at-risk behaviours (e.g., sexual activity, alcohol/drug use) in teens and adults.</td>
</tr>
<tr>
<td></td>
<td>□ Refer to a psychiatrist as warranted by clinical findings.</td>
</tr>
</tbody>
</table>

© 2011 Surrey Place Centre
### CONSIDERATIONS

| Many of the childhood psychiatric disorders do not necessarily persist, nor do they predict psychiatric illness during adulthood |
| Schizophrenia can become apparent in adolescence and ~25% develop schizophrenia or other psychotic disorders in adulthood |

## RECOMMENDATIONS

- Consider psychiatric assessment at or near puberty with behavioural changes.

### 11. ENDOCRINE

- **Children & Adults:** ~60% have episodic hypocalcemia (often missed when mild or transient)
- Hypocalcemia is due to hypoparathyroidism in children and adults
- Long-term calcium supplementation can lead to renal calculi
- Hypo- and hyperthyroidism have been reported in children and adults
  - ~4% have growth hormone deficiency
  - ~35% of adults are obese
  - ~20% of adults have hypothyroidism
  - ~5% of adults have hyperthyroidism

- Measure serum ionized calcium concentration in neonates then annually to assess for hypoparathyroidism.
- Assess calcium levels in infancy, every 3 to 6 months, every 5 years through childhood, and every 1 to 2 years thereafter.
- Be vigilant regarding risk of hypocalcemia with acute illness and childbirth.
- All patients should have vitamin D supplementation; those with documented hypocalcemia and/or relative or absolute hypoparathyroidism may require prescribed hormonal forms supervised by endocrinologist.
- Refer to an endocrinologist as warranted by clinical and laboratory findings and for initial management of hypocalcemia.
- Consider densitometry to assess for osteopenia earlier than in general population.
- Undertake T4 and TSH baseline screening.
- Treat with standard thyroid replacement or antithyroid therapy where warranted.
- Monitor growth and growth hormone levels annually and consider endocrinology assessment for poor growth.

### 12. HEMATOLOGY

- **Children and Adults:** Autoimmune diseases (e.g., thrombocytopenia, juvenile rheumatoid arthritis [JRA], Grave’s disease, vitiligo, neutropenia, hemolytic anemia) may be more common than in the general population
  - ~10% develop splenomegaly

- Monitor with CBC; thyroid function annually or if concerns arise.
- Investigate arthritis problems for JRA and refer to a rheumatologist as warranted.

### 13. INFECTIOUS DISEASE/IMMUNIZATION

- **Children and Adults:** Congenital thymic aplasia is recognizable in infancy
  - Immune function may be impaired (although thymic aplasia is rare, thymic hypoplasia is common); improvement in T-cell production occurs over time
  - ~75% have chronic middle ear infections (otitis media) and frequent respiratory infections
  - Irradiated blood products have been used when blood replacement has been

- In addition to obtaining a CBC with differential in newborns, consider undertaking flow cytometry. At age 9 to 12 months (prior to live vaccines), assess flow cytometry, immunoglobulins and T-cell function.
- For infants, minimize exposure to infectious diseases and withhold live vaccines initially. Refer infants to an infectious disease specialist to assess regarding influenza vaccines, CMV-negative irradiated blood products and RSV prophylaxis.
- Measure absolute lymphocyte count following initial diagnosis and refer to an immunologist if count is low.
- Evaluate immune status before offering any live vaccines.
- Treat respiratory and other infections aggressively in children and adults.
<table>
<thead>
<tr>
<th>CONSIDERATIONS</th>
<th>RECOMMENDATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>necessary</td>
<td></td>
</tr>
<tr>
<td>Recurrent upper and lower respiratory tract infections are common in adults</td>
<td></td>
</tr>
</tbody>
</table>

### 14. OTHER

- **Incidence**: 1/4000, but more likely higher and many without typical features.
- **Huge variability in level of developmental disability and the number and severity of associated features.**
- **IQ**: The majority of affected people with 22q11 deletion fall in the high mild to borderline range; moderate to severe rates and average levels of IQ are less common.
- **A selection bias in reported studies may result in over-estimating some prevalence rates.**

### WEBSITES THAT MAY BE HELPFUL FOR FAMILIES AND CAREGIVERS

- Chromosome 22 Central
  - [www.c22c.org](http://www.c22c.org)
- The International 22q11.2 Foundation Inc.
  - [www.22q.org](http://www.22q.org)

### REFERENCES CITED


### PUBLISHED HEALTH CARE GUIDELINES REVIEWED AND COMPARED

Developed by: **Forster-Gibson, Cynthia, MD, PhD** and **Berg, Joseph M, MB, BCh, MSc, FRCPSYCH, FCCMG**

**Expert Clinician Reviewers**
*Thanks to the following clinician for her review and helpful suggestions.*

Anne Bassett, MD  
Director, Clinical Genetics Research Program, Centre for Addiction and Mental Health, Toronto  
Canada Research Chair, Schizophrenia Genetics

**About this Health Watch Table**

Initial publication:  
May 2011

Edit history:  
20 November 2012, PT  
26 May 2015, PT