

# Neurofibromatosis

## [Disclaimer](#)

This pathway is about neurofibromatosis type 1 (NF1) in children and adults.

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## Red Flags

- New change in visual acuity
- Neurological symptoms suggestive of space-occupying lesion (SOL)
- New persistent pain or change in neurofibroma suggestive of cancerous change
- Severe hypertension

## Background – About Neurofibromatosis

Neurofibromatosis type 1 (NF1) is an autosomal dominant condition with an incidence of 1 in 3000. Tumours that grow on nerves and affects mainly the skin, nervous, and skeletal systems. It has distinctive features such as café au lait spots, neurofibromas, and plexiform neurofibromas. About 60% of cases have no medical complications.

Complications include:

- Hypertension due to renal artery stenosis or pheochromocytomas
- Skeletal dysplasia, including scoliosis
- Optic nerve gliomas and visual deficits
- Coarctation of aorta or renal artery stenosis
- Learning and behavioural concerns
- Psychological difficulties
- Cosmetic disfigurement due to neurofibromas
- Increased incidence of malignancies

## Assessment

### Diagnostic criteria for NF1

1. Consider diagnosis in all infants or children with  $\geq 6$  café au lait macules each  $> 0.5$  cm. Monitor infants with small or  $< 6$  café au lait macules.
2. **NF1 diagnostic criteria** develop during childhood and are not present in infancy. Examples:  
**NF1 diagnostic criteria**
  - 6 or more café au lait macules ( $> 0.5$  cm in children or  $> 1.5$  cm in adults)
  - 2 or more cutaneous/subcutaneous neurofibromas or one plexiform neurofibroma
  - Axillary or groin freckling
  - Optic pathway glioma
  - 2 or more Lisch nodules (iris hamartomas seen on slit lamp examination). Lisch nodules are tiny tumours on the iris of the eye. After puberty and are present in 97 to 100% of patients with NF1. Clinically, they do not cause any problems but help to confirm diagnosis.
  - Bony dysplasia (sphenoid wing dysplasia, bowing of long bone with or without pseudarthrosis)
  - First degree relative with NF1

- **Café au lait**



Source: DermNet NZ – [Café Au Lait Macule](#)

- **Neurofibroma**

**Types of neurofibromas:**

- *Cutaneous neurofibromas are bumps that emanate from superficial nerves and can be itchy.*
- *Plexiform neurofibromas are more extensive. They can be located anywhere including the face and have malignant potential. Ask about pain and change in growth pattern.*
- [Solitary neurofibroma](#)



Source: DermNet NZ – [Skin Signs of Neurological Diseases](#)

- **Axillary/groin freckling**



Source: DermNet NZ – [Neurofibromatosis](#)

## All patients

1. Take a targeted **history**.

### **History**

- *New or persistent headache or other neurological symptoms*
- *Changes in neurofibromas*
- *Development of pain or hardness in neurofibromas*
- *New ocular symptoms or decreased visual acuity*
- *Social and cognitive function, mood*

2. Perform an examination:

- Complete a full skin check to assess for **neurofibromas**.
- Assess for **skeletal complications**, including scoliosis and macrocephaly.

### **Skeletal complications**

- *Macrocephaly – common in NF, but if dramatic consider pathological causes such as tumour, aqueductal stenosis, or hydrocephalus.*
- *Scoliosis – can be diagnosed clinically. See [RCH adolescent idiopathic scoliosis fact sheet](#). In NF1, scoliosis affects lower cervical and upper thoracic spine. Can be rapidly progressive and require surgical fusion.*
- *Measure height, weight, and head circumference.*
- *With older children and adults, check visual acuity and fields. Changes may indicate presence of an optic glioma.*

## Adults

1. Take blood pressure. Hypertension can be caused by renal artery stenosis (2%) or phaeochromocytoma (2%).
2. Review systems, indicating **other complications**.

### **Other complications of neurofibromatosis**

- Abdominal symptoms may suggest gastrointestinal neurofibroma
- Coarctation of aorta and pulmonary stenosis
- Disfiguring plexiform neurofibromas
- Seizure disorder – more common in childhood

### **3. Perform a *women's health and family planning check*.**

- Early screening for breast cancer aged 40 to 50 years.
- Genetic counselling – 50% chance of passing onto offspring. Complications from NF1 are unpredictable.
- Pre-pregnancy counselling – 3 day old embryos can be screened prior to implantation. Prenatal testing by chorionic villus sampling (CVS) or amniocentesis is possible but many do not take up this as there is an inability to detect disease severity.
- Pregnancy issues – increased incidence of intrauterine growth restriction (IUGR) and stillbirth, and hypertension. Pregnancy can dramatically increase size and number of plexiform neurofibromas.

## Management

1. If patient identifies as Aboriginal or Torres Strait Islander, understand their ***specific cultural and spiritual needs when*** discussing and delivering treatment options, including eligibility for [Integrated Team Care \(ITC\) services](#).

### ***Cultural and spiritual considerations for Aboriginal and Torres Strait Islander People***

- Offer referral to culturally appropriate social and emotional wellbeing [services](#).
- Consider including an [expert](#) in the multidisciplinary team, to provide culturally appropriate care to Aboriginal and Torres Strait Islander people.
- Provide culturally appropriate information or resources about the signs and symptoms of recurrent disease, secondary prevention, and healthy living.

2. If patient has a disability, consider allied health referral.

## For probable new NF1 diagnosis

1. Arrange an urgent paediatric referral or to the **Neurofibromatosis clinics** to confirm diagnosis.  
**Neurofibromatosis clinics**
  - Refer to Paediatric Neurology at [Monash Children's](#) and [Royal Children's Hospital](#) citing new NF1 referral.
  - Referrals are accepted from GPs and Paediatricians statewide.
2. Provide parents with [Neurofibromatosis Type 1 \(NF1\) factsheet](#).
3. Reassure that most instances there are no medical issues and there is no cure for NF1.

## Children

1. Arrange [immediate paediatric medicine referral or admission](#) if presenting with:
  - new neurological symptoms suggestive of a space-occupying lesion.
  - neurofibromas that appear to have become malignant.
  - severe hypertension.
2. If presenting with new changes in visual acuity, arrange [immediate paediatric ophthalmology referral or admission](#).
3. Arrange an urgent paediatric referral or to the **Neurofibromatosis Clinic**, if:
  - new or progressive scoliosis.
  - growth or head circumference crossing centiles.
  - premature puberty.

Refer to Paediatric Neurology at [Monash Children's](#) and [Royal Children's Hospital](#) citing new NF1 referral.

4. If developmental or behavioural difficulties, see [Behavioural Concerns in Children and Adolescents](#).
5. For all children with neurofibromatosis, ensure annual review by arranging routine paediatric referral or **Neurofibromatosis Clinic** referral.

## Adults

1. For any complication of neurofibromatosis in an adult including skin, bone, eye and neurological symptoms, refer urgently to the Royal Melbourne Hospital neuro-oncology clinic via the Neurosurgery Department.

The Alfred – [click here](#)

Monash Hospital - [click here](#)

Peninsula Health – [click here](#)

2. Treat [hypertension](#) depending on severity:
  - If borderline hypertension, consider home monitoring.
  - If severe, assess for renal artery stenosis (2%).
  - If symptomatic, measure urinary catecholamines for pheochromocytoma (2%).
3. If woman with neurofibromatosis:
  - ensure all women aged  $\geq 40$  years engage in regular [breast screening](#) every year until aged 50 years and then 2-yearly thereafter.
  - and considering pregnancy, refer for [genetic counselling](#).
4. If adolescent or adult experiencing mental health symptoms, refer to a [psychologist](#) or [psychiatrist](#).

## Referral

The two tertiary services in Victoria that have paediatric neurofibromatosis clinics are The Royal Children's Hospital and Monash Health. Adult neurofibromatosis patients requiring complication management are seen at The Royal Melbourne Hospital.

- If aged < 16 years:
  - Arrange [immediate paediatric medicine referral or admission](#) if presenting with:
    - new neurological symptoms suggestive of a space-occupying lesion.
    - neurofibromas that appear to have become malignant.
    - severe hypertension.
  - If presenting with new changes in visual acuity, arrange [immediate paediatric ophthalmology referral or admission](#).
  - Arrange an [urgent paediatric referral](#) or to the **Neurofibromatosis Clinic**, if:
    - progression of plexiform neurofibromas.
    - new or progressive scoliosis.
    - growth or head circumference crossing centiles; premature puberty.
  - For all children with neurofibromatosis, ensure annual review by arranging [routine paediatric referral](#) or **Neurofibromatosis Clinic** referral.
- If aged > 16 years:
  - If symptoms of a space-occupying lesion or new changes in visual acuity, refer for [immediate neurosurgery referral or admission](#).
  - For all concerns about neurofibromatosis management including neurofibromas, scoliosis, ocular complications and malignancies, refer urgently to the neuro-oncology clinic at the Royal Melbourne Hospital via the [Neurosurgery Department](#).

The Alfred – [click here](#)

Monash Hospital - [click here](#)

Peninsula Health – [click here](#)

- If uncontrolled hypertension or suspected pheochromocytoma in an adult with neurofibromatosis, arrange [urgent nephrology referral](#).
- If patient is considering family planning, refer for [genetic counselling](#).
- If experiencing mental health symptoms, refer to a [psychologist](#) or [psychiatrist](#).
- Arrange community referrals as required:
  - [Allied health referral](#) for disability and mobility management.
  - [Breast screening](#) for women aged ≥ 40 years, every year until aged 50 years and then 2-yearly thereafter.
- If Aboriginal or Torres Strait Islander patient, offer referral to **specific Aboriginal and Torres Strait Islander services**. For all referrals, to both mainstream and Indigenous services, ensure Indigenous status is clearly marked on the referral.
  - **Referral Options for Aboriginal and Torres Strait Islander people**
    - For hospital referrals, consider engaging support from the [Aboriginal Hospital Liaison Officers](#).
    - For community referrals, consider referral to an Aboriginal Community Controlled Health [service](#).
    - For care coordination, support and advocacy throughout treatment, consider referral to [Integrated Team Care Program](#).

# Information

## For health professionals

### Further information

- BMJ Journal of Medical Genetics – [Guidelines for the Diagnosis and Management of Individuals with Neurofibromatosis 1](#)
- Cancer Council Australia:
  - [Optimal Cancer Care Pathway for High-Grade Glioma](#)
  - [Optimal Cancer Care Pathway for High-Grade Glioma: Quick Reference Guide](#)
- DermNet NZ – [Neurofibromatosis](#)
- NSW Government Centre for Genetics Education – [Neurofibromatosis Type 1](#)

## For patients

- [Children's Tumour Foundation](#)
- NSW Government Centre for Genetics Education – [Neurofibromatosis Type 1](#)
- The Royal Children's Hospital Melbourne – [Neurofibromatosis Type 1 \(NF1\)](#)

# References

1. [Neurofibromatosis. Conference statement. National Institutes of Health Consensus Development Conference.](#) Arch. Neurol. 1988 May;45(5):575-8.

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