

# Radiotherapy Side Effects

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# What is radiotherapy?

- Radiotherapy or X-Ray therapy – uses high energy ionizing radiation as a treatment
  - Diagnostic X-Rays are in the KV range ( $10^3$  volts) ~ 25-150KV
  - Radiotherapy uses X-Rays in the MV range ( $10^6$  volts) ~1-25 MV

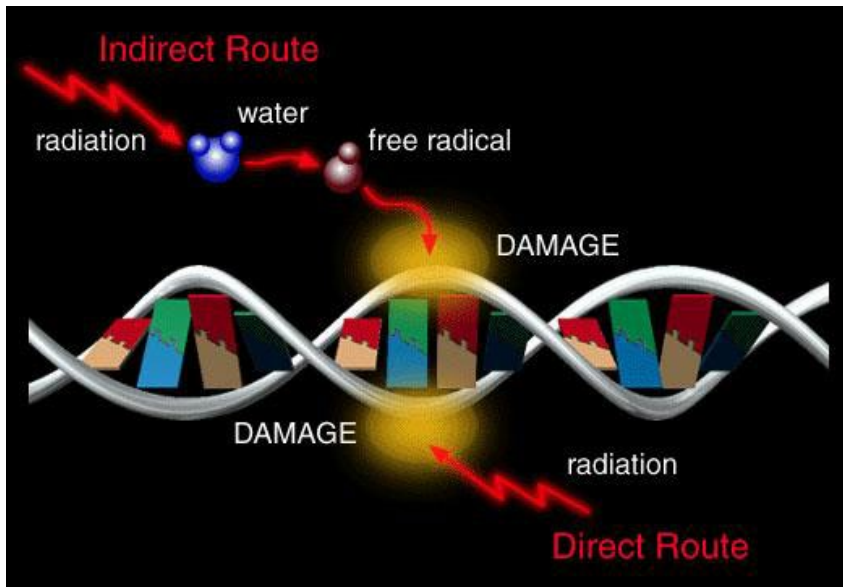


# Radiotherapy as part of the cancer solution

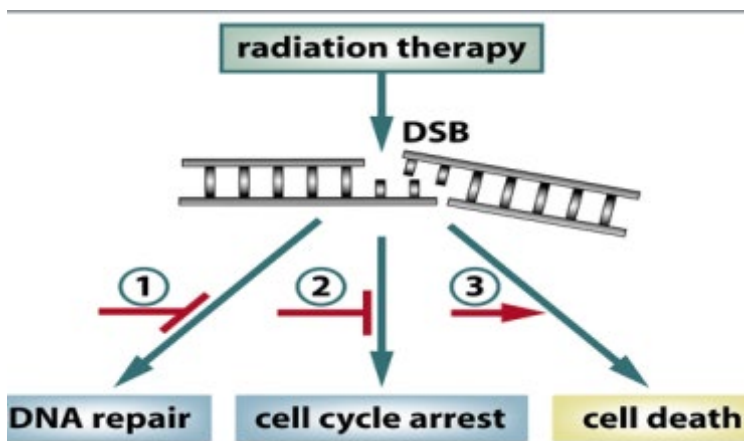
- Radiotherapy has been an effective tool for treating cancer for more than 100 years
- Approx 50% of patients with cancer would benefit from radiotherapy but utilisation rates were 38% in 2012
- Radiotherapy contributes significantly to cancer survival
  - **49% surgery**
  - **40% radiotherapy**
  - **11% systemic treatments**
- Radiotherapy has a major impact on local control
- Radiotherapy is highly effective for palliation of symptoms especially pain



# How does Radiotherapy Work?



- DNA is damaged
- Damage expressed when cells divide
- Tumour cells more radiosensitive
- Normal cells more efficient at repair
- Multiple treatments help with normal cell repair

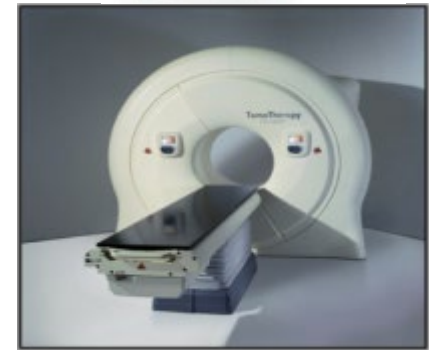


# Ways of delivering radiotherapy

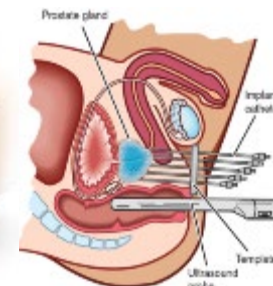
- Linear Accelerators (LINACS)



- Helical IMRT (eg Tomotherapy)



- Brachytherapy
  - Pulsed dose rate
  - High dose rate
  - Unsealed sources





# Radiation Does Work



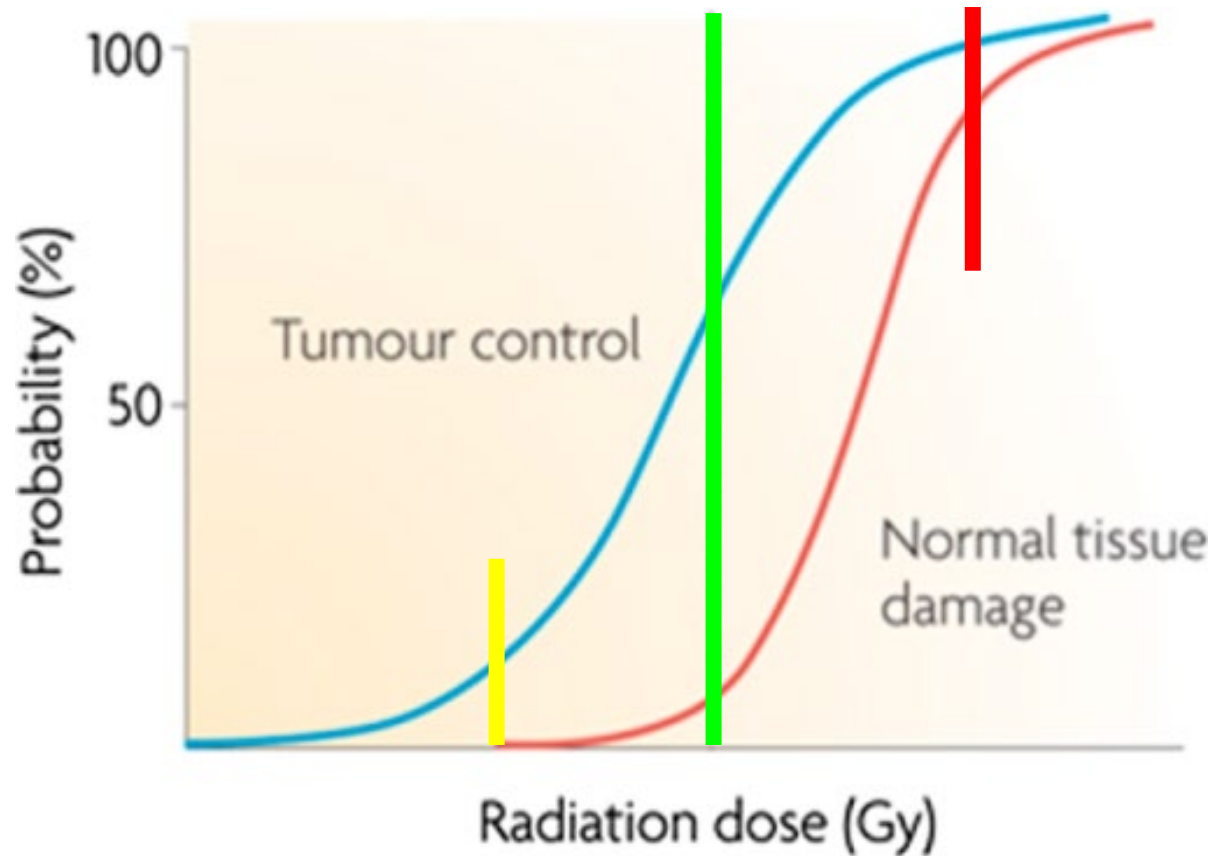
# Why doesn't radiation always work?

- Target is missed
- Tumour not sensitive to radiotherapy
- Unable to give sufficient dose
- Volume is too big



# Mechanism of Radiotherapy

- Benefit produced by depletion of cancer cells
- Toxicity caused by depletion of normal cells





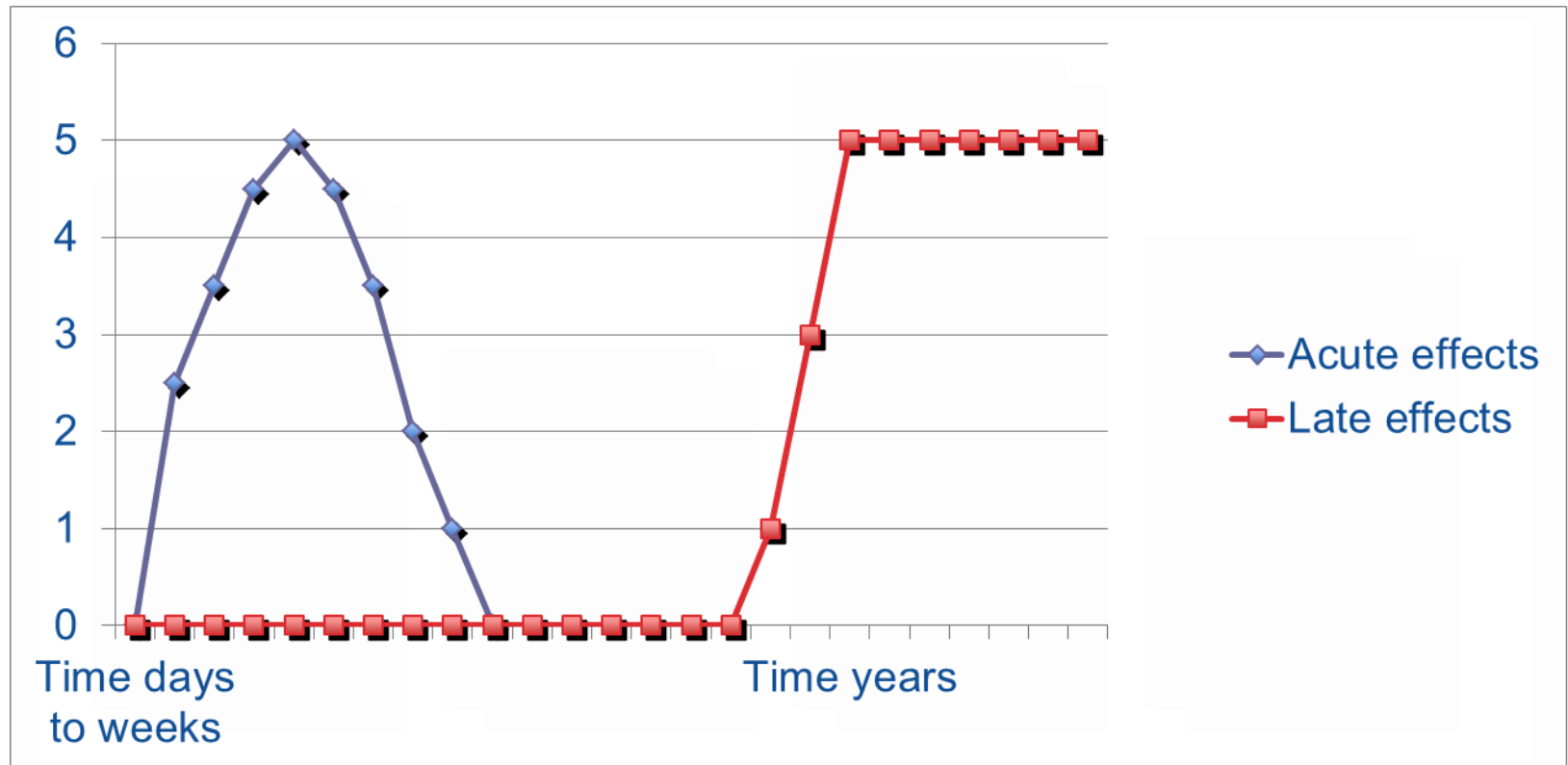
# Why are there side effects from radiotherapy?

- Due to the damage to the surrounding normal tissue
- Side effects depend on the region treated
- Balance between tumour control and causing a side effect
- Willing to accept some mild side effects but not severe side effects
- Vary from patient to patient
- Timing can be acute or late

Radiation causes **local** side effects **in** the treatment field



# Acute and Late Side Effects



**Acute - early – during or just after treatment**

**Late - >3 months to years**



# Side effects

## Acute

- Reversible
- Different intensity from person to person
- Location dependent
- Significant acute effects in rapid turnover tissue
  - Epidermis, GI epithelium, Haemopoietic system

## Late

- May not occur
- May be permanent
- Soft tissue effects due to slow scarring process/vascular effects
- Second malignancy
- Slow turnover tissue
  - Liver, Kidney, Lungs, Brain



# Side Effects

## Common Acute

- Tiredness and lethargy
- Skin irritation
- Nausea + Vomiting
- Hair loss in the radiation field
- Mucositis

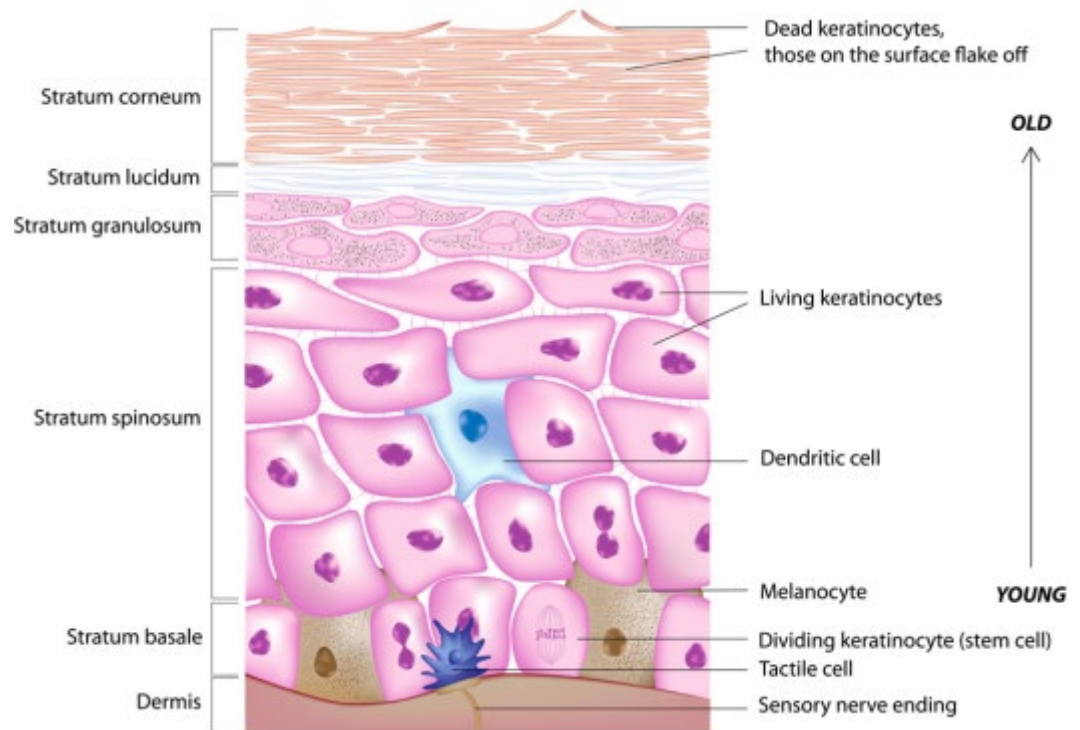
## Common Late

- Scarring/Fibrosis
- Hypoplasia
- Necrosis
- Vascular effects
- Second cancer (uncommon)



# Radiation Dermatitis

- Most common side effect – 95% patients
- Mitotic death of basal keratinocytes





# Managing Radiation Dermatitis

Grade

Appearance

Management

0



No change

Maintain skin integrity and moisture:  
 Water based moisturiser  
 Moisturising skin cleanser  
 Keep out of sun and avoid heat,  
 no sunscreen  
 Avoid skin irritants

1



Erythema  
 Dry desquamation

Moisturiser  
 Keep out of sun, no  
 sunscreen  
 Minimise trauma and friction



# Managing Radiation Dermatitis

Grade

Appearance

Management

3



Patches of moist desquamation

Hydrogels and dressings  
Keep out of sun

4



Confluent  
Moist desquamation

Hydrogels and dressings  
Keep out of sun



# Managing Radiation Dermatitis



# Skin



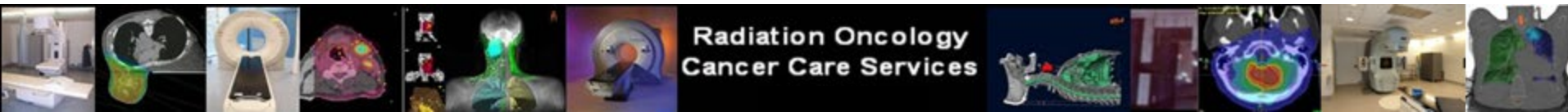
Pretreatment



During



After treatment





# Radiation Dermatitis Post Treatment



**Final day of treatment**  
Grade 4 – confluent moist desquamation



**1 week post**  
Grade 3 – patchy moist desquamation



**6 weeks post**  
Grade 1 – residual erythema



# Radiation Dermatitis Post Treatment



**2 days post**  
Grade 2 – areas of  
moist desquamation



**1 week post**  
Grade 1 – most areas  
re-epithelialised



**3 weeks post**  
Near complete  
recovery

# Breast Cancer Radiotherapy

## What to expect - Acute

- Depends on prior surgery and chemotherapy and areas treated with radiotherapy as well as radiotherapy techniques used. e.g. breast only, breast and nodal regions, breast boost
- Skin effects – erythema, dry/moist desquamation, skin pigmentation
  - Skin moisturiser throughout treatment to maintain skin integrity. Other options include Mepitel film, StrataXRT
  - If itchy and skin not compromised - steroid topically, cool compresses
  - If moist desquamation, dressings usually required during treatment including intrasite gel with adaptic/combine or Mepitel lite/other silicone dressing
  - After treatment then Zinc + castor oil/Sudocrem or flamazine
  - NOT normal burns and antibiotics not routinely needed unless obviously infected
- Breast oedema
- Arm lymphoedema
- Pain
- Lethargy



# Breast skin reactions





# Problems with Mepitel Film



# Intermediate side effects

- Radiation pneumonitis
  - Rare
  - Symptoms include cough, mild fever, SOB + lethargy
  - Chest X-ray and CT scan chest - straight line effect where the consolidation doesn't follow anatomical subunits but rather conforms to the edge of the radiation beam
  - Treat only if function reduced more than 10% and symptomatic - steroids (prednisone 60 mg /day) for 2 weeks then slow taper





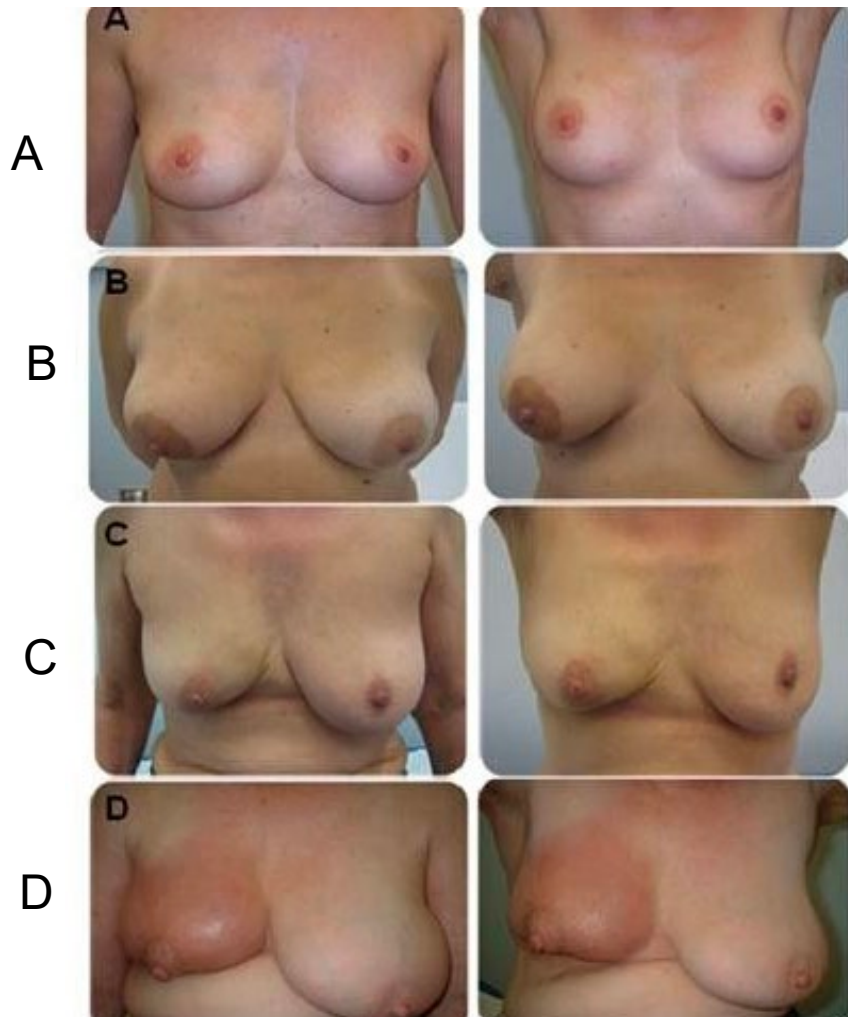
# Breast Cancer Radiotherapy

## What to expect - Late

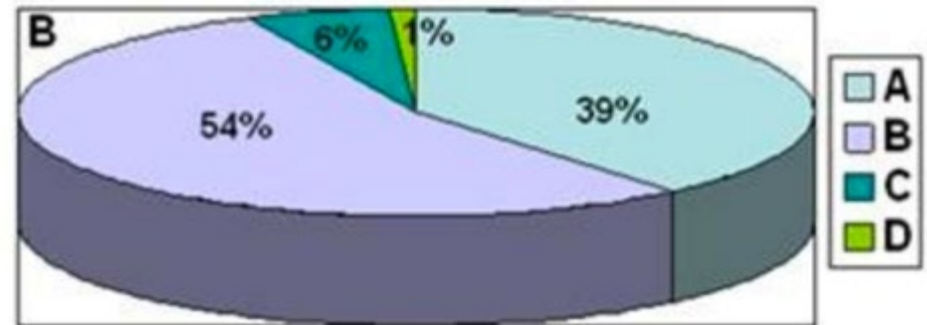
- Lymphoedema - physiotherapy and compression garment, massage, exercise
- Cosmetic changes - counsel
- Rib fracture risk, chronic costochondritis
- Reduced range of motion of arm due to soft tissue scarring - educate
- Second malignancy – awareness and avoid increased cancer risk behaviour



# Radiotherapy Cosmesis



- A. Excellent
- B. Good
- C. Fair
- D. Poor



Ciammella, P et al (2014) Toxicity and cosmetic outcome of hypofractionated whole-breast radiotherapy: predictive clinical and dosimetric factor. Radiation Oncology 2014



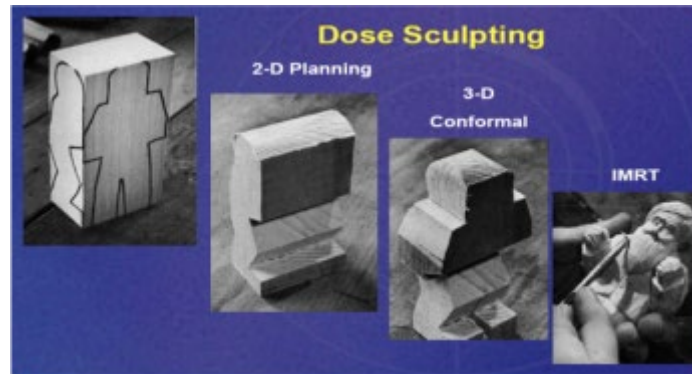
# Severity of side effects

- Patient factors
  - Sensitivity to radiotherapy syndromes
  - Co-morbidities eg smoking, prior sun exposure
- Tumour factors
  - Location and proximity to critical structures, tumour size
- Treatment factors
  - Concurrent treatments
  - Technique



# How do we improve side-effects

- Conforming treatment
- Avoiding normal tissues
- Image guidance and better targeting/better imaging
- Motion management
- Tomotherapy
- DIBH
- IMRT, IGRT, stereotactic
- Personalised brachytherapy moulds



Resulting in

- Hitting the target more accurately
- Allows treatment volume to be reduced
- Reduce high dose to surrounding tissues



## Royal Brisbane and Women's Hospital

Radiation Therapy  
Cancer Care Services

Level 3

Joyce Tweddell Building

### Treatment Appointment Card

Reception ph: 3646 8517

Nurses ph: 3646 8471

Patient Sticker Here

Radiation Oncologist: \_\_\_\_\_

Machine : LA \_\_\_\_\_

No. of Treatments: \_\_\_\_\_

Estimated Finishing Date: \_\_\_\_\_

**Available for  
advice from  
0700 to 2130,  
Mon to Fri**

**Contact the  
treating  
Radiation  
Oncologist**



Radiation Oncology  
Cancer Care Services



- About Radiation Oncology
- What is Radiation Oncology?
- What is Radiation Therapy?
- Benefits and Effectiveness
- Side Effects
- Treatment Process
- Radiation Oncology Team
  - Radiation Oncologists
  - Radiation Therapists
  - Radiation Oncology Medical Physicists
  - Radiation Oncology Nurses
  - GPs/Health Professionals

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## Side Effects

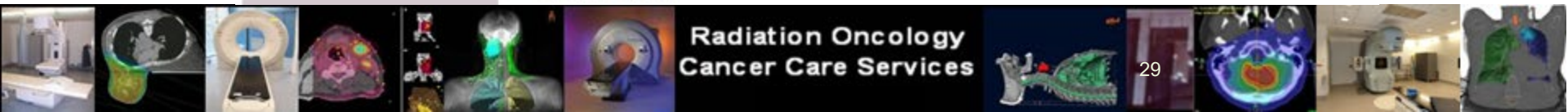
The side effects of radiation therapy (also called radiotherapy) vary depending on the type of cancer being treated, the area being treated, and the length and purpose of treatment. Side effects can also vary from patient to patient, even for those undergoing the same type of treatment. While some patients report no side effects at all, most people having radiation therapy will have some mild side effects during and/or just after treatment.

Many patients experience fatigue which builds up throughout the treatment period, especially if the treatment course takes several weeks. Depending on the site treated, other common side effects include skin redness and soreness, bowel upset, bladder symptoms, nausea, and sore mouth or throat. There are medications, creams and other measures to help with many of these common side effects.

It is rare that radiation therapy treatment would need to be stopped or someone is admitted to hospital as a result of side effects. Organs and body parts outside the treated area will not be affected by radiation therapy. For example, the skin will not get red and sore if it is away from the area where the radiation is being targeted. Hair will only thin or fall out if the hair is in the area being treated. This means that only patients with cancer in the brain, skull or scalp will experience hair loss on their head.

The majority of side effects disappear completely within a few weeks of finishing radiation therapy. A small number of patients experience more serious and/or long-term side effects.

The treating doctor will discuss these side effects in detail with each person who might be recommended to have radiation therapy. Radiation therapy would only be prescribed if it is agreed that the overall benefits of the treatment outweigh the risk of more serious side effects. As side effects largely depend on the location of the tumour in the body (either the original cancer and/or where the cancer has spread to), it is difficult to generalise about side effects.



Questions?  
(They will have to wait for the  
next session)

