# Commonly Prescribed Medications in Radiation Oncology

12th Edition


*More breakthroughs. More victories.®*

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*Commonly Prescribed Medications in Radiation Oncology* (12th edition) has been prepared/updated to assist radiation oncology staff in the approach to, and prescribing information for common pharmaceuticals in managing radiation oncology side effects. As always, it is intended as an aid to decision making, and is not an exhaustive compilation of all available approaches and medications (or associated side effects of these medications), or as the final authority for managing all potential side effects. No pharmaceutical company or distributor is involved in the production of this document.

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The contents are primarily an organized compilation of the editor's personal prescribing notes and practices. No warranty, expressed or implied, is made as to accuracy. Although every attempt has been made, in both writing and editing, to ensure accuracy, the reader is urged to carefully review information

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# SKIN

**Pearl:** Versus earlier recommendations: Patients can use deodorant (to intact skin) during treatment, and can safely apply topicals creams to the treatment prior to daily radiotherapy.

## Lesion Descriptions

**Macule** – well-circumscribed lesion, not elevated

**Papule** – solid elevated lesion, < 5mm

**Plaque** – elevated circumscribed lesion, covers a larger area

**Nodule** – solid elevated lesion, > 5mm

**Pustule** – superficial cavity filled with purulent exudate

**Vesicle** - superficial cavity filled with usually clear fluid

**Desquamation** (**scaling**) - epidermal cells replaced every 27 days, scales are flakes of stratum corneum. Initially dry, may progress to moist as dermis is exposed.

**Ulcer** - skin defect with loss of epidermis and upper papillary layer, heals with scarring. An erosion is a defect of the dermis only, heals without scarring

## Radiation Dermatitis – Prevention

There are several approaches that have shown efficacy in reducing radiation dermatitis. One is the daily application of a low to medium potency corticosteroid, such as **mometasone** or **triamcinolone** (medium potency) or **hydrocortisone 2.5%** (low potency). Another is bacterial decolonization, with daily breast cleansing using **chlorhexidine gluconate,** with twice daily application of **mupirocin ointment**. For intact breast, consider application to axilla, inframammary, and (if treated) supraclavicular regions alone, as they are often the only sites involved). Post mastectomy, apply to the entire chest.

**Chlorhexidine gluconate 4%** (generic) – wash area qd

**Hydrocortisone 2.5%** (generic) – apply bid

**Mometasone 0.1%** (generic) - apply qd

**Mupirocin Ointment 2%** - apply bid

**Triamcinolone Topical Cream 0.1%** - apply qd

## Early Radiation Dermatitis & Focal Pruritus

Early radiation dermatitis manifests as pruritus, erythema, and/or scaly, flaky dry desquamation. ***Aquaphor***, **Calendula**, ***Calmoseptine***, ***RadiaPlexRX Gel, Miaderm, StrataXRT*** are options for early radiation dermatitis (as well as Radiation Dermatitis Prevention medications).

As symptoms progress, ***Domeboro*** compresses usually provides relief to intact skin and appear to delay further skin reaction; when dry, add a cream/ointment to preserve moisture. Eventually **Aspercreme with Lidocaine,** topical **lidocaine**, ***EMLA*** may be needed.

Miliaria rubra (inflammation of sweat glands) may develop early or late, and is a pruritic, erythematous punctate rash, that can extend outside the treatment field; use **hydrocortisone 1%** initially; advance prn to medium potency steroids (e.g. **mometasone** or **triamcinolone**).

***Aquaphor - Healing Ointment*** (OTC) -apply tid

***Asprecreme with Lidocaine*** (OTC) – apply tid

***Calmoseptine*** (OTC) – apply prn

**Calendula Cream** (OTC) – apply prn

***Dermoplast*** (OTC topical anesthetic) -apply to affected area tid
-spray 2 oz and 2.75 oz -lotion 3 oz
- available in original and antibacterial formulae

***Domeboro*** compresses (OTC) -dissolve 1 tablet or packet in 1 pint water, apply moist (not wet) soak 20 min tid -qid
-packets or tablets of 12 and 100

***EMLA*** Cream (lidocaine 2.5%, prilocaine 2.5%) – apply prn

**Hydrocortisone 1%** (OTC -e.g. ***Cortaid, Cortizone -10***)
-apply qid prn

**Lidocaine** -apply to affected area prn for topical anesthesia
-2.5% ointment (OTC) -1.25oz tubes
***-L.M.X.4 & L.M.X.5*** (OTC 4% & 5% **lidocaine** cream)

***Miaderm*** (OTC) – apply tid at initiation of XRT; or for symptoms
- ***Miaderm L*** – also contains 4% Lidocaine

**Mometasone 0.1%** (generic) - apply qd

***RadiaPlex Rx Gel*** (with **Hyaluronic Acid**) -apply tid

***Sarna Sensitive*** (OTC, 1% hydrocortisone; 1% pramoxine (a topical anaesthetic) )– apply tid

***StrataXRT*** – apply tid
- note: a new, prescription medication, expensive but effective

**Triamcinolone 0.1%** - apply tid

## Dry and Moist Desquamation

Areas preparing to desquamate develop a dusky erythematous appearance - begin a prevention protocol. If already on a prevention protocol, for pending desquamation, ***Regenecare HA*** (gel or spray) or ***Aspercreme with Lidocaine*** (OTC) are good initial options.

For moist desquamation, begin ***Silvadene*** or **Silver Nylon Dressings**. If symptoms persist, ***Domeboro*** compresses provide relief to skin and appears to delay further reaction. Cover the wound with ***Telfa*** as needed.

If deep moist desquamation develops with greater than 1000 cGy XRT remaining, continue as above, with radiation held until new skin islets appear (about 7 – 10 days). If malodorous or discolored exudate, while on ***Silvadene*** or **Silver Nylon Dressings** (if allergic to sulfa drugs), consider **mupirocin** initially, advance to systemic antibiotic as needed.

**Hydrogel Wound Dressings** are best for persistent dry desquamation; for moist desquamation coverage, consider **Hydrocolloids** dressings.

***Aspercreme with Lidocaine*** (OTC) – apply tid

***Bactroban*** (**mupirocin**) apply 3 times daily

***Domeboro*** soaks (OTC) -dissolve 1 tablet or packet in 1 pint water
-apply moist (not wet) soak 20 min tid -qid
-packets or tablets of 12 and 100

**Hydrocolloids (e.g. *Dyoderm, Tegasorb, Comfeel*)**
-apply prn

**Hydrogel Wound Dressings** (e.g. ***Vigilon, Geliperm, Cool Magic***)
-apply prn
-note: Hydrogel dressings can be cooled in the refrigerator

***Regenecare*** (**hydrogel** with 2% **lidocaine**) – bid to tid
-***Regenecare Wound Gel*** – 3 oz
-***Regenecare HA*** (my preference) – 3 oz
-***Regenecare HA*** Spray – 4 0z

***Silvadene*** cream 1% -apply to affected area tid

**Silver Nylon Dressings** (OTC) - apply for up to 1 week

***Telfa*** (OTC non-stick adhesive pads) -cover wound prn

## Ulceration -Slow Healing

To promote healing, the wound should be free of infection and bacteria, free of debris, and moist. For debridement, consider **normal saline** or ***MPM Wound and Skin Cleanser;*** then apply **Aquaphor** or ***Regenecare HA***; ***Silvadene*** or ***SilverMed*** can be applied as an overcoat to prevent infection. Vascularization is important – consider ***Xenaderm***, a capillary bed stimulant, or ***Trental*** with ***Vitamin E.*** To maintain a moist environment, consider covering with a **Hydrocolloid**, or if dry, a **Hydrogel**.

For more aggressive therapy, consider a physical therapy or home health consult. Vacuum assisted wound closure systems (VACS) can provide rapid wound healing of smaller sites. Eventually, it may be necessary to refer for hyperbaric oxygen or surgical intervention.

***Domeboro*** soaks (OTC) - dissolve 1 tab or packet in 1 pint water,
-apply moist (not wet) soak 20 min qid

**Hydrocolloids (e.g. *Dyoderm, Tegasorb, Comfeel*)**
-apply prn

**Hydrogel Wound Dressings** (e.g. ***Vigilon, Geliperm, Cool Magic***)
-apply prn

***MPM Wound and Skin Cleanser*** (OTC) – spray, allow time to soften, adjust nozzle to 'STREAM' to loosen debris

**Pentoxifylline** (***Trental***, generic) - 400 mg po tid

***Regenecare*** (hydrogel with 2% **lidocaine**) – bid to tid
-***Regenecare Wound Gel*** – 3 oz
-***Regenecare HA*** (my preference) – 3 oz
-***Regenecare HA*** Spray – 4 0z

***Silvadene*** cream 1% -apply to affected area tid

***Silver Med Nylon Dressing*** - apply tid to bid

**Vitamin E** (OTC) – 1000 IU po qd

***Xenaderm*** (Balsau Peru, Trypsin & Castor Oil) - apply bid -tid

## Antibiotics/Wound Infection Treatment

***Polysporin, Bactroban,*** or ***Bacitracin*** is effective for superficial open wound infections (caution regarding ***Neosporin***, as approximately 10% of patients are allergic to **neomycin**). ***Silvadene*** or ***Silvermed*** are used for mild wound sepsis.

***Keflex, Bactrim*** and ***Augmentin*** are effective for subcutaneous infection/involvement as systemic treatment, if considerable erythema and warmth, use ***Levaquin, Cipro*** or a ***Z-pak***. For skin infections/cellulitis in diabetic patients or for groin and perineum infections, add ***Cleocin***. If pseudomonas is suspected (foul-smelling, greenish exudate), ***Cipro*** or ***Levaquin*** are systemic choices.

***Acetic acid*** 0.05% (OTC) -apply qd or qod to open wound
-for superficial pseudomonas infection
avoid 0.1% acetic acid as it delays granulation tissue

**Amoxicillin/clavulanate** (***Augmentin***, generic) -500 mg tid,
875 mg bid

**Azithromycin** (***Z-Pak***) -as directed

**Bacitracin** (OTC) -apply bid -tid

***Bactrim DS*** (**trimethropin/sulfamethoxazole,** generic) – 1 po bid
-800mg/160mg tablets

***Bactroban*** (**mupirocin**) -apply to affected area tid

**Cephalexin** (***Keflex***, generic) -250 mg -500 mg po q 6 hr
-suspension 125 mg & 250 mg/5 ml

**Ciprofloxacin** (***Cipro***, **Cipro XR**, generic) -250 -750 mg po bid
-XR 500 mg -1000 mg po qd
-IR tablets 250 mg, 500 mg & 750 mg
-XR tablets 500 mg & 1000 mg

**Clindamycin** (***Cleocin***, generic) -150 -450 mg po q 6 hrs
-capsules 75 mg, 150 mg & 300 mg
-MRSA and nonaerobic coverage

**Levofloxacin** (***Levaquin***)– 500 -750 mg qd
-oral solution 25 mg/ml

***Neosporin*** (OTC, **neomycin,/polymyxinB/bacitracin**) -bid -tid
***Neosporin + Pain Relief*** (OTC, with pramoxine)

***Polysporin*** (OTC, **polymyxinB/bacitracin**) -apply bid -tid

***Silvadene cream 1%*** -apply to affected area tid

***SilverMed*** - apply tid to bid

## Antifungals/Antivirals

For yeast or fungus infections, consider topical OTC medications initially. If dry, scaly, and annular, suspect fungus -use ***Lamisel***. If moist and papular, suspect yeast -use ***Lotrimin***. If refractory to OTC medications, prescribe topical ***Naftin*** or oral **fluconazole.** In regions of chronic drainage, use ***Aquaphor*** as a barrier/protectant For herpetic infections, prescribe ***Zovirax***, ***Valtrex***, or ***Famvir***, with different dosing for h. simplex versus h. zoster.

**Fluconazole** (***Diflucan***, generic) -200 mg day 1, then 100 mg qd

***Famvir*** (**famciclovir**) -h. simplex -1000 mg bid x 1 day
-h. simplex suppressive therapy 250 mg qd
-h. zoster - 500 mg tid x 7 days

***Lamisel*** (**terbinafine** -OTC antifungal) -apply bid
-12 gm & 24 gm tubes -30 cc pump spray

***Lotrimin Antifungal*** (OTC antifungal) – apply bid
-AF -(**clotrimazole**) Ultra -(**butenafine**)

***Naftin*** (**naftifine** 1%) – apply qd
-tubes 30g, 60g, 90g

***Valtrex*** (**valacyclovir**) -h. simplex -1 gm bid x 7 days
-h. zoster - 1 gm tid x 7 days

**Zovirax** (**acyclovir**) -h. simplex 200 mg po 5 times daily x 10 d
-h. zoster - 800mg po 5 times daily x 7-10 d

## Generalized Pruritus

Most generalized (or focal) pruritus responds to the treatments below. Additional etiologies include: renal pruritus, cholestatic pruritus, hematologic pruritus, lymphoma, etc.

**Aveeno Bath Treatments** (OTC) -soak in bath prn

**Diphenhydramine** (OTC, e.g. ***Benadryl***) -25 mg -50 mg po qid

**Dexamthasone** (***DexPax,*** 1.5 mg **dexamethasone**) – as directed
-6-day, 10-day, 13-day tapering dose packs.

**Doxepin** (***Sinequan***, generic) -10 -75 mg po qd
note: antidepressant/anxiolytic effect; low dose initially with gradual escalation.

**Hydroxyzine** (***Vistaril***, generic) -10 mg -25 mg po tid
-syrup 10 mg/5 ml
note: nonbenzodiazepam anxiolytic

***Medol Dosepak*** (**methylprednisolone**) – as directed-
-6-day dosepak (4mg)

## HEAD AND NECK

**Pearl**: **Tetracaine lollipops** for oral pain

Radiotherapy of the head and neck impacts many structures. Acute effects include radiation dermatitis (see skin section), loss of taste, mucositis, odynophagia/dysphagia, and xerostomia. Head and neck cancer local control rates decrease with breaks in radiotherapy - the patient should be strongly informed of the need for continued treatment regardless of the severity of side effects. Minimizing alcohol and [especially] tobacco use decreases the probability and duration of side effects (~ 20%); eliminating tobacco use increases the local control rate (~ 20%).

Weight loss usually begins in the 3rd or 4th week, and continues for 3 – 4 weeks post XRT. Despite aggressive pain management, a feeding tube is required in roughly one-third of patients. Consider initial placement of a PEG for severe dysphagia, or for poor performance status with planned combined modality therapy.

Skin reactions and odynophagia begin to resolve at 3 – 6 weeks (possibly longer with chemotherapy or hyperfractionated radiotherapy). Decreased taste, decreased hearing, dysphagia, laryngeal oedema, and xerostomia persist longer.

Xerostomia increases the risk for dental caries that can rapidly progress despite fluoride prophylaxis. The potential for tooth extraction causing bone necrosis increases with dose above 5,000 cGy; see the section on Dental Prophylaxis.

Radiation to the lower neck, can cause thyroid failure. A rare, debilitating side effect is carotid stenosis: ~15% of patients develop >50% carotid stenosis at 5 or more years; treatment required when stenosis is >70%.

## Eye

A common combination used during pterygium irradiation is ***Proparacaine*** as a topical analgesic, and **tobramycin** post XRT. If ocular inflammation from XRT, prescribe **Prednisone 1% Eye Drops**, or ***Cortisporin Ophthalmic***.

***Cortisporin Ophthalmic*** (combination steroid & antimicrobial, generic)

-apply ointment or 1 -2 gtts q 3 -4 hrs
note: do not use more than 5 -10 days

**Prednisone 1% Eye Drops** (generic) – 1 – 2 gtts q 3 – 4 hours
note: do not use more than 5 -10 days

***Proparacaine hydrochloride 0.5%*** -2 gtts prior to procedure
note: exercise care with manipulation of eye while anesthetic being used as abrasions will not be felt.

**Tobradex** (***tobramycin 0.3% + dexamethasone***) -3 gtts post procedure

## Dry Eye

Most preparations are mild anti-inflammatory or tear replacement agents. For dry eye irritation use OTC tear lubricants, and advance to ***Lacrisert*** if minimal relief. ***Restasis*** increases tear production suppressed by ocular inflammation (as in keratoconjunctivitis sicca). For refractory dry eye, plugging the lacrimal duct (**silicone plugs**, surgery) or trapping devices (**corneal shields**) can be used.

**Cyclosporin emulsion** (***Restasis***) – 1 gtt q 12 hr
-single use vials (32 vials per package)

***Lacrisert*** -insert as directed qd note: consider for severe dryness

***Refresh*** (OTC) -ususally 1 -2 gtts to affected eye qid
-***Tears*** (mild to moderate dry eye)
-***Celluvisc*** (moderate to severe dry eye)
-***Endura*** (severe dry eye)
-***Liquigel*** (moderate to severe dry eye)

***Tears Naturale*** (OTC) 1 – 2 gtts prn
-***Tears Naturale Forte*** – 15 and 30 cc bottles
-***Tears Naturale Free*** – small, multi-use vials

**Visine** (OTC) – usually 1 – 2 gtts to affected eye qid
-***Visine Original*** – for minor redness
-***Visine-A*** – contains antihistamine; for redness due to allergens
-***Visine Advanced Relief*** – addition of a lubricant
-***Visine Tears*** – lubricant only; use prn

## Ear

For allergy-induced eustachian tube dysfunction, use an antihistamine (see Sinuses section). For XRT-induced eustachian tube oedema, initially prescribe an OTC decongestant (e.g. **pseudoephedrine**); if refractory, prescribe ***Mucinex***, and if needed, a short course of tapering steroids (e.g. ***Medrol Dosepak*** or ***DexPax)***; eventually, TM tube placement may be required.

For external otitis, ***Ciprodex*** is best; also **Otitis Externa Mix** (OTC), ***Cipro HC Otic***, or ***Cortisporin Otic***.

For uncomplicated otitis media, **amoxicillin** is commonly prescribed; advance to ***Augmentin*** or ***Levaquin*** if no improvement after 3 days.

For XRT-induced external otitis, ***Tympagesic Otic Solution*** has analgesic and anaesthetic properties.

**Amoxicillin** - (***Amoxil***, generic) - 250 mg q 8 hr (500 mg q 8 hr if severe); 875 mg bid, or 775 mg ER qd

**Amoxicillin/clavulanate** (***Augmentin***, generic) -500 mg tid,

**Dexamthasone** (***DexPax,*** 1.5 mg **dexamethasone**) – as directed -6-day, 10-day, 13-day tapering dose packs.

**Diphenhydramine** (OTC, e.g. ***Benadryl***) -25 mg po q 6 -8 hrs

***Ciprodex*** (**Ciprofloxicin** & **dexemethasone,** generic) – 4 gtts bid x 7 days

***CiproHC Otic-*** **(Ciprofloxicin& prednisone,** generic) –3 gtts bid x 7 days

***Cortisporin Otic (***generic***)*** -4 gtts to affected ear q 6 hrs
-bottle of 10 cc

**Levofloxacin** (***Levaquin,*** generic***)***– 500 -750 mg qd
-tablets 250, 500, 750 mg
-oral solution 25 mg/ml

**Methylprednisolone** (***Medrol Dosepak***) -po as directed
-4 mg tablets, given over a 6 day taper

***Otitis Externa Mix*** (OTC) -2 -4 gtts to affected ear, bid –qid
-mix 1:1 water:white vinegar

**Pseudoephedrine** (OTC decongestant) -as directed

***Tympagesic Otic Solution*** – fill canal q 4 hrs, place stopper
-13 ml bottles

## Mucositis

For prevention of focal buccal or tongue stomatitis -insure fillings are covered with gauze, or alternately, a customized mouth guard can be manufactured by a dentist.

Mucositis (mouth to anus) or stomatitis (mouth alone) is variable in time to onset, extent of involvement, and impact to the patient. A clinical trial demonstrated decresed oral pain usng ***MuGard*** prophylactically. To minimize the impact of mucositis, encourage good oral hygiene including **baking soda mouthwash**, soft toothbush, mild toothpaste (e.g. ***Biotene***), minimal flossing, fluoride carriers or toothpaste; use of a humidifier; and minimizing spicy foods, alcohol, caffeine, and tobacco.

Candida can present in an atypical, patchy fashion - if in doubt, treat. Gastric reflux exacerbates mucositis, and can be improvedwith a proton pump inhibitor (e.g. ***Prevacid, Prilosec***). For mild to mild odynophagia or oral pain, ***Cepacol*** lozenges can work well. Focal aphthous ulcers (an excessive immune response to minor trauma) can be managed with topical medications such as OTC ***Ulcerease*** or ***Orabase***, or prescription **Triple Mix**.

Moderate to severe mucositis can cause rapid weight loss necessitating a feeding tube. Initially consider topical medications, such as **Triple Mix**, topical anaesthetics (**Tetracaine Lollipops, benzocaine** and **lidocaine** preparations, and ***UlcerEase*** mixed with ice chips). ***RadiCare Oral Wound Rinse***, ***Gelclai***r, ***OraMagic RX*** or ***Plus,*** are also options; in most cases systemic pain medication is eventually required. A normal progression is **NSAID**, **hydrocodone**, and eventually **fentanyl** (or other long-acting pain medication) with break thru medication. ***Carafate slurry*** may help the healing process.

**Baking Soda mouthwash** -1 -3 tsp gargle and spit, > 4 – 6 qd
-mix 1 tbs baking soda, 1 tbs salt, 1 quart water

***Carafate suspension*** (**sucralfate**) -2 tsp swish and swallow qid
-suspension 1 g/10 ml

***Cepacol lozenges*** – use as needed

***Gelclair*** – swish in oral cavity one minute, spit; avoid eating or drinking for 1 hour -use up to tid
-barrier/hydrating/anti-inflammatory function

**Lidocaine** – system absorption, 5 min to onset, 40 min duration
-***Xylocaine Oral Spray*** 10% -po prn (10 mg per dose)
-26.8 cc aerosol container

-***Xylocaine Viscous 2%*** -2 tsp po swish and swallow/ swish and spit prn
-note: patient may mix 2% viscuous lidocaine 1:1 with liquid antacid (Maalox or Mylanta) to improve coating
-bottles 100 ml, 450 ml -packages of 25 20 ml bottles

**Miracle Mouthwash** -2 tsp po swish and swallow/spit qid
-mix 60 ml tetracycline oral suspension (125 mg/5 ml), 30 ml **mycostatin oral suspension** (100,000 u/ml), 30 ml **hydrocortisone oral suspension** (10 mg/5 ml), and 240 ml ***Benadryl*** syrup (12.5 mg/5 ml)

***MuGuard*** – 5 ml 4 – 6 times per day

**Omeprazole** (***Prilosec***, generic, OTC) -20 mg po qd

***Orabase Paste*** (20% **Benzocaine,** OTC) – apply prn
-6 gm tube

***OraMagic*** (OTC) – swish and spit qid
***OraMagic Rx*** – regular formulation
***OraMagic Plus*** - with benozcaine

***RadiCare Oral Wound Rinse*** – 15 cc swish/gargle qid
-23 g powdered mouthwash mix -12/box

**Tetracaine 0.5% Lollipops** – q 2 – 3 hours

**Triple mix** - 1:1:1 Benadryl elixir:Maalox:viscous Xylocaine 2% - 2tsp po 10min qac and qhs

***Ulcerease*** (OTC topical anesthetic) -2 tsp swish and swallow or spit prn - 6 oz bottle
-mix with ice chips for posterior pharyngitis.

## Oral Infection & Candidiasis

For oral infections, consider **clindamycin** or ***Augmentin***.

**Mycelex troche** and **nystatin** oral suspension can be used initially for candidiasis, with **fluconazole** for severe or refractory cases. Xerostomia makes troches difficult to tolerate. If candidasis develops within severe mucositis, the infection may require a longer (4 – 8 weeks) course of systemic antifungal therapy.

**Amoxicillin/clavulanate** (***Augmentin***, generic)
-250mg - 500 mg po tid -875 mg po bid

***Augmentin Extended-Release*** -2 tablets bid
-(tablets of 1000 mg amoxicillin; reduced clavulanate)

**Clindamycin** (***Cleocin,*** generic) -150 mg -450 mg po q 6 hrs
-MRSA and nonaerobic coverage

**Fluconazole** (***Diflucan***, generic) -200 mg po day 1, then 100 mg po qd, x 7 days (if candida recurs, repeat for 21 days)

***Mycelex troche*** -dissolve lozenge in mouth, 5 per day, x 14 days

**Nystatin suspension** (***Nystatin***, generic) - 5 cc swish well for 2 minute and swallow qid; or dissolve 2 lozenges orally bid; thru 2 days post clinical resolution

## Sialdenitis

Acute sialdenitis is a mild to severe swelling of the parotid or submandibular glands/ducts, occurring in the first 24 – 48 hours of radiotherapy (as rapidly as 2 hours). The patient is often alarmed, and describes swelling and/or pain, and possibly dry mouth. It is usually self limiting to 24 – 48 hours. Reassure the patient and prescribe NSAID and heating pad. If associated with temp > 101 degrees and parotid is hot, treat with **oxacillin** or **vancomycin**.

## Sinuses

***Allegra***, ***Claritin***, and ***Zyrtec*** are used for sllergy-induced nasal congestion or eustachian tube dysfunction, prescribe an antihistamine. To promote sinus drainage, use decongestants and/or high dose expectorants (e.g. 1200 mg) that help thin nasal secretions. For infection, ***Augmentin*** or **Doxycycline** are initial choices. If pseudomonas is suspected (foul-smelling green purulent discharge) use ***Cipro*** or ***Levaquin***.

***Actifed*** (OTC antihistamine and decongestant) -1 po q 6 hrs

**Amoxicillin/clavulanate** (**Augmentin**) -250mg -500 mg po tid;
-875 mg po bid
-suspension 125 mg/5 ml, 250 mg/5 ml, 400 mg/5 ml
-***Augmentin Extended-Release*** -2 tablets bid
(tablets of 1000 mg **amoxicillin**; reduced **clavulanate**)

***Benadryl*** (OTC antihistamine) -25 -50 mg po q 4 -6 hrs

**Cetirizine** (***Zyrtec***, OTC) – 10 mg po qd
-tablets 10 mg -syrup 5 mg/5 ml
-***Zyrtec-D*** – po bid (5 mg + 120 mg pseudoephedrine)

**Ciprofloxacin** (***Cipro, Cipro XR,*** generic) -250 -750 mg q 12 hr
-IR tablets 250 mg, 500 mg & 750 mg
-XR 500mg - 1000mg qd

**Doxycycline** (***Vibramycin***, generic), 100 mg twice daily

**Fexofenadine** (***Allegra***) – 60 mg po bid, or 180 mg po qd
-tablets 30 mg, 60 mg, 180 mg
***Allegra D 12 Hr*** -po bid (60 mg + 120 mg pseudoephedrine)
***Allegra D 24 Hr*** -po qd (180 mg + 240 mg pseudoephedrine)

**Loratadine** (***Claritin***, OTC) – po qd
-***Clairitn-D*** 12 hour (with 120 mg pseudoephedrine) – bid
-***Claritin-D*** 24 hour (with 240 mg pseudoephedrine) -qd

**Levofloxacin** (***Levaquin,*** **generic**)– 500 -750 mg qd
-oral solution 250 mg/10 ml

***Mucinex*** (**guaifenesin**, OTC) – 600 mg – 1200 mg po bid
-tablets 600 mg
-***Mucinex DM*** -with cough suppressant
-***Mucinex D*** -with pseudoephedrine

**Pseudoephedrine** (OTC decongestant) - 1 po q 6

## Dental Prophylaxsis and Osteoradionecrosis

Whenever possible prior to XRT, restorable teeth should be repaired, and nonrestorable and questionably restorable teeth extracted. Full mouth extraction is the best option when there is extensive decay, poor or undependable oral hygiene, moderate peridontal problems (pockets greater than 3 mm deep), and less than 50% of remaining alveolar bone support. XRT can begin as soon as one week after simple extraction, and up to 3 to 4 weeks after more complex extractions.

Post treatment, if extraction or dental work is required within treatment field greater than 50 Gy, there are several antibiotic regimens. Simplest (mandible irradiated, teeth not in the radiation field) is **amoxicillin** or **clindamycin** 2 days prior and 5 days post extraction. A more aggressive option (teeth within the treatment field) is ***Augmentin*** or **clindamycin**, and **chlorhexidine**, started 10 days prior to the procedure, and continued for 7 days. If multiple extractions, removal one at a time with alveoplasty (if indicated) will reduce the risk of osteoradionecrosis.

Osteoradionecrosis occurs in 3 to 10 percent of patients post radiotherapy, through damage of intraosseous small blood vessels. Initial antibiotic management with Augmentin, azithromycin, or clindaycin. For refractory or large radionecrotic lesions, **pentoxifylline** and **vitamin E** may be of benefit; often hyperbaric oxygen (+/- subsequent flap reconstruction) is necessary.

**Amoxicillin** (***Amoxil***, generic) – 500 mg q 8 hr

**Amoxicillin/clavulanate** (***Augmentin***, generic) 500 mg tid to 875 mg bid

**Azithromycin** (***Z-pak***, generic) – as directed

**Chlorhexidine** (***Peridex***, generic)- ½ ox swish 30 sec and spit, bid

**Clindamycin** (***Cleocin***, generic) - 300 mg q 6 h

## Xerostomia

Xerostomia may begin in the third week of XRT. Initially the serous cells are impacted producing a thickened saliva; at higher doses, the mucous cells fail and saliva diminshes. Post treatment, salivation may worsen out to 6 months, and then may improve up to three years. Symptomatic relief can be approached with saliva substitutes, or saliva stimulation.

Artificial salivas (e.g. ***Aquoral***, ***Salivart***, ***Numoisyn***, ***Moi-Stir***), glycerin, or baking soda gargles can provide symptomatic relief. In non-edentulous patients, fluoride protection must be provided, either with a **fluoride toothpaste** (***GelKam***, ***Biotene***, or ***Prevident***) or a **fluoride carrier**. OTC mouthwashes should be avoided as the alcohol content tends to dry the oral tissues. Moisture stimulants include **Biotene Products,** chewing gum, sugar-free candy.

XRT-induced xerostomia can be worsened by, or confused with dehydration, candidiasis, anticholinergic drugs (e.g. tricyclic antidepressants) opioids, antihistamines, decongestants, antidepressants, anxiolytics, and antidiarrheals.

For symptomatic thickened saliva, **baking soda gargle** is an nitial approach; an expectorant (e.g. **guaifenesin**) and/or hydration may provide significant relief.

Occasionally a patient develops a severe gag response to thickened saliva, refractory to baking soda gargle, or normal antiemetics – **Scopolamine patches** may decrease salivation and gag reflex. Advance to **Lorazepam** as needed.

A small study has shown prophylactic benefit with ***NeutraSal***. ***Salagen*** does not have significant prophylactic benefit but does benefit post XRT as primary treatment. ***Evoxac***, approved for Sjogrens Syndrome, has statistically significant benefit for XRT-associated xerostomia.

***Aquoral*** -2 sprays po tid -qid prn
-400 spray container

**Artificial saliva** (OTC) -apply to oral mucosa prn
-***Salivart*** -25g and 75 g containers
-***Saliva Substitute*** -120 ml squirt bottle

***Baking Soda Mouthwash*** (OTC) -1 -3 tsp swish and spit prn
-mix 1 tbs baking soda, 1 tbs salt, 1 quart water
note: soothing and promotes good oral hygiene; restores normal oral pH

***Biotene Antibacterial Mouthwash*** (OTC) 15 cc swish and spit prn
-16 oz
note: contains 4 antibacterial enzymes

***Biotene Dry Mouth Toothpaste*** (OTC) – bid – tid brushing
-4.5 oz tube
note: contains anitbacterial enzymes, fluoride, natural Xylitol

***Biotene Dental Gum*** (OTC) – chew 1 -2 pieces prn
-16 pieces per pkg

**Cevimeline** (***Evoxac***) – 30 mg po tid
-capsules 30 mg

**Fluoride carriers** -arranged via Dental consultation

***GelKam*** (**Fluoride Toothpaste**) -brush 10 min bid
-pack of 2 -3 1/2 oz tubes

**Glycerin** (OTC) -mix 1/4 tsp in 8 oz water

**Lorazepam** (***Ativan***), 0.5- 2 mg 3 times daily
- tablets 0.5 mg, 1 mg, 2 mg - solution 2 mg/mL

***Moi-Stir*** (OTC) – spray prn
-spray bottles, 1oz, 4oz

***Mouth Kote 1%*** (OTC) -5 cc po gargle, swish, hold for 1 minute, then spit
note: combination moisturizer/lubricant

***Mucinex*** (**guaifenesin**, OTC) – 600 mg – 1200 mg po bid
-tablets 600 mg
-***Mucinex DM*** -with cough suppressant
-***Mucinex D*** -with pseudoephedrine

***Numoisyn*** (**sorbitol**) – 5 cc swish 30 sec; spit; 3 – 10 qd 3 – 10 qd
- 0.3 gm lozenge

***Prevident*** (**fluoride toothpaste**) -brush 10 min bid
-tube 1.8 oz

***Neutra Sal* –** 1 packet in 1 oz water
Swish 1 minute and spit
4/day prophylaxsis; 2 – 10 day mucositis

**Pilocarpine** (***Salagen,*** generic) -5 mg po tid initially;
consider 10 mg po tid prn (12 weeks required to assess efficacy)
-tablets 5 & 7.5 mg

**Scopolamine patches** (***Transderm Scop***) apply to skin behind ear, 2-3 days per patch.

***SalvaSure*** (OTC) -dissolve po prn
-packages of 90 tablets

# THORAX

## Air Hunger

**Codeine** -30 mg po q 4 -6 h
-oral solution 15 mg/5 ml

**Morphine Sulfate** -7.5 mg -30 mg po q 4 hr
-solution 10 mg/5 ml, 20 mg/5 ml
-injectable -3 -5 + mg IV/IM q 2 -4 hr

**Alprazolam** (***Xanax***) - start at .25 - .5 mg tid
-max 4 mg/d
-***Xanax XR*** (extended release) – start at 0.5 – 1.0 mg/d
-max 3 – 6 mg/d

**Diazepam** (***Valium***) -2 mg -10 mg po bid -qid

**Lorazepam** (***Ativan***) -.5 – 2 mg po bid – qid

## Obstructive Airways Disease (Asthma, COPD)

Asthma produces intermittent dyspnea, while COPD (chronic bronchitis and/or emphysema) produces a relatively nonfluctuating, progressive dyspnea. First line therapy for COPD exacerbation is inhaled short acting beta-agonists (SABA), adding anticholinergics, (or a combination), and eventually steroids (the classes have different mechanisms, so can be used simultaneously).

**SABA**

**Albuterol sulfate** (e.g. ***Proventil***, ***Ventolin***, generic)
-Inhalation aerosol -2 puffs q 4 hrs prn
-Inhaler with mouthpiece, 190 dose unit

**Levalbuterol** (***Xopenex***, generic) – 2 puffs q 4 – 6 hrs
- Inhaler with mouthpiece, 200 dose unit
- Less cardiac side effects

**Anticholinergics**

**Ipratropium bromide** (***Atrovent***) -2 puffs q 4 -6 hrs
- Inhaler – 200 dose unit

Combinations

***Advair*** **(Fluticasone + Salmeterol)** -d 1 puff bid
- Canisters of 60 and 120 metered doses

**Oral Steroids**

**Prednisone** – 30 to 40 mg po qd x 7 – 10 days, then taper

**Dexamethasone** (***Decadron***) – 8 to16 mg po qd x 7 d, then taper
-***DexPax,*** (1.5 mg **dexamethasone**) – as directed
-6-day, 10-day, 13-day tapering dose packs.

## Cough

A sudden increase in cough and/or dyspnea should be evaluated, and antibiotics begun if purulent sputum, increased temperature (above 101°), or marked increase in sputum production with worsening of dyspnea; or a pneumoniae is identified. Often antibiotics are begun empirically. If no infectious etiology is suspected, and the main complaint is dyspnea, initiate COPD airway management. Supplemental oxygen is indicated for resting O2 saturation < 88%.

For chronic cough, initially rule out postnasal drip etiology – inhaled glucocorticoid (e.g. ***Flonase***, ***Nasonex***), advancing to a second-generation antihistamine (**cetirizine, fexofenadine, loratidine**). For GERD, use H2-blockers or pro-motility agents (***Reglan***). Antibiotics may be required for bronchitis, or pneumonia with increased or purulent secretions and worsening dyspnea.

Initial acute cough management is OTC cough suppressants with **dextromethorphan** (centrally acting antitussive); if thickened secretions, include an expectorant such as **guaifenesin** (liquefies and reduces the viscosity of thickened secretions). If persistent, add ***Tessalon Perles*** (especially for dry cough with inspiration). If this combination does not provide adequate relief, advance to narcotic-containing cough suppressants (**codeine**, **hydrocodone**, **morphine**). If refractory, consider **gabapentin.**

**Fexofenadine** (***Allegra***, OTC) – 60 mg po bid, or 180 mg po qd
-tablets 30 mg, 60 mg, 180 mg
***Allegra D 12 Hr*** -po bid (60 mg + 120 mg pseudoephedrine)
***Allegra D 24 Hr*** -po qd (180 mg + 240 mg pseudoephedrine)

**Cetirizine** (***Zyrtec***, OTC) – 10 mg po qd

-tablets 10 mg
***Zyrtec-D12 HR*** -bid (5 mg + 120 mg pseudoephedrine)

**Dextromethorphan + Guaifenesin** (OTC expectorant & antitussive, e.g. ***Robitussin DM***) -2 tsp q 4hr

**Guaifenesin** (OTC expectorant, e.g. ***Robitussin***) -2 -4 tsp q 4 hrs
-bottles 4 oz, 8 oz, 12 oz

**Guaifenesin with codeine** -2 tsp po q 4 hrs; max 8 tsp per day
-codeine 10 mg/5 ml, guaifenesin 100 mg/5 ml

**Fluticasone** (***Flonase***, OTC) – 1 spray bid or 2 sprays qd
- 120 metered sprays per bottle

**Loratadine** (***Claritin***, OTC) – po bid or qd
-***Claritin*** 24 hour – qd
-***Clairitn-D 12*** hour (with 120 mg pseudoephedrine) – bid
-***Claritin-D 24*** hour (with 240 mg pseudoephedrine) -qd

**Gapapentin** (***Neurontin***, generic)– 300 mg qd to 600 mg tid

**Hydrocodone** – ***Hydromet*** (with homatropine antitussive)
- 5 mg q 4 hrs
  - 5 mg tablets - alcohol free syrup 5mg/5ml
- ***Tussionex*** (with **chlorpheniramine**) - 5 ml q 12h
  - 10 - 8mg/5 ml extend release syrup
- ***HYCOTUSS*** (with **guaifenesin**) – 5 – 15 ml q 4 hr
  - 5 - 100 mg per 5 ml
- **Guaifenesin with hydrocodone, pseudoephdrine** (generic) – 5 ml q 4 hr
- 30 mg per day max

***Mucinex*** (**guaifenesin**, OTC) – 600 mg – 1200 mg po bid

-tablets 600 mg
-***Mucinex DM*** -with cough suppressant
-***Mucinex D*** -with pseudoephedrine

**Mometasone** (***Nasonex***, generic, OTC) – 2 sprays each nostril qd
- 120 sprays per contaniner

**Pseudoephedrine** (OTC decongestant, e.g. **Sudafed**) -1 po q 6 hrs

***Tessalon*** (**benzonatate**) -100 -200 po q 8 hrs

## Infectious Processes

Determining the etiologic agent is helpful, but empiric therapy is often required. If influenza is suspected, antivirals (***Relenza***, ***Tamiflu***) may be used early in the infection, or prophylactically.

For outpatient pneumoniae, **azithromycin** or **doxycycline** are initial choices. If immune compromised or multiple cormobidities, category 1 recommendations are **Moxifloxacin**, or a combination of macrolide (***Biaxin*** or ***Zithromax***) and ***Augmentin*** or **Clindamycin.**

If aspiration or an anerobe infection is suspected, consider **Clindamycin**. For purulent bronchitis or sinusitis, many of the above drugs are effective as well as **trimethorphran/ sulfamethaxazole** and cephalosporins (***Keflex***, ***Ceftin***)

**Amoxicillin/clavulanate** (***Augmentin***, generic) -250 mg -500 mg po tid; 875 mg po bid
-***Augmentin Extended-Release*** -2 tablets bid
(tablets of 1000 mg **amoxicillin**; reduced **clavulanate**)

**Azithromycin** (***Zithromax***, ***Z-Pak***, generic) -500 mg po qd day 1, then 250 mg po qd x 4d

***Bactrim*** and ***Bactrim DS*** (generic) 2 regular or 1 DS tab po bid
-tablets 80 mg **trimethoprim**/400 mg **sulfamethoxazole**; or 160/800 for DS

**Cefuroxime** (***Ceftin***, generic) – 250 mg – 500 mg po bid

**Cephalexin** (***Keflex***, generic)– 250 mg – 500 mg po qid
-capsules 250, 500, & 750 mg

**Ciprofloxacin** (***Cipro***, ***Cipro XR***, generic) -250 -750 mg q 12 hr

-XR 500 mg -1000 mg qd
-IR tablets 250 mg, 500 mg & 750 mg
-XR tablets 500 mg & 1000 mg

**Clarithromycin** (***Biaxin***, generic – 250 -500 mg po bid;
-***Biaxin XL*** 500 mg qd
-***Biaxin XL*** tablets 500 mg

**Clindamycin** (***Cleocin***, generic) – 150 mg – 450 mg po tid – qid
-MRSA and nonaerobic coverage

**Doxycycline** (e.g. ***Vibramycin***, generic) – 100 mg po bid

**Levofloxacin** (***Levaquin***, generic) – 500 -750 mg qd

**Moxifloxacin** (***Avelox***) – 400 mg po qd

**Oseltamivir** (***Tamiflu***, antiviral) – 75 mg bid x 5 days
-prophylaxis 75 mg po qd x 10 days

**Zanamivir Inhalation** (***Relenza***) –Inhale bid x 5 days
- Use Diskhaler and five Rotadisks

## Radiation Pneumonitis and Pulmonary Fibrosis

Radiation pneumonitis is an inflammatory response in the lung to radiation, occurring at 2 weeks to 6 months following completion of radiotherapy. There re multiple variables, but V20 is the most important variable.

It can present with dyspnea, tachycadia, cough, pleuritic chest pain and/or hypoxia. CT scan is more sensitive than CXR, demonstrating an infiltrate within parts of the radiation treatment field. Mild symptons can be treated with **NSAID**, advancing to systemic steroids as needed. An infectious process should be ruled out prior to starting steroids.

Pulmonary fibrosis can appear months to years after radiation, seen as a sharply demarcated fibrous lesion, versus some haziness with radiation pneumonitis (see Radiation Fibrosis section).

**NSAID**

- **Ibuprofen** -200 mg -800 mg po q 6 h
  -OTC 200mg -Rx (***IBU***) 600 mg, 800 mg
- **Naproxen** (***Naprosyn***, generic) -500 -750 mg po initially, then 250 -500 mg po q 6-12 h
- **Indomethacin** (***Indocin***,generic) -25 mg bid –tid initially; maximum 200 mg per day

**Oral Steroids -Prednisone** -20 mg po q 8 hrs (or 60 mg po qd) is a reasonable starting dose; published recommendations include 1 mg/kg at diagnosis maintained for several weeks followed by slow taper

## Smoking Cessation

More effective with a behavior modification program, in addition to medical management. The US Public Health Service recognizes five first-line medications: **bupropion**, **nicotine gum, nicotine inhaler**, **nicotine nasal spray**, and the **nicotine patch**.

**Bupropion** (***Zyban***, generic) – 150 mg po qd before quitting, then 150 mg po bid x 7– 12 weeks

***Nicorette Lozanges*** (**nicotine lozenge**, OTC) – 2 – 4 mg q 1 – 8 hr

***Nicoderm CQ*** (transdermal, OTC) – variable dosing, 7 mg/day to 21 mg/day - worn 16 to 24 hours/day
- > 10 cigarettes per day: 6 wks @ 21 mg/d; 2–4 wks @ 14 mg/d; then 4–8 weeks @ 7 mg/d
- < 10 cigarettes or weight < 45 kg: 6 weeks @ 14 mg/d; 8 weeks @ 7 mg/d

***Nicorette Gum*** (OTC)– chew gum several minutes, then store in cheek 30 min
- weeks 1- 6 @ q 1–2 hrs; weeks 7–8 @ q 2 – 4 hours; weeks 9 - 10 @ q 4 – 8 hours
-2 mg (<25 cigarettees/day), 4 mg >25 cigaretttes/day)

**Nicotine Inhaler** (***Nicotrol Inhaler***, OTC) – 6 – 16 cartridges per day, up to 12 weeks; then gradual reduction over 12 weeks.

**Varenicline** (***Chantix***) – 0.5 mg/d x 3 dys; bid x 4 days, then
- 1 mg qd x 12 – 24 week

## BREAST

**Pearl**: For patients with pendulous breasts, place a 60 cc syringe (stylus removed) at the inframammary fold to prevent self bolusing.

Skin erythema is expected during breast irradiation, and desquamation is not uncommon. The avoidance of deodorants (especially aluminum containing) during breast irradiation is no longer recommended. Also, no studies demonstrate worse outcome with lotions applied prior to breast irradiation.

A pruritic, erythematous, punctate rash that begins in the upper inner quadrant breast is most likely miliaria rubra (inflammed sweat glands), and can be treated with topical steroids (see page 1).

Fungal infections are prevalent in the inframammary region (see pages 8 & 9).

Breast oedema may develop during radiation, producing swelling and increased warmth and erythema (due to increased internal body heat transmission). This warmth/erythema is usually diffuse and mild, with gradual onset.

Local or diffuse infectious processes present more suddenly, with marked warmth and erythema, and often tenderness of the breast. If refractory to antibiotic therapy, rule out abscess, then consider a collagen vascular disease associated vasculitis (steroids) or progression to an inflammatory breast cancer (biopsy).

Stretching exercises are important post axillary dissection, and may need to continue for a number of years. If physical therapy is not involved, two simple stretches are: (1) with the arms extended in

front of the patient ("rope over door"), and (2) extended laterally to the patient ("spider up the wall"; shoulders must be perpendicular to the wall); 20 times each, stretching slowly with control to the maximum stretch, 3 to 4 times daily.

There are two types of cords that can develop in the arm post lymph node dissection. With Axillary Web Syndrome, a tight cord of tissue extends from the mid axilla to the antecubital fossa. Treatment involves physical therapy, including myofascial release and a home program for arm stretching.

Occasionally a patient will develop one or multple superficial blood clots (versus a DVT). The usual presentation is a palpable, linear, tender axillary cord traceable beyond the antecubital fossa, with no distal oedema. These commonly resolve over 3 -4 weeks. Reassure the patient, and prescribe a heating pad 30 min tid and **aspirin** (unless contraindicated). Mondor's disease is a variant, where the patient initially presents with a red, tender superficial thrombophletis that scleroses to form a tough fibrous band, causing pain and skin retraction; manage conservatively. NOTE: Although Mondor's usually occurs in the axilla, it can also present in the breast, and as one to multiple linear bands extending caudally to the abdomen.

Irradiation of the prosthetically augmented breast can result in capsule contracture (the probability of contracture increases with increased prosthesis to breast tissue volume, smoking, and diabetes.) Some surgeons recommend ***Singulair*** 10 mg qd for 3 months , followed by ***Trental*** 400 mg tid with **Vitamin E** 1000 mg qd for 6 months.

## Abscess/Infection

For generalized erythema, swelling, and warmth (greater than ~2 degrees versus the opposite breast), treat for mastitis with ***Augmentin***, or alternately **dicloxicillin**, **cephalexin**, ***Bactrim DS***, or **clindamycin**.

For nonsubareolar abscess and localized warmth/erythema, drain abscess and prescribe **dicloxicillin, cephalexin, clindamycin.** If subareolar & odoriferous, add **metronidazole** (preferably) or **clindamycin** for anaerobic coverage. If there is an obvious localized abscess, with marked erythema/warmth of the breast, drainage and IV antibiotics (**Vancomycin**) are usually required.

**Amoxicillin/clavulanate** (***Augmentin***, generic) -250 mg -500 mg po tid; 875 mg po bid
-***Augmentin Extended-Release*** -2 tablets bid

***Bactrim DS*** (**sulfamethoxazole/trimethropin,** generic) – 1 po bid

**Cephalexin** (***Keflex***, generic)– 250 mg – 500 mg po qid

**Clindamycin** (***Cleocin***, generic) – 150 mg – 450 mg po tid – qid
-MRSA and nonaerobic coverage

**Dicloxacillin** (generic) – 500 mg qid

**Metronidazole** (***Flagyl***, generic) – 500 mg po tid
note: IV **metronidazole** for serious anaerobic infections

## Costochondritis & Superficial Dorsal Cutaneous Neuritis

Two types of localized inflammations may occur when treating the breast. Costochondritis presents as a highly localized point tenderness along the anterior costochondral junctions, and may involve one or multiple joints. Post axillary dissection, the patient may maintain a slightly different posture, eventually causing nerve (or muscular) inflammation that presents as a point tenderness immediately medial to either scapula; portural changes are needed. Costochondritis usually responds to a short course (3 days) of **NSAID**'s (**IBU** 600 mg tid) or ***Celebrex*** 100 mg bid to 200 mg qd.

## Lymphedema

Lymphedema can be an issue of the upper extremity and/or the treated breast. Arm and breast oedema is most prominent after axillary node dissection. Following sentinel node biopsy, a supraclavicular field will slightly increase the risk for upper extremity lymphadema; there is still moderate risk of oedema of the irradiated breast.

Lymphedema consult should be initiated early for the upper extremity. For the breast, refer early if there is moderate pain or pore prominence with pitting oedma; otherwise consider waiting six months to allow for resolution/improvement, .

## Hot Flashes

Hot flashes from decreased estrogen availability impacts the thermoregulatory functions at the hypothalamus; randomized clinical trials show a placebo effect greater than 20% (the reason for the large number of anecdotal remedies).

Relieving 'triggers' may reduce the severity or length of hot flashes:
Avoid or minimize (admittedly, some easier said than done):

-stress -alcohol -hot foods -hot beds
-caffeine -diet pills -hot tubs -hot rooms
-saunas -smoking

Increase activity level.
Initiate relaxation techniques
Begin a low-fat diet

A recommended algorithm: for mild, nondisruptive hot flashes, prescribe **Vitamin E** (800 – 1000 IU qd). For refractory or more severe symptoms, prescribe ***Effexor, Lexapro,*** or ***Paxil;*** advance to ***Catapress TTS*** or ***Aldomet;*** and finally ***Neurontin.*** If symptoms persist, consider, after discussion with patient, advancing to progestational agents (***Megace*** or ***Depo-Provera***).

**Gabapentin** (***Neurontin***, generic) – 300 mg qd x 3 days, then 300 mg tid or titrate down to effective level

**Clonidine patch** (***CatapressTTS***) – 0.1 mg patch q week

**Escitaloprom** (***Lexapro***, generic) - 10 mg qd

**Medroxyprogesterone** (***Depo Provera*** -)– 150 mg I.M. q 3 month

**Megesterol** (e.g. ***Megace***) -20 mg po bid initially; 10 mg qd or qod once responsive.

**Methyldopa** (***Aldomet***) – 250 mg po bid

**Paroxetine** (***Paxil CR***)– 12.5 + mg po qd

**Venlavaxine** (***Effexor XR***)– 75 mg po qhs (titrate upward from -37.5 mg)

## GASTROINTESTINAL TRACT

Esophagitis can begin as early as 2 weeks into radiotherapy, with healing 2 -8+ weeks after treatment ends. A prominent long-term effect is stricture from submucosal fibrosis, usually remedied with single or multiple dilitations; for stricture refractory to dilitation consider an XRT fibrosis protocol and then redilitation.

Irradiation of the stomach often results in anorexia, nausea and vomiting. Abdominal irradiation can cause hypomotility, hypermotility, flatus/gas cramping, and diarrhea (both chronic and post-prandial). Irradiation of the colon and rectum can produce tenesmus, proctitis, urgency, hemorhoidal inflammation, and rectal bleeding. Extending the field inferiorly can produce severe perianal irritation.

Long-term effects may include chronic diarrhea, bowel adhesions, bleeding from ulceration and neovasculaturity, and protein losing enteropathy.

## Antacids/Hypersecretion Medications

For short-term antacid relief consider OTC extra strength liquid antacids. For chronic antacid/GERD treatment, consider H-2 blockers (H2B), either OTC or Rx, or proton pump inhibitors (PPI). Stomach ulcers may develop 1 -2 months following doses exceeding 5,000 cGy. **Carafate** protects the stomach with a coating action, and may have some prophylactic benefit. The H2B medications are especially useful for prophylaxis during steroidal and nonsteroidal antiinflammatory therapy, many are OTC. For erosive gastritis or esophagitis, considering doubling the recommended doses for H2B and PPI.

**Aluminum**, **Magnesium** & **Simethecone** (OTC combination), eg:
-***Maalox Max Antacid/Anti-gas*** – 2 – 4 tsp qid
***Mylanta Double Strength*** -2 -4 tsp prn; maximum 12 per day

**Cimetidine** (***Tagamet***, OTC, generic, H2B) -300 mg po q ac and q hs; or 800 mg po q hs
-For steroid prophylaxsis, 400 mg po qhs

**Dexlansoprazole** (***Kapidex***, PPI) – 60 mg po qd x 8 weeks, then 30 mg po qd maintenance

**Esomeprazole** (***Nexium***, OTC, generic, PPI) – 20 - 40 mg po qd

**Famotidine** (***Pepcid***, OTC, generic, H2B) -10 -20 mg po bid
-tablets 10 & 20 mg
-***Pepcid Complete***, 10 mg with antacid
-oral suspension 40mg/5ml

**Lansoprazole** (***Prevacid***, OTC, generic PPI) – esophagitis 30 mg -qd;
-GERD 15 mg qd -capsules 15 mg, 30 mg
-***SoluTab*** (dissolve po) 15 mg, 30 mg
-Oral Suspension packets 15 mg, 30 mg
note: Oral Suspension po only; for enteral, open capsules into 40 ml apple juice, or Solu Tab into water.

**Omeprazole** (***Prilosec***, OTC, generic, PPI) -20 mg po qd
-tablet 20 mg

**Pantoprazole** (***Protonix***, generic, PPI) – 40 mg po qd

**Rabeprazole** (***Aciphex***, generic, PPI) – 20 mg po qd
-tablets 20 mg

**Ranitidine** (***Zantac***, OTC, generic, H2B) 150 mg po bid or 300 mg po qhs
-Rx - syrup 75mg/5 ml

## Diarrhea

History is important for proper management of diarrhea: assess watery diarrhea (po antidiarrheals) versus loose/soft stool (dietary modification alone), frequency, flatus/gas cramping (antiflautlent +/-antidiarrheal), urgency or rectal/hemorrhoidal pain (rectal suppository), and whether urination triggers bowel movement (GU antispasmodic). The goal should be normalization of bowel movements using dietary modifications and prophylactic medications. It is important to monitor weight loss, fluid loss (tenting and dry mucuous membranes), and electrolyte imbalance (especially potassium).

For XRT-induced diarrhea, begin with post bowel movement mild OTC antidiarrheals (e.g ***Pepto-Bismol***, ***Kaopectate***). For more aggressive therapy, ***Imodium*** (OTC) is more accessible, while ***Lomotil*** is cheaper but with more side effects. ***Lomotil*** or ***Imodium*** are usually prescribed after each loose bowel movement. However, once multiple daily antidiarrheals are required, attempt a prophylactic regimen: ½ to 2 tablets po q AM (pre bowel movement) to bid, titrating up to 8 per day to normalize bowel movements. If refractory include a low residue diet, and increase foods high in pectin (e.g. oatmeal, ripe bananas, and applesauce, which help bind stool)

***Lomotil*** and ***Imodium*** may be combined to a total of 16 tablets per day. Before pursuing this combination, consider **tincture of opium** or antimotility agents (increasing order of preference – see antimotility section): ***Bentyl***, ***Donnatal***, ***Levsin***, or ***Librax***. This may benefit the patient by controlling diarrhea, and associated bloating, cramping, and urgency. Post prandial diarrhea may be controlled with antimotility agents given qAC and qHS.

For severe, refractry diarrhea, obtain stool cultures to rule out C. difficile (which can be caused by high doses of antibiotics). If negative, consider possible infection (e.g diverticulitis, perforation). If there has been 5-FU administration, administer subcutaneous [expensive] ***Sandostatin***.

**Bismuth subsalicylate** (***Kaopectate***, ***Pepto-Bismol***, OTC, generic)
-suspension -2 tbs after each loose BM; 16 tbs qd max
-Extra Strength ***Kaopectate*** – 2 tbs prn; 8 tbs qd max

**Diphenoxylate/atropine** (***Lomotil***, generic is ***Lonox***) -1/2 -2 tablets or 10 ml po initially or q am, then 1 after each loose stool as needed
-diphenoxylate 2.5 mg/atropine .025 mg per tablet or per 5 ml
note: maximum 8 tablets or 40 ml per day

**Loperamide** (***Imodium A-D***,OTC, generic)– 1 – 4 mg po q am, then 2 mg po prn; 1 – 4 mg qd -bid as prophylysis prn
-caplet 2 mg -liquid 1 mg/5 ml, 1 mg/7.5 ml
-***Imodium Advanced*** (2 mg), with **simethicone** 125 mg/ chewable tablet
note: maximum 16 mg **loperamide** per day

**Octreotide** (***Sandostatin***) -50 – 200 mcg SQ bid – tid
-50 mcg/ml, 100 mcg/ml, 500 mcg/ml
-***Sandostatin LAR Depot*** – 20 mg IM q 4 weeks; 30 mg IM max

**Tincture of Opium**
-***Optium tincture***, deodorized – 0.6 cc po qid
-10 mg anhydrous morphine per ml
-***Paregoric*** – 5cc – 10cc po qd – qid
-2 mg anhydrous morphine per 5 ml

## Antiflatulants

Increased gas production, especially when associated with hypermotility, can produce severe abdominal cramping. Initial management involves **simethicone,** adding antitidiarrheal medications as needed. ***Bean-O*** may enable a normal diet, and in some cases reduces post prandial diarrhea. If cramping symptoms persist, consider a low residue diet, followed by antimotility agents.

***Bean-O*** (OTC, **alpha-galactosidase** enzyme) – 5 drops or 3 tablets q 3 servings

**Simethicone** (OTC antiflatulent, + generics) – variable dosing, see Individual products
-***Gas-X*** *Regular*, *Extra Strength*, *Maximum Strength*
-***Maalox***, *Maximum Strength*, *Regular Strength*
-***Phazyme*** 125 mg, 180 mg

***Imodium Advanced*** (OTC, generic) – 2 – 4 mg po q am, then 2 mg po prn; 1 – 4 mg po qd
-bid as prophylaxis if needed
-**loperamide** (2 mg), with **simethicone** 125 mg/ chewable tablet
note: maximum 16 mg **loperamide** per day

## Anorexia/Appetite Stimulant

Anorexia/weight loss may be multifactorial, beyond simple loss of appetite.Underlying issues and potential treatments include: ***Reglan*** for early satiety, antiemetics for nausea, antacids for gastric hyperacidity, antiflatulents for gas cramping, motility agents for postprandial diarrhea, laxatives for constipation, zinc for altered taste, analeptics for fatigue, and antidepressants.

The strongest weight-based clinical support is for **corticosteroids** and **megestrol**; there is also support for **dronabinol**. **Mirtazapine** is an atypical antidepressant that stimulates appetite.

***Oxandrin*** is an anabolic steroid which promotes appetite and weight gain, especially muscle mass. It is generally safe and when effective, provides the patient a sense of physical well-being. Observe women for signs of virilization.

**Dronabinol** (***Marinol***) -2.5 po q hs -bid initially; max 10 mg bid

**Megesterol** (***Megace ES***, ***Megace*** & generic)
-***Megace*** & generic oral suspension -800 mg qd
40 mg/ml, 240 ml bottles
-***Megace ES*** -625 mg/5ml po qd
bottles of 150 ml

**Oxandrolone** (***Oxandrin***)– 2.5 -20 mg qd, in 2 -4 divided doses

***Remeron*** (**mirtazapine**)- 7.5 mg 15 mg nightly

**Prednisone** -10 to 40 mg q day

**Zinc** -may improve taste

## Chronic Radiation Enteritis, Proctitis, or Rectal Bleeding

Following abdominal or pelvic irradiation, chronic diarrhea +/malabsorption, with associated weight loss can persist or develop after one to several years. Malabsorption (e.g. short bowel syndrome, radiation enteritis, pancreatic insufficienty, HIV) should be suspected if there is continued weight loss despite normal thyroid function and adequate caloric intake. Fecal fat assays may be helpful to determine if malabsorption or maldigestion is present. Usually endoscopic and radiographic evaluations are performed.

The first attempt at control of chronic diarrhea beyond dietary modifications, is with prophylactic antidiarrheals, ***Imodium***, or ***Lomotil*** (***Lomotil*** is more efficacious in "short bowel syndrome"). For refractory classic radiation enteritis an unusual combination of ***Imodium*** and ***Lactulose*** should be considered. If still no improvement, consider two-week trial courses of **Pancrelipase**, ***Questran***, and finally **prednisone**. In some patients, elemental formulas as sole source of nutrition provide the only remedy.

For chronic proctitis or rectal bleeding, begin with **sucralfate enema**. If refractory, then **sulfasalazine** with **steroid suppositories**. If minimal improvement, change to a two-week trial ***Colocort*** (**hydrocortisone retention enema**); if improvement, continue four additional weeks. If symptoms persist, oral ***Colazal*** may be helpful.

Sigmoidoscopy is indicated when refractory to the above, as evidenced in one study that showed a 6% incidence of malignancy. For refractory bleeding, studies have shown benefit from direct application (by the gastroenterologist) of dilute **formalin** (usually 4%) by a gastroenterologist., Nd:YAG Laser therapy or Argon plasma coagulation have also been shown to be beneficial. Finally (or prior to formalin/coagulation), begin a three-month course of **Trental** and **Vitamin E** (extend to six months if improvement), or proceed to hyperbaric oxygen.

**Balsalazide** (***Colazal***) -2250 mg po tid

**Cholestyramine** (***Questran***, generic) -1 packet or 1 scoopful mixed per directions po qd initially; may increase to 1 -2 packets or scoopfuls po bid
-1 scoop (9 gms) or 1 gm packets contain 4 gms cholestyramine (mix dose with at least 2 oz water)

***Colocort*** (**hydrocortisone retention enema**) -1 pr q hs, retain for 1 hr to all night
-single dose units, 100 mg hydrocortisone/60 ml

**Diphenoxylate/atropine** (***Lomotil***,generic is ***Lonox***) -2 tablets or 10 ml po q am or initially; 1 after each loose stool as needed
-**diphenoxylate** 2.5 mg/**atropine** .025 mg per tablet or 5 ml
note: maximum 8 tablets or 40 ml per day

**Formalin** -apply directly to involved area; most use a 4% solution.

**Hydrocortisone Rectal Suppository** (***Anusol-HC***, generic)
-1 pr bid -tid - boxes of 12 and 24

**Lactulose** (***Cephulac***, generic) -adjust from 30 -45 cc po qd -qid
***Kristalose*** (less sweet) – 10 – 20 mg po qd, up to 40
-10 mg and 20 mg packets; cartons of 30

**Loperamide** (***Imodium AD***, generic) -2 – 4 mg po q am, then 2 mg po prn
-1 – 4 mg po qd -bid as prophylaxis if needed
-caplet 2 mg -liquid 1 mg/5 ml

**Pancrealipase** (***Pancrease***)– 400 -2500 units/kg/meal
-Capsules of 4k, 10k, 16k, & 20k of lipase
***Creon*** 10 & ***Creon*** 20 -1 po with meals

**Pentoxifylline** (***Trental***, generic) -400 mg po tid with meals
note: do not use if history or cerebral or retinal bleeding

**Prednisone** – 10 to 40 mg po q day

**Sucralfate enema** – 2 grams in 50 ml water. Bid for 10 – 14 days

**Sulfasalazine** (***Azulfidine***, generic) 500 mg po bid -qid ; up to 1000 mg qid -tablets 500 mg
-***Azulfidine-EN*** -enteric coated tablet

**Vitamin E** (**tocopherol**) – 1000 IU po qd

## Esophagitis

For early esophagitis without CTX (especially with steroid therapy), suspect candida and treat with aggressive systemic medication (**fluconazole**). For XRT-esophagitis, initially prescribe topical anaesthetics (***Triple mix***), adding prn systemic pain medications (e.g. **hydrocodone elixir**) and scheduled pain medications (e.g. **transdermal patches**). Reflux may exacerbate esophagitis - prescribe antacids, PPI, or H2B initially (consider doubling PPI or H2B), followed by ***Carafate***. ***Advera***, a semi-elemental nutrition supplement, is peptide-based, and enhances the body's ability to heal the alimentary tract (see nutrition section).

Erosive pill esophagitis presents as a sudden onset, very localized, severe odynophagia (**hydrocodone** is one pill commonly involved). Healing can take up to three weeks; pain management often requires class II narcotics. For prevention (especially in patients with dysphagia), recommend pills be coated with cooking or olive oil before ingesting.

***Carafate*** suspension (**sucralfate**) -2 tsp swish and swallow qid
-suspension 1 g/10 ml

**Fluconazole** (***Diflucan***, generic) -200 mg po day 1, then 100 mg po qd, x 7 days (if candida recurs, repeat for 21 days)

**Hydrocodone/acetaminophen elixir** (generic) -15 ml po q 4 h
-***Lortab elixir*** -7.5/500 mg per 15 ml
-***Hycet*** -7.5 mg/325 mg per 15 ml

***Triple mix*** – 2 tsp q ac and q hs
-mix 1:1:1 Benadryl elixir:Maalox:viscous Xylocaine 2%
note: anesthetic lasts ~ 20 minutes; may as needed

## Enteral/Oral Nutritional Supplements

Maintaining adequate nutrient, fluid, and electrolyte intake/balance with the myriad of potential radiation side effects can be difficult. Other sections address issues of intake and diarrhea management.

Maintaining oral intake may require management of anorexia, loss of taste, xerostomia, nausea, odynopagia/dysphagia. If available, a registeted dietitian can provide support. On a very individualized basis, tube feeding may be indicated once the patient begins weight loss. Parenteral feeding (TPN) is a last resort in some circumstances (e.g. vomiting, severe diarrhea, etc). It is important to monitor weight closely late in late radiation treatment and subsequently until the patient "turns the corner"; this will vary considerably from patient to patient.

***General Guidelines for Calculating Basic Nutritional Needs***:

Minimal daily caloric needs**:**

Normal weight: weight (kg) x 25 cal/kg

Decreased weight: weight (kg) x 35 cal/kg

Stressed weight loss: weight (kg) x 45 cal/kg

Minimum daily protein needs:
Normal weight: weight (kg) x 0.8 gm protein/kg
Decreased weight: weight (kg) x 1.0 gm protein/kg
Stressed weight loss: weight (kg) x 1.5 g protein/kg

Fluid needs: 1 ml per calorie

When using a tube feeding formula, fluid needs are the same, but the fluid in the supplement plus tube flushing fluid is included in the total amount.

***Oral Intake/Supplements***

A patient should be maintained on a regular diet as long as possible. Eventually, they may require addition of oral supplements, and eventually oral supplements alone.

The reality of caloric intake can be quite different versus the patients' perspective - daily calorie counting can be invaluable to demonstrate inadequate intake to the patient, and as a guide to adequate diet.

A common issue - the desire to start or resume a healthy diet – can exacerbate weight loss due to: low calorie to volume ratio (early satiety reduces total caloric intake); a healthy high fiber diet (painful to swallow, and again with decreased caloric volumes).

Examples of Oral Supplements - per 8 oz can

Retail:
***Boost*** – 240 cals & 10 gm protein
***Boost*** Plus – 360 cals & 13 gm protein
***Boost*** High Protein – 240 cals & 15 gm protein
***Boost*** with Fiber – 240 cals & 10 gm protein & 3 gm fiber
***Boost*** Glucose Control– 190 cals & 3 gm fiber
***Ensure***– 250 cals & 9 gm protein
***Ensure*** Plus – 355 cals & 13 gm protein
***Ensure*** High Protein – 230 cals & 12 gm protein
***Ensure*** with Fiber -250 cals & 9 gm protein & 3 gm fiber
***Enlive Juice Drink*** -300 cals & 10 gm protein
***Glucerna*** -220 cals (for diabetics; contains sugar alcohols)

***Nutritional Support*** (Walgreen's, lower cost) – 335 cal & 13 gm protein
***Prosure*** (introduce in small amounts & increase to a maximum of 2 cans daily) -300 cals & 16 gm protein; high ratio of omega fatty acids

Also:
***Carnation Instant Breakfast***, with 1 cup whole milk – 315 cals & 12 gm protein
***Scandi-Shake***, 3oz with 1 cup whole milk – 600 cals & 12 gm Protein

***Impact*** products by Nestle – Prescription lactose-free and gluten-free products that taste well and are to improve immune response: ***Impact***, ***Impact Advanced Recovery***, ***Impact Glutamine***, ***Impact Peptide***

Oral Supplements are available retail at the local drugstore or supermarket. Tube Feeding Supplements are available through a medical supply company; a doctor's order is required if insurance reimbursement is anticipated (usually only reimbursed if this is the sole source of nutrition for the patient).

Tube Feeding Supplements (medical supply only) -per 8 oz can
***Jevity*** 1 – 250 cals & 10.5 gm protein
***Jevity*** 1.2 – 285 cals & 13 gm protein
***Jevity*** 1.5 – 355 cals & 15 gm protein
***Osmolite*** – 250 cals & 9 gm protein
***Osmolite*** 1 – 250 cals & 10.5 gm protein
***Osmolite*** 1.2 – 285 cals & 13.2 gm protein

***General Guidelines for Tube Feedings.***

- Transition patient to feeding tube when they are unable to consume 75% of dietary needs orally
- Be aware of fluid (and electrolyte) needs, which are increased with vomiting, diarrhea, and ostomy drainage
- Most patients tolerate a standard formula; others may require specialized formulas (e.g. organ dysfunction, diabetes, etc).
- For cancer patients, the usual tube type is gastrostomy or jejunostomy

**Feedings may be**

Bolus (via syringe). ~ 250 ml over 10 – 20 minutes. Best for ambulatory patients. May cause cramping, pain, nausea, or vomiting

Intermittent (gravity or feeding pump). 250 – 500 ml over 60 minutes.

Cyclic (feeding pump). Specific volume for 8 – 20 hours per day. Used when transitioning back to normal diet.

Continuous (feeding pump). For jejunal feeding, and those unable to tolerate bolus feedings (reflux, aspiration, medically unstable).

## Hiccups

Hiccups may be remedied by a number of physical maneuvers:
-breath holding, Valsalva maneuver
-pharyngeal stimulation – sipping cold water, swallowing a teaspoon of dry sugar
-pressing on eyeballs
-pulling knees hard into chest

Hiccups can be secondary to reflux – consider a proton pump inhibitor.

**Baclofen** is a good intial choice followed by ***Reglan.*** ***Thorazine*** is used for refractory hiccups. Other drugs used for refractory hiccups, include **scopolamine**, **amphetamine**, **prochlorperazine**, **phenobarbital**, and narcotics. Phrenic nerve block has been used in severe cases.

**Baclofen** (***Gablafen***, generic) -5 mg -20 mg po tid; titrating up at 2 day intervals
note: antispastic muscle relaxant

**Metoclopramide** (***Reglan***, generic) -10 mg -20 mg po q 4 hr
-syrup 5 mg/5 ml

**Chlorpromazine** (***Thorazine***) -25 mg IVor IM, or 50 mg po tid (range 25 mg po tid -50 mg po qid); maintenance 10 mg 50 mg po tid
-syrup 10 mg/5 ml

## Motility Agents

Antimotility agents should be considered as second line therapy for refractory diarrhea and bowel/gas cramping (see Diarrhea section). ***Levsin*** is a good first choice for spastic colon. ***Librax*** is another antispasmodic, with the added benefit of sedation.

For early satiety, ***Reglan*** is used to increase motility. It can also be used following esophagectomy with stomach pull-through, to improve food passage through the thorax.

**Dicyclomine** (***Bentyl***, generic) -20 mg po qid, to 40 mg po qid if tolerated
-syrup 5 mg/5 ml, 10 mg/5 ml

**Hyoscyamine** (***Levsin***, generic) .125 -.25 mg po/sl tid -qid
-***Levsinex TIMECAPS***-.375 -.75 mg po bid -tid

**Chlordiazepoxide/clidinium** (Librax) -1 -2 po q ac and q hs

**Metoclopramide** (***Reglan***, generic) -10 mg -20 mg po q 4 hr

## Nausea/Vomiting

Nausea can result from chemotherapy, opioid induced constipation or direct nausea, anxiety, delayed gastric emptying, excess flatus, diarrhea, vertigo, brain mets, etc. For XRT-induced nausea, **ondansetron** or **granissetron** 45 minutes prior to XRT are initial choices, with addition of ***Ativan*** if needed. **Prochlorperazine** are **promethazine** are second choices, although less efficacious.

For chronic XRT-induced nausea, consider a longer acting, prophylactic antiemetic, such as ***Zofran*** or ***Kytril***. If nausea persists, consider addition of **metoclopromide**, anxiolytic, or steroid. If the patient can tolerate the side effects, ***Marinol*** (Class III) can be effective .

Educate the patient whether the antiemetic is to be taken prn or scheduled, and insure the patient is following prescription instructions. The patient may benefit by decreasing fat or being on a clear liquid diet during the time the nausea is worst. Clear liquid supplements, such as ***Resource Juices***, are a consideration.

***Ativan*** (**lorazepam**, generic) -anticipatory -1 mg -2 mg po 45 min prior to XRT
-adjunct to antinausea medications .5 mg -1 mg po tid
-tablets .5 mg, 1 mg, 2 mg

***Compazine*** (**prochlorperazine**, generic)
-oral -5 mg -10 mg po q 6 -8 hrs
-tablets 5 mg, 10 mg, 25 mg -syrup 5 mg/5 ml
-oral spansules -10 – 15 mg q 12 hrs, or 15 – 30 mg q am
-spansules 10 mg, 15 mg, 30 mg
-suppositories -25 mg bid

**Dexamethasone** (***Decadron***, generic) -2 -4 mg po q 8 h
-tablets 0.5 mg, 0.75 mg, 1.5 mg, 2 mg, 4 mg, 8 mg

***Kytril*** (**granisetron**) -2 mg tablet po 1 hour within XRT
-tablets 1 mg -oral solution 2 mg/10ml

***Marinol*** (**dronabinol**) -2.5 -10 mg po q 6 -8 hrs
-capsules 2.5 mg, 5 mg, 10 mg

**Metoclopramide** (***Reglan***, generic) -10 mg -20 mg po q 4 hr
-tablets 5 mg, 10 mg -syrup 5 mg/5 ml

***Phenergan*** (**promethazine**, -12.5 -25 mg po/pr q 4 -6 hrs
-tablets 12.5 mg, 25 mg, 50 mg - syrup 6.25 mg/5ml
-suppositories 12.5 mg, 25 mg, 50 mg; 12 per box
-ampuls 25 mg/ml, 50 mg/ml
note: sedating, may potentiate CNS depressants
NOTE reduction: 6.75 -12.5 mg IV/IM q 4 -6 hr

***Zofran*** (**ondansetron**, generic -8 mg po q 8 hrs
-also ***Zofran ODT*** (Orally Disintegrating Tablet, generic)
-tablets 4 mg, 8 mg -solution 4 mg/5 ml
-and ***Zuplenz*** – Oral dissolving film
- film 4 mg, 8 mg

## Constipation

Chronic constipation occurs in 20% to 40% of patients receiving narcotic pain medications. Patients may manage using their personal historic approaches: high fiber diet, prunes or prune juice, ***MOM***, stool softeners, etc.

For chronic constipation, bulking agents alone may be successful (high-fiber diets and bulking agents can cause obstipation if fluid intake is inadequate). Daily **docusate** or ***Miralax*** may be required, advancing to stimulant laxatives as needed.

If more aggressive therapy is required (especially recent onset and/or narcotic induced) rule out fecal impaction. Daily **senna** with or without **docusate** is a good first choice. Advance to **magnesium citrate** to initiate bowel movement, then **senna**. If refractory, begin **lactulose** or OTC **sorbitol,** with the addition of ***Reglan*** as needed. If still no benefit in the setting of opiod - iinduced constiption, advance to ***Amitiza*** or ***Movantik***. A newer drug for opioid induced constipation is Class II subcutaneous ***Relistor***.

If refractory fecal impaction has occurred, arrange for admission or home health consult, and manual disimpaction and/or soap suds or tap water enema.

Rectal suppositories should be placed against the rectal wall and not in stool. **Senna**, **lactulose** and ***MiraLax*** can cause bloating and abdominal cramping; add an antiflatulant (**simethicone**) if needed. Elecrolyte levels should be periodically checked, except for patients solely on stool softeners or bulking agents.

***Amitiza*** **(lubiprostone)** – 24 mcg bid

**Bulking Agents**
**-calium polycarbophil** (e.g. ***FiberCon***) – 1 gm po qid
**-methylcellulose** (e.g. ***Citrucel***) – 2 gm po qd – tid
**-psyllium** (e.g. ***Metamucil***) – 1 – 2 tsp po qd – tid
**-wheat dextrin** (***Benefiber***) -2 tsp tid (dissolves in beverages & soft foods; used in cooking)

**Lactulose** (***Cephulac***, generic) -adjust from 30 -45 cc po qd -qid
***-Kristalose*** (less sweet) – 10 – 20 mg po qd, up to 40

**Bisacodyl** (e.g. ***Dulcolax***, OTC laxative) -10 mg – 30 mg po prn
-5 mg – 10 mg per rectum prn
-po effective in 1 to 6 hours; pr effective in ~15 minutes

**Docusate** – 50 – 400 mg qd, 1 – 4 doses

***Fleets enema*** (generics available, OTC) -1 -2 as directed pr prn
***-Fleets*** Biscadoyl Enema -if phosphate or sodium enema contraindicated
***-Fleets*** Mineral Oil Enema -for passage of hard stools
***-Fleets*** Enema -regular formula

**Magnesium Citrate** (OTC) -1/2 -1 bottle po prn (may titrate to lower dose) -bottle 10 oz

**Magnesium hydroxide** (***Milk of Magnesia***, OTC) – 2–4 tbs po qd

***Miralax*** **(Polyethylene glycol)** – 17 gm in 8 oz fluid qd
-for severe constipation, multidose (i.e. bowel prep) with 17 gm per hour to 3, possibly 4 doses maximum

***Movantik*** (**naloxegol,** schedule II) – 25 mg qam (reduce to 12.5 mg prn)
- tablets 12.5 mg, 25 mg

***Relistar*** (**methylnaltrexone**, schedule II) – 8 - 12 mg subq qod
- weight 84 to 134 #, 8 mg subcutaneous qod
- weight 135 to 250#, 12 mg subcutaneous qod
- Weight 251#, 0.15 mg/kg subcutaneous qod

**Senna** (e.g.***Senokot***, generic, OTC) – 1 – 4 tablets qd to tid
- some preparations have stool softener (e.g. ***Senokot-S***)
- ***SenokotXTRA*** -double strength

**Sorbitol** (OTC 70% solution)
- acute constipation – 30 – 150 ml, x 1
- chronic constipation – 15 – 30 ml qd

***Texas cocktail*** (OTC) -30 ml mineral oil in 8 oz juice; follow at 1 hour with 10 oz **magnesium citrate**

## Acute Proctitis/Tenesmus

OTC ***Preparation*** H suppositories are a good initial choice for hemorrhoid inflammation; if of minimal benefit, prescribe ***Anusol HC*** or ***Proctocort*** suppositories for internal hemorrhoids, and ***Proctofoam HC*** or ***Cortifoam*** for external hemorrhoids.

For XRT-induced proctitis or tenesmus/urgency, determine whether the irrtitation is external or internal to the anal verge. If internal, use stool softeners and OTC medications initially, then ***Anusol HC*** or **Proctocort** suppositories, ***Proctofoam HC*** or ***Cortifoam***. If unresponsive, the best is for **sodium butyrate** enemas which require compounding pharmacy. Alternately, consider **sucralfate** enema for 2 weeks; if minimal response, advance to ***mesalamine*** suppository.

For perianal irritation, use OTC ***Tuck's Ointment*** (previously Anusol HC), ***Nupercainal Ointment*** or ***ELA-Max*** for relief. If refractory, prescribe ***Proctofoam HC*** or ***Cortifoam***, advancing to ***Pramosone*** or ***Analpram*** if needed.

For extensive perianal skin breakdown, ***Silvadene*** (or **Silver Med**) is an intitial choice. If needed, advance to a combination of ***Domeboro*** soaks, Silvadene, and a final layer of **lidocaine** preparation**.**

For sudden onset, severe pain with bowel movement and tenesmus, rule out rectal fissure (managed differently). ***Analpram*** and high fiber diet are the mainstay with a longer perirecovery period.

***Analpram-HC*** – apply tid – qid cream
-***Analpram*** cream 1%, 2.5% -***Analpram*** lotion 2.5%

***Aquaphor*-Original Formula/Xylocaine 5% Ointment** -apply tid
-mix 1:1 by pharmacist, produces a soothing cream

***Cortifoam*** (**hydrocortisone** 10%) – 1 pr qd – bid
-15g (14 dose) applicator

***ELA-Max 5 Anorectal Cream*** (5% lidocaine -OTC) – apply to intact skin

**Hydrocortisone Rectal Suppository** (***Anusol-HC***, generic)
-1 pr bid -tid

***LMX.5*** (5% lidocaine cream -OTC) 15 gm, 30 gm tubes

**Mesalamine**
-***Rowasa*** -rectal suspension enema -1 per rectum q hs
-***Canasa*** – rectal suppository – 1 per rectum bid -tid

***Nupercainal Hemorrhoidal and Anesthetic Ointment*** (OTC)
-apply per rectum bid and after each bowel movement

***Pramasone*** (**hydrocortisone** + **pramoxine**) -apply to intact skin qid
-***Pramasone*** Cream 1% -1 oz, 2 oz
-***Pramasone*** Lotion 1% -2 oz, 4 oz, 8 oz
-***Pramasone*** Ointment 1%, 2.5% -1 oz

***Preparation H***
-***Preparation H Hydrocortisone 1%*** (OTC) -apply qid
-***Preparation H Suppositories*** (OTC) -1 pr 3 -5 daily
-***Preparation H Cooling Gel*** (OTC, with aloe)
-***Preparation H Maximum Strength*** (OTC, with topical anaesthetic)

***Proctocort*** (**hydrocortisone**) -30 mg suppository – 1 – 2 pr bid
-1% cream – apply bid – qid prn

***Proctofoam HC*** -apply pr as directed tid -qid
-10 gm (14 unit dose) aerosol container
note: contains hydrocortisone 1%, and pramoxine 1% (a topical anaesthetic)

**Sucralfate enema** – 2 grams in 50 ml water. Bid for 10 – 14 days

**Sodium butyrate enema** (requires compounding pharmacy)
- Sodium butyrate 4.4 mg/ml enema
  60 cc enema bid, x 3 weeks
-

***Tuck's Ointment*** (1% hydrocortisone, OTC) -apply tid -qid

## GENITOURINARY

Radiation of the bladder can cause cystitis, urgency, frequency, dysuria, and nocturia. Bladder infection may occur during the first week if bacteria are introduced with contrast at simulation, or during the third to fifth week as bladder wall integrity is compromised by XRT. Non-infectious cystitis is mild and intermittent initially, beginning in the third to fifth week. Patients with enlarged prostates are at risk for increased urinary obstructive symptoms (often with dysuria) secondary to XRT-induced prostate oedema, as early as the second treatment.

Increased frequency and volume without increased fluid intake suggests diabetes; urinalysis will establish infection versus glucosuria. Urgency, frequency and/or dysuria, with a good stream and no hesitation, suggests bladder spasms and/or cystitis – treat wth analgesics or antispasmodics if UA is negative; antibiotics if UA is positive. Urgency, frequency and/or dysuria, with hesitancy and intermittent or decreased stream, suggests obstruction - treat with a urinary obstruction modifier, adding analgesics if needed.

NOTE: **Finasteride** compounds, ***Propecia*** (used for hair growth), ***Avodart***, and ***Proscar*** can dramatically reduce (50%, up to 90%) Prostate Specific Antigen levels.

NOTE: To rule out UTI after hours or weekends, consider home urine tests, such as **UTI Tests** or **AZO Test Strips**.

## Analgesics/Antispasmodics/Incontinence

Infectious or XRT-cystitis and bladder spasms can cause dysuria from the tip of the penis to the suprapubic region. The below presumes UTI has been ruled out, or that symptoms persist post treatment.

For painless increased frequency with good force of stream, or for pain through the course of urination, treat topically with **Phenazopyridine**. If dysuria remains severe, advance to ***Urised*** or ***Prosed DS***, and then ***Elmiron*** or systemic pain medications. (caution the patient regarding urine discoloration with some of these medications.

If flow is good, but there is urgency, pain at initiation or completion of urniation, or urge incontinence, treat for bladder spasms with antispasmodics - ***Enablex***, ***VESIcare***, ***Detrol LA***, ***Ditropan XL*** or ***Urispas***. If symptoms persist, one study showed benefit with the drug combination ***Ditropal XL*** and ***Detrol LA*** . If severe symptoms persist, consider **Hyoscyamine**, ***Donnatal Extentabs***, or ***B&O Suprettes***.

The most common types of urinary incontinence in the XRT patients are (1) urge incontinenc, (2) mechanical incontinence (post prostatectomy, or TURP), and (3) overflow incontinence. For urge and mechanical incontinence, antispasmodics are the initial treatment of choice. For refractory mechanical incontinence, placement of an 'urethral blocking device' may provide significant benefit. See the **Urinary Obstruction Modifiers** section for recommendations regarding overflow incontinence.

***B & O Supprettes*** (***belladonna/opium***, Class II)
-1 supprette PR qd - -qid
-15A: 30 mg **opium**, 16.2 mg **belladonna**
-16A: 60 mg **opium**, 16.2 mg **belladonna**

***Detrol LA*** (**tolterodine**) – 4 mg po qd
-tablets 2 mg, 4 mg

***Ditropan XL*** (**oxybutynin**, generic) – 5 -10 mg qd; increase 5 mg qd weekly to 30 qd max
-tablets 5 mg, 10 mg, 15

***Elmiron*** (**pentosan**) – 100 mg po tid
-capsules 100 mg

***Enablex*** (**darifenacin**) -7.5 mg, advancing to 15 mg po qd
-tablets 7.5 mg, 15 mg

**Hyoscyamine** (***Levsin***, generic) .125 -.25 mg po/sl tid -qid
-tablets .125 mg -elixir .125 mg/5 ml
-L***evsinex TIMECAPS***-.375 -.75 mg po bid -tid
-capsules, tablets .375 mg
-***Donnatal Extentabs*** – 1 po bid (to tid)
-**hyoscyamine**+**phenobarbital**, **atropine**, **scopolamine**

***Oxytrol*** (***Oxybutynin Transdermal System***) -1 patch q 3 - 4 days

***Prosed DS*** (combination of local analgesic, antiseptic and parasympatholytic) -1 tab qid
note: contraindicated in glaucoma, urinary bladder neck obstruction, pyloric or duodenal obstruction, or cardiospasm; do not use with sulfonamides. Formulation includes atropine.

**Phenazopyridine** (***Pyridium***, or OTC ***Azo-Standard***) -200 mg po tid
-tablets 100 mg, 200 mg -OTC tablets 95 mg

***Urispas*** (**flavoxate**) -100 mg -200 mg po tid -qid

**VESIcare** (***solifenacin***) -5 mg, advancing to 10 mg po qd

## Antibiotics

For acute cystitis/UTI, consider ***Bactrim/Septra*** initially, with ***Cipro*** or ***Levaquin*** as second-line therapy for 7 – 14 days. Additional options are ***Keflex*** and ***Augmentin***. Prostatitis (boggy, tender prostate on exam) requires longer therapy, 28 days of ***Levaquin*** or 3 months of ***Bactrim***.

For uncomplicated implant procedures, ***Ancef*** 1 gm IV or ***Levaquin*** 500 mg IV is recommended. If bacterial endocarditis prophylaxis is indicated, administer ***Ampicillin*** 2 g and ***Gentamicin*** 1.5 mg/kg (120 mg max) 30 min pre procedure, and ***Ampicillin*** 1 g at 6 hrs is recommended. Alternately, ***Vancomycin***
1 gm and ***Gentamicin*** 1.5 mg/kg (120 mg max) 30 min pre procedure can be used.

**Amoxicilin/clavulanate** (***Augmentin***, generic) -500/125 mg tid

**Cephalexin** (***Keflex***, generic) – 500 mg qid

**Ciprofloxacin** (***Cipro***, ***Cipro XR***, generic) -250 -750 mg po bid
-***Cipro XR*** - 500 mg -1000 mg qd

**Levofloxacin** (***Levaquin***)– 500 -750 mg qd
-oral solution 250 mg/10 ml

**Nitrofurantoin** (***Macrobid***, generic) -treatment -50 mg-100 mg qid
-long-term suppression -50 mg -100 mg po q hs

**Trimethoprim/sulfamethoxazole** (***Bactrim***, ***Bactrim DS***, generic)
-treatment -2 regular or 1 DS tablet po q 12 hrs
-long-term suppression -1 regular po qd
-suspension available: 40 mg/200 mg per 5 ml

## Erectile Dysfunction Therapy

Erectile dysfunction can have many causes. The onset following XRT is roughly 8 to 16 months. The primary etiology in XRT-induced ED is arteriogenic. Studies indicated limiting dose to the penile bulb and corporal bodies decreases risk. Prostatectomy more commonly involves a neurogenic compromise.Other etiologies include antiandrogen therapy, pharmaceuticals (e.g. blood pressure medications, antidepressants), and psychological issues.

***Viagra***, ***Levitra, Cialis*** or ***Stendra*** (PDE5 inhibitors) are effective approximately half the time for XRT-induced erectile dysfunction; they are prescribed as one dose per day max, except low-dose ***Cialis*** that may be taken on a daily basis. ***Viagra*** or ***Levitra*** are taken approximately 1 hour prior to intercourse; ***Stendra*** can be taken 30 minutes prior to activity. Duration of benefit is 4 to 5 hours, except ***Cialis*** may have provide benefit to 36 hours (single dose regimen). Contraindications include organic nitrates in heart patients, and alpha blockers (except ***Flomax***).

Erectile function refractory to medication is managed by the urologist - options include “the pump”, ***Caverject*** injections to the penile shaft, and ***MUSE*** urethral suppositories.

***Cialis*** (**tadalafil**) - 10mg qd prn (range 5–20mg) as single dose
- 2.5 mg qd (up to 5 mg qd) for continuous dosing

***Levitra*** (**vardenafil**) -10 mg po prn (range 5 – 20 mg)

***Stendra*** (***avanafil***) – 100 mg qd prn(range 50 – 200 mg)

***Viagra*** (**sildenavil**) – 50 mg qd prn (range 25 mg to 100 mg)

## Male Hot Flashes

Progestional agents (e.g. ***Megace***, ***Depo-Provera***) and certain antidepressants (e.g ***Effexor XR***) provide the most consistent relief.

***Depo-Provera*** (**Medroxyprogesterone**) – 150 mg I.M. q 3 months

***Effexor XR*** (**Venlavaxine**) – 75 mg po qhs

**Megesterol** (***Megace***, generic) -20 mg po bid, 10 mg qd or qod once responsive.

## Hematuria and Chronic Radiation Cystitis

Sudden onset hematuria can be caused by UTI, radiation cystitis, tumor retraction, or bleeding diathesis. If during XRT, rule out UTI, and then provide supportive care, unless bleeding is severe or does not begin to improve 4 weeks post radiation. For acute bleeding following an implant procedure, manage initially with bladder irrigation (saline or distilled water). If this fails after 24 hours or there is severe clot formation disrupting the irrigation process (and platelets are normal and coagulation is not an issue), ***Amicar*** may be of benefit.

For late or persistant bleeding , rule out UTI and assess and adjust (if possible) anticoagulations therapies (e.g. decrease **aspirin** from 325 mg/d to 81 mg/d). Several studies have shown benefit from direct application of dilute **formalin**, usually 4%, or use of Argon plasma coagulation. Finally try a three month course of ***Trental*** and **Vitamin E** (extend to six months if improvement). Proceed to hyperbaric oxygen if needed.

Managing late radiation cystitis symptoms can be complex (and frustrating for all involved). Occasionally, chronic prostatitis or an UTI deep in the bladder walls will produce symptoms, and may require long-term antibiotics. Antispasmodic may be required; some patients will require urinary obstruction modifiers (UOB) and antispasmodics. If symptoms persist, bladder analgesia therapy is the next choice – consider ***Elmiron*** before using systemic narcotics. Eventually, long-term pain management may be the only option.

If decreased flow does not respond to urinary obstruction modifier (UOB) medications, cystoscopy is indicated to reduce any urethral strictures and assess for bladder outlet obstruction. If TURP is indicated; it should be staged in multiple procedures (if possible), removing as little tissue as possible for relief of symptoms.

***Amicar*** (**Aminocaproic Acid**) – 5 g in 250 ml IV, or 5 mg PO 1st hour; then 1 g po or IV q hr. - maximum 8 g qd.
-injectible 250 mg/ml

***Elmiron*** (**pentosan**) – 100 mg po qd

**Formalin** -apply a 4% solution directly to involved area

**Pentoxifylline** (***Trental***, generic) -400 mg po tid with meals
-tablets 400 mg
- 3 months trial, extend additional 3 months if effective
note: do not use if history or cerebral or retinal bleeding

**Vitamin E** (**tocopherol**) – 1000 IU po qd

## Urinary Obstruction Modifiers

Radiation can cause oedema of the prostate very early in the course of treatment, further obstructing a compromised stream. With normal urination, the onset will be slower. Obstruction can also occur in the acute and chronic post implant phase. Ensure that the patient is not on antihistamines, decongestants, antispasmodics, or anticholinergics, which increase urinary obstruction symptoms.

For acute and chronic urinary obstructive symptoms seconday to BPH and/or XRT-oedema, alpha 1 blockers are the treatment of choice (decreasing smooth muscle tone in the prostate, prostate capsule, and proximal urethral sphincter). ***Flomax***, ***Rapaflo***, and ***Uroxatral*** can provide excellent relief with less potential for hypotension. ***Proscar*** and ***Avodart*** provide antiandrogen therapy (5a reductase inhibitors; will also lower PSA) and requires months for effectiveness, but may be especially useful in treatment of chronic obstruction. For severe symptoms, use a combination of alpha-1 blocker and 5a reductase inhibitor (e.g. ***Jalyn***).

Occasionally an indwelling catheter or suprapubic catheter, is required throughout the course of therapy or in the post implant phase, versus intermittent self catherization (patients preference). External XRT-induced oedema usually begins to subside 2 -4 weeks post treatment. In patients presenting with severe obstructive symptoms prior to XRT, obstruction may require surgical intervention or permanent catheter.

***Avodart*** **(dutasteride)** -0.5 mg qd

***Flomax*** **(tamsulosin**, generic) – 0.4 mg–0.8 mg qd

**Jalyn (*dutasteride/tamsulosin*)** – 1 tablet post same meal qd

***Proscar*** **(finasteride**, generic) -5 mg qd

***Rapaflo*** **(sildosin,** generic**)** – 4 mg to 8 mg po with same meal qd

***Uroxatral*** **(alfuzosin)** – 10 mg po following same meal qd

# GYNECOLOGICAL

## Perineal Reaction

Radiation to the labia, perineum and inguinal folds often results in severe skin reaction, requiring a break in treatment. Use steroid creams cautiously, as fungal infections can develop in the moist skin. Distal dysuria from desquamation around the meatus can be reduced using **aquaphor** as a barrier. ***Domeboro*** soaks should be started early, with ***Silvadene*** or ***SilvaMed*** applied after drying. Add oral pain medications or topical anaesthetics as needed.

## Acute Vaginitis

Vaginal irritation may be secondary to radiation or to superinfection. Normal vaginal discharge (nonirritating, milky white or mucoid, odorless) often increases during radiotherapy, and does not indicate infection. Infectious etiologies include bacterial (40-50%), candida (10-25%), and trichomonas (15-20%).

For noninfectious etiology, consider standard OTC douche, **hydrogen peroxide** douche, ***Betadine*** douche and suppositories, or ***Replens*** moisturizer. If symptoms persist, topical **lidocaine** or ***EMLA*** usually provides benefit. For postmenopausal atrophic vaginitis, consider topical hormonal therapy (e.g. ***estradiol vaginal cream***, vaginal tablets, or ***estradiol rings***).

The most common etiology for symptomatic (pruritus, soreness) vaginitis is candida, which produces a thick, white orodless, curd-like discharge. Clinicians should have a low threshold for suspicion, and treat early. Candidal vaginitis risk increases with diabetes, steroids use, and immune compromise. Use OTC topical meds initially (e.g. ***Monistat***, ***Femstat***, or ***Mycelex***): add ***Diflucan*** if refractory.

Bacterial vaginosis has minimal irritatative/pruritic symptoms, and produces a profuse, gray, thin discharge, often with a fishy smel. Topical **metronidazole** or **clindamycin** is the treatment of choice (oral **metronidazole** also works, with increased side effects). Trichomoniasis (8 – 13% in older populations) produces a greenish-yellow purulent discharge. Confirm with laboratory testing, treat with **metronidazole**.

***Betadine medicated douche*** (**povidine-iodine 10%;** OTC mixtures)
-2 tbsp concentrate to quart warm water qd
-concentrate 1 oz, 8 oz; ½ oz packets

***Betadine medicated gel*** (**povidine-iodine 10%,** OTC**)**
-one applicator full q hs; may apply externally as well
-18 gm tubes (single use); 3 oz tubes

***Betadine medicated vaginal suppositories (*****povidine-iodine** 10%,
-OTC) -insert intravaginally q hs
-suppositories 7 per package with applicator

**Butoconazole** – (***Femstat-3***, generic, otc) – q d to q 3 d

***Cleocin Vaginal Ovules*** (**clindamycin**) -one ovule intravaginally q hs x 3 d -3 pack ovules, with applicator

**Clotrimazole** (***Mycelex***, generic, OTC)–qd x1, 3or 7d
-e.g. **Mycelex**-3, **Mycelex**-7
-cream or vaginal tablets; follow insert instructions

***Diflucan*** (**fluconazole**, generic) -150 mg po x 1 d;
if refractory, 100 mg qd x 14 d

**Hydrogen Peroxide douche** – qd
Mix 1 tsp 3% hydrogen peroxide and 1 cup water

**Lidocaine** -apply to affected area prn for topical anesthesia
-***LMX 4*** & ***LMX 5*** (OTC 4% & 5% cream)

***EMLA Cream*** (**lidocaine** 2.5%, **prilocaine** 2.5%)
-apply topically prn -5 gm, 30 gm

**Metronidazole** (***Flagyl***, generic)– 375 -500 mg po bid
-tablets 250, 375, 500 mg
-***Flagyl ER*** – 750 mg po qd x 7 d
-extended release (ER) 750 mg
-***Metrogel-Vaginal*** (0.75%) -1 applicator qd -bid x 5 days
-70 gm tube with 5 applicators

**Miconazole** (***Monistat***, generic, OTC) -100 mg intravaginally qd x 7 d or 200 mg qd x 3 d
-packages of cream or suppository; follow insert instructions

***Replens Vaginal Moisturizer*** (OTC) -one applicatorful q 2-3 d as -needed
-boxes of 3 or 8 pre-filled applicators (2.5 gm)

## Vaginal Late Toxicity

Severe acute vaginal radiation toxicity predicts for late vaginal necrosis or fistula formation. Conservative management of vaginal necrosis includes local debridement, hydrogen peroxide douches, antibiotics, antifungals, and topical estrogen. Hyperbaric oxygen has demonstrated benefit; lternately, consider ***Trental*** and **Vitamin E**.

Stenosis of the vaginal apex is common post brachytherapy. Early, there may be stricture formation that must be manually lysed by the clinician, or through vaginal dilator use or sexual intercourse. For long-term prevention of vaginal stenosis, routine use of a **vaginal dilator** or sexual intercourse is required. Sexual intercourse has the advantage of decreasing vaginal shortening. Topical medications, as **estrogen** creams, may improve discomfort.

**Estrogen** creams (e.g. ***Premarin Vaginal Cream***, generic)
-three times weekly for 6 to 9 months

**Vaginal Dilators** – use 3 – 5 times weekly, essentially forever
- lubricate and advance into vagina for 10 minutes
-3 sizes

# NERVOUS SYSTEM

## Oedema Management

Primary or metastatic cancer of the brain and the spinal cord is often associated with symptomatic oedema, which can worsen during radiotherapy (especially during the first several fractions). Steroids decrease existing or developing oedema, and help to prevent increased oedema from the radiotherapy. Onset is rapid, with peak plasma levels at 1 hour for IV and 1 – 2 hours for oral routes.

Steroids should never be abruptly discontinued. Depending upon the potential morbidity of progressive oedema, a steroid taper can be initiated during the radiotherapy, reversing the taper if symptoms develop. A taper is begun or continued at treatment completion, with one approach involving a 50% reduction every 4 to 7 days. Oral decadron has a 2 ½ day duration, so equal spacing throughout the day is not required.

Studies show up to 20% steroid myopathy with dexamthasone use. This is a distinctive proximal lower extremity weakness (similar to Eaton- Lambert Syndrome). Resolution (or at least improvement) of symptoms may occur during steroid taper, but usually begins at 1 – 3 months post steroid discontinuation. The weakness should be differentiated from progressive disease and the patient reassured.

For dexamethasone doses 8 per day or higher, prophylactic proton pump inhibitors should be used.

Pneumocystitis pneumoniae occurs in 1.7% of patients on Dexamethasone, increased in HIV-positive patients. Consider prophylactic Bactrim DS especially in this at-risk population.

Oral candidasis is common with dexamethasone use (see "Oral Infection and Candidiasis").

Steroids can dramatically elevate blood glucose levels, especially in diabetics, causing fatigue and altered mental status, easily confused with disease progression or XRT-induced oedema. Other common side effects include hypertension, and Cushinoid appearance.

Steroids often cause insominia, managed initially by alternating the schedule with no dosing after 2 pm. Sleep medications are often indicated. Mood disorders (from hypermania to hypomania) may require psytropic medication. Occasionally, steroid psychosis may develop.

**Dexamethasone** (***Decadron***, generic)
-XRT-induced symptomatic oedema or prophylaxsis
    -2 - 6mg po q6-8h; + 8 mg load initially
-tumor-induced symptomatic edema
    -10 mg -25 mg IV initially, then 4 -10 mg IV/po q 6 hr

## Vertigo

Benign positional vertigo (< 60 second episodes with certain head positions) can be controlled with repositioning manuevers (e.g. **Epley manuever**). For other causes, symptomatic relief requires prophylactic vestibular nerve suppressants: antihistamines (**meclizine**), benzodiazepines (**diazapam**), antiemetics (**ondanzetron**) or anticholanergics (**Scopolamine patches)**.

**Diazepam** (***Valium***, generic) -2 mg -5 mg qid -tid
    -tablets 2 mg, 5 mg, 10 mg

**Meclizine** (***Antivert***, generic, OTC) 25 mg -50 mg po tid
    -tablets 12.5 mg, 25 mg, 50 mg

**Scopolamine patches** (***Transderm Scop***) -apply to skin behind ear; effective for several days per patch
-box containing four patches

***Zofran*** (**ondansetron**, generic -8 mg po q 8 hrs
-also ***Zofran ODT*** (Orally Disintegrating Tablet, generic)

## Seizure

Seizures associated with primary or metastatic brain tumors are usually focal, but may generalize. Incidence is reported at 30 - 40%. Most are managed with **phenytoin** or **divalproeex**. Newer agents, such as **levetiracetam**, **pregabalin**, or **topiramate**, are preferred for their lower side-effect profile. Begin with a single drug regimen.

***Depakote ER*** **(divalproex)** – initial 10-15 mg/kg/day. Titrate upward 5-10 mg/kg/day in weekly intervals for optimal response; maximum 60 mg/kg/day
-extended release tablets 250 mg, 500 mg.

***Keppra*** **(levetiracetam)** -500 -750 mg bid; maximum 3000 mg qd
-tablets 250, 500, 750, 1000 mg
-oral solution 100 mg/ml

***Lyrica*** **(pregabalin)** – 50 mg tid; increase to 200 mg tid max
-capsules – 25mg, 50mg, 75mg, 100mg, 200mg, 225mg, 300mg

**Phenytoin** (***Dilantin***, generic) – 100 mg tid initially, increase 100 mg every 2 weeks to desired response (usually 300 – 600 mg)
- capsules 50 mg
Once stabilized, change to extended release daily
- ER capsules 30, 100, 200, 300 mg

***Tegretol*** **(carbamazepine)** -200 -600 mg bid
-tablets 100, 200 mg -XR 100, 200, 400 mg
-suspension 100 mg/5 ml

***Topamax*** **(topiramate)** – 200 mg bid; weekly increase 50 mg bid to 800 mg bid max -capsules/sprinkles – 15 mg, 25 mg
-tablets – 25 mg, 50 mg, 100 mg, 200 mg

## PAIN MANAGEMENT

**Pearl**

Acetaminophen works centrally. NSAIDs works centrally, and peripherally to block COX 1 (which protects gastric mucosa) and COX 2 (which causes pain and inflammation)

**Aspirin** q 4 h
**IBU** q 6 h
***Aleve*** q 12 h
**Meloxicam** q 24 h
***Celebrex*** q 12 - 24 hr (COX 2 only)

Effective pain management is tailored to the type and intensity of pain. Initial management should target the cause of the pain, and if ineffective, then central acting medications initiated. Some common examples are:

Bone pain/costochondritis – steroid or **NSAID**
Mucositis/esophagitis – topical medications
Breast (tumor bed) pain – **NSAID**
Neuropathic pain – **neurontin**
Brain metastases/oedema – steroids
Gas cramping – ***Gas-X***

Begin acute (or chronic) pain management using immediate release medication, titrating upward until pain controlled. The consider switching to an equivalent dose of long acting pain medication.

Chronic pain management may involve a two-drug approach, a long-acting narcotic administered q 12 – 24 hours, with a short-acting, prn medication for breakthrough pain. Coanalgesics are added as needed.

Equianalgesic effects is usually related to oral morphine

| Oral **morphine** | Oral dose of **opoid** |
|---|---|
| 4 mg | 30 mg **codeine**<br>4 mg **hydrocodone**<br>3 mg **oxycodone**<br>1 mg **hydromorphone** |

For opioid-naieve patients, following starting doses are recommended:

| | |
|---|---|
| **Codeine** | 15 - 30 mg q 4 h |
| **Morphine** | 5 – 15 mg q 6 hr |
| **Hydrocodone** | 5 – 10 mg q 6 h |
| **Hydromorphone** | 2 – 4 mg q 4 hr |
| **Oxycodone** | 2.5 – 10 mg q 6h |

For all opiods, caution is recommended in patients with impaired respiratory funciton, bronchial asthma, increased intracranial pressure, and liver failure.

Constipation is most common, and tolerance is uncommon. Once/if acute impaction is resolved, chronic management can be initiated. Begin with a cathartic (e.g. **senna** 1 qd to 2 tid, with **simethicon** if gas cramps develop) as needed. If ineffective, advance to an osmotic agent (e.g. **lactulose** 30 cc bid to tid). ***Amitiza*** or ***Movantik*** are remaining medical alternatives.

Nausea may develop, but tolerance develops over several days to weeks. Management may be local (e.g. **ranitidine** for **NSAID**), or central (e.g. **prochlorperazine** 10 mg q 6 h, **promethazine** 25mg q 4 h). If persistant, advance to **ondansetron**.

If sedation and altered mental status occur, symptoms usually resolve after several days

- for persistant sedation, consider ***Ritalin*** (5 -10 mg bid) or ***Provigil*** (100 mg – 200 mg q am)
- for persistant confusion, consider ***Haldol*** (.5 -1.0 mg tid)

Sudden onset of nausea or confusion without a change in medications warrants evaluation for brain metastases, liver failure, hypercalcemia, hyponatremia, hypoxemia, or hyperglycemia.

**General Guide in Order of Increasing Oral Analgesic Effects**

| Generic Name (unit size) | Initial Dose | Comments |
|---|---|---|
| **Acetaminophen** (OTC) (325 - 650 mg ER) | 325 -1000 mg q 4 -6 h | 4000 mg/d max. No GI/platelet toxicity. |
| **Aspirin** (OTC) Mult doses, forms | 325 -1000 mg q 4 -6 h | 4000 mg/d max. Platelet toxicity |
| **Ibuprofen** (OTC/Rx) (200 mg, 400 mg, 600 mg, 800 mg) | 200 -800 mg q4-6 | 3200 mg/d max. |
| **Naproxen** (OTC/Rx) (250, 375, 500 mg) | 250 -500 mg Q 12 h | 1500mg/d max. |
| **Indomethacin** (25 – 75 mg ER) | 25 mg – 50 mg qd - bid | 200 mg/d max, |
| **Celecoxib** (100, 200, 400 mg) | 100 mg – 200 mg bid | inhibits COX-2 400 mg/d max. |
| **Meloxicam** (7.5mg, 15 mg) | 7.5 mg – 15 mg qd | |
| **Tramadol** (50 mg – 300 mg ER) | 50 mg -100 mg q4-6h | 300mg/d max. |

**General Guide in Order of Increasing Oral Analgesic Effects (cont'd)**

| Generic Name (unit size) | Initial Dose | Comments |
|---|---|---|
| **Codeine** (15, 30, 60 mg) | 15mg – 60 mg q 4 – 6 h | 360mg/d max |
| **Hydrocodone** (5 mg, 7.5 mg, 10 mg) | 5 – 10 mg q 4 – 6 hr | 60 mg/d max |
| **Oxycodone** immediate to slow release | 4.5 – 9 mg q 4 h to 10+ mg q 12 h | Most formulas contain **aspirin**, **acetaminophen** |
| **Morphine** - immediate to 24 hour release | 15+ mg q 3-4 h to 20+ mg q 24 h | IM/IV available |
| **Hydromorphone** (2mg - 32 mg ER) | 2 – 4 mg q 3 – 6 h | Liquid available Extended-release available |
| **Oxymorphone** – | | |
| Immediate release | 5 – 20+ mg q 4-6 h | |
| 12 hour release | 5 – 20+ mg q 12 h | |
| **Fentanyl** Transdermal 3-day (12,25,50,75,100 ug/hr) | 12 + ug/hr | Skin patch & transmucosal |

## Nonopiod Analgesics

**Acetaminophen** (***Tylenol***, generic, OTC) -325 - 650 mg q 4 -6 h
note: 4000 mg/d maximum; not anti-inflammatory

**Aspirin** (OTC) -325 mg -1000 mg po q 4 -6 h
-multiple doses and formulations
note: 4000 mg/d maximum; anti-inflammatory

**Celecoxib** (***Celebrex***) – 100 mg – 200 mg po bid

**Ibuprofen** -200 -800 mg po q 4 -6 h
-OTC: ***Advil***, ***Motrin***, generic –tablets 200 mg
-Rx: ***IBU*** -tablets 400 mg, 600 mg, 800 mg

**Indomethacin** (***Indocin***, generic) – 25 – 50 mg bid to tid
- begin at 25 mg bid, advance q week.
-exended release capsules 75 mg; Rx 75 mg qd – bid

**Meloxicam** (***Vivlodex***, generic) – 7.5 – 15 mg qd

**Naproxen** (***Naprosyn***, generic) -250 mg -500 mg bid
-suspension 125 mg/5 ml
-OTC (***Aleve***, generic) – caplets, gelcaps, tablets 220 mg
-***Anaprox DS*** (rapid onset) -550 mg bid
-tablets 550 mg note: 1500 mg/d max

**Tramadol** (***Ultram***, generic) -50 - 100 mg q 4 -6 hr
- daily max: 300 mg/d

-***Ultram ER*** -100 -300 mg qd

-***Ultracet*** – 37.5 mg tramadol/325 mg acetaminophen
2 po q 4 – 6 hr
-8 tablets per day max; limit therapy to 5 days

## Opioid Analgesics for Mild to Moderate Pain

**Codeine** -15 mg - 60 mg po q 4 h
- syrup – 15 mg/ml

-**Codeine/acetaminophen** (e..g. ***Tylenol #3***) -30 mg,

-***Tylenol #4*** -60 mg; acetaminophen 300 mg

max: **codeine** 360 mg/d max, **acetaminophen** 4000 mg/d

**Hydrocodone** -5 -10 mg po q 4 – 6 hr
- maximum 5/300 8 per day; 7.5 and 10/300 6 per day

-***hydrocodone/acetaminophen*** (most combinations generic)

-***Lortab*** tablets 2.5/500, 5/500, 7.5/500, 10 mg/500 mg

-***Lorcet*** tablets 5/500, 7.5/650, 10/650 mg

-***Lortab Elixir*** 7.5/500 mg per 15 ml

-***Vicodin*** 5/500mg

-***Vicodin ES*** 7.5/750mg,

-***Vicodin HP*** 10/660mg

-***Norco*** (generic) 5/325, 7.5/325, 10/325 mg

-**hydrocodone/guaifenesin** (generic) - 5 & 15mg per 5 ml

-***HYCOTUSS*** –(5/100 mg per 5 ml) - 5 -15 ml q 4 hr
- 30 mg per day max

-**hydrocodone/chlorpheneniramine** (***Tussionex***) – 5 ml bid
- 10 mg hydrodocone, 8 mg chlorpheriarame per 5 ml

-**hydrocodone/ibuprofen** - 7.5mg/200mg

-***Vicoprofen*** – 1 po q 4 – 6 hr max 5/day

## Opioid Analgesics for Severe Pain (Class II Narcotics)

**Morphine** and **oxycodone** are available in immediate release, standard release, and delayed/extended release forms.

**Fentanyl**

- **transdermal system** (***Duragesic***, generic) -12 ug/hr + q 3 days - patch 12, 25, 50, 75, 100 ug/hr
- **oral transmucocal** (***Actiq***) - 200 + mcg q 30 min prn breakthrough pain
  -100, 200, 400, 600, 800, 1200, 1600 ug
- **buccal transmucosal films** (***Onsolis***) - 200 ug
  -dosing separated by minimum 2 hours
  -once correct dose established, 4 doses per day max
  - films 200 ug, 400 ug, 600 ug, 800 ug, 1200 ug
- **sublingual spray** (***Subsys***) – 100 + ug, 1 - 2 doses, q 4 hrs
  - 1st dose, then can deliver 2nd dose at 30 minutes.
  - begin at 100 ug - no more than 4 episodes per day
  - 100, 200, 400, 600, 800, 1200, 1600 ug per spray
- **intranasa**l (***Lazanda***) – begin at 100 ug q 2 hours, increase stepwise to 800 ug qd max
  - each spray 100 mcL - 8 sprays per vial
  - 100 ucg/100 mcL, 300 ucg/100 mcL, 400 mcg/100 mcL

**Hydromorphone (*Dilaudid*, g**eneric) -2 mg – 8+ mg po q 4 -6 hr

-tablets 2 mg, 4 mg, 8 mg - liquid 5 mg/5 ml

-**extended release** (***Dilaudid-HP)*** – equivalent to total immediate relase daily dose.

- liquid - 2.5 – 10 mg q 3 – 6 hrs - 5mg/5ml

**Morphine**

- **-immediate release** -5 mg + po q 4 h
  - -generic: tabs 10, 15, 30 mg
  - -solution 10 mg/5cc, 20 mg/5cc. 20 mg/cc
  - -**suppositories** – 5, 10, 20, 30 mg
- **-delayed release** -30 mg + po q 8 -12 h
  - ***-M.S. Contin*** -tabs 15, 30, 60, 100, 200 mg
  - -**generic CR**: tabs 15, 30, 60, 100, 200 mg
- **-sustained release** -20 mg + po q 24 hr
  - -***Avinza*** – capsules 30, 45, 60, 75, 90, 120 mg
  - -***KADIAN*** -capsules 20 to 200 mg
  - -both can be sprinkled into applesauce
- **-injectable** – 5 to 20 mg IM/SQ q 4 h
  - - 5 – 15 mg IV q 4 h
  - -IV/IM to po conversion factor ~ 1:4

***Oxycodone*** -4.5 mg -10 mg po q 4 -6 h

- **oxycodone** (generic) -tablets 5 mg; sol'n 5 mg/5 ml
  - -***OxyIR*** – immediate release 5 mg oral capsules
  - -***OxyFast*** – oral concentrate 20mg/1 ml
- **-oxycodone/aspirin** (***Percodan***, generic) -tab 4.5/325
- **-oxycodone/acetaminophen**
  - -***Percocet*** -7.5/325 mg, 10/325 mg
  - -**generic** – 5/325, 7.5/325, 10/325, 5/500, 7.5/500, 10/650 mg
- **-delayed release** -10 - 40 mg + po bid
  - -***Oxycontin*** 10 mg, 20 mg, 40 mg, 80 mg, 160mg
  - -**generic**, CR -10 mg, 20 mg, 40 mg, 80 mg

**Oxymorphone** (***Opana***) -5 -20 mg q 4 -6 hr

- -tablets 5, 10 mg
- -***Opana ER*** -5 -20+ mg q 12 hr
  - -extended release capsules -5 thru 40 mg

## Coanalgesics

**Nonsteroidal antiflammatory** drugs are effective for treating prostaglandin-associated pain, such as bone mets, arthritis, acute surgical pain (see preceeding section for drugs). **Steroids** can reduce oedema and are useful for tumor-induced nerve compression, increased intracranial pressure, and soft tissue infiltration. Neuropathic pain can be rapidly relieved with **gapapentin**. Other coanalgesics include analeptics, anxiolytics, antispasmodics, topical anaesthetics, and muscle relaxants (see subsequent sections). **Amitryptyline** is the antidepressant that has shown most benefit as an adjunct, especially in neuropathic pain. See ***uptodate.com*** for more complete information.

**Amitriptyline** (***Elavil***, generic) – as an adjunct, begin at 25 mg tid; titrate to 50 mg tid
-tablets 10 mg, 25 mg, 50 mg, 75 mg, 100 mg, 150 mg

***Neurontin*** (**gabapentin**) – 300 mg tid, increase to 600 mg tid prn
-capsules 100 mg, 300 mg, 400 mg.
-film-coated tablets 600 mg, 800 mg

## Narcotic Antagonist

***Narcan*** (**naloxone**) -0.4 mg -2.0 mg IV, IM, or SQ; repeated q 2 – 3 minutes
-pre filled syringes and ampules -0.4 mg/ml 1 mg/ml

## PSYCHOTROPIC MEDICATIONS

Anxiety, depression, and altered sleep patterns are common in cancer patients. Antianxiety medication is a good first intervention, but many patients also benefit from antidepressant medication. Depression tends to be undertreated in this group of patients.

### Somnolence and Fatigue

Fatigue during radiation occurs in greater than 30% of patients. It can be mild (e.g. afternoon naps) or occasionally severe (e.g. not able to drive). The fatigue can be sporadic (variable thru the day after XRT), periodic (increasing fatigue by weekend, much better on Monday), of chronic through radiation. Recovery begins by two weeks for sporadic patterns, longer for periodic and chronic patterns. If severe during radiotherapy and comorbid factdors ruled out,

Before attempting to remedy chronic somnolence and fatigue, rule out comorbid factors: anemia, electrolyte imbalances, nutritional issues, endocrine, pain, and depression. ***Ritalin*** and ***Provigil*** are the drugs most commonly prescribed for cancer-related fatigue. "Energizing" antidepressants (***Prozac***, ***Wellbutrin***) are another option.

***Navigil*** (**armondafinil**, Class IV) - 50-150mg (elderly),
(non elderly) 250 mg q am - tablets, 50, 150, 250 mg

***Provigil*** (**Modafinil**, Class IV) –100 mg (elderly), 200 mg po q am
-tablets 100 mg, 200 mg

***Prozac*** (**fluoxetine**, generic -SSRI) -20 mg qd -40 mg bid
-capsules 10 mg, 20 mg, 40 mg; liquid 20 mg/5 ml
-***Prozac Weekly*** – delayed release capsule, 90 mg q week

***Ritalin*** (**Methylphenidate**, generic -Class II)
-10 -20 mg po bid -tid
-tablets 5 mg, 10 mg, 20 mg
-***Ritalin*** SR -20 mg tab – 20 mg po tid
-***Ritalin*** LA – 20 mg po q am; increase 10 mg q week to 60 mg qd max
-capsules 20 mg, 30 mg, 40 mg

***Wellbutrin*** (**bupropion,** generic) – 100 mg po bid; 300 mg tid max
-tablets 75 mg, 100 mg
-***Wellbutrin XL*** (extended release) -150 mg -300 mg qd
-tablets 150 mg, 300 mg

## Antianxiety

For short term management**,** benzodiazepines are often prescribed. ***Ativan*** is useful for anticipatory anxiety and nausea, and may have slight amnestic effect. ***Librium*** and ***Valium*** are useful for managing withdrawal symptoms. ***Valium*** has additional benefit as a muscle relaxant. ***Xanax*** is a good choice for associated panic disorder. Try to avoid long-term daily use (longer than 2 months) and use with caution in patients with a history of addiction. For patiets unable to take benzodiazepines, **hydroxyzine**, **gabapentin**, or **propanolol** can be considered.

For long-term management, prescribe SSRI or SNRI (see antidepressant section)

**Lorazepam** (***Ativan***, generic)- 0.5 – 2mg po tid
1 – 4 mg po qhs prn insomnia
-tablets 0.5 mg, 1 mg, 2 mg -solution 2 mg/ml

**Chlordiazepoxide** (***Librium***, generic)
-mild anxiety: 5 -10 mg tid - qid
-severe anxiety: 20 mg -25 mg po tid -qid
-tablets 5 mg, 10 mg, 25 mg

**Diazepam** (***Valium***, generic) -2 mg -10 mg po bid -qid
-tablets 2 mg, 5 mg, 10 mg
-oral solution 1 mg/nk, 5 mg/ml

**Alprazolam** (***Xanax***, generic) .25 mg-1 mg po tid (max 4 mg/d)
-tablets .25 mg, .5 mg, 1 mg, 2 mg
-***Xanax XR*** (extended release) – 2 – 6 mg po qd
-tablets 0.5 mg, 1 mg, 2 mg, 3 mg

**Clonazepam** (***Klonopin***) - .25 – 2 mg bid-qid.
- tablets .5 mg, 1 mg, 2 mg

## Antidepressants

Clinical depression, depressed mood and anhedonia (marked loss of interest or pleasure in all activities) occurs in up to 20% of cancer patients. Newer classes of antidepressants (see listed drugs), with increased patient tolerance, include Selective Serotonin - Reuptake Inhibitors (SSRIs), Serotonin Norepinephrine-Reuptake Inhibitors (SNRIs), and Serotonin Antagonist-Reuptake Inhibitors (SARIs). Tricyclic antidepressants tend to have more anticholinergic side effects.

Antidepressants, like ***Trazadone*** and ***Mitazapine***, enhance the serotonogenic system, and can be helpful when insomnia and anxiety are the major symptoms. ***Wellbutrin*** enhances dopamine, and is useful when the primary symptoms are lack of energy, concentration, and motivation.

Monamine oxidase inhibitors should be avoided (unless previously successful for the patient). Dose escalation should be performed on a weekly basis.

***Celexa*** (**citalopram**, SSRI) – 20 mg po qd; to 40 mg qd max
-tablets 10 mg, 20 mg, 40 mg

***Cymbalta*** (**duloxetine**, SNRI) – 20 to 120 mo qd
- capsules 20 mg, 50 mg, 100 mg.

***Effexor*** (**venlafaxine**, generic, SNRIs) -25 mg tid; 75 mg tid max
-tablets 25 mg, 37.5 mg, 50 mg, 75 mg, 100 mg
***Effexor XR*** (extended release) -75 -225 mg/day max
-capsules 37.5 mg, 75 mg, 150 mg

***Lexapro*** (**escitalopram**, SSRI) – 10 mg po qd; 20 mg po qd max
-tablets 5 mg, 10 mg, 20 mg -solution 5 mg/5 ml

***Paxil*** (**paroxetine**, generic -SSRI) -20 mg po q am (50 mg/d max)
-debilitated patients: 10 mg po q am (40 mg/d max)
-tablets 10 mg, 20 mg, 30 mg, 40 mg
-***Paxil CR*** (continuous release) -25 mg -62.5 mg/day max
-tablets 12.5 mg, 25 mg, 37.5 mg

***Pristiq*** (**desvenlafaxine**, SNRI) – 25 mg to 200 mg qd
- tablets 25 mg, 50 mg, 100 mg.

***Prozac*** (**fluoxetine**, generic -SSRI) -20 mg qd -40 mg bid
-capsules 10 mg, 20 mg, 40 mg; liquid 20 mg/5 ml
-***Prozac Weekly*** – delayed release capsule, 90 mg q week

***Remeron*** (**mirtazapine**) - 15 mg to 45 mg qhs
- tablets 15 mg, 30 mg, 45 mg

***Trazadone*** (generic) – 150 mg qd, increasing 50 mg q 4 days, to 400 mg qd max.
-tablets 50 mg, 100 mg, 150 mg, 300 mg

***Wellbutrin*** (**bupropion,** generic) – 100 mg po bid; 300 mg tid max
-tablets 75 mg, 100 mg
-***Wellbutrin XL*** (extended release) -150 mg -300 mg qd
-tablets 150 mg, 300 mg

***Zoloft*** (**sertraline** – SSRI) -50 mg po qd; 200 mg/d maximum
-tablets 25 mg, 50 mg, 100 mg

## Antipsychotics

Antipsychotics are occasionally used during XRT for patients with moderate to severe agitation, combativeness, or who have altered mental status and are non cooperative. For milder cases, an anxiolytic medication such as ***Ativan*** may be appropriate. Choice is usually based on the patient's history and physician's clinical experience. For moderate to severe cases, second generation antipsychotics are used.

***Abilify*** (**aripiprazole**) -10 -15 mg po qd
-tablets 2, 5, 10, 15, 20, 30 mg

***Risperdal*** (**risperidone**) – 1 mg po bid; 3 mg po bid max
-tablets .25 mg, .5 mg, 1 mg, 2 mg, 3mg, 4 mg

***Zyprexa*** (**olanzapine**) – 5 mg po qd; 20 mg po qd max
-tablets 2.5 mg, 5 mg, 7.5 mg, 10 mg

## Hypnotics/Sleep Aids

***Benadryl*** and/or **Melatonin** can be effective sleep aids, and are a good initial choice as they do not cause tolerance and dependence problems. Good initial choices are ***Roserem*** (which works through the melatonin system), and **trazadone** or **mirtazapine** in elderly patients antidepressants, (with antianxiety benefit).

**Trazadone** is a good non-benzodiazepines initial choice. Other non-benzodiazepines are ***Ambien, Sonata*** (shorter acting) and ***Lunesta*** (longer acting).

The four listed **benzodiazepines (**are approximately equal in efficacy of sleep induction and maintenance; ***Dalmane*** and ***ProSom*** may have some slight advantage in continued early am sleep, and ***Restoril*** is known to not produce "hangover".

If patients are awakening after 2 -4 hours of sleep, consider a longer-acting anxiolytic such as ***Xanax, Ativan***, ***Ambien CR, Lunesta.***

All of these medications should be monitored for tolerance and dependence. There can be problems with amnesia, falls, and depression with long-term use, especially in the elderly.

***Ambien*** (**zolpidem**, generic -10 mg po q hs; elderly patients 5 mg
-***Ambien CR*** -6.25 mg -12.5 mg po qhs
-tablets 5 mg, 10 mg -CR 6.25 mg, 12.5 mg
-caution re sleepwalking

***Ativan (*lorazepam,** generic)- 1 – 4 mg po qhs -
solution 2 mg/ml

***Benadryl*** (**diphenhydramine**, OTC) -50 mg po q hs

***ProSom*** (**estazolam**, generic) -1.0 -2.0 mg po q hs

***Dalmane*** (**flurazepam**, generic) -30 mg po q hs
-elderly patients 15 mg po q hs

***Lunesta*** (**eszopiclone**) -2 -3 mg po qhs

**Melatonin** – 0.2 to 5 mg qhs
-begin with smaller dose.

***Sonata*** (**zalepon**) -5 mg -20 mg po qhs

***Restoril*** (**temazepam**, generic) -15 mg -30 mg po q hs

***Rozerem*** (**ramelteon;** works thru melatonin system) – 8 mg po qhs
-

**Trazadone** (generic) – 50 mg – 100 mg qhs

## Sedatives

Sedatives are used in agitated patients to facilitate treatment, with XRT or other office procedures. ***Ativan*** is a good initial choice for XRT anxiety or claustrophobia.

**Lorazepam** (***Ativan***, generic) -oral: 0.5mg - 3mg po
-injectable: IM .05 mg/kg, 4 mg max
-IV smallest of 2 mg or .044 mg/kg
-TUBEX Units and vials -2 mg/cc, 4 mg/cc

**Diazepam** (***Valium***, generic) -2 mg -10 mg IV or IM q 3 hrs
- 2mg - 10 mg po
-tablets 2 mg, 5 mg, 10 mg
-injectable 5 mg/cc

***Versed*** (**midazolam**)
-age < 60 IV 1 mg -2.5 mg, then small boosts q 2 min to maximum 8 – 10 mg
-debilitated/age > 60: IV 0.5 mg -1.5 mg, then small boosts q 2 min to maximum 3.5 mg
-injectable 1 mg/cc, 5 mg/cc
note: use cardiorespiratory monitoring and slow IV administration

## Benzodiazepine Receptor Antagonist

***Romazicon*** (**flumazenil**) -0.2 mg IV over 30 sec, then 0.3 mg IV over 30 sec, then 0.5 mg over 30 sec q min up to 3.0 mg max until **benzodiazepine** overdose reversed

## Neurocognition preservation

Cognitive impairment is common treating brain metastases (~ 20%, increasing to ~ 45% with whole brain radiotherapy), or CNS treatment fields that include the hippocampus. Memantine and/or hippocampal sparing techniques are an NCCN recommendation for cognitive preservation.

***Namenda*** (**Memantine, generic**) - 20 mg/d, for 24 weeks

**Memantine** is titrated upward, 5 mg daily per week to the maximum dose of 20 mg daily.

Simplest written prescription is 10 mg tablets - one half p.o. daily week 1; 1 p.o. daily week 2; 1-1/2 p.o. daily week 3; 1 p.o. twice daily week 4 and beyond.

Alternately, prescribe a **Memantine Titration Pak,** for the first month, then continue 20 mg daily.

## RADIATION FIBROSIS AND MUSCLE RELAXANTS

Muscle spasms may occur secondary to anxiety over treatment, positioning for therapy, splinting, or nerve stimulation. ***Flexeril*** or ***Zanaflex*** are good initial choices, but the patient may have previous success with other relaxants. ***Valium*** serves and an anxiolytic as well as muscle relaxant.

Radiation fibrosis is relatively common and can be debilitating. Statistically significant regression has been demonstrated using a combination of **Vitamin E** and ***Trental*** for a six month period. Phase 2 clinical trials have shown a 50% improvement in radiation fibrosis with P**ravastatin**.

**Carisoprodol** (***Soma***, generic) -1 tablet po qid

**Carisoprodol/aspirin** (***Soma Compound***, generic)-1 -2 po qid
-tablets 200 mg/325 mg

**Cyclobenzaprine** (***Flexeril***, generic) -5 mg -20 mg po tid
-tablets 5 mg, 10 mg
note: therapy should be limited to 3 weeks maximum

**Diazepam** (***Valium***, generic) -2 mg -10 mg po tid -qid

**Pentoxifylline** (***Trental***) – 400 mg tid

***Pravachol*** (**pravastatin**, generic) 40 mg daily

**Tizanidine** (***Zanaflex***) – 2 mg qd, increasing frequency and dose by 2 to 4 mg every 4 days; maximum 8 mg tid

**Tocopherol** (**Vitamin E**, OTC) – 400 iu qd

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This 12th edition contains updates and guidelines/approaches for medications commonly prescribed in Radiation Oncology. Although some common drug interactions and contraindications are include, this document if not intended as all inclusive.

Comments, criticisms, or suggestions for future edition are greatly appreciated. Please send to:

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