



COMMONLY PRESCRIBED MEDICATIONS IN RADIATION ONCOLOGY

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Commonly Prescribed Medications in Radiation Oncology (11th edition – updated) 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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All additions of this document have previously been distributed/sold as a copyrighted hard copy. This update of the 11th edition is not as exhaustively researched as previous editions. We are placing the modified 11th edition as a downloadable PDF file, available free of charge for use and distribution.

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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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Early Radiation Dermatitis and Focal Pruritus

Early radiation dermatitis manifests as pruritus, erythema, and/or scaly, flaky dry desquamation. *Aquaphor*, *Calendula*, *Calmoseptine*, *RadiaPlexRX Gel*, *Miaderm*, *StrataXRT* are used to prevent and treat radiation dermatitis. As symptoms progress, *Domeboro* compresses usually provides relief to intact skin and appears to delay further skin reaction. Eventually *aquaphor/xylocaine*, *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 *bethemasonone* or *Topicort*

Aquaphor - Healing Ointment (OTC)

- apply tid

Aquaphor/Xylocaine 5% Ointment

- apply tid
- mix 1:1 by pharmacist, produces a soothing cream
- usually written for multiples of 70 gm

Betamethasone 0.05% (Diprolene, generic)

- apply qd to bid
- cream 50 gm tubes
- ointment (strongest) 45 gm tubes

Calmoseptine (OTC)

- apply prn
- 4 oz. tubes

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 formulations

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
- 5 gm, 30 gm

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

- apply qid prn
- ointment .5 oz., 1 oz., 2 oz.

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) – 5 gm, 15 gm, 30 gm

Miaderm (OTC)

- apply tid at initiation of XRT; or for symptoms
- *Miaderm L* – also contains 4% Lidocaine
- Available in 4 oz. and 8 oz. tubes

RadiaPlex Rx Gel (with **Hyaluronic Acid**)

- apply tid
- 6 oz. tube

Sarna Sensitive (OTC, 1% hydrocortisone; 1% pramoxine (a topical anaesthetic))

- apply tid
- 7.5 oz. bottle

StrataXRT

- apply tid
- 20 gm, 50 gm
- note: a new, prescription medication, expensive but effective

Topicort (**desoximetasone**)

- apply bid
- cream 0.25%, 0.05% -15 gm, 60 gm, 100 gm
- ointment 0.25% -15 gm, 60gm , 100 gm

Dry and Moist Desquamation

Areas preparing to desquamate develop a dusky erythematous appearance. Once significant dusky changes or desquamation develops, **Silvadene** or **Silvermed** should begin. If there is moist desquamation, begin **Domeboro** soaks prior to topical meds.

Cover with **Telfa** if needed to protect clothing and to minimize abrading. **Hydrogel Wound Dressings** are best for persistent dry desquamation; for moist desquamation coverage, consider **Hydrocolloids** dressings.

Small, white epithelial cell islands within the desquamated area are a sign of tissue regeneration. Cornstarch should be avoided in moist desquamation.

If deep moist desquamation develops with greater than 500 to 1000 cGy XRT remaining, continue as above, with radiation held until new skin islets are visualized (at about 7 – 10 days). If malodorous or discolored exudate, consider **mupirocin** initially, advance to systemic antibiotic as needed.

Aquaphor/Xylocaine 5% Ointment

- apply tid
- mix 1:1 by pharmacist, produces a soothing cream
- usually written for multiples of 70 gm

Bactroban (mupirocin)

- apply 3 times daily
- 15 g, 30 g tubes

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

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 oz

Silvadene cream 1%

- apply to affected area tid
- tubes 20 & 85 gm
- jars 50, 400, & 1000 gm

SilverMed (OTC)

- apply tid to bid
- 1.5 oz tube

Telfa (OTC non-stick adhesive pads)

- cover wound prn

Ulceration – Slow Healing

To promote healing, the wound needs to 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 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

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

MPM Wound and Skin Cleanser (OTC)

- spray, allow time to soften, adjust nozzle to 'STREAM' to loosen debris
- 8oz, 16 oz

Pentoxifylline (**Trental**, generic)

- 400 mg po tid
- tablets 400 mg

Regenecare (hydrogel with 2% **lidocaine**)

- bid to tid
- **Regenecare Wound Gel** – 3 oz
- **Regenecare HA** (my preference) – 3 oz
- **Regenecare HA Spray** – 4 oz

Silvadene cream 1%

- apply to affected area tid
- tubes 20 & 85 gm
- jars 50, 400, & 1000 gm

SilverMed (OTC)

- apply tid to bid
- 1.5 oz tube

Vitamin E (OTC)

- 1000 IU po qd

Xenaderm (Balsau Peru, Trypsin & Castor Oil)

- apply bid-tid
- 30 gm, 60 gm

Antibiotics/Wound Infection Treatment

For minor superficial skin/open wound infections, consider *Polysporin*, or *Bacitracin* (caution regarding *Neosporin*, as approximately 10% of patients are allergic to **neomycin**). *Silvadene* or *SilverMed* is used for mild wound sepsis, *Bactroban* if more aggressive topical therapy needed.

For uncomplicated subcutaneous infection/involvement, use (or add) *Keflex*, *Bactrim DS*, *Augmentin* as systemic treatment; if considerable erythema and warmth, use *Levaquin*, *Cipro* or a *Z-Pak*. For skin infections/cellulitis in diabetic patients, or for infections of the groin and perineum, consider adding *Cleocin*. If pseudomonas is suspected (foul-smelling, greenish exudate), *Cipro* or *Levaquin* is a systemic choice.

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
- tablets 250 mg, 500 mg, & 875 mg
- suspension 125 mg, 200 mg, 250 mg & 400 mg/5 ml

Azithromycin (*Z-Pak*)

- as directed

Bacitracin (OTC)

- apply bid-tid
- 1/2 oz, 1 oz

Bactrim DS (trimethoprin/sulfamethoxazole, generic)

- 1 po bid
- 800mg/160mg tablets

Bactroban (mupirocin)

- apply to affected area tid
- tubes 15 gm and 30 gm

Cephalexin (*Keflex*, generic)

- 250 mg -500 mg po q 6 hr
- suspension 125 mg & 250 mg/5 ml
- tablets 250 mg, 500mg, 750 mg (generic in 250 & 500 mg)

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
- tablets 250, 500, 750 mg
- oral solution 25 mg/ml

Neosporin (OTC, **neomycin/polymyxinB/bacitracin**)

- bid -tid
- 1 oz, 2 oz
- *Neosporin + Pain Relief* (OTC, with pramoxine)
– apply bid – tid – 1/2 oz, 1 oz.

Polysporin (OTC, **polymyxinB/bacitracin**)

- apply bid -tid
- tubes 1/2 oz and 1 oz.

Silvadene cream 1%

- apply to affected area tid
- tubes 20 & 85 gm
- jars 50, 400, & 1000 gm

SilverMed (OTC)

- apply tid to bid
- 1.5 oz tube

Antifungals/Antivirals

For yeast or fungus infections, consider topical OTC medications initially. If dry, scaly, and annular, suspect fungus -use **Lamisil**. 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
- tablets 50 mg, 100 mg, 150 mg, & 200 mg

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
- tablets 125 mg, 250 mg, & 500 mg

Lamisil (terbinafine - OTC antifungal)

- apply bid
- 12 gm & 24 gm tubes -30 cc pump spray

Lotrimin Antifungal (OTC antifungal)

- apply bid
- AF (**clotrimazole**) Ultra (**butenafine**)
- 12 gm & 24 gm tubes

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
- caplets 500 mg, 1000 mg

Zovirax (acyclovir)

- h. simplex 200 mg po 5 times daily x 10 d
- h. zoster - 800mg po 5 times daily x 7-10 d
- capsules 200 mg
- tablets 400 mg, 800 mg

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
- tablets 25 mg

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
- capsules 10 mg, 25 mg, 50 mg, 75 mg
- note: antidepressant/anxiolytic effect; low dose initially with gradual escalation.

Hydroxyzine (*Vistaril*, generic)

- 10 mg -25 mg po tid
- tablets 10 mg, 25 mg, 50 mg, 100 mg
- syrup 10 mg/5 ml
- note: nonbenzodiazepam anxiolytic

Medol Dosepak (**methylprednisolone**)

- as directed
- 6-day dosepak (4mg)

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 (roughly 20%); eliminating tobacco use increases the local control rate (also roughly 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 for severe dysphagia, or for poor performance status with planned combined modality therapy. A PEG tube is usually placed (versus nasogastric approach).

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; prophylactic pre-and post-extraction hyperbaric oxygen is usually advised. If minor osteonecrosis does develop, manage conservatively with careful oral hygiene and periodic evaluation for possible infection. For refractory or large radionecrotic lesions, pentoxifylline and vitamin E may be of benefit; often hyperbaric oxygen (+/- subsequent flap reconstruction) is necessary. Radiation to the lower neck, can cause thyroid failure.

Eye

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

Cortisporin Ophthalmic (combination steroid and antimicrobial)

- apply ointment or 1-2 gtts q 3-4 hrs
- ointment 1/8 oz tube • suspension 7.5 ml
- 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
- suspension dispensers – 2.5 cc, 5 cc

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
- box of 60 unit doses, plus applicators
- note: consider for severe dryness

Refresh (OTC)

- usually 1-2 gtts to affected eye qid
- **Tears** (mild to moderate dry eye)
- **Celluvise** (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, use **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
- capsules 250 mg, 500 mg, 875 mg
- ER 775 mg
- tablets 125 mg and 250 mg,
- suspension 125 mg/5 ml and 250 mg/5 ml

Amoxicillin/clavulanate (*Augmentin*, generic)

- 500 mg tid, 875 mg bid
- tablets 250 mg, 500 mg, & 875 mg
- suspension 125 mg, 200 mg, 250 mg & 400 mg/5 ml

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 - hrs
- tablets 25 mg

Ciprodex (**Ciprofloxacin** & **dexamethasone**)

- 4 gtts bid x 7 days
- 7.5 cc Drop-Tainer system

CiproHC Otic- (**Ciprofloxacin** & **prednisone**)

- 3 gtts bid x 7 days
- bottle 10 cc

Cortisporin Otic

- 4 gtts to affected ear q 6 hrs
- bottle of 10 cc

Levofloxacin (*Levaquin*)

- 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

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 decreased oral pain using **MuGuard** prophylactically. To minimize the impact of mucositis, encourage good oral hygiene including **baking soda mouthwash**, soft toothbrush, 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 improved with a proton pump inhibitor (e.g. **Prevacid**, **Prilosec**). For mild to moderate 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**.

Severe mucositis can cause rapid weight loss necessitating a feeding tube. Initially consider topical medications, such as **Triple Mix**, topical anaesthetics (**phenol**, **benzocaine** and **lidocaine** preparations, and **UlcerEase** mixed with ice chips). **RadiCare Oral Wound Rinse**, **Gelclair**, **OraMagic RX** or **Plus** are also used, but 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 through 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
- maximum 12 per day

Gelclair

- swish in oral cavity one minute, spit; avoid eating or drinking for 1 hour
- use up to tid
- provides relief for 1 to 6 hours
- barrier/hydrating/anti-inflammatory function
- box of 15 single use packets

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% viscous 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
- bottles 8 fluid oz; lasts ~ 1 week

Omeprazole (*Prilosec*, generic, OTC)

- 20 mg po qd
- tablet 20 mg

***Orabase Paste* (20% **Benzocaine**, OTC)**

- apply prn
- 6 gm tube

***OraMagic* (OTC)**

- swish and spit qid
- ***OraMagic Rx*** – regular formulation
- ***OraMagic Plus*** - with **benzocaine**
- 8 oz bottles

RadiCare Oral Wound Rinse

- 15 cc swish/gargle qid
- 23 g powdered mouthwash mix
- 12/box

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 may make troches difficult to tolerate. If candidiasis 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
- tablets 250 mg, 500 mg, 875 mg
- 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**)

Chlorhexidine (*Peridex*)

- 1/2 oz swish 30 sec and spit bid
- 1 pint dispenser
- note: used as a prophylactic oral antibiotic

Clindamycin (*Cleocin*, generic)

- 150 mg–450 mg po q 6 hrs
- tablets 75mg, 150 mg, 200 mg
- MRSA and nonaerobic coverage

Fluconazole (*Diflucan*)

- 200 mg po day 1, then 100 mg po qd, x 7 days (if candida recurs, repeat for 21 days)
- tablets 50, 100, 150, & 200 mg

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; through 2 days post clinical resolution

Sialadenitis

Acute sialadenitis is a mild to severe swelling of the parotid or submandibular glands, occurring in the first 24 – 48 hours of radiotherapy. 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

For allergy-induced nasal congestion or eustachian tube dysfunction, prescribe an antihistamine; Allegra, Claritin, and Zyrtec can be used in hypertensive patients. To promote sinus drainage, use decongestants and/or high dose expectorants (e.g. 1200 mg) that help thin nasal secretions. For infection, Augmentin or Levaquin 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
- boxes of 12, 24, 48; bottles of 100

Amoxicillin/clavulanate (*Augmentin*, generic)

- 250mg–500 mg po tid
- 875 mg po bid
- tablets 250 mg, 500 mg, 875 mg
- 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
- XR tablets 500, 1000 mg

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
- **Claritin-D 12 hour**
– (with 120 mg pseudoephedrine) – bid
- **Claritin-D 24 hour**
– (with 240 mg pseudoephedrine) -qd

Levofloxacin (*Levaquin*)

- 500 -750 mg qd
- tablets 250, 500, 750 mg
- 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 hrs

Teeth 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 periodontal 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.

Osteoradionecrosis occurs in 3 to 10 percent of patients post radiotherapy, through damage of intraosseous small blood vessels. Hyperbaric oxygen is the primary treatment for osteoradionecrosis, and is used prophylactically for teeth extraction post radiotherapy (especially when the mandible has received high dose radiotherapy) or the extracted teeth are within the irradiated field.

Post treatment, if extraction or dental work is required, antibiotics should be started one day prior to the procedure. If multiple extractions, removal one at a time with alveoplasty (if indicated) will reduce the risk of osteoradionecrosis.

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 diminishes. 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. *Numosyn*, *Aquoral*, *Salivart*, *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. For symptomatic thickened saliva, **baking soda gargle** is an initial approach; an expectorant (e.g. **guaifenesin**) and/or hydration may provide significant relief. Xerostomia can be caused or worsened by candidiasis, anticholinergic drugs (e.g. tricyclic antidepressants) opioids, antihistamines, decongestants, antidepressants, anxiolytics, and antidiarrheals.

Occasionally a patient develops a severe gag response to the 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 antibacterial 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**

NeutraSal

- swish and spit qid
- dissolve 1 packet in 1 oz water
- boxes of 30

Numosyn

- 2cc swish and swallow prn
- bottles 30 cc, 300 cc.

***Prevident* (fluoride toothpaste)**

- brush 10 min bid
- tube 1.8 oz

***Pilocarpine* (*Salagen*)**

- 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

Air Hunger**Narcotics****Codeine**

- 30 mg po q 4-6 h
- tablets 15 mg, 30 mg, 60 mg
- oral solution 15 mg/5 ml

Morphine Sulfate

- 7.5 mg -30 mg po q 4 hr
- tablets 10mg, 15 mg, 30 mg
- solution 10 mg/5 ml, 20 mg/5 ml
- injectable -3 -5 + mg IV/IM q 2 -4 hr

Anxiolytics**Alprazolam (*Xanax*)**

- start at .25 - .5 mg tid
- tablets .25 mg, .5 mg, 1 mg, 2mg
- max 4 mg/d
- ***Xanax XR*** (extended release)
 - start at 0.5 – 1.0 mg/d
 - max 3 – 6 mg/d
 - tablets 0.5 mg, 1 mg, 2 mg, 3 mg

Diazepam (*Valium*)

- 2 mg -10 mg po bid-qid
- tablets 2 mg, 5 mg, 10 mg

Lorazepam (*Ativan*)

- .5 – 2 mg po bid-qid
- tablets .5 mg, 1 mg, 2 mg

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
- tablets 1, 2.5, 5, 10, 20, 50 mg

Dexamethasone (*Decadron*)

- 8 to 16 mg po qd x 7 d, then taper
- tablets .25, .5, .75, 1.5, 4, 6
- **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 an oral first-generation antihistamine OTC medication containing **brompheniramine** (e.g. *Dimetapp Cold and Allergy Elixir*) or **chlorpheniramine** (e.g. *Chlor-Trimeton*), **diphenhydramine**, or combination (e.g. *Bromfed-DM*). If too sedating, use a less anticholinergic 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**.

Brompheniramine (e.g. *Dimetapp*, OTC)

- 4 – 8 mg tid
- extended release 6 – 12 mg bid

Chlorpheniramine (e.g. *Chlor-Trimeton*, OTC)

- 4 mg q 4 – 6 h
- sustained release: 8 – 16 mg bid tid
- hydrocodone/chlorpheniramine (*Tussionex*)
- 5 ml bid
- 10 mg hydrocodone, 8 mg chlorpheniramine per 5 ml

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**)

Benadryl (diphenhydramine-OTC)

- 25 – 50 mg q 4 – 6 hrs
- note: avoid if COPD, asthma, glaucoma, urinary retention

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 qd
- **Claritin-D 12 hour**
 - (with 120 mg pseudoephedrine) – bid
- **Claritin-D 24 hour**
 - (with 240 mg pseudoephedrine) -qd

Gabapentin (*Neurontin*, generic)

- 300 mg qd to 600 mg tid
- capsules 100 mg, 300 mg, 400 mg

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, pseudoephedrine** (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 container

Pseudoephedrine (OTC decongestant, e.g. *Sudafed*)

- 1 po q 6 hrs

Tessalon (**benzonatate**)

- 100 -200 po q 8 hrs
- perles 100 mg
- capsules 200 mg

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, with immune compromise or comorbidities, category 1 recommendations are Moxifloxacin, or a combination of macrolide (Biaxin or Zithromax) and Augmentin or Cleocin. If no immune compromise or comorbidities, azithromycin or doxycycline are appropriate choices.

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 trimethophran/ sulfamethaxazole and cephalosporins (Keflex, Ceftin)

Amoxicillin/clavulanate (*Augmentin*, generic)

- 250mg–500 mg po tid
- 875 mg po bid
- tablets 250 mg, 500 mg, 875 mg
- suspension 125 mg/5 ml, 250 mg/5 ml, 400 mg/5 ml

Azithromycin (*Zithromax*, *Z-Pak*, generic)

- 500 mg po qd day 1, then 250 mg po qd x 4d
- tablets 250 mg, 500 mg, 600 mg

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
- tablets 250 mg, 500 mg
- suspension 125mg/5 ml, 250 mg/5 ml

Cefpodoxime (*Vantin*, generic)

- 200 mg po bid
- tablets 100 mg, 200 mg

Cephalexin (*Keflex*, generic)

- 250 mg–500 mg po qid
- capsules 250, 500, & 750 mg

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

Clarithromycin (*Biaxin*, generic)

- 250 -500 mg po bid
- tablet 250 mg, 500 mg
- **Biaxin XL** 500 mg qd
- **Biaxin XL** tablets 500 mg

Clindamycin (*Cleocin*, generic)

- 150 mg – 450 mg po tid-qid
- capsules 150, 300 mg
- MRSA and nonaerobic coverage

Doxycycline (e.g. *Vibramycin*, generic)

- 100 mg po bid
- capsules 50 mg, 100 mg
- tablets 100 mg

Levofloxacin (*Levaquin*, generic)

- 500 -750 mg qd
- tablets 250, 500, 750 mg
- oral solution 250 mg/10ml

Moxifloxacin (*Avelox*)

- 400 mg po qd
- tablets 400 mg

Oseltamivir (*Tamiflu*, antiviral)

- 75 mg bid x 5 days
- prophylaxis 75 mg po qd x 10 days
- capsules 75 mg

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 are multiple variables, but V20 is the most important variable:

- V20 < 22% – no pneumonitis
- V20 22% – 31% – 8% grade 2+ pneumonitis
- V20 > 35% – 15%, with ~5% grade 5 pneumonitis

It presents with dyspnea, tachycardia, 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 symptoms 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
- tablets 250 mg, 375 mg, 500 mg -susp 125 mg/5 ml

Indomethacin (*Indocin*, generic)

- 25 mg bid-tid initially; maximum 200 mg per day
- capsules 25 mg, 50 mg
- suspension 25 mg/5 ml

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
- tablets 1, 2.5, 5, 10, 20, 50 mg

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
- tablets 150 mg

Nicorette Lozenges (nicotine lozenge, OTC)

- 2–4 mg q 1–8 hr
- lozenges 2 mg, 4 mg

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 cigarettes/day), 4 mg >25 cigarettes/day)

Nicotine Inhaler (*Nicotrol Inhaler*, OTC)

- 6–16 cartridges per day, up to 12 weeks; then gradual reduction over 12 weeks
- supplied as kit of 168 cartridges

Varenicline (*Chantix*)

- 0.5 mg/d x 3 days; bid x 4 days, then 1 mg qd x 12–24 week
- 0.5 mg and 1.0 mg tablets

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, there are no studies that demonstrate worse outcome with lotions applied prior to breast irradiation (we performed a small trial, and the areas where lotion/cream was applied had less reaction).

A pruritic, erythematous, punctate rash that begins in the upper inner quadrant breast is most likely miliaria rubra (inflamed 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 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. Patient compliance seems to decrease with increasing exercise expectations. Two simple stretches that can be used 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 involved physical therapy, including myofascial release and a home program for stretching the arm.

Occasionally a patient will develop one or multiple superficial blood clots (versus a DVT). The usual presentation is a palpable, linear, tender axillary cord often 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 seems to increase with increased prosthesis to breast tissue volume, smoking, and diabetes.) Following augmentation, there appears to be reduced contracture with a leukotriene antagonist – (off-label) **Singulair** 10 mg qd for 3 months has been prescribed. Radiating the implanted breast, 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 **dicloxacillin**, **cephalexin**, **Bactrim DS**, or **clindamycin**.

For nonsubareolar abscess and localized warmth/erythema, drain abscess and prescribe **dicloxacillin**, **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.

Bactrim DS (trimethoprin/sulfamethoxazole, generic)

- 1 po bid
- 800mg/160mg tablets

Cephalexin (*Keflex*, generic)

- 250 mg -500 mg po q 6 hr
- capsules 250 mg, 500mg, 750 mg (generic in 250 & 500 mg)

Clindamycin (*Cleocin*, generic)

- 150 - 450 mg po q 6 hrs
- capsules 150 mg & 300 mg
- MRSA and nonaerobic coverage

Dicloxacillin (generic)

- 500 mg qid
- tablets 250 mg, 500 mg

Metronidazole (*Flagyl*, generic)

- 500 mg po tid
- tablets 250, 375, & 500 mg
- 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; postural changes are needed. Costochondritis usually responds to a short course of **NSAID**'s (600 mg tid, x 3 d) 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 lymphedema; 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 oedema; otherwise consider waiting six months to allow for resolution/improvement.

An excellent website is through the National Lymphedema Network (lymphnet.org).

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 beds
 - hot foods
 - caffeine
 - diet pills
 - hot tubs
 - hot rooms
 - saunas
 - smoking
- Increase activity level
- Initiate relaxation techniques
- Begin a low-fat diet

Neurontin, newer antidepressants (**Effexor**, **Paxil**), and antihypertensives (**CatapresTTS**, **Aldomet**) have shown significant benefit in randomized clinical trials. Of the many complementary therapies, only **Vitamin E** has shown modest benefit (reduction of hot flashes by 1 per day).

Estrogen like-herbs to specifically avoid include red clover, chasteberry, hops, ginseng, and soy (and to a lesser extent dong quai and licorice).

A recommended algorithm: for mild, nondisruptive hot flashes, prescribe **Vitamin E** (800 – 1000 IU qd). For severe symptoms, prescribe **Effexor** or **Paxil**. Advance to **Catapress** or **Aldomet**, and finally **Neurontin** if symptoms continue. 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
- capsules 100mg, 300 mg, 400 mg

Clonidine patch (*CatapresTTS*)

- 0.1 mg patch q week

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.
- tablets 20 mg, 40 mg

Methyldopa (*Aldomet*)

- 250 mg po bid
- tablets 125 mg, 250mg, 500mg

Paroxetine (*Paxil CR*)

- 12.5 + mg po qd
- Controlled-release tablets 12.5 mg, 25 mg, 37.5 mg

Venlafaxine (*Effexor XR*)

- 75 mg po qhs (titrate upward from 37.5 mg)
- tablets 37.5 mg, 75 mg, 150 mg

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 dilations; for stricture refractory to dilatation consider an XRT fibrosis protocol and then redilatation.

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, hemorrhoidal 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 neovascularity, and protein losing enteropathy.

Antacids/Hypersecretion Medications

For short-term antacid relief consider OTC extra strength liquid antacids. For chronic antacid/GERD treatment, consider H₂ 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 anti-inflammatory therapy, many are OTC. For erosive gastritis or esophagitis, considering doubling the recommended doses for H₂B and PPI.

Aluminum, Magnesium & Simethicone (OTC combination), eg:

- **Maalox Max Antacid/Anti-gas** – 2 – 4 tsp qi
- **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 prophylaxis, 400 mg po qhs
- Rx -tablets 300 mg, 400 mg, 800 mg
- OTC -tablets 200 mg

Dexlansoprazole (**Kapidex**, PPI)

- 60 mg po qd x 8 weeks, then 30 mg po qd maintenance
- capsules 30mg, 60 mg.

Esomeprazole (**Nexium**, PPI)

- 20 -40 mg po qd
- capsules 20 mg, 40 mg
- powder for suspension 10mg, 20mg, 40mg

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**, 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**, PPI, OTC, generic)

- 20 mg po qd
- tablet 20 mg

Pantoprazole (**Protonix**, generic, PPI)

- 40 mg po qd
- tablets 20 & 40 mg

Rabeprazole (**Aciphex**, 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
- OTC -tablets 75 mg, 150 mg, 300 mg

Anti-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 (antiflatulent +/-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 mucous membranes), and electrolyte imbalance (especially potassium should be monitored).

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: 1/2 - 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 q AC and qHS.

For severe, refractory 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 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 prophylaxis 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

- **Opium 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

Anti-Flatulents

Increased gas production, especially when associated with hypermotility, can produce severe abdominal cramping. Initial management involves **simethicone**, antiflatulents, and antidiarrheal medications as needed. **Bean-O** may enable a normal diet, and in some cases seems to reduce 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** (contraindicated for elderly patients). There is also support for **dronabinol** and **mirtazapine** (consider for elderly patients)

Dronabinol (*Marinol*)

- 2.5 po q hs-bid initially; max 10 mg bid
- capsules 2.5 mg, 5 mg, 10 mg

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

Remeron (*mirtazapine*)

- 7.5 mg 15 mg nightly
- 15 mg, 30 mg, 45 mg tablets

Prednisone

- 10 to 40 mg q day
- tablets 1 mg, 2.5 mg, 5 mg, 10 mg, 20 mg, 50 mg

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 insufficiency, 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 **steroid suppositories** or a '**Rectal Rocket**'. If minimal improvement, change to a two-week trial **Colocort** (**hydrocortisone retention enema**); if improvement, continue for four more weeks. If symptoms persist, oral **Asulfidine** or **Colazal** may be of benefit. One study showed a significant decrease in proctitis with prophylactic **Colazal**.

Obtain a GI consult if symptoms persists; sigmoidoscopy is indicated when refractory to the above, as one study showed a 6% incidence of malignancy. For refractory bleeding, studies have shown benefit from direct application (by the gastroenterologist) of dilute **formalin**, usually 4%, or use of Nd:YAG Laser therapy or Argon plasma coagulation. Finally (or prior to formalin/coagulation), begin a three month course of **Trental** and **Vitamin E** (extend to six months if improvement), and then proceed to hyperbaric oxygen if needed.

Balsalazide (**Colazal**)

- 2250 mg po tid
- capsules 750 mg

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**)

- 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

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
- tablets 400 mg
- note: do not use if history of cerebral or retinal bleeding

Prednisone

- 10 to 40 mg po q day
- tablets 1 mg, 2.5 mg, 5 mg, 10 mg, 20 mg, 50mg

Rectal Rocket

- 1 per rectum qhs x 5 days
- custom formulation or **hydrocortisone** 5%, **lidocaine** 2.5% (or 5%), **nifedipine** 0.3% (to 0.4%)

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**, **miracle mouthwash**), 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)
- tablets 50, 100, 150, & 200 mg

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

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)

Triple mix

- 2tsp po 10min qac and qhs
- 1:1:1 **Benadryl** elixir, **Maalox**: viscous, **Xylocaine 2%**
- note: anesthetic lasts ~ 20 minutes; may repeat once during meal

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, odynophagia/dysphagia. If available, a registered 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.

e.g. If a patient requires 2000 cal, 2000 ml of fluid is required. The supplement provides between 70% to 80% of the fluid, 1600-1800 ml. Flushing the tube would provide an additional 200-400 ml. No additional fluid may be required.

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 cal & 10 gm protein

Boost Plus – 360 cal & 13 gm protein

Boost High Protein – 240 cal & 15 gm protein

Boost with Fiber – 240 cal & 10 gm protein & 3 gm fiber

Boost Glucose Control – 190 cal & 3 gm fiber

Ensure – 250 cal & 9 gm protein

Ensure Plus – 355 cal & 13 gm protein

Ensure High Protein – 230 cal & 12 gm protein

Ensure with Fiber -250 cal & 9 gm protein & 3 gm fiber

Enlive Juice Drink -300 cal & 10 gm protein

Glucerna -220 cal (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 cal & 16 gm protein; high ratio of omega fatty acids

Also:

Carnation Instant Breakfast, with 1 cup whole milk – 315 cal & 12 gm protein

Scandi-Shake, 3oz with 1 cup whole milk – 600 cal & 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 1.5**.

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).

Examples of Tube Feeding Supplements (medical supply only) - per 8 oz can

Jevity 1 – 250 cal & 10.5 gm protein

Jevity 1.2 – 285 cal & 13 gm protein

Jevity 1.5 – 355 cal & 15 gm protein

Osmolite – 250 cal & 9 gm protein

Osmolite 1 – 250 cal & 10.5 gm protein

Osmolite 1.2 – 285 cal & 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).

Potential Problems

Metabolic Issues – fluid, electrolyte, and glucose imbalances prevented by appropriate monitoring and using appropriate formula

Gastric – Nausea/vomiting, aspiration, diarrhea, bloating and pain minimized by using appropriate formula and feeding type

Mechanical – tube clogging or migration, skin irritation

- keep head of bed elevated 30 - 45 degrees during and 30 minutes post feeding
- flush every 4 hours during continuous feeding, before and after bolus feedings
- G-tubes with skin disks anchors; J-tube with skin anchor
- do not use dressings
- clean around site daily

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 initial 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
- tablets 10 mg, 20 mg note: antispastic muscle relaxant

Metoclopramide (*Reglan*, generic)

- 10 mg -20 mg po q 4 hr
- tablets 5 mg, 10 mg
- syrup 5 mg/5 ml

Chlorpromazine (*Thorazine*)

- 25 mg IV or IM, or 50 mg po tid (range 25 mg po tid- 50 mg po qid); maintenance 10 mg 50 mg po tid
- tablets 10 mg, 25 mg, 50 mg, 100 mg, 200 mg
- 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
- capsules, tablets 10 mg, 20 mg
- syrup 5 mg/5 ml, 10 mg/5 ml

Hyoscyamine (*Levsin*, generic)

- .125 -.25 mg po/sl tid -qid
- tablets .125 mg
- elixir .125 mg/5 ml
- **Levsinex TIMECAPS**
 - .375 -.75 mg po bid -tid
 - capsules, tablets .375 mg

Chlordiazepoxide/clidinium (*Librax*)

- 1 -2 po q ac and q hs
- tablets 5 mg **chlordiazepoxide**/2.5 mg **clidinium**

Metoclopramide (*Reglan*, generic)

- 10 mg -20 mg po q 4 hr
- tablets 5 mg, 10 mg
- syrup 5 mg/5 ml

Nausea/Vomiting

Nausea in the cancer patient can be caused by chemotherapy, opioid induced constipation or direct nausea, anxiety, delayed gastric emptying, excess flatus, diarrhea, vertigo, brain mets, etc. For XRT-induced nausea, the chronology is important. If anticipatory, initially use **ondansetron** 45 minutes prior to XRT, advancing to **Ativan** if needed. For nausea occurring 30 minutes to 4 hours post XRT, po/IM/IV **Compazine** or **Phenergan** 15 to 30 minutes prior to XRT is a good initial option; advance to **ondansetron**.

For chronic XRT-induced nausea, consider a longer acting, prophylactic antiemetic, such as **Zofran** or **Kytril**. If nausea persists, consider addition of **metoclopramide**, 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 if recent onset, and/or narcotic induced; rule out fecal impaction), **Dulcolax** or **senna** with or without **docusate** is a good first choice. Advance to magnesium citrate, **Texas Cocktail**, or multidose **Miralax** to initiate bowel movement, then **senna** qd-tid. If refractory, begin **lactulose**. If still no benefit in the setting of opioid induced constipation, advance to **Amitiza** or **Movantik**. A new 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 antifatulent (**simethicone**) if needed. Electrolyte levels should be periodically checked, except for patients solely on stool softeners or bulking agents.

Amitiza (lubiprostone)

- 24 mcg bid
- capsules 8mcg, 24mcg

Bulking Agents

- **calcium 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
 - 10 mg and 20 mg packets; cartons of 30

Bisacodyl (e.g. **Dulcolax**, OTC laxative)

- 10 m-30 mg po prn
- 5 mg-10 mg per rectum prn
- tablets 5 mg
- suppositories 5 mg, 10 mg
- po effective in 6 -1 hours; pr effective in ~15 minutes

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

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. If persistent pain or bleeding, use a **Rectal Rocket**.

For XRT-induced proctitis or tenesmus/urgency, determine whether the irritation 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**. Advance to a **Rectal Rocket**. If unresponsive, use **Colocort** enema, and eventually **mesalamine**.

For perianal irritation, OTC **Tuck's Ointment** (previously Anusol HC), **Nupercainal Ointment**, **ELA-Max** usually provides relief. If refractory, prescribe **Proctofoam HC**, **Cortifoam**, or **LMX 5**; advancing to **Pramosone** or **Analpram** if needed. If there is extensive perianal skin breakdown, a combination of **Domeboro** soaks and **Aquaphor/Xylocaine** is usually of benefit.

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

Analpram-HC

- apply tid-qid cream
- **Analpram** cream 1%, 2.5%
 - cream 1 oz
- **Analpram** lotion 2.5%
 - lotion 2 oz

Aquaphor-Original Formula/Xylocaine 5% Ointment

- apply tid
- mix 1:1 by pharmacist, produces a soothing cream
- usually written for multiples of 70 gm

Colocort (hydrocortisone retention enema)

- 1 pr q hs, retain for 1 hr to all night
- single dose units, 100 mg hydrocortisone/60 ml

Cortifoam (hydrocortisone 10%)

- 1 pr qd-bid
- 15g (14 dose) applicator

ELA-Max 5 Anorectal Cream (5% lidocaine -OTC)

- apply to intact skin
- 30 g tube

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)

Rectal Rocket

- 1 per rectum qhs x 5 days
- custom formulation or **hydrocortisone** 5%, **lidocaine** 2.5% (or 5%), **nifedipine** 0.3% (to 0.4%)

Tuck's Ointment (1% **hydrocortisone**, OTC)

- apply tid-qid

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 with 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 urination, 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 **Ditropan 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 incontinence, (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 Suprettes (belladonna/opium, Class II)

- 1 suprette 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
- **Levsinex 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
- tablets 100 mg

VESIcare (solifenacin)

- 5 mg, advancing to 10 mg po qd
- tablets 5 mg, 10 mg

Antibiotics

For acute cystitis/UTI, consider **Bactrim/Septa** 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** I 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
- tablets 250, 500.

Cephalexin (*Keflex*, generic)

- 500 mg qid
- capsules 250, 500 & 750 mg

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

Levofloxacin (*Levaquin*)

- 500 -750 mg qd
- tablets 250, 500, 750 mg
- 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
- capsules 25 mg, 50 mg, 100 mg

Trimethoprim/sulfamethoxazole (*Bactrim*, *Bactrim DS*, generic)

- treatment -2 regular or 1 DS tablet po q 12 hrs
- long-term suppression -1 regular po qd
- regular 80 mg/400 mg; DS 160 mg/800 mg
- 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
- tablets 2.5 mg, 5 mg, 10mg, 20 mg

Levitra (vardenafil)

- 10 mg po prn (range 5-20 mg)
- tablets 2.5 mg, 5 mg, 10mg, 20 mg

Stendra (avanafil)

- 100 mg qd prn(range 50-200 mg)
- tablets 50,mg 100 mg, 200 mg

Viagra (sildenafil)

- 50 mg qd prn (range 25 mg to 100 mg)
- tablets 25 mg, 50 mg, 100 mg

Male Hot Flashes

Progestational 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 (Venlafaxine)

- 75 mg po qhs
- tablets 37.5 mg, 75 mg, 150 mg

Megesterol (*Megace*, generic)

- 20 mg po bid, 10 mg qd or qod once responsive.
- tablets 20 mg, 40 mg

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 persistent 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.
- injectable 250 mg/ml
- tablets 500mg, 1000mg
- syrup 1.25gm/5 ml

Elmiron (pentosan)

- 100 mg po qd
- capsules 100 mg

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 secondary 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. **Hytrin**, and **Cardura XL** are also effective Alpha-1 blocking agents, although the dose must be titrated upwards, respecting the possibility 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 occasionally suprapubic catheter, is required throughout the course of therapy or in the post implant phase (versus intermittent self catheterization, at the 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
- capsules 0.5 mg

Cardura XL (doxazosin, generic)

- 4 mg qd; increase to 8 mg qd after 3-4weeks
- tablets 4 mg, 8 mg

Flomax (tamsulosin, generic)

- 0.4 mg-0.8 mg 30 min post same meal qd
- capsules 0.4 mg
- note: Flomax may be tapered to a prn schedule

Jalyn (dutasteride/tamsulosin)

- 1 tablet post same meal qd
- capsules 0.5mg/0.4mg

Hytrin (terazosin, generic)

- 1 mg qhs initially; increase stepwise to 2mg, 5 mg, 10 mg (the target dose) qhs
- capsules 1 mg, 2 mg, 5 mg, 10 mg
- note: may cause significant hypotension at beginning of treatment ; initiate at bedtime checking blood pressure routinely

Proscar (finasteride, generic)

- 5 mg qd
- tablets 5 mg

Rapaflo (sildenafil, generic)

- 4 mg to 8 mg po with same meal qd
- capsules 4 mg, 8 mg

Uroxatral (alfuzosin)

- 10 mg po following same meal qd
- tablets 10 mg

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.

The most common etiology for vaginitis is candida; clinicians should have a low threshold for suspicion, and treat early. Candidal vaginitis risk increases with diabetes, steroids use, and immune compromise. It can cause pruritus, burning or irritation, and produces a thick, white cottage cheese-like discharge that adheres to the vaginal wall. Use OTC topical meds initially (e.g. **Monistat**, **Femstat**, or **Mycelex**), and **Diflucan** if refractory.

Bacterial vaginosis produces a profuse, gray, thin discharge, often with a fishy smell; 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 douche and suppositories or **Replens** moisturizer may soothe noninfected vaginitis. 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**).

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, etc)

- q d to q 3 d
- cream (x3 d) or extended release cream (x1 d);
- follow insert instructions

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
- tablets 50 mg, 100 mg, 150 mg, 200 mg

Lidocaine

- apply to affected area prn for topical anesthesia
- 2.5% ointment (OTC) -1.25oz tubes
- **LMX 4** & **LMX 5** (OTC 4% & 5% cream)
 - 5 gm, 15 gm, 30 gm

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. Alternately, 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

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 (progressive headache is okay, progressive cord compression is not), 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 two weeks. Oral decadron has a 2 ½ day duration, so equal spacing throughout the day is not required.

Studies show up to 60% steroid myopathy with steroid 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.

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, candidiasis, gastritis, and Cushingoid appearance.

Steroids often cause insomnia, 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 psyotropic medication. Occasionally, steroid psychosis may develop.

Dexamethasone (*Decadron*, generic)

- XRT-induced symptomatic oedema or prophylaxis
- 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 maneuvers (e.g. **Epley maneuver**). For other causes, symptomatic relief requires vestibular nerve suppressants, such as **diazepam** or **meclizine**. **Scopolamine patches** are used for prophylaxis.

Diazepam (*Valium*, generic)

- 2 mg-5 mg qid-tid
- tablets 2 mg, 5 mg, 10 mg

Meclizine (*Antivert*, generic)

- 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

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 **divalproex**. Newer agents, such as **levetiracetam**, **pregabalin**, or **topiramate**, are preferred for their lower side-effect profile. Start 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

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**

Chronic pain management usually involves a two-drug approach, a long-acting narcotic administered q 12–24 hours, with a short-acting, prn medication for breakthrough pain. The long-acting narcotic dose is increased or decreased, so that 2–3 prn doses are required daily. Coanalgesics are added as needed.

If concerned about drug seeking or addictive behavior, attempt to control pain with long-acting medications alone.

Equianalgesic effects are usually related to oral morphine.

ORAL MORPHINE ORAL DOSE OF OPIOID

2 mg 30 mg **codeine**

5 mg **hydrocodone**

5mg 5mg **oxycodone**

15mg 4 mg **hydromorphone**

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

Morphine 2.5 – 5 mg q 6 hr

Long-acting morphine 15 mg bid

Hydromorphone 0.5 – 1 mg q 4 hr

Fentanyl 12.5 ug/hr

For all opioids, caution is recommended in patients with impaired respiratory function, 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 or a cathartic (e.g. **senna** 1 qd to 2 tid, with **simethicone** 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 persistent, advance to **ondansetron**.

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

- for persistent sedation, consider **Ritalin** (5 -10 mg bid) or **Provigil** (100 mg – 200 mg q am)
- for persistent 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) Multi doses, forms	32-1000 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, q 4-6	3200 mg/d max.
Naproxen (OTC/Rx) (250, 375, 500 mg)	250-500 mg, Q 12 h	1500 mg/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.
Tramadol (50 mg-300 mg ER)	50 mg-100 mg, q 4-6h	300 mg/d max.
Codeine (15, 30, 60 mg)	15mg-60 mg, q 4-6 h	360 mg/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 12 hour release	5-20+ mg q 4-6 h 5-20+ mg q 12 h	
Fentanyl Transdermal 3-day (12, 25, 50, 75, 100 ug/hr)	12 + ug/hr	Skin patch & transmucosal

Non-Opioid Analgesics

Acetaminophen (*Tylenol*, generic, OTC)

- 325-650 mg q 4-6 h
- multiple doses and formulations
- 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
- capsules 100mg, 200 mg, 400 mg

Ibuprofen

- 200-800 mg po q 4-6 h
- -multiple doses and formulations
- 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.
- capsules 20, 25, 40, 50 mg
- extended release capsules 75 mg; Rx 75 mg qd-bid

Naproxen (*Naprosyn*, generic)

- 250 mg -500 mg bid
- tablets 250 mg, 375 mg, 500 mg
- 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
- tablets 50 mg, 100 mg -daily max: 300 mg/d
- *Ultram ER*
 - 100 -300 mg qd
 - capsules and tablets, 100, 150, 200, 300 mg
- *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
- **Codeine** (CII)
 - tablets 15 mg, 30 mg, 60 mg
 - 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 **hydrocodone**, 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 transmucosal** (*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

Hydromorphone (*Dilaudid*, generic)

- 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 release daily dose.
 - 8, 2, 16, 32 mg
 - 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 through 40 mg

Coanalgesics

Nonsteroidal anti-inflammatory drugs are effective for treating prostaglandin-associated pain, such as bone mets, arthritis, acute surgical pain (see preceding 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 **gabapentin**. Other coanalgesics include analeptics, anxiolytics, antispasmodics, topical anaesthetics, and muscle relaxants (see subsequent sections). **Amitriptyline** 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

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 under-treated in this group of patients.

Somnolence and Fatigue

Before attempting to remedy somnolence and fatigue, rule out comorbid factors: anemia, electrolyte imbalances, nutritional issues, endocrine, pain, and depression. *Ritalin* and *Provigil* and the drugs most commonly prescribed for cancer-related fatigue.

Navigil (armodafinil, Class IV)

- 50-150mg (elderly)
- 250 mg q am (non-elderly)
- tablets, 50, 150, 250 mg

Provigil (Modafinil, Class IV)

- 100 mg (elderly)
- 200 mg po q am (non-elderly)
- tablets 100 mg, 200 mg

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

Antianxiety

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 patients unable to take benzodiazepines, **hydroxyzine**, **gabapentin**, or **propanolol** can be considered.

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 *Mirtazapine*, enhance the serotonergic 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 mg 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)
 - 7 -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. **Haldol** can cause severe extrapyramidal syndromes, but is appropriate for severe psychoses. The newer antipsychotics have less side effects, and may be more appropriate for less severe psychoses.

Haloperidol (*Haldol*, generic)

- moderate: 0.5-2.0 mg po tid
- severe: 3.0-5.0 mg po tid
- tablets 0.5 mg, 1 mg, 2 mg, 5 mg, 10 mg, 20 mg
- acute: 2 -5 mg IM q 4 hr; max 100 mg/day

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. **Roserem** (which works through the melatonin system), and **trazadone** or **mirtazapine** in elderly patients antidepressants, with antianxiety benefit) are good initial prescription choices.

For patients not previously treated with **benzodiazepines**, **Ambien** is a good first Rx choice. The three 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** or **Ativan**, or **Ambien CR**. 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

Benadryl (diphenhydramine, OTC)

- 50 mg po q hs
- tablets 25 mg

ProSom (estazolam, generic)

- 1.0-2.0 mg po q hs
- tablets 1.0 mg, 2.0 mg

Dalmane (flurazepam, generic)

- 30 mg po q hs
- elderly patients 15 mg po q hs
- capsules 15 mg, 30 mg

Lunesta (eszopiclone)

- 2-3 mg po qhs
- tablets 1mg, 2mg, 3 mg

Melatonin

- 0.2 to 5 mg qhs
- begin with smaller dose.

Sonata (zalepon)

- 5 mg-20 mg po qhs
- capsules 5 mg, 10 mg

Restoril (temazepam, generic)

- 15 mg -30 mg po q hs
- capsules 7.5 mg, 15 mg, 22.5 mg, 30 mg

Rozarem (ramelteon)

- 8 mg po qhs
- tablets 8 mg

Trazadone (generic)

- 50 mg-100 mg qhs
- tablets 50 mg, 100 mg, 150 mg, 300 mg.

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)

- 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
- oral: 0.5mg - 3mg po
- tablets 0.5 mg, 1 mg, 2 mg

Diazepam (*Valium*, generic)

- 2 mg -10 mg IV or IM q 3 hrs
- 2mg-10mg 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)

- 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 the **Namenda Titration Pak** if available, for the first month, then continue 20 mg daily.

Tablets 5 mg, 10 mg; oral solution 2 mg/mL

Namenda Titration Pak

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 as 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 **Pravastatin**.

Carisoprodol (*Soma*, generic)

- 1 tablet po qid
- tablets 350 mg

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
- tablets 2 mg, 5 mg, 10 mg

Pentoxifylline (*Trental*)

- 400 mg tid
- tablets 400 mg

Pravachol (**pravastatin**, generic)

- 40 mg daily
- tablets - 10 mg, 20 mg, 40 mg, 80 mg

Tizanidine (*Zanaflex*)

- 2 mg qd, increasing frequency and dose by 2 to 4 mg every 4 days; maximum 8 mg tid
- capsules 2 mg , 4 mg, 6 mg - tablets 2 mg, 4 mg

Tocopherol (**Vitamin E**, OTC)

- 400 iu qd

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