Melanoma

Melanoma is cancer derived from the malignant transformation of melanocytes, with cutaneous (93%), ocular (6%) and mucosal (1%) manifestations (Cancer Cell Int 2024;24:63).

Ultraviolet light, consisting of UV-A, B and C, is the most important environmental cause of skin cancers. All UV-C and most UV-B is blocked by the atmosphere, but the rest (i.e. all UV-A and a little UV-B) reaches the surface (BMJ 2012;345:e4757). Until relatively recently, only UV-B was thought harmful, but, in 2009, the entire UV spectrum was declared a 'group 1' carcinogen.

This article was reviewed in April 2026.

At Red Whale, we aim to minimise bias and use inclusive terms where possible. In this article, we use the term 'darker skin' because this is the descriptive term used in source articles to stratify risk of melanoma. We therefore reproduce the language seen in the source article. We've included links in the box at the end of the article to resources that illustrate lesion appearances in different skin types.

1. Background

- Melanoma is the 5th most common cancer in the UK (Cancer Research UK, accessed October 2025).
- Skin cancers are one of the most preventable malignancies (BMJ 2025;390:r1570).
- 6% of those presenting with a pigmented skin lesion are diagnosed with melanoma or squamous cell carcinoma (BMJ 2024;385:e077845).
- Melanoma is the most lethal form of skin cancer (Cancer Cell Int 2024;24:63).
- The stage at diagnosis is of greater prognostic importance in melanoma than in almost any other cancer (Nat Rev Dis Primers 2025;11:23).
- Common sites for metastases are liver, lung, brain and bone.

2. Epidemiology

The incidence of melanoma continues to rise (Cancers 2025;17:707). In the UK, incidence has risen by 147% since the early 1990s (Cancer Research UK, accessed October 2025). Melanoma overdiagnosis is an increasing issue: the increase in incidence is not accompanied by an increase in

mortality because many of the lesions, if left untreated, would never cause symptoms or limit life (Dermatol Pract Concept. 2023;13:e2023246).

Despite rising incidence, mortality rates are declining slightly (Biomedicines 2022;10:822). This is likely due to **immunotherapies** and **targeted therapies**.

Median age at diagnosis varies between countries, but is generally in the 7th decade.

Females are at increased risk of developing melanoma while young. At age 20–24y in the UK, there are almost 3x as many melanomas diagnosed in females than in males (BMJ 2024;385:e077845).

Inequalities in melanoma diagnosis, management and outcomes

- Melanoma (along with breast cancer) is one of the few cancers with reduced incidence in those with the highest deprivation scores. This may be partly attributable to frequency of sunny holidays (Br J Cancer 2010;102:1661).
- 5-year survival rates vary with deprivation: 93.1% 5-year survival for the least deprived, falling to 89.7% in the most deprived groups (England, 2016–2020) (Cancer Research UK, accessed October 2025).

Melanoma may present later in those with darker skin, which may be due to lower suspicion, reduced access to healthcare or reduced confidence in diagnosis by professionals (BMJ 2024;385:e077845).

Historically, publications have focused on the appearance of pigmented lesions in white skin. One study found that only 2% of images available through a web search were on pigmented skin, and 0% of ABCDE infographics contained darker skin tones (J Am Ac Dermatology 2024;91:AB141). The British Association of Dermatologists

produces educational resources for clinicians on skin of colour. It signposts us to Skin Deep, among other publications.

3. Histological types

SIGN uses the conventional subtypes of melanoma (SIGN 2017 updated 2023, 146):

- Superficial spreading melanoma: the most common type, usually presents as a suspicious mole.
- Nodular melanoma: second most common, a shorter presentation, bleeds and ulcerates more often than others.
- Lentigo maligna melanoma: third most common, seen in the face/neck of the elderly, a long in-situ phase (called lentigo maligna).
- Acral melanoma: on the palms, soles or under the nail (subungual). Unlike other types, which tend to affect those with fair, easily sunburned skin, this type is more common in deeply pigmented skin (BMJ 2025;390:e085121).
- Desmoplastic melanoma: uncommon, scar-like (skin-coloured, firm), most on head and neck on white skin (Dermnet.nz, accessed 2025).
- Pigmented epithelioid melanocytoma: rare, indolent, with little incidence of metastases.

The WHO revised its classification of melanoma in 2018 into 9 'melanoma pathways', taking into account mutation signatures and cumulative solar damage (Front Oncol. 2021;11:675296).

Amelanotic melanoma

8% of melanomas are 'amelanotic'. This means that most of the tumour cells

are no longer producing melanin so the melanomas are atypical in appearance and difficult to spot.

They are usually the nodular or acral subtypes, rather than the superficial spreading type.

They tend to be diagnosed at a later stage than pigmented melanomas (BMJ 2018;360:k826).

What do they look like?

- Red and inflammatory, or skin-coloured in appearance.
- Nodular and more 'symmetrical' than classical melanomas.
- They may be mistaken for BCCs, SCCs and pyogenic granulomas.
- They may occur on the hand/foot and be mistaken for fungal infections or ulcers.

Be suspicious of rapidly growing or new lesions. For any new pink nodule, particularly in a high-risk individual, have a low threshold for referring/sending dermoscopic images for advice and guidance. The bottom line: if unsure, refer!

4. Risk factors

90% of melanoma is sporadic and 10% of cases are hereditary (Cancer Treat Res Commun 2024;40:100837).

There are several risk factors for melanoma:

- Family history (RR 1.74).
- High density of freckles (RR 2.1).

- Skin colour; fair vs. black (RR 2.06).
- Eye colour; blue vs. brown (RR 1.47).
- Hair colour; red vs. dark (RR 3.64).
- Skin type I vs IV (RR 2.09).
- Actinic damage indicators (RR 2.02).

Sun (UV) exposure, especially intermittent exposure and history of sunburn, is the most important environmental risk factor for melanoma (BMJ 2024;385:e077845). Chronic UV exposure is more closely associated with BCC or SCC.

UV sunbed use increases the risk of melanoma in a dose-dependent fashion. 'Ever users' of indoor tanning devices have RR 1.2, and this rises to RR 2.0 if use starts before age 35y (BMJ 2012;345:e4757).

Other risk factors include: advancing age, previous skin cancer, smoking, occupational (working outside), outdoor hobbies, immune suppression and genetic disorders such as xeroderma pigmentosum (BMJ 2024;385:e077845).

Melanoma susceptibility genes

There are several genetic variants associated with increased melanoma risk (Cancer Treat Res Commun 2024;40:100837). These are divided into high-penetrance genes (relative risk >5.0, e.g. CDKN2A and CDK4), medium-penetrance genes (e.g. MC1R) and low-penetrance genes (RR <2.0, e.g. ASIP). Additionally, there are hereditary cancer syndromes, e.g. familial atypical multiple mole melanoma syndrome (autosomal dominant) and Li-Fraumeni syndrome.

Atypical mole syndrome

Some people have numerous atypical naevi, which may indicate hereditary

'atypical mole syndrome' (affecting around 2% of the UK population) (BMJ 2008;337:a2249).

- This syndrome increases the risk of melanoma by 5–20-fold.
- It is recognisable in those with:
    - More than 100 common naevi (≤2mm diameter).
    - More than 2 atypical naevi (≥5mm diameter). Atypical naevi are usually symmetrical, with an indistinct border (melanomas are usually asymmetrical and have sharp-edged borders).
    - Naevi on unusual sites: buttocks, scalp, ears, dorsum of feet and breasts in women.
- Removing atypical naevi is *not* helpful in these people: do so only if melanoma suspected.
- Refer to a dermatologist if family history of melanoma and atypical mole syndrome.

5. Detection

SIGN suggests that we opportunistically examine patients' skin for melanoma during other clinical examinations (SIGN 146, 2023). Are we looking for suspicious skin lesions when we listen to a chest, feel a tummy or check leg pulses? This might feel like a bridge too far in a busy surgery, but we might be seeing a person's back that hasn't been seen by another human in years!

What improves detection rates?

- Dermatologists are better than GPs at recognising melanoma, but this difference may not be clinically significant (studies may be too small to calculate this) (BMJ 2008;337:a2488).

- Dermoscopy by experienced users increases diagnostic accuracy, but, when used by inexperienced individuals, it does not improve diagnostic accuracy (BMJ 2008;337:a2488).

A Cochrane review looked at whether using a dermatoscope in person was more accurate than looking at dermoscopy images sent remotely for review (Cochrane 2018;12:CD011902).

- Dermoscopy in person was over four times more accurate than visual inspection on its own at diagnosing melanoma.
- Remote image-based dermoscopy was five times more accurate than lesion photographs alone.
- Sensitivity and specificity for in-person dermoscopy was in the 90%s and fell to the 80%s when done remotely.

Can artificial intelligence (AI) apps spot melanoma?

NICE has approved DERM (Deep Ensemble for Recognition of Malignancy), an AI technology, 'as an option' to assess and triage skin lesions in adults within the suspected skin cancer pathway service. In 2025, NICE approved NHS funding for this software for 3 years, during which time more evidence will be collected (NICE 2025, HTE24).

In contrast, the British Association of Dermatologists (BAD) made a statement in 2025. In summary:

- BAD identifies several AI-based diagnostic apps which do not meet regulatory requirements.
- Apps may carry unsubstantiated claims.
- There is little published evidence that suggests that AI can reliably diagnose skin conditions.

There is concern that apps may provide false reassurance to people who

warrant clinical assessment.

A systematic review of 34 studies from 2016 to 2024 looked specifically at AI developments in melanoma diagnosis. Some systems had 'outstanding performance', with over 95% accuracy. Conclusions: AI systems show 'potential'; further work required before clinical applicability (BMC Cancer 2025;25:75).

In primary care, we should not currently rely on apps or recommend that patients use them. NICE recommends against routine use of computer-assisted diagnostic tools in the detection of melanoma (NICE NG14, 2015, updated 2022).

6. Assessment of pigmented lesions in primary care

A BMJ 10-Minute Consultation article helpfully sets out how we might approach assessment of a pigmented skin lesion in primary care (BMJ 2024;385:e077845). It suggests:

- **Targeted history focusing on skin cancer risk factors**, including: how the lesion was recognised and by whom (suspicion of malignancy should be higher with lesions that the patient can't see themselves or when the onset or duration is unknown); any changes (using the ABCDE rule that we outline below); symptoms; and risk factors for skin cancer.
- **Macroscopic examination** (using ABCDE as a guide), including palpation of the lesion.
- If possible, **assessment with dermoscopy** to determine whether the lesion is melanocytic and to assess for malignant features.

Those that are likely malignant will need referral on an urgent suspected cancer pathway. Those that are likely benign can be managed in primary care with appropriate safety-netting and advice (around self-examination and the ABCDE rule).

Checklists to aid pigmented lesion assessment

There are two main systems used to assess melanoma with the naked eye: the 7-point checklist and ABCDE.

7-point checklist for pigmented skin lesions

The 7-point checklist was designed as an educational tool, not as the referral tool it is now used as.

It's slightly complicated because there are two versions: the original '7-point checklist' (which SIGN uses) and the 'weighted 7-point checklist' (which NICE uses, with a cut-off score of 3 or more).

A BJGP study compared the original and weighted 7-point checklist. It found that the weighted score performed better in primary care to identify clinically significant lesions, though not malignancy (BJGP 2013;63:e345).

Weighted 7-point primary care checklist (used by NICE in its suspected cancer guidance)	
Major features (score 2 for each)	**Minor features (score 1 for each)**
• Change in size. • Irregular shape. • Irregular colour.	• Largest diameter ≥7mm. • Inflammation. • Oozing/crusting. • Change in sensation (including itch).
A score of 3 or more is considered suspicious.	

ABCDE checklist for pigmented lesions

While NICE suggests using the weighted 7-point checklist (NICE 2015 updated 2025, NG12), SIGN (SIGN 2017 updated 2023, 146) differs, suggesting we can also use either the original 7-point checklist OR the ABCDE checklist for suspicious pigmented lesions. A lesion with ANY of the ABCDE criteria warrants referral. In practice, we are likely to choose the guideline that applies to our country or local guidance where available.

A	Geometrical asymmetry in two axes.
B	Irregular border.
C	At least two different colours in lesion.
D	Maximum diameter >6mm.
E	Evolution/change in lesion.

7. Referral and evaluation

Refer all patients with suspected lesions via the suspected cancer pathway for assessment (NICE NG12, 2015, updated 2025).

Excisional biopsy is usually performed (incisional biopsies are generally not undertaken), with margins of 0.5–2cm, depending on stage, according to NICE (NICE NG14, 2015, updated 2022). SIGN suggests a 2mm border of normal skin, with a cuff of fat, for all suspicious lesions (SIGN 146, 2023).

Diagnosis is based on histology. Histology also provides lesion depth (Breslow thickness), which is used in staging.

Staging

Melanoma is staged using the TNM system (The eighth edition American Joint Committee on Cancer TNM system for melanoma, Expert Rev Anticancer Ther. 2018;18:775).

- T depends on lesion depth and presence or absence of ulceration (ranges from 'Tis' (which is melanoma in-situ), then from T0 (which is used when the primary can't be found) to T4 (more than 4mm thick)).
- N ranges from 0 (no melanoma in nearby lymph nodes) to 3 (melanoma in 4 or more nodes, matted nodes or ≥2 nodes with int-transit, satellite or microsatellite lesions).
- M is either 0 (no metastases) or 1.

Staging using sentinel node biopsy is reserved for those with Breslow thickness 0.8–1.0mm plus other features, or Breslow thickness >1.0mm without other features. NICE suggests that patients may also undergo whole-body and brain contrast-enhanced CT (or whole-body or brain MRI).

If targeted systemic therapy is an option, genetic testing is performed, e.g. BRAF analysis (NICE NG14, 2015, updated 2022). A variant BRAF gene may be a target for immune therapy.

8. Management

Wide excision is the primary treatment, with the aim of this being curative. Depending on the stage, lymph node dissection may be performed. Topical imiquimod may be an option for stage 0 melanoma (melanoma in-situ) if surgery is unacceptable (NICE NG14, 2015, updated 2022).

Targeted therapies and immunotherapy

Treating advanced melanoma is challenging, but targeted therapies (BRAF/MEK kinase inhibitors) and immunotherapies (anti-PD1 and anti-CTLA-4 antibodies) have increased long-term survival to around 50% (Cancer Cell Int 2024;24:63).

- **Non-targeted systemic therapies**: chemotherapy destroys cancer and non-cancer cells, causing collateral damage, e.g. dacarbazine (NICE NG14, 2015, updated 2022).
- **Targeted melanoma therapies** directly destroy cancer cells and minimise collateral damage, e.g. trametinib (MEK1/2 kinase inhibitor) with dabrafenib (BRAF inhibitor) or encorafenib (RAF kinase inhibitor) with binimetinib (MEK1/2 kinase inhibitor) (NICE 2016, TA396 and NICE 2019, TA562).
- **Immunotherapies** use the patient's own immune system to kill the tumour, e.g. checkpoint inhibitors. Immune system checkpoints limit immune system 'over-reach', stopping it from targeting healthy cells. Inhibiting these checkpoints allows T-cells to continue unrestricted. Examples of checkpoint proteins include CTLA-4 and the rather

sinister-sounding 'programmed cell death-ligand 1' (PD-L1). In melanoma, drugs such as pembrolizumab (NICE 2016, TA366), ipilimumab and nivolumab are approved by NICE (NICE 2016, TA400).

9. Prognosis

90% of melanomas are primary lesions with no evidence of metastases, and have a 10-year survival rate of 75–95% (Cancer Cell Int 2024;24:63).

Survival rates are improving. Increased mortality is associated with age, lesion thickness, location and nodular subtype (JAAD Int. 2024;16:144).

In 2018, UK 10-year melanoma survival was 93% (increased from 46% in the 1970s) (Cancer Research UK, accessed October 2025).

Survival rates for metastatic melanoma after checkpoint inhibitors for cutaneous, acral, ocular and mucosal melanoma were reported as being 46%, 34%, 21% and 22% respectively (J Immunother Cancer 2020;8:e000341).

10. Sunscreen and sun avoidance

Is sunlight good or bad?

There is a causal relationship between UV light and skin cancer: more sun exposure leads to more skin cancer. However, many studies of other cancers report LOWER risks associated with sun exposure. This may, in part, be due to adequate vitamin D production. Low vitamin D levels are associated with cardiovascular disease, malignancy and metabolic disorders (JAMA 2025;333:1824). Alternative mechanisms have been proposed, including

sunlight lowering blood pressure, mediated via nitric oxide (J Invest Dermatol 2024;144:1724).

Associations observed in these studies are subject to uncontrolled confounding, meaning that the level of bias leaves evidence mixed, with some reports concluding that sun exposure increases your risk of dying, while others report that sun exposure decreases your risk of dying (NIHR Open Res 2025;5:51).

Does sunscreen prevent melanoma?

There is indirect evidence that sun avoidance prevents melanoma, but it is hard to prove the efficacy of protection offered by sunscreen (BMJ 2025;390:e085121). Confounding may be present: high-risk individuals are more likely to use sunscreen, and those using sunscreen spend more time in the sun. Furthermore, some ingredients in sunscreen may be carcinogenic. Case–control studies and clinical trials have not shown an increase or decrease in melanoma incidence with sunscreen use. Physical protection such as clothing, hats and shade should be considered more important than sunscreen (SIGN 146, 2023).

The WHO recommends sunscreen outdoors if the UV index is 3 or more (BMJ 2025;390:e085121).

The BMJ article also recommends the following:

- Those age <2y are kept out of direct sun using a combination of shade, clothing, hat and sunglasses (if appropriate).
- Sunscreen is NOT recommended for those age <6m (due to mass:surface area ratio – systemic absorption is an issue).
- Sunscreen is the last line of defence for children age >6m.
- Those working outdoors should use all available protective measures: shade, personal protective equipment (including eyewear) and

sunscreen.

Common questions and concerns about sunscreen

What's the difference between organic (chemical) and inorganic (physical) sunscreen?	*Organic chemical sunscreens absorb UV light, e.g. oxybenzone. Physical sunscreens also absorb UV, with a little reflection and scattering. Each substance has its own absorption spectrum so they are sometimes combined to create a broad spectrum of protection.*
Which is better? Organic or physical?	*They're all effective at UV blocking. Inorganic products are more easily applied and more cosmetically acceptable, with less visibility on the skin, but tend to be applied less well, making them less effective.*
Why can't I find SPF 100?	*SPF 30 or more should be used on skin not covered by clothing. There's a little evidence that higher SPF products are better than SPF 50, but due to difficulty in getting accurate test results, many countries restrict claims to a maximum 'SPF 50+'.*
Are nanoparticles bad for you?	*Some sunscreens contain micronised particles. In-vivo human trials show little evidence of absorption into the deeper skin layers. No evidence has emerged after decades of use.*
I heard that some ingredients are unsafe. What do I avoid?	*The only established harms are contact dermatitis or allergy. A patch test can be performed before widespread use of a new product.*
Will sunscreen harm	*It's true that sunscreen enters aquatic environments.*

marine life?	*There is no evidence linking sunscreen and harm to marine life (including coral). Some products claim to be 'reef safe', but there are no standards to which these are held.*
I heard that sunscreen can actually cause sunburn. Is that true?	*No. Sunburn may follow application of sunscreen. This is an association. Sunburn is due to the sun, not sunscreen.*
I heard sunscreen causes hair loss. Is that true?	*There is insufficient evidence to demonstrate a causal relationship.*
I want to make my own sunscreen at home. Is that ok?	*No.*

11. Vitamin D deficiency resulting from sun avoidance

While avoiding excess sun exposure *may* reduce the incidence of melanoma, sun avoidance can also lead to vitamin D deficiency. Vitamin D is involved in bone metabolism, is associated with improved immune function and has protective effects against cancer, autoimmune diseases and psychiatric illness (BMJ 2008;337:a2249).

Advice about sun protection should be adapted for those at increased risk of vitamin D deficiency, e.g. darker skin, limited sun exposure, cultural clothing practices that reduce skin exposure to sun (BMJ 2025;390:r1570).

12. Tips on skin protection

A BMJ article reminds us (BMJ 2024;385:e077845):

- UV is present all day, even if the sun isn't shining.
- Water reflects 20% of UV.
- Snow reflects 70% of UV.
- Windows do not block ALL UV.

Protection tips:

- Avoid the sun between 11am and 4pm.
- Use clothing for protection, e.g. sleeves and hats.
- Re-apply sunscreen 2-hourly and use SPF 50 for children.
- Avoid sunbeds for tanning.
- If at increased risk, consider regular self-examination.

Melanoma

- Risk factors include the obvious (sun exposure, fair skin), but also consider family history.
- The weighted 7-point checklist is advocated to improve detection rates in primary care (NICE), or alternatively the ABCDE checklist can be used.
- Refer all suspicious lesions for assessment via the suspected cancer pathway.
- AI and apps have not yet reached the point for clinical application.
- Treatment is wide excision.
- Targeted therapies and immunotherapies are used for unresectable or metastatic tumours.
- Survival rates have increased dramatically in the UK over the past 5 decades.

Useful resources:

Websites (all resources are hyperlinked for ease of use on Red Whale Knowledge)

- Cancer Research UK - melanoma resources
- Skin Deep
- British Association of Dermatologists
- Dermnet NZ - melanoma

Websites describing appearances of lesions in different skin types:

- BAD Skin Health Info - skin of colour
- Dermnet NZ - skin conditions in skin of colour
- Nottingham Centre of Evidence Based Dermatology - skin of colour

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