Skin Cancer Technical Manual

What this manual will include:

BACKGROUND

what is skin cancer? What causes it? How prevalent is skin cancer in the United States? Globally? Is there a higher prevalence of skin cancer in certain communities, races, or groups?

SUSCEPTIBILITY

Who is most at risk for developing skin cancer? Are certain populations more likely to develop it? What risk factors are involved?

DIAGNOSIS

How early can skin cancer be diagnosed? Are there signs and symptoms people should be aware of?

TREATMENT

What treatments are available for those with different types of skin cancer? Is it curable?

This manual will present the basics of skin cancer and how it affects the body. It will also contain information about diagnosis and treatments, as well as global rates of the different types of skin cancers.

Purpose: To educate those at risk about the causes, treatments, and prevalence of skin cancer.

Background/ Introduction

What will be discussed in this section:

Causes

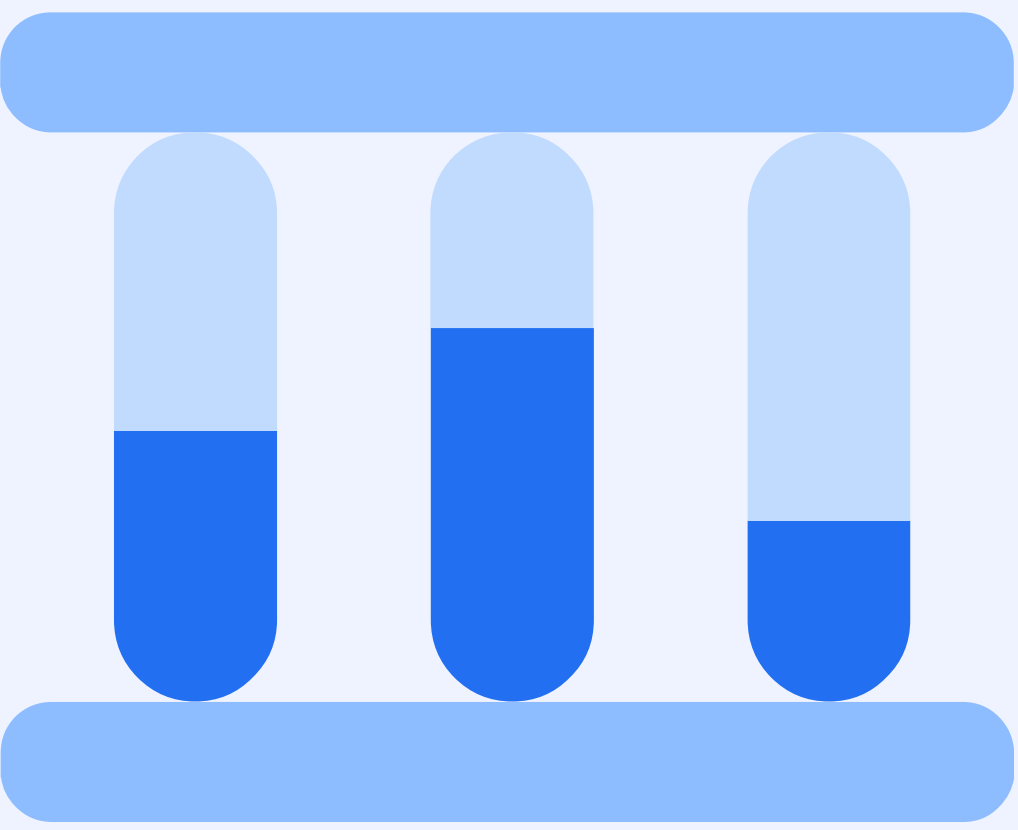
Development

Prevalence

What is skin cancer?

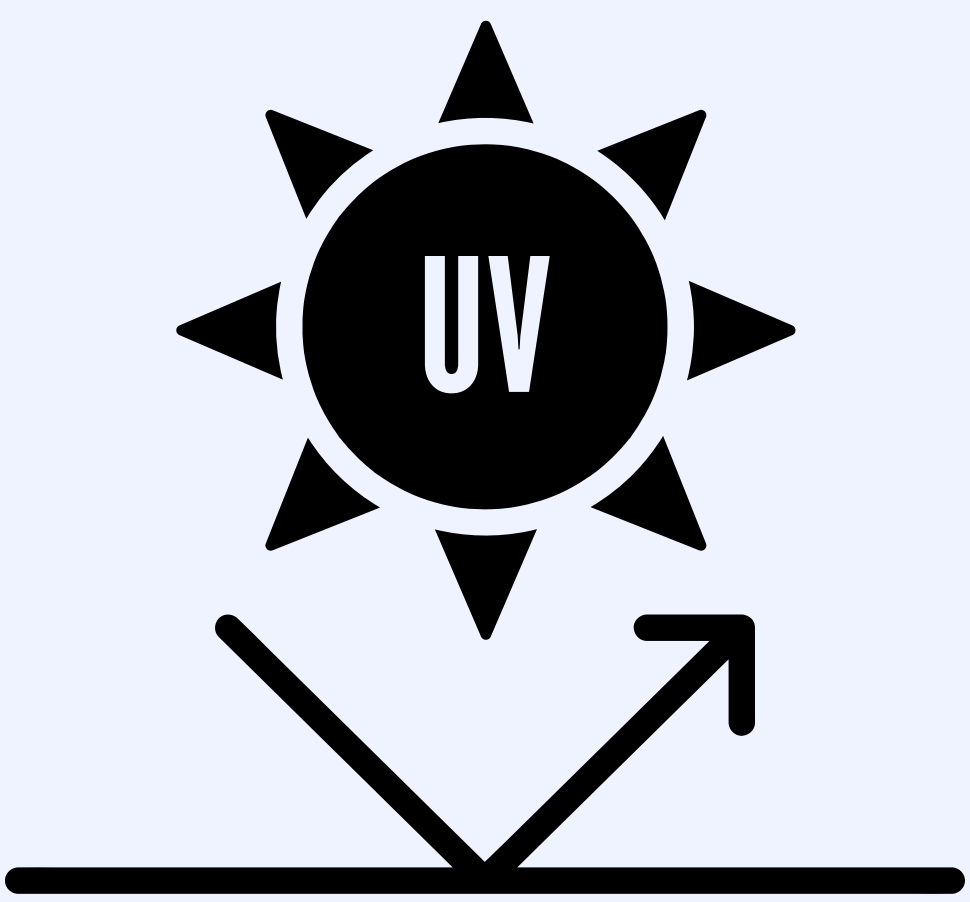
Skin cancer is a growth of abnormal cells due to over exposure to sunlight and UV rays(5). There are multiple different types of skin cancer including basal cell carcinoma, squamous cell carcinoma, and melanoma(5).

Basal and squamous cell carcinomas are the two most common types of skin cancer(4). They begin in the basal and squamous layers of the skin(4). Melanoma, the third most common type of skin cancer, begins in the melanocytes that are contained in the dermis(4).



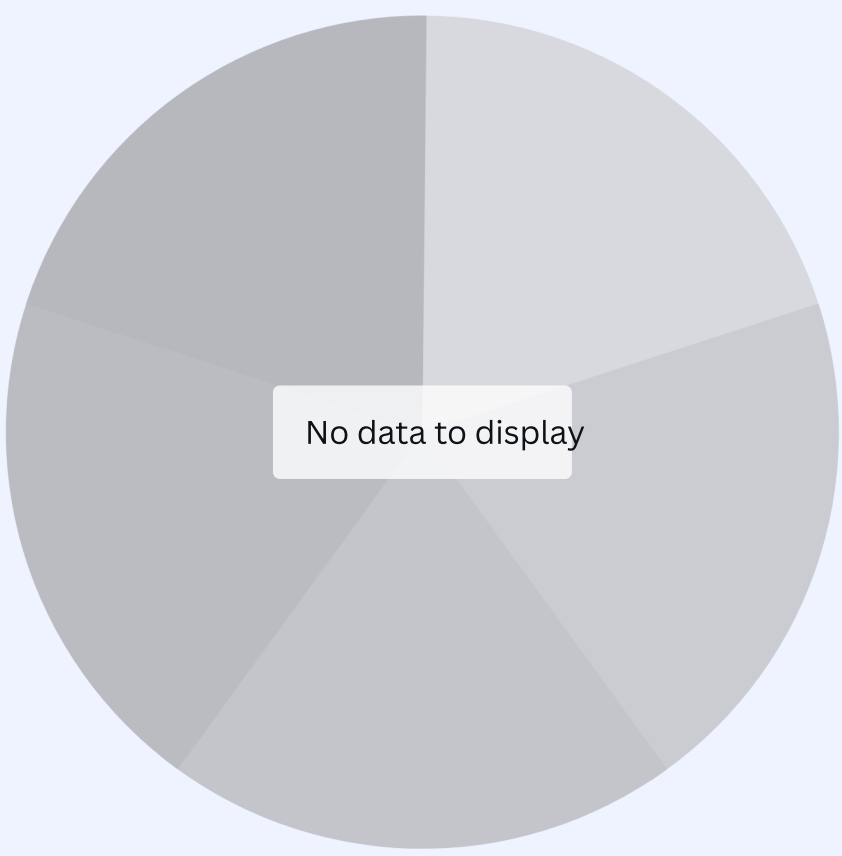
How does skin cancer develop?

UV exposure to the epidermis causes skin cancer(4). The epidermis is made up of three kinds of cells: squamous cells, basal cells, and melanocytes(4). Squamous cells are thin, flat cells that form the top layer of the epidermis(4). Basal cells are round cells underneath the squamous cells(4). Melanocytes are cells that make melanin and are found in the lower part of the epidermis(4). Each of these cells have the ability to create cancer cells if exposed to UV radiation for long amounts of time without protection(4). There is no set duration of time that skin cancer takes to appear(7). Different forms and types of skin cancer appear in different amounts of time. It’s most important to recognize the signs and symptoms for an early diagnosis(7).



Prevalence of Skin Cancer

Skin cancer is the seventeenth most common cancer globally, with over three-hundred thousand new cases in 2022(6). In 2022, over one-hundred thousand new cases of skin cancer were reported globally(6). However, The United States has the highest prevalence of skin cancer worldwide(6). Skin cancer is also the most common type of cancer in the United States(2). Studies have shown that one in five Americans will develop skin cancer at one point in their life(2). Statistically, 9,500 people in the United States are diagnosed with skin cancer every day(2). Furthermore, Over 1 million Americans are living with melanoma as of 2022(2).



Data from this graph was calculated based on data from 2022(6).

Differences between Men and Women

Women

Women are more educated on preventative practices for skin cancer as well as basic knowledge on the condition(1). Up until the age of 50, females have twice the incidence of melanoma(9). After that, men are much more likely to develop skin cancer than women, due to lack of knowledge and increased risk behaviors(9). Women also are less likely to develop skin cancer due to the presence of estrogen(9). Estrogen can act as a powerful immune-enhancer, potentiating antibody and inflammatory responses against cancer cells, thus decreasing a woman's likelihood of developing skin cancer(9).

Men

Men are less educated about skin cancer(1). Men are much less likely to engage in protecting their skin(1). This causes men to have an increased likelihood to develop skin cancer, thus more men are more likely to die of melanoma(1). Additionally, by the age of fifty, men are more likely to develop melanoma(1). While women have estrogen to protect their bodies from cancer cells, men produce a hormone called testosterone, which actually increases the activity of cancer cells(9). This might be why men are much more likely to develop skin cancer than women(9).

Differences Among Races

Skin cancer diagnosis has been increasing among Caucasians, but remains low for people of color(3). The low incidence of skin cancers in darker skinned groups is primarily a result of photo-protection due to increased melanocytes in the dermis which produce melanin(3).Melanin in people of color filters twice as much UV radiation than that of the epidermis of Caucasians(3). When skin cancer occurs in people of color, patients often present with an advanced stage, and thus, worse prognosis in comparison to Caucasian patients(3). Even though incidence rates for people of color are mcuh lower than those of Caucasians, their prognos is worse (3). Basal cell cancer (BCC) is the most common type of skin cancer in Caucasians, Hispanics, and Asians(3). Hispanics are 6 times more, likely to develop basal cell carcinoma(3). Squamous cell carcinoma is the most frequently diagnosed skin cancer in Blacks and the second most common skin cancer in Caucasians, Asians, and Hispanics(3).

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Risk Factors and Susceptibilty

The following sections will be coverd:

Prevention

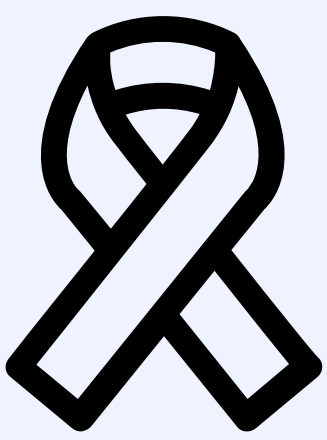
Risk Behaviors

Age

Genetics

Melanin

Moles



Prevention 6 & 7

What measures can you take

Sunscreen

Using a daily sunscreen of 15 SPF can reduce your risk by 50%

Protection

Wear sunglasses, hats, stay away from high sun exposure.

See the Doctor

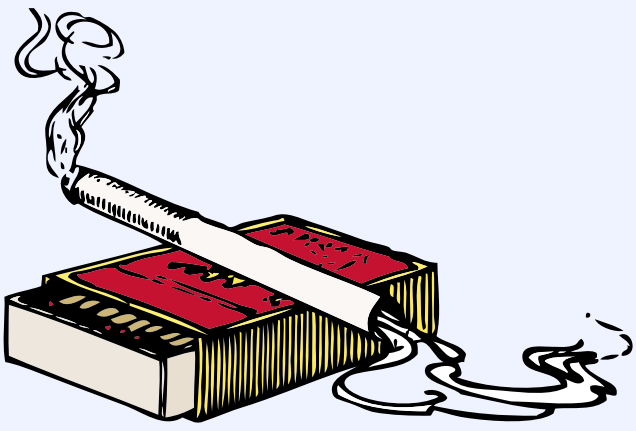
Regular consultations are effective in ensuring the cancer is caught at its earliest and most preventable stage

Risk Behaviors[8]

These behaviors put you at a greater risk for developing skin cancer

UV EXPOSURE

SMOKING



ALCOHOL

Age^3

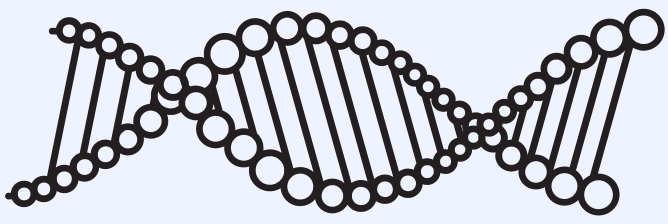
Diagnoses are more prevalent for people above the age of 75.

Skin cancer is developed from prolongued sun exposure, so older individuals are more at risk.

Records show that the median age range for skin cancer development is increasing.

Genetics[4]

How does it play a role?



Genetic Conditions

There are several conditions that worsen the risk of developing skin cancer. Firstly, there is basal cell nervus syndrome and this increases the risk of basal cell carcinoma. Oculocutaneous albinism, epidermolysis bullosa, and fanconi anemia increase risk of squamous cell carcinoma. Xeroderma pigmentosum or XP is an autosomal recessive disease that increases risk of skin cancer as a whole

Gene Variants

There are certain gene variations that also affect the onset of skin cancer. There is a tumor suppressor gene called CDK21 which increases the risk for melanoma. It aids in cancer tumor formation. 35-40% of all familial melanomas are attributed to variation in this specific gene.

Genetics

What about history?

Genetic Conditions

Family history: 1 in 10 people who have melanoma have a family history of it.[1]

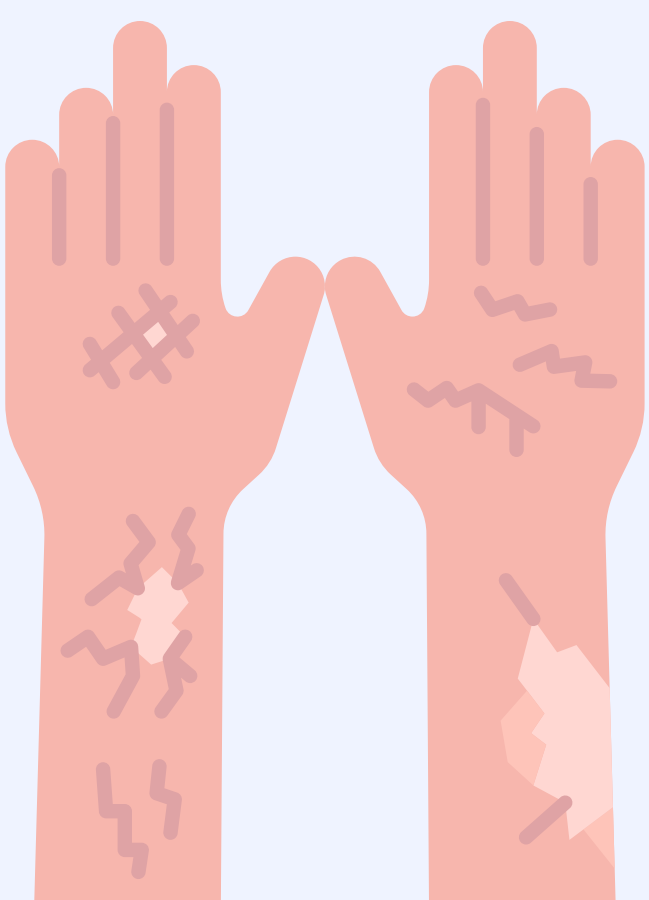
Previous history of having melanoma increases the risk of developing once again. [2]

Having a history or organ transplants can cause immune suppression - a compromised [3] immune system increases risk.

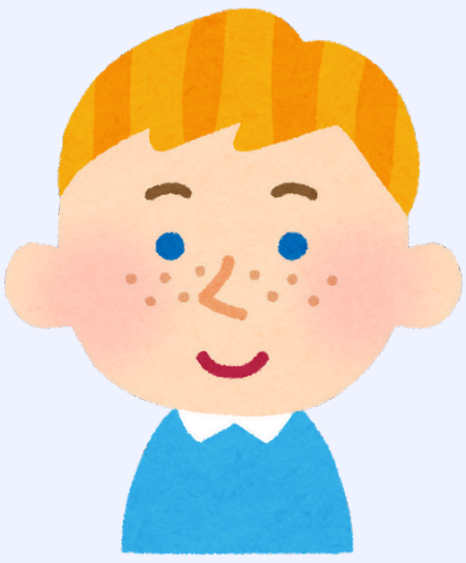
Xeroderma Pigmentosum [1]

A rare inherited condition

This condition lower's the skin's ability to repair damage to its DNA. This coupled with sun exposure causes a high risk of developing skin cancer especially at a young age.



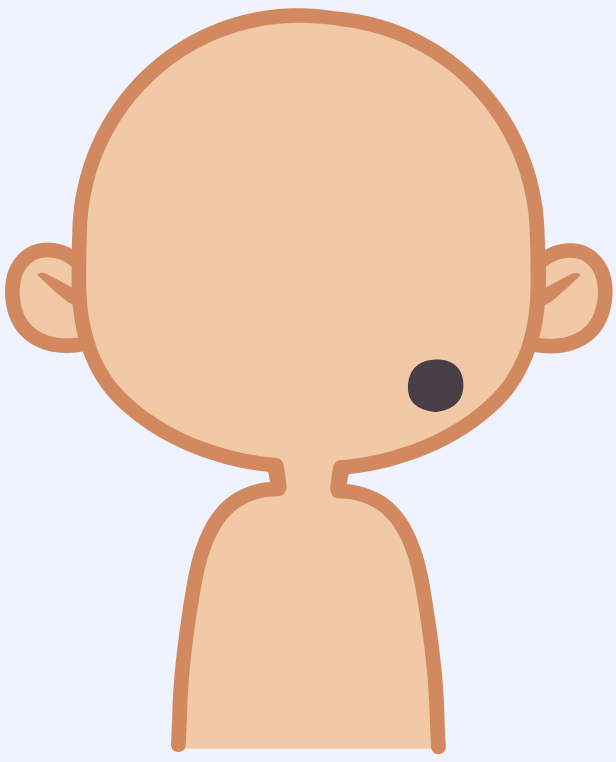
Melanin [1]



Melanin is a naturally made pigment that colors skin, hair, and eyes. It serves as a protective barrier from UV light. Those who lack melanin (lighter skin and hair) are at an elevated risk for developing skin cancer. They are predisposed to more sunburns and overall skin damage from the sun.

What does low melanin look like?
Typically lighter skin that turns red easily, freckles, and blond or red hair

Moles [1]



Most moles develop with age. A person who has many moles is more susceptible to getting cancer, as moles can develop to become cancerous.

Dyplastic nevus syndrome or atypical mole syndrome is where people inherit a condition causing them to have many abnormal moles (larger, strange shapes, abnormal coloring). Having this syndrome puts people at a high lifetime risk & monthly self skin exams are recommended

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Diagnosis

What to look for?

When to plan doctor visits?

We will cover various diagnostic tests utilized for the assessment of skin cancer, as well as the distinct stages of skin cancer that may develop.

On-Set Diagnosis[1]

Monitoring your skin for any new or changing features is crucial for early detection of potential skin conditions, including skin cancer

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- **New markings**
  - The appearance of new moles, spots, or growths on your skin
- **Changes in sizes and appearance**
  - Existing moles or spots that increase in size, shape, or color change.
- **Excessive itching, bleeding, and pain**
  - Lesions that itch persistently bleed without healing or cause discomfort.

These signs can indicate skin disorders, including various forms of skin cancer. Early consultation with a doctor allows for prompt evaluation and, if necessary, timely treatment.

Diagnostic Tests for Skin Cancer[5]

Tests

- **Reflectance Confocal Microscopy (RCM)**
  - An imaging method that lets doctors examine the layers of the skin at a cellular level in real-time without any invasive procedures.

- **Dermoscopy or “dermatoscopy”**
  - A diagnostic technique to enhance visualization of subsurface skin structures to distinguish between benign and malignant conditions like melanoma.

- **Imaging Tests**
  - Determine the extent of the disease and guide appropriate treatment strategies.

    - **<u>Computed Tomography (CT) Scans:</u>**
      - CT scans provide detailed cross-sectional images of the body, helping to identify the spread of skin cancer to internal organs
    - **<u>Magnetic Resonance Imaging (MRI):</u>**
      - MRI uses magnets to create clear pictures of the body. This technique is especially good for examining soft tissues and spotting metastases.
    - **Positron Emission Tomography (PET):**
      - PET scans detects areas of high metabolic activity, often indicative of cancer cells, and are used to assess the spread of melanoma

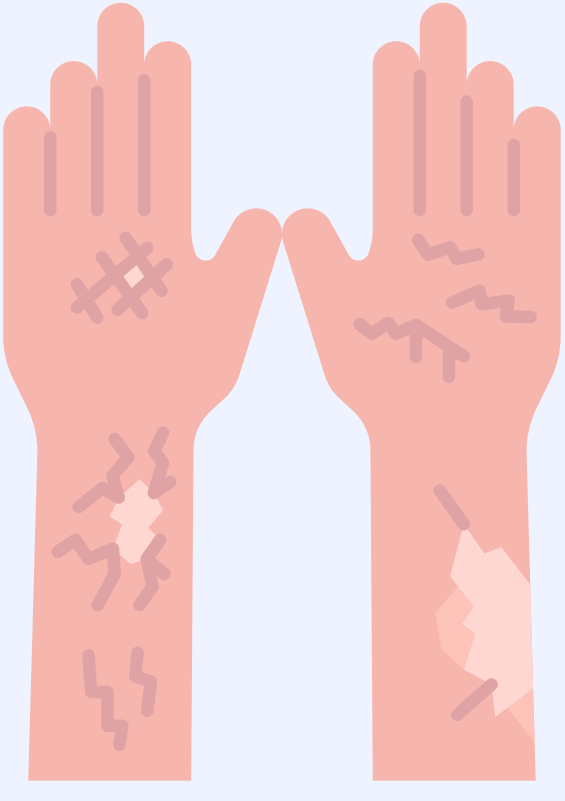
Blood Tests in Skin Cancer Diagnosis [2]

Purpose:

Blood tests are not typically used to diagnose skin cancer but can provide valuable information in certain scenarios

- **<u>Lactate Dehydrogenase (LDH) Levels:</u>**
  - elevated LDH levels may indicate that the cancer has spread, aiding in staging and prognosis

Blood tests can measure specific markers for metastatic skin cancer to help assess disease progression and response to treatment.



Skin Biopsy [4]

Incisional biopsy

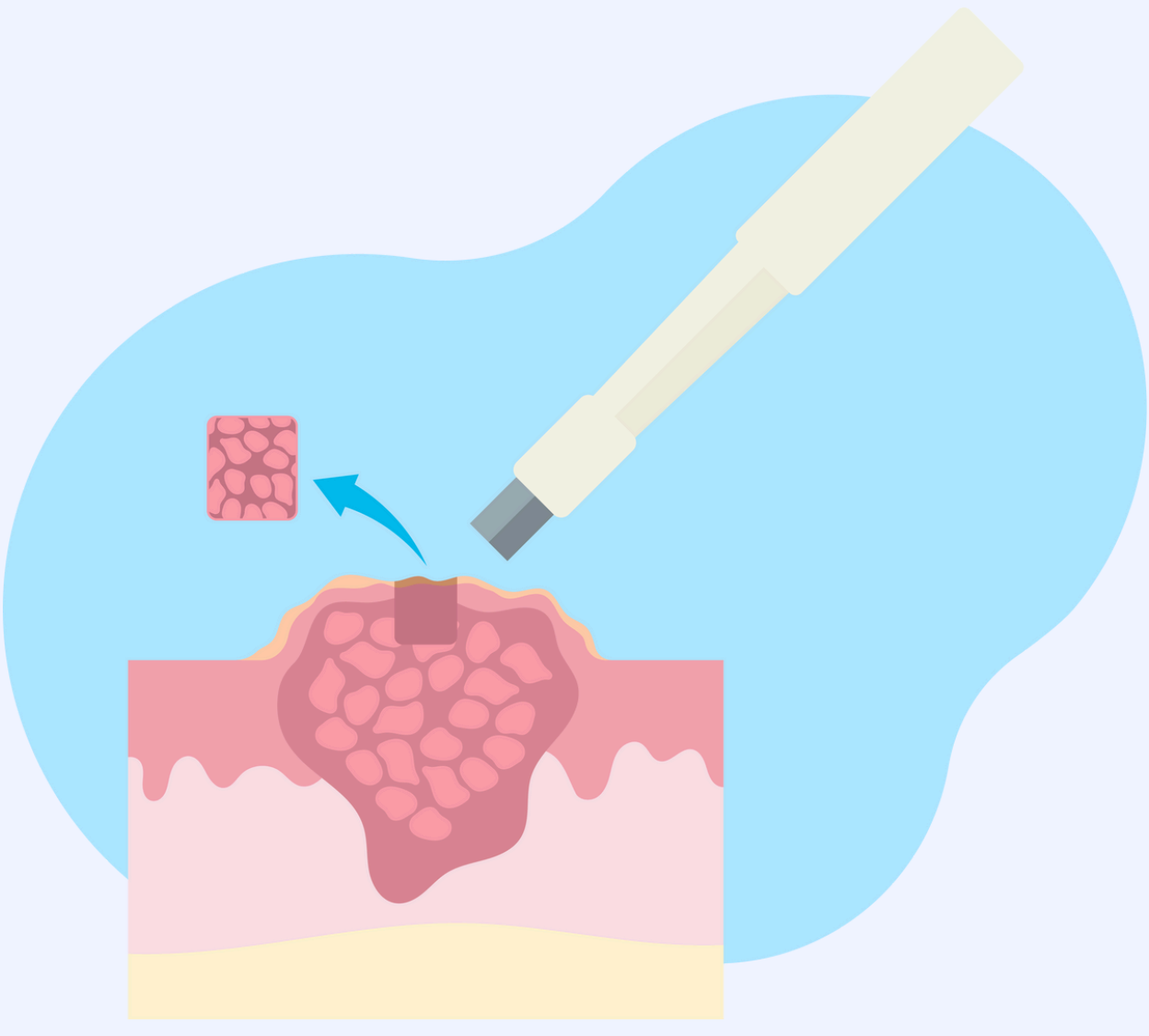
- a surgical knife to remove a small piece of the abnormal area. They remove the full thickness of the skin

Excisional biopsy

- *a surgical knife to remove the whole abnormal area. They also remove a border of healthy tissue from around it*

Punch biopsy

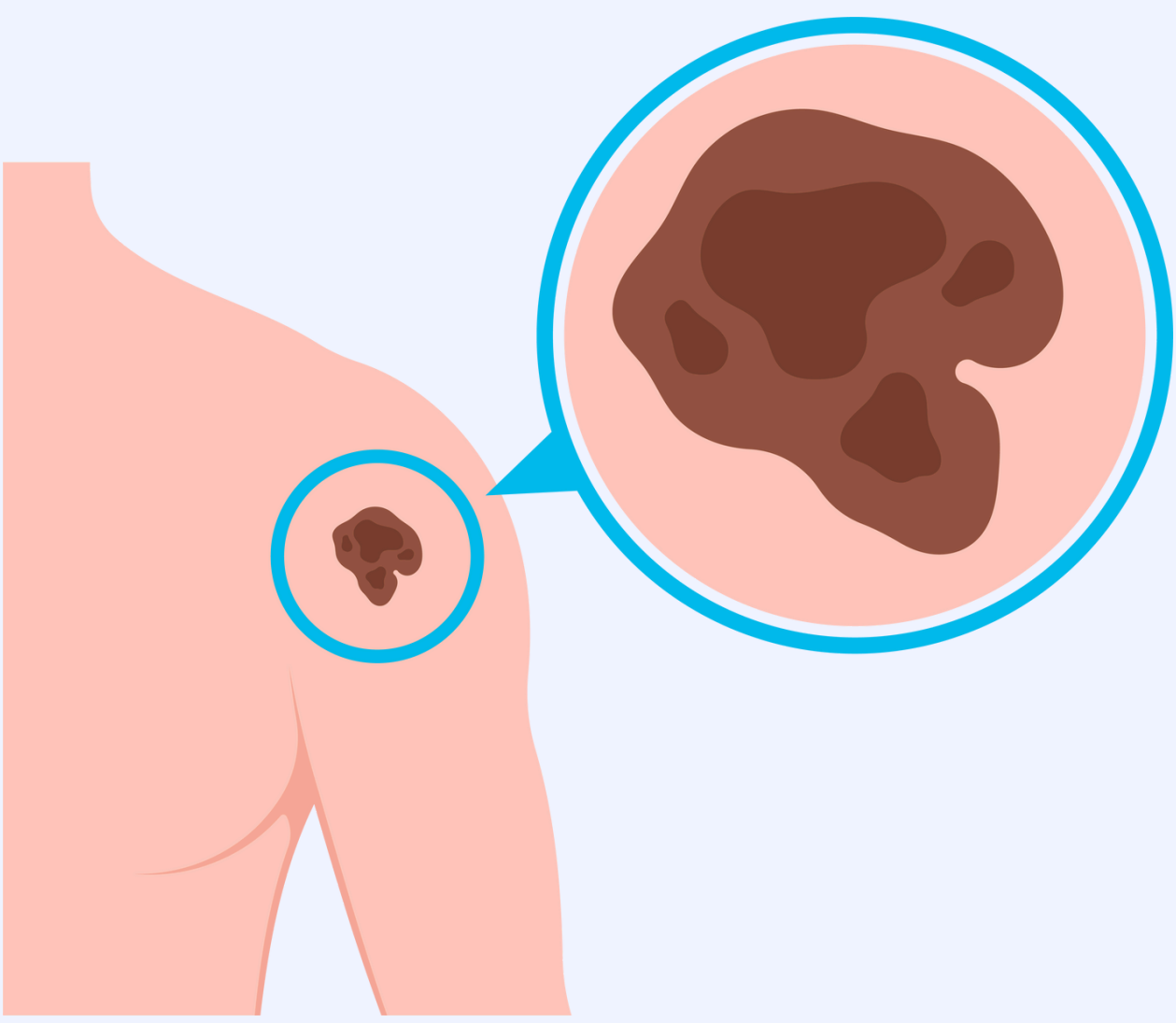
- *a special instrument to take a punch biopsy. They remove a small circle of the full thickness of the skin*



Skin Cancer Stages [3]

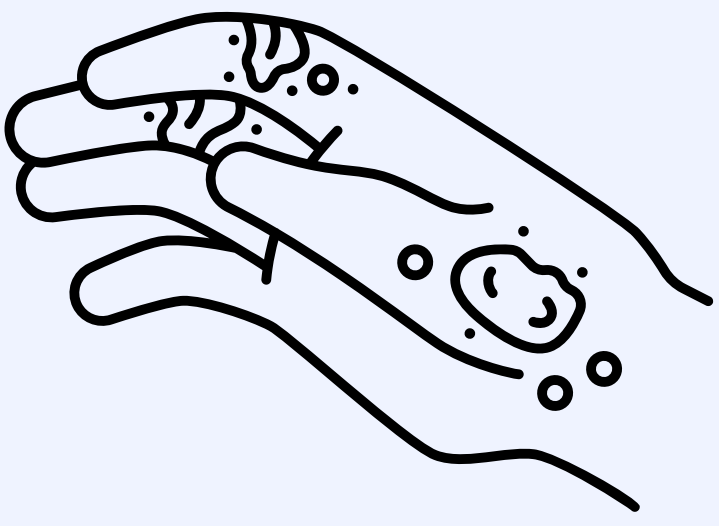
Melanoma Staging

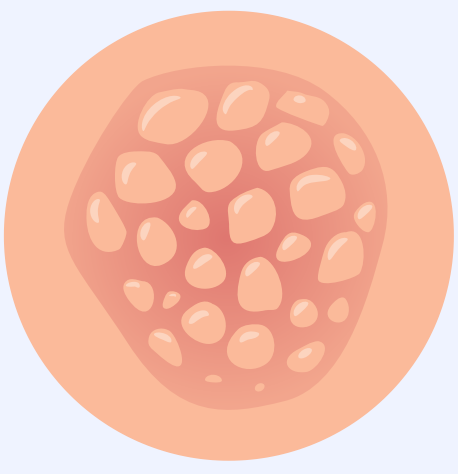
- **Stage 0 (melanoma in situ)**
  - melanoma only in the top layer of the skin
- **Stage 1**
  - Melanoma is low risk & no evidence of it spreading
- **Stage 2**
  - Indicates recurring features, but no evidence of spreading
- **Stage 3**
  - Melanoma spreads to lymph nodes or neighboring skin
- **Stage 4**
  - Melanoma spreads to distant lymph nodes and internal organs



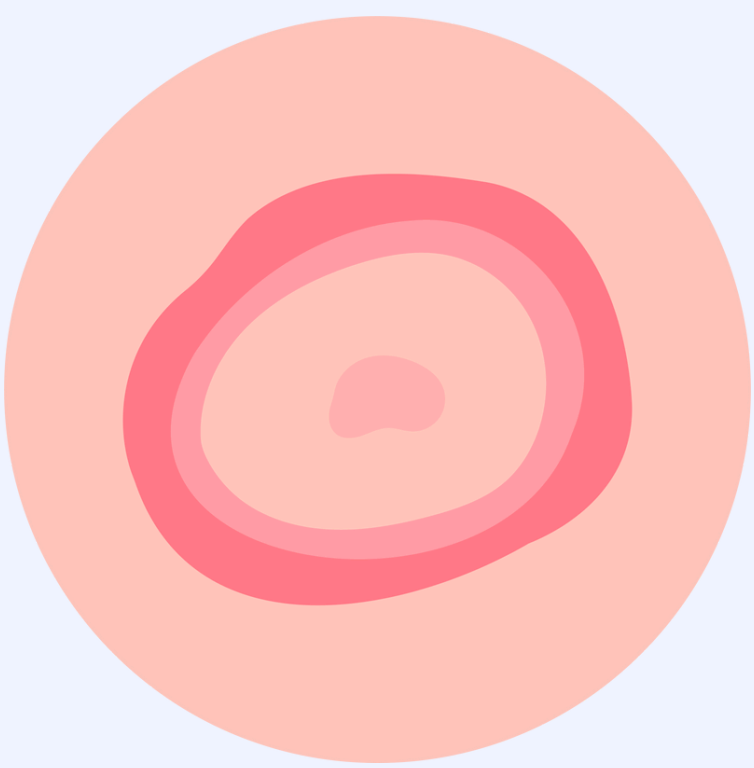
Skin Cancer Stages[3]

Non-Melanoma Staging





- ***Stage 0***
  - *Cancer only on the top layer*
- **Stage 1**
  - *Cancer on top & middle layers*
- ***Stage 2***
  - *Cancer on top & middle layers and moves to target deeper nerves & layers of skin*
- ***Stage 3***
  - *The cancer spreads beyond your skin and to lymph nodes*
- ***Stage 4***
  - *Cancer spread to other parts of the body and organs (liver, lungs, or brain)*



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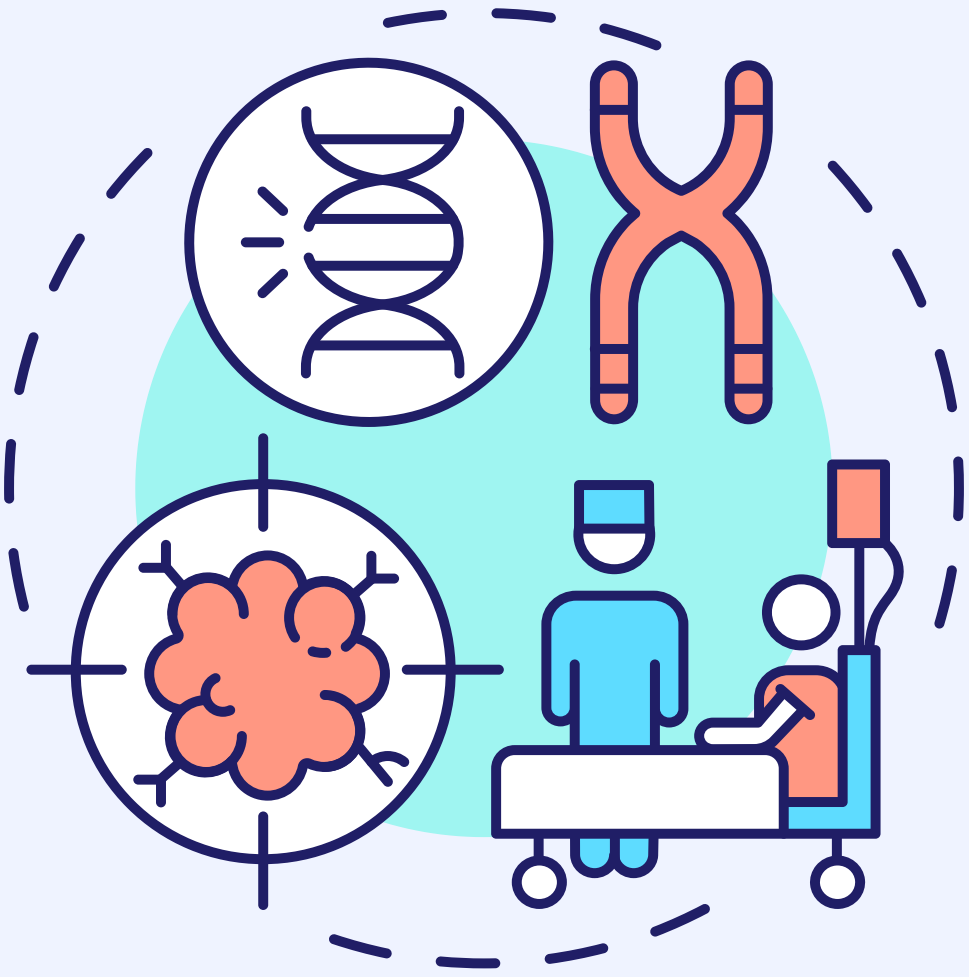
Treatment



Treatment Options Available

Treatment options for skin cancer and precancerous lesions depend on the size, type, depth, and location of the lesions.

For small, surface-level skin cancers, an initial biopsy that completely removes the growth may be the only treatment needed.

Therapies Available:

- Chemotherapy
- Radiation Therapy
- Mohs Surgery
- Photodynamic therapy
- Cryotherapy

How do these Therapies Work?

Chemotherapy

Chemotherapy involves using drugs to destroy cancer cells. Systemic chemotherapy is used to treat skin cancers that have spread to other areas of the body.

Radiation Therapy

Radiation therapy employs high-energy beams, such as X-rays, to destroy cancer cells. It may be used when surgery cannot fully remove the cancer.

Mohs Surgery

Mohs surgery involves the removal of skin growth layer by layer, with each layer examined under a microscope until no abnormal cells are detected. This minimizes the removal of healthy surrounding skin while effectively eliminating cancerous cells.

Photodynamic Therapy

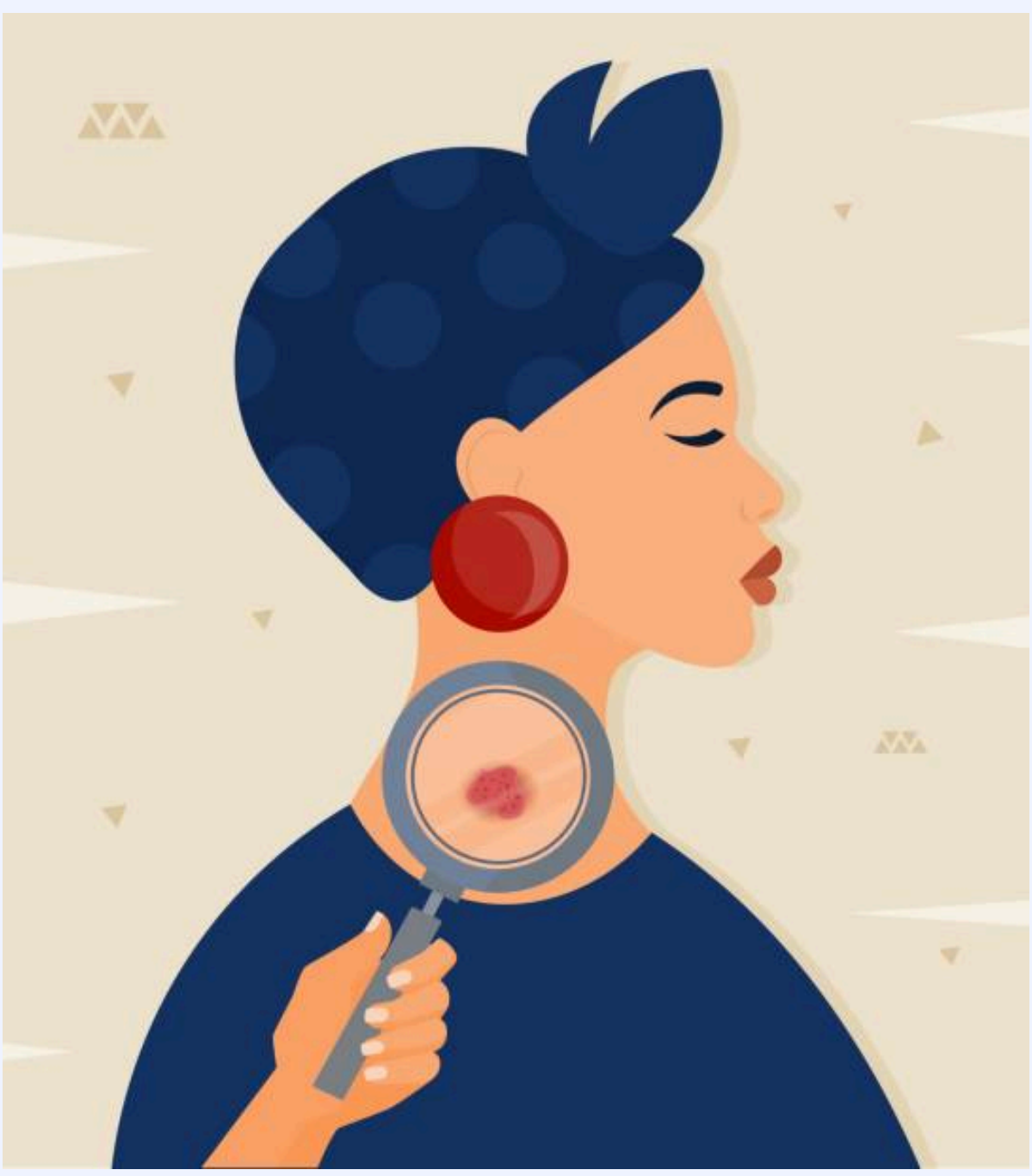
This treatment eliminates skin cancer cells using a combination of laser light and drugs that increase the cells' sensitivity to light.

Cryotherapy

Actinic keratoses and some small, early skin cancers may be treated with cryosurgery, where liquid nitrogen is used to freeze the abnormal tissue. The frozen tissue then thaws and naturally sloughs off.

Outlook / Prognosis

- Nearly all skin cancers can be successfully treated if caught early
- Regular follow-ups with a dermatologist are essential to monitor for recurrence.
- Melanoma accounts for most skin cancer-related deaths.
    - 99% if found before spreading to the lymph nodes.
    - 66% if it has spread to nearby lymph nodes.
    - 27% if it has spread to distant lymph nodes or other organs.



Concluding Statement

In conclusion, skin cancer is highly treatable when detected early, making awareness, prevention, and regular screenings critical. By protecting your skin, recognizing warning signs, and seeking prompt medical attention, you can significantly reduce the risks associated with skin cancer. Together, proactive care and early intervention can save lives.

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