Radiotherapy Side Effects

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RADIATION ONCOLOGY
TARGETING CANCER

Queensland Government

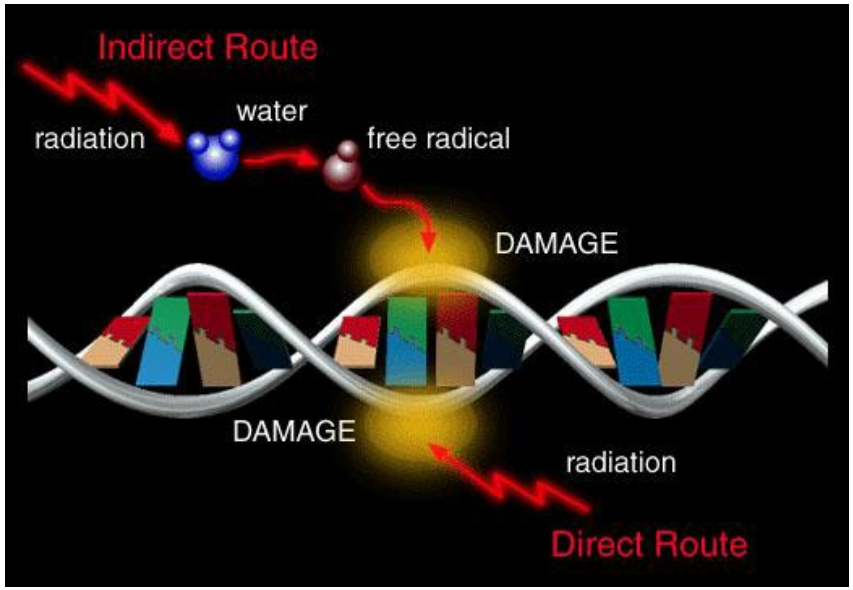
What is radiotherapy?

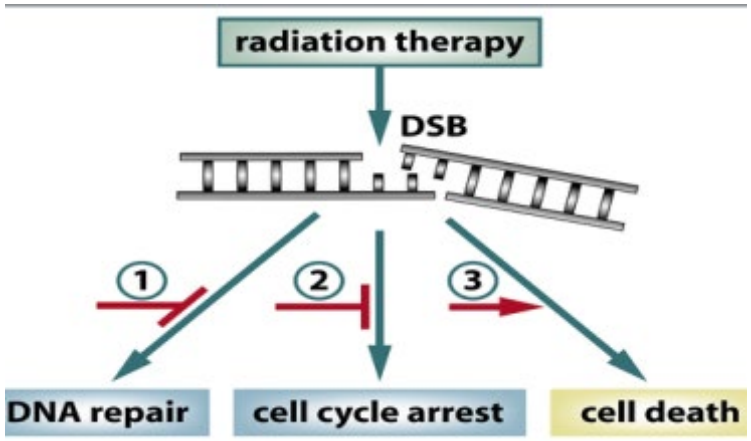
- Radiotherapy or X-Ray therapy – uses high energy ionizing radiation as a treatment
  - Diagnostic X-Rays are in the KV range (10^3 volts) ~ 25-150KV
  - Radiotherapy uses X-Rays in the MV range (10^6 volts) ~1-25 MV

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?



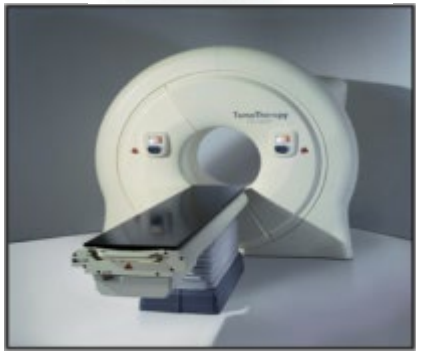


- DNA is damaged
- Damage expressed when cells divide
- Tumour cells more radiosensitive
- Normal cells more efficient at repair
- Multiple treatments help with normal cell repair

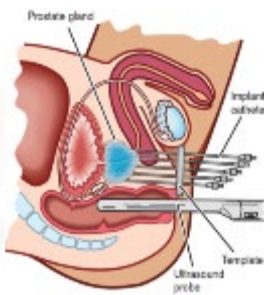
Ways of delivering radiotherapy

- Linear Accelerators (LINACS)

- Helical IMRT (eg Tomotherapy)



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



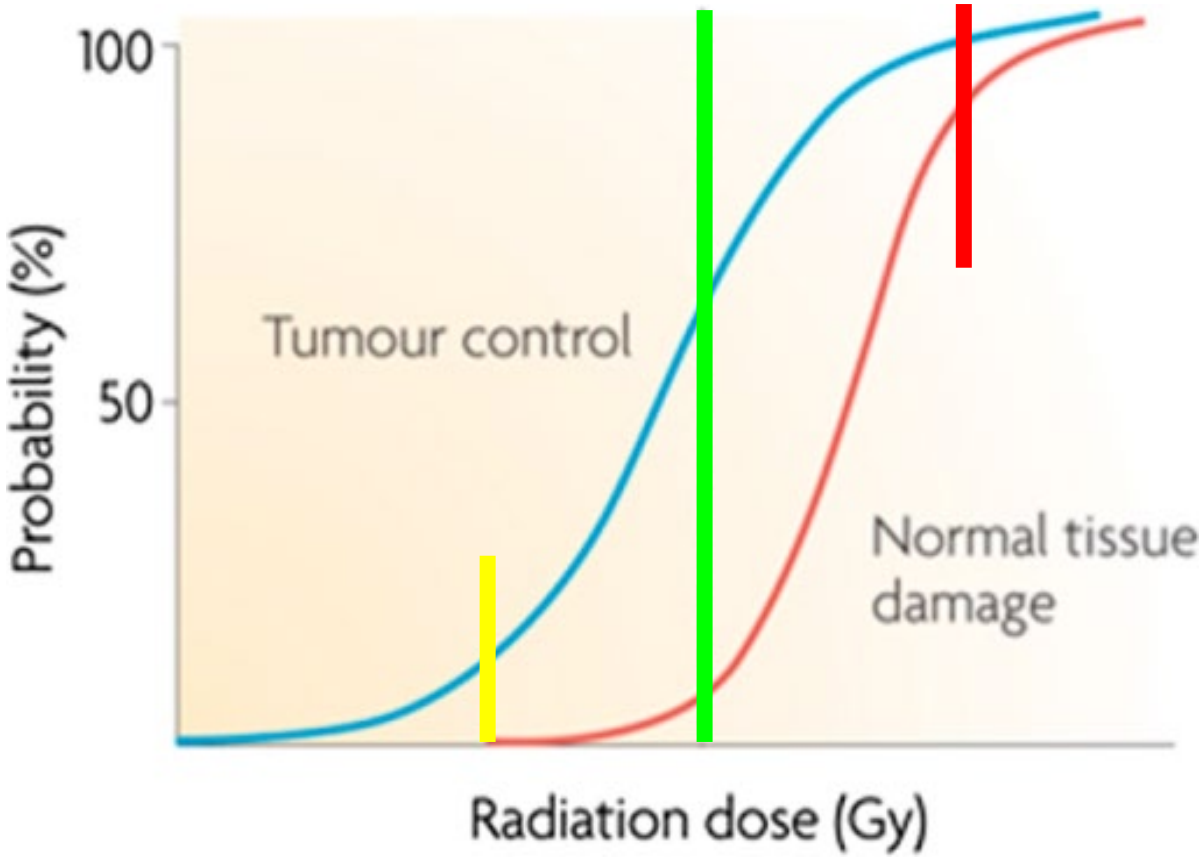
Radiation Does Work

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

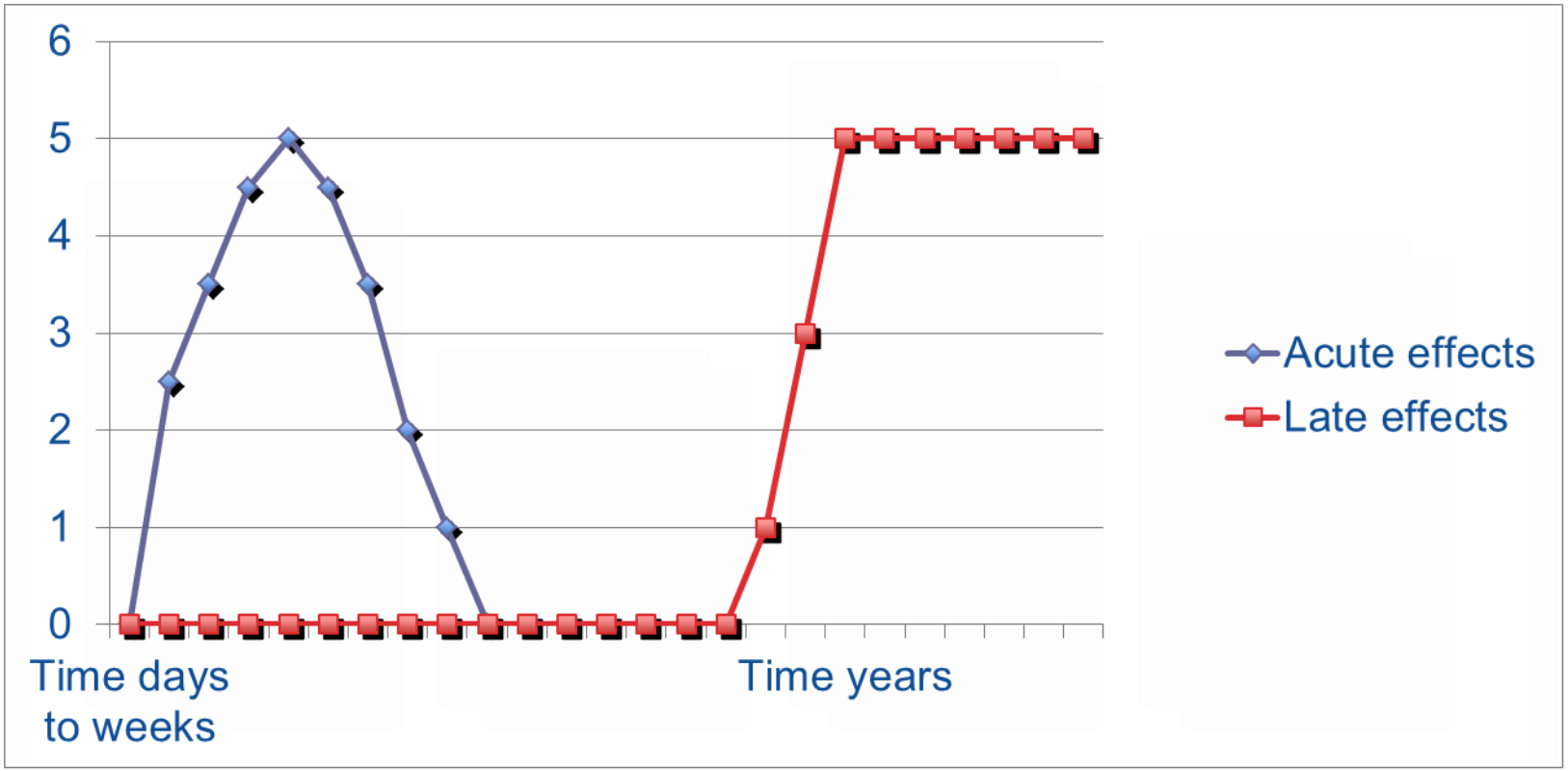


Why are there side effects from radiotherapy?

- 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

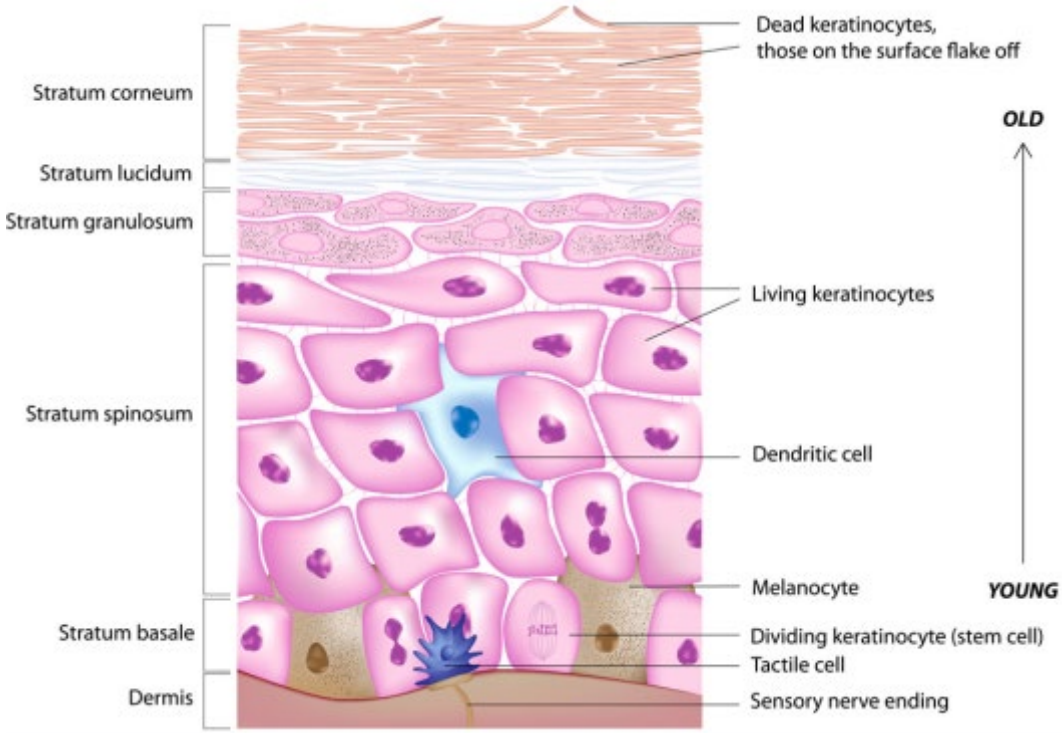
- Tiredness and lethargy
- Skin irritation
- Nausea + Vomiting
- Hair loss in the radiation field
- Mucositis

Common Late

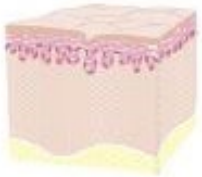
- Scarring/Fibrosis
- Hypoplasia
- Necrosis
- Vascular effects
- Second cancer (uncommon)

Radiation Dermatitis

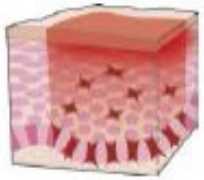
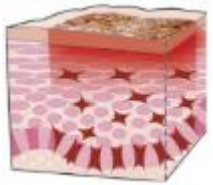
- Most common side effect – 95% patients
- Mitotic death of basal keratinocytes



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

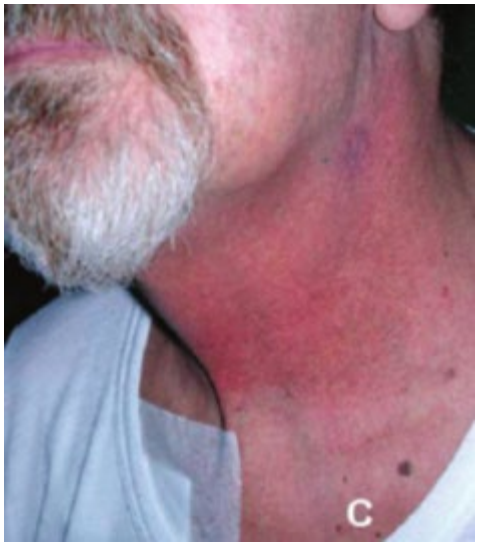
After treatment

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

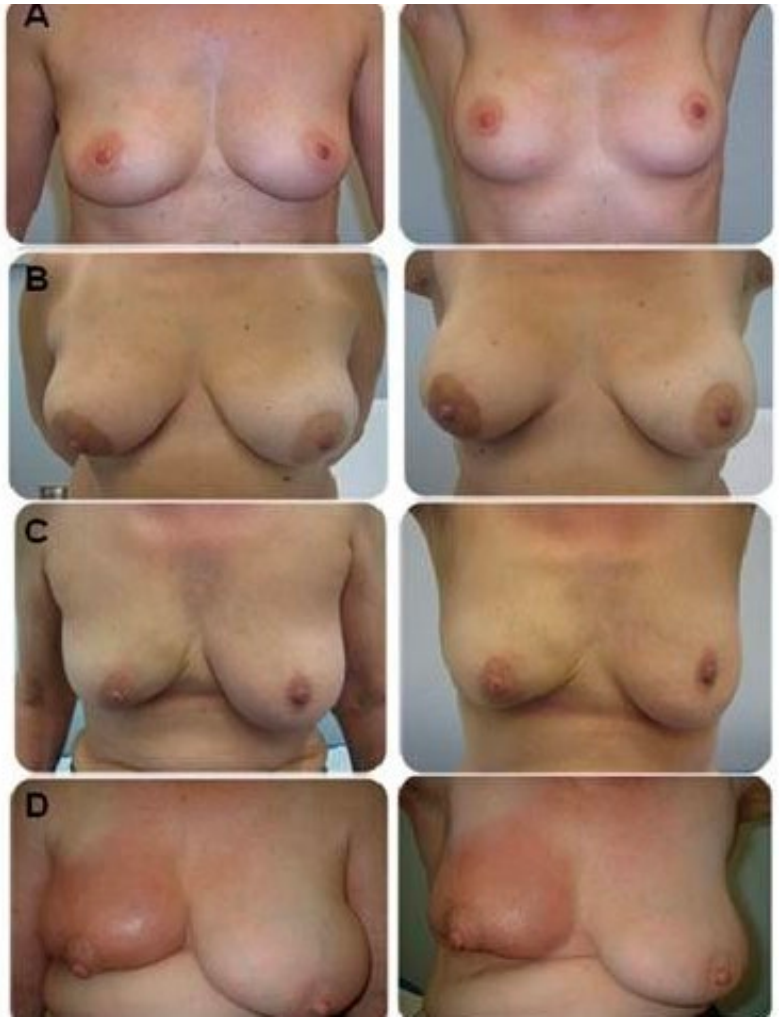
Intermediate side effects

- 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

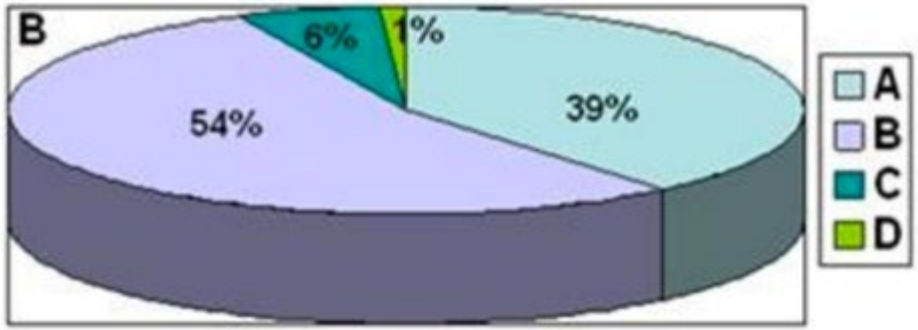


A. Excellent

B. Good

C. Fair

D. Poor



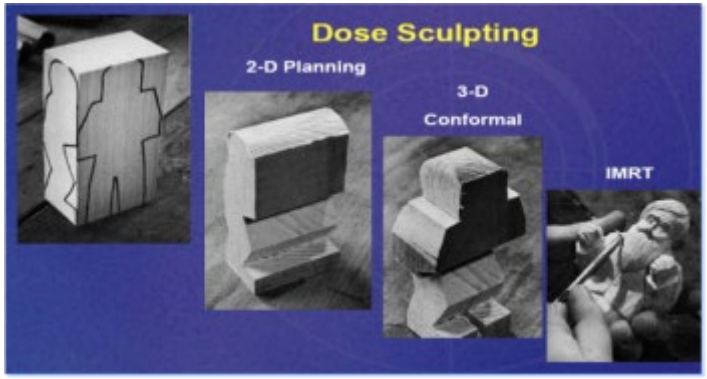
Ciammella, P et al (2014) Toxicity and cosmetic outcome of hypofractionated whole-breast radiotherapy: predictive clinical and dosimetric factor. Radiation Oncology 2014

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 _____

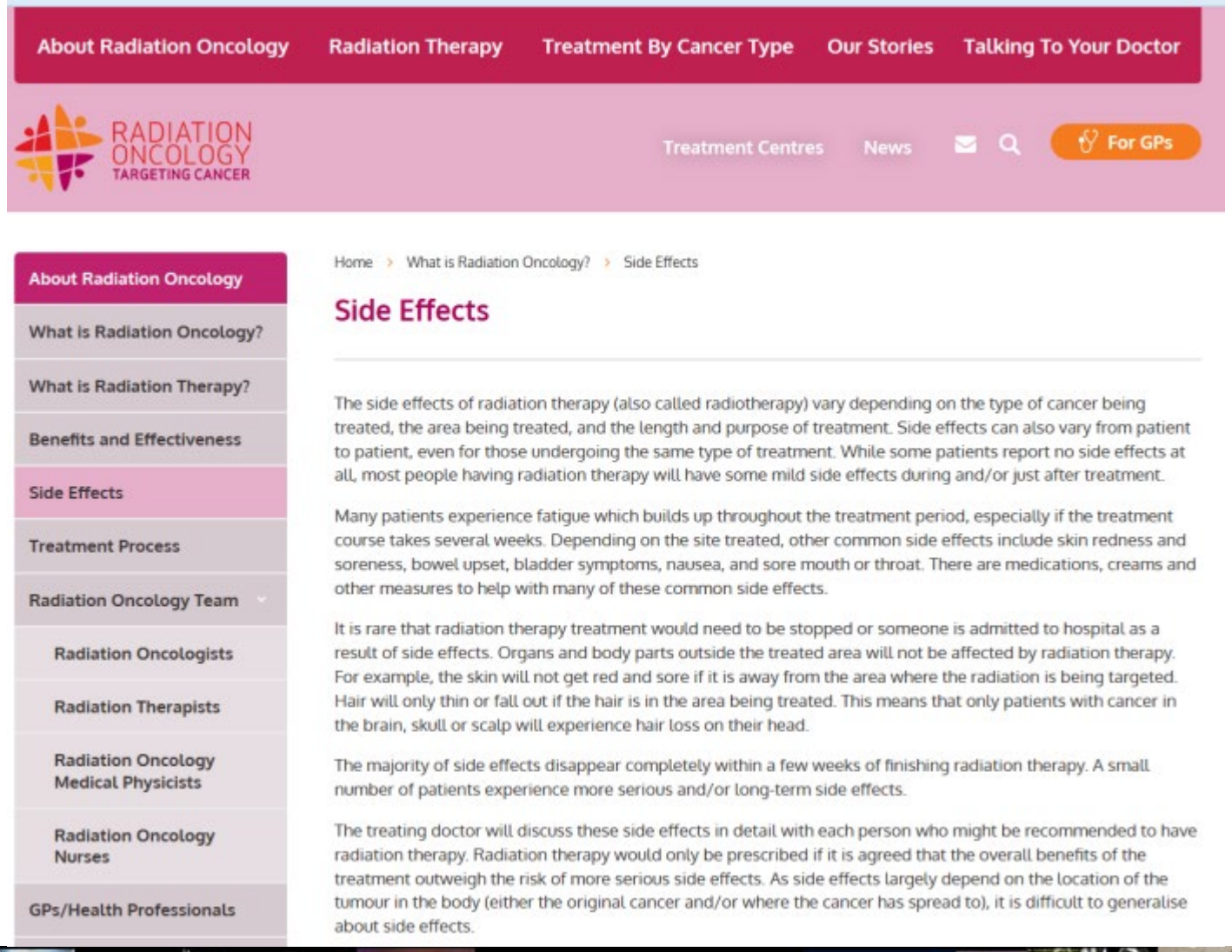
No. of Treatments: _____

Estimated Finishing Date: _____

Available for advice from 0700 to 2130, Mon to Fri

Contact the treating Radiation Oncologist

https://www.targetingcancer.com.au/about-radiation-oncology/side-effects/



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