Fred Hutch Cancer Center

Supportive Care

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UW Medicine

What is supportive care?

- Encompasses significant amount of what an oncologist does – widely applicable
- Not specific to any oncologic disease
- Aimed at improving symptoms and tolerance of therapy
- Multiple topics
- Guidelines by NCCN, MASCC, ASCO, and others
- Palliative/Supportive Care, Survivorship, and Communication = 11% boards

Topics – covered today

Antiemesis

Anemia

Myeloid growth factors

Skeletal

Fatigue

Brief reviews – neuropathy, cachexia

Not covered: pain, mucositis, GI, distress, palliative care, infections, survivorship, chemotherapy dosing, IV access, immunotherapy toxicity management, VTE, smoking cessation, communication …

Antiemesis

CINV Introduction

- N/V are the most common and feared symptoms of cancer chemotherapy
- Management of these symptoms is the most important determinant of the patient experience
- Innovation in this area has undoubtedly improved QOL and likely survival though improved adherence

Potential problems due to N/V:

- Metabolic disturbances
- Dehydration
- Anorexia
- Decline in PS
- Wound complications, esophageal tears
- Withdrawal from treatment

Definitions

- Acute onset N/V usually occurs within minutes to hours after chemotherapy administration and , it peaks after ~ 6 hours and commonly resolves within 24 hours

Delayed CINV

- Delayed = (>24hrs)
- Common with platins, cyclophosphamide, doxorubicin
- Cisplatin – peaks at 48-72 hours, can last up to a week
- The risk of N/V extends to at least 4 days after drug is given for agents of moderate to high emetogenic potential and patients should be protected through this period

Anticipatory CINV

- N/V before next chemotherapy
- a conditioned response
- estimates range from 20-60%
- main indication for benzodiazepines (lorazepam) in CINV

Refractory/Breakthrough CINV

- Breakthrough emesis occurs despite prophylactic treatment and/or requires “rescue” antiemetics

- Refractory emesis may occur during subsequent cycles following ineffective treatment in earlier cycles

CINV Risk Factors

Acute

Patient-related factors

- Age
- Gender
- Alcohol use
- previous CINV
- History of anxiety
- Prone to motion sickness
- Morning sickness during pregnancy

Chemotherapy-related factors

- Emetogenicity
- Combination regimens, dose
- Number of cycles
- Unfractionated regimens
- Infusion time

Delayed

Any predictive factor for acute CINV

Poor control of acute CINV

Concomitant drugs after chemotherapy (i.e. opioids, antibiotics)

Low QOL score

Am J Health-Syst Pharm. 1999;56:729. J Clin Oncol. 1999;17:2971.

Emetogenicity of Chemotherapy

- No universal classification system, NCCN guidelines
- High (> 90%) of patients experience emesis
- Moderate (30-90%)
- Low (10-30%)
- Minimal (< 10%)

EMETOGENIC POTENTIAL OF PARENTERAL ANTICANCER AGENTS

LEVEL	AGENT		
High emetic risk (>90% frequency of emesis)[a]	• AC combination defined as any chemotherapy regimen that contains an anthracycline and cyclophosphamide • Carboplatin AUC ≥4 • Carmustine >250 mg/m^2	• Cisplatin • Cyclophosphamide >1500 mg/m^2 • Dacarbazine • Doxorubicin ≥60 mg/m^2 • Epirubicin >90 mg/m^2 • Fam-trastuzumab deruxtecan-nxki	• Ifosfamide ≥2 g/m^2 per dose • Mechlorethamine • Melphalan ≥140 mg/m^2 • Sacituzumab govitecan-hziy • Streptozocin
Moderate emetic risk (>30%–90% frequency of emesis)[a]	• Aldesleukin >12–15 million IU/m^2 • Amifostine >300 mg/m^2 • Bendamustine • Busulfan • Carboplatin[b] AUC <4 • Carmustine[b] ≤250 mg/m^2 • Clofarabine • Cyclophosphamide[b] ≤1500 mg/m^2 • Cytarabine >200 mg/m^2 • Dactinomycin[b] • Daunorubicin[b]	• Dinutuximab • Doxorubicin[b] <60 mg/m^2 • Dual-drug liposomal encapsulation of cytarabine and daunorubicin • Epirubicin[b] ≤90 mg/m^2 • Idarubicin[b] • Ifosfamide[b] <2 g/m^2 per dose • Irinotecan[b] • Irinotecan (liposomal) • Lurbinectedin	• Melphalan <140 mg/m^2 • Methotrexate[b] ≥250 mg/m^2 • Mirvetuximab soravtansine-gynx • Naxitamab-gqgk • Oxaliplatin[b] • Romidepsin • Temozolomide • Trabectedin[b]

Table framework is based on the emetogenicity classifications described in the following publications: Hesketh PJ, et al. J Clin Oncol 1997;15:103-109. Grunberg SM, et al. Support Care Cancer 2011;19:S43-S47.

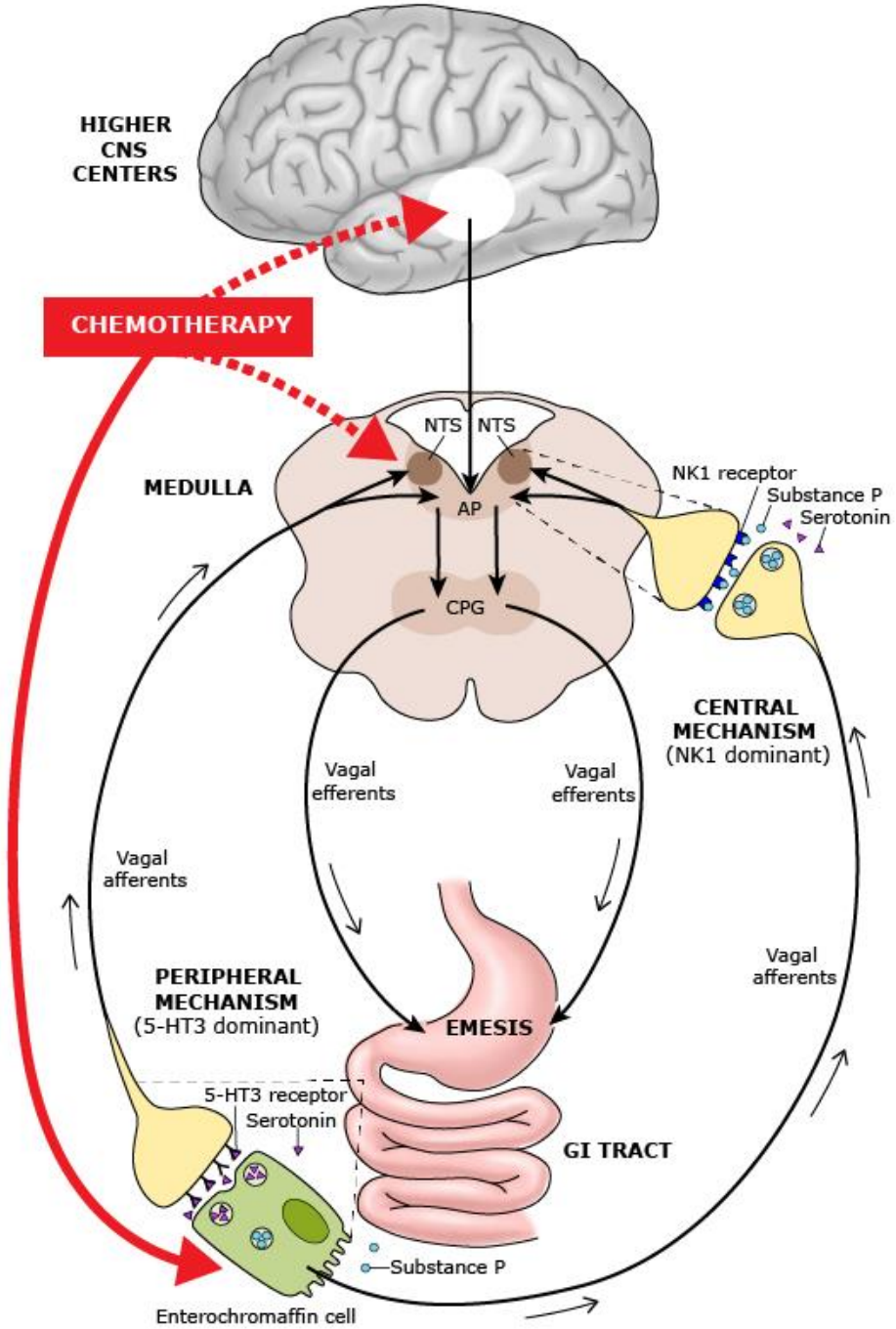
EMETOGENIC POTENTIAL OF PARENTERAL ANTICANCER AGENTS

LEVEL	AGENT			
Low emetic risk (10%–30% frequency of emesis)[a,c]	• Ado-trastuzumab emtansine • Aldesleukin ≤12 million IU/m² • Amifostine ≤300 mg/m² • Amivantamab-vmjw • Arsenic trioxide • Axicabtagene ciloleucel[d] • Azacitidine • Belinostat • Brentuximab vedotin • Brexucabtagene autoleucel[d] • Cabazitaxel • Carfilzomib • Ciltacabtagene autoleucel[d] • Copanlisib • Cytarabine (low dose) 100 mg/m² – 200 mg/m²	• Docetaxel • Doxorubicin (liposomal) • Enfortumab vedotin-ejfv • Eribulin • Etoposide • Floxuridine • 5-Fluorouracil (5-FU) • Gemcitabine • Gemtuzumab ozogamicin • Idecabtagene vicleucel[d] • Inotuzumab ozogamicin • Isatuximab-irfc • Ixabepilone • Lisocabtagene maraleucel[d] • Loncastuximab tesirine-lpyl	• Methotrexate >50 mg/m² – <250 mg/m² • Mitomycin • Mitomycin pyelocalyceal solution • Mitoxantrone • Mogamulizumab-kpkc • Mosunetuzumab-axgb • Necitumumab • Omacetaxine • Paclitaxel • Paclitaxel-albumin • Pemetrexed • Pentostatin • Polatuzumab vedotin-piig • Pralatrexate	• Tafasitamab-cxix • Tagraxofusp-erzs • Talimogene laherparepvec • Tebentafusp-tebn • Thiotepa • Tisagenlecleucel[d] • Tisotumab vedotin-tftv • Topotecan • Ziv-aflibercept
Minimal emetic risk (<10% frequency of emesis)[a,c]	• Alemtuzumab • Asparaginase[e] • Atezolizumab • Avelumab • Bevacizumab • Bleomycin • Blinatumomab • Bortezomib • Cemiplimab-rwlc • Cetuximab • Cladribine • Cytarabine <100 mg/m² • Daratumumab • Daratumumab and hyaluronidase-fihj • Decitabine • Degarelix • Dexrazoxane	• Dostarlimab-gxly • Durvalumab • Elotuzumab • Epcoritamab-bysp • Fludarabine • Fulvestrant • Glofitamab-gxbm • Goserelin • Histrelin • Ipilimumab • Lanreotide • Leuprolide • Luspatercept-aamt • Margetuximab-cmkb • Methotrexate ≤50 mg/m²	• Nelarabine • Nivolumab • Nivolumab/relatlimab-rmbw • Obinutuzumab • Octreotide • Ofatumumab • Panitumumab • Pembrolizumab • Pertuzumab • Pertuzumab/trastuzumab and hyaluronidase-zzxf • Ramucirumab • Retifanlimab-dlwr • Rituximab • Rituximab and hyaluronidase	• Siltuximab • Sirolimus-albumin • Teclistamab-cqyv • Temsirolimus • Trastuzumab • Trastuzumab and hyaluronidase-oysk • Tremelimumab-actl • Triptorelin • Valrubicin • Vinblastine • Vincristine • Vincristine (liposomal) • Vinorelbine

EMETOGENIC POTENTIAL OF ORAL ANTICANCER AGENTS

LEVEL	AGENT			
Moderate to high emetic risk[a] (≥30% frequency of emesis): Prophylaxis required on days of oral anticancer agent administration	• Azacitidine[w] • Busulfan ≥4 mg/day • Ceritinib • Cyclophosphamide ≥100 mg/m²/day	• Fedratinib • Lomustine (single day) • Midostaurin • Mitotane	• Selinexor[x] • Temozolomide >75 mg/m²/day	
Moderate to high emetic risk[a,v] (≥30% frequency of emesis): As needed (PRN) dosing is *initially* appropriate on days of oral anticancer agent administration	• Adagrasib • Avapritinib • Binimetinib • Bosutinib >400 mg/day • Cabozantinib	• Crizotinib • Dabrafenib • Elacestrant • Enasidenib • Encorafenib	• Estramustine • Etoposide • Imatinib >400 mg/day • Lenvatinib >12 mg/day	• Niraparib • Olaparib • Procarbazine • Rucaparib
Minimal to low emetic risk[a] (<30% frequency of emesis)	• Abemaciclib • Abiraterone • Acalabrutinib • Afatinib • Alectinib • Alpelisib • Anastrozole • Apalutamide • Asciminib • Axitinib • Belzutifan • Bexarotene • Bicalutamide • Bosutinib ≤400 mg/day • Brigatinib • Busulfan <4 mg/day • Capecitabine • Capmatinib • Chlorambucil • Cobimetinib • Cyclophosphamide <100 mg/m²/day • Dacomitinib • Darolutamide • Dasatinib	• Decitabine and cedazuridine • Duvelisib • Entrectinib • Enzalutamide • Erdafitinib • Erlotinib • Everolimus • Exemestane • Fludarabine • Flutamide • Futibatinib • Gefitinib • Gilteritinib • Glasdegib • Hydroxyurea • Ibrutinib • Idelalisib • Imatinib ≤400 mg/day • Ivosidenib • Ixazomib • Lapatinib • Larotrectinib • Lenalidomide • Lenvatinib ≤12 mg/day • Letrozole	• Lorlatinib • Megestrol • Melphalan • Mercaptopurine • Methotrexate • Momelotinib • Neratinib • Nilotinib • Nilutamide • Olutasidenib • Osimertinib • Pacritinib • Palbociclib • Pazopanib • Pemigatinib • Pexidartinib • Pirtobrutinib • Pomalidomide • Ponatinib • Pralsetinib • Regorafenib • Relugolix • Repotrectinib • Ribociclib • Ripretinib • Ruxolitinib	• Selpercatinib • Sonidegib • Sorafenib • Sotorasib • Sunitinib • Talazoparib tosylate • Tamoxifen • Tazemetostat • Temozolomide ≤75 mg/m²/day[y] • Tepotinib • Thalidomide • Thioguanine • Tivozanib • Topotecan • Toremifene • Trametinib • Tretinoin • Trifluridine/tipiracil • Tucatinib • Vandetanib • Vemurafenib • Venetoclax • Vismodegib • Vorinostat • Zanubrutinib

Biology of CINV



NTS: nucleus tractus solitarius
AP: area postrema
CPG: central pattern generator

From: UpToDate

Pharmacologic options for CINV

- $5HT_3$ antagonists (ondansetron, dolasetron, granisetron, palonosetron)
- Corticosteroid (dexamethasone)
- Benzodiazepines (lorazepam)
- Phenothiazines** (prochlorperazine, promethazine)
- Butyrophenones** (droperidol, haloperidol)
- Olanzapine
- Cannabinoids (dronabinol)**
- Substituted benzamides (metoclopramide)**
- Antihistamine/Anticholinergics (diphenhydramine, scopolamine)**
- Substance P/NK_1 receptor antagonist (aprepitant, netupitant)

** low therapeutic index agents not discussed in this lecture

- No final common pathway has been discovered
- Current agents act on different receptor families

  (M1, D2, H1, 5-HT3, NK1)
- No single agent expected to provide complete protection

Serotonin ($5HT_3$) in CINV

- Closely associated with acute phase CINV
- Chemotherapy administration causes release of serotonin from the GI tract, thereby stimulating emesis via vagus and greater splanchnic nerves, as well as the area postrema of the brain
- In early trials, $5HT_3$ release was not found in delayed phase of CINV
- Palonosetron has efficacy for prevention of delayed emesis, but role of other $5HT_3$ is debated

5-HT3 receptor antagonists

- ondansetron (1991), granisetron, dolasetron, palonsetron (2003)
- Numerous studies have demonstrated the 5-HT3 agents have same SE profile and efficacy*
- SE are mild – HA, constipation – counsel patients
- Steroids improve efficacy
- QTc prolongation (except palonosetron and ER formulations)
- Limited role in treatment of delayed phase N/V

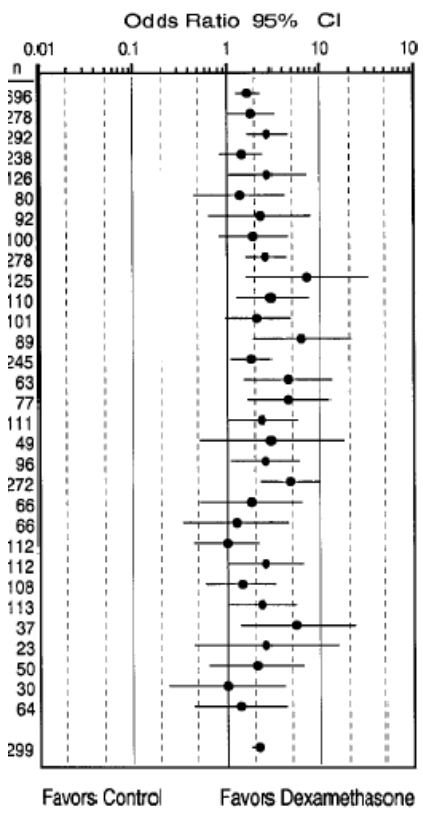
Palonsetron

- pharmacologically distinct
- 100-fold higher binding affinity for 5-HT3R
- T ½ ~ 40 hours
- As effective as traditional 5-HT3 agents for acute CINV (single dose)
- Superior in preventing delayed emesis (single dose)

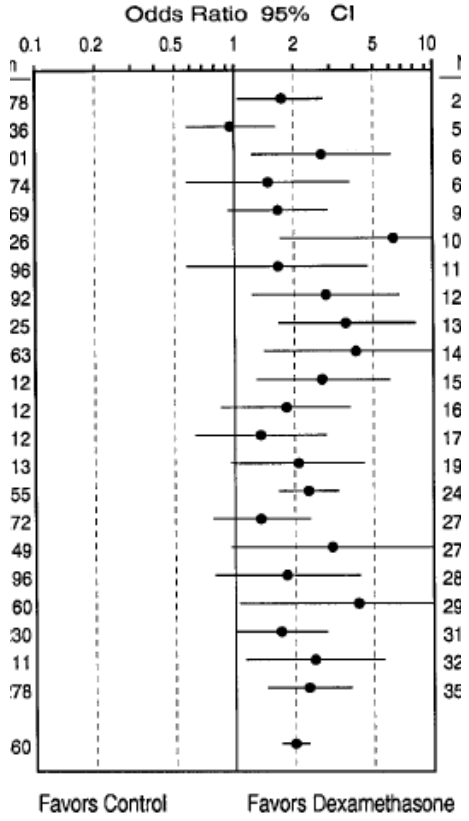
Dexamethasone addition to 5HT3

Meta-analysis of 32 studies showing OR of 2 vs 5HT3 monotherapy for acute and delayed phase

Acute Phase



Delayed Phase



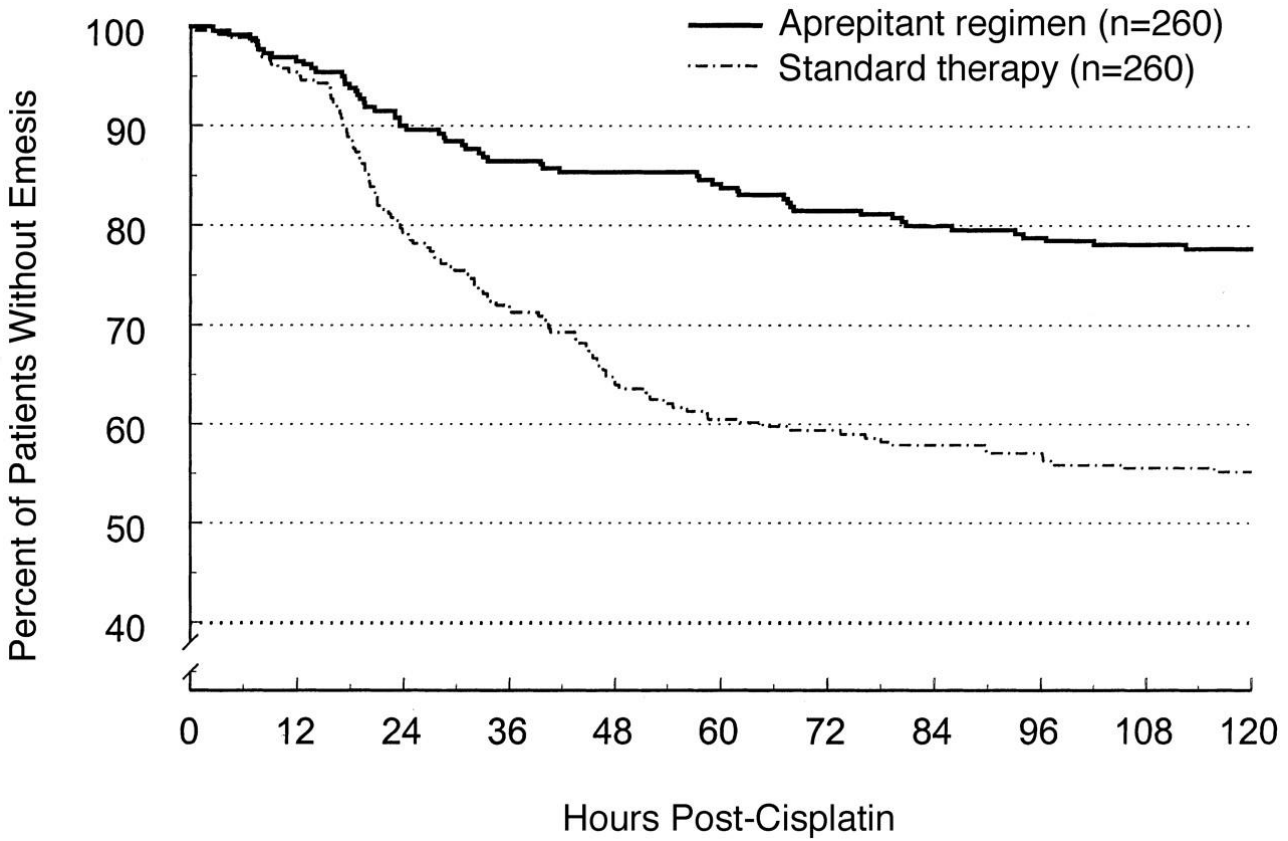
(side note – dexamethasone induced hiccup -> prednisone)

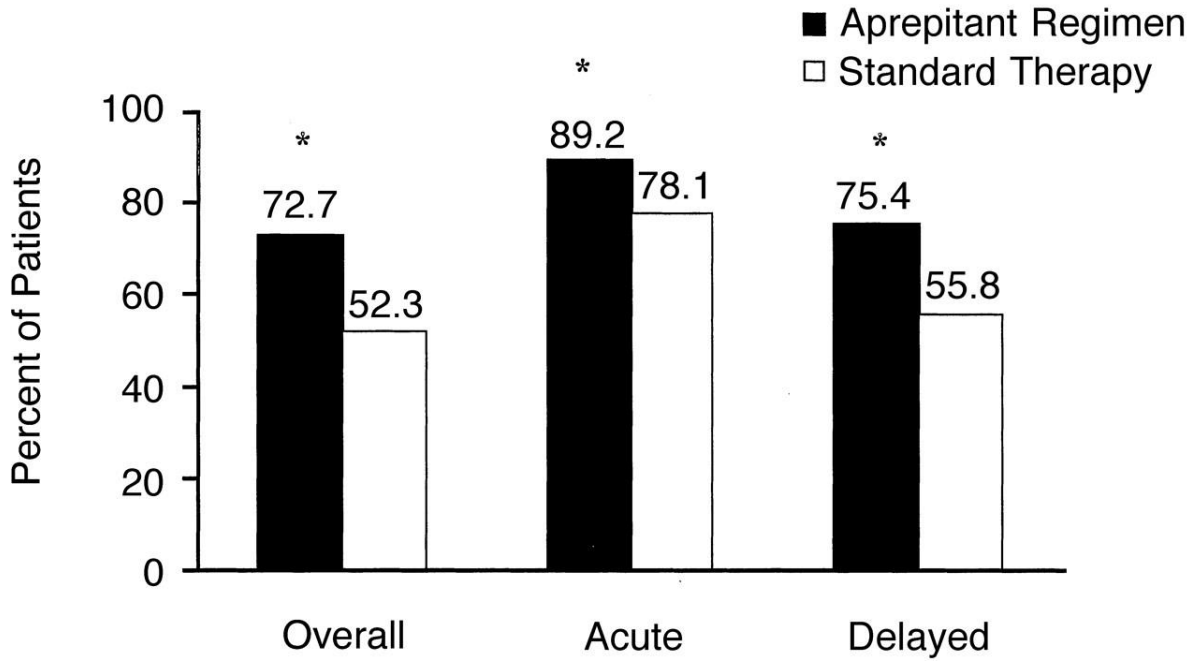
Ioannidis et al. JCO. PMID 11013282

Substance P / Neurokinin Receptors Aprepitant/fosaprepitant, others

- Substance P: a member of the tachykinin family of neuropeptides
- Biological activity mediated by neurokinin (NK-1) receptor
- Substance P and NK-1 receptors located in brain stem dorsal vagal complex – nucleus tractus solitarus (NTS) and area postrema and the GI tract
- Beneficial in delayed > acute CINV, but use is in prevention
- Fosaprepitant 150 mg IV over ~30 min (polysorbate 80, HSR)
- Aprepitant 130mg IV over ~2 min
- Many drug interactions, ~CYP3A4 -reduce dexamethasone 50%

Kaplan-Meier curves demonstrating percentages of patients without emesis during the 120-hour study period.





Standard therapy – ondansetron d1, dexamethasone d1-4

Hesketh et al. JCO 2003;21:4112-4119

RCT: (**olanzapine** 10 mg vs placebo) + fosaprepitant, 5HT3, Dex

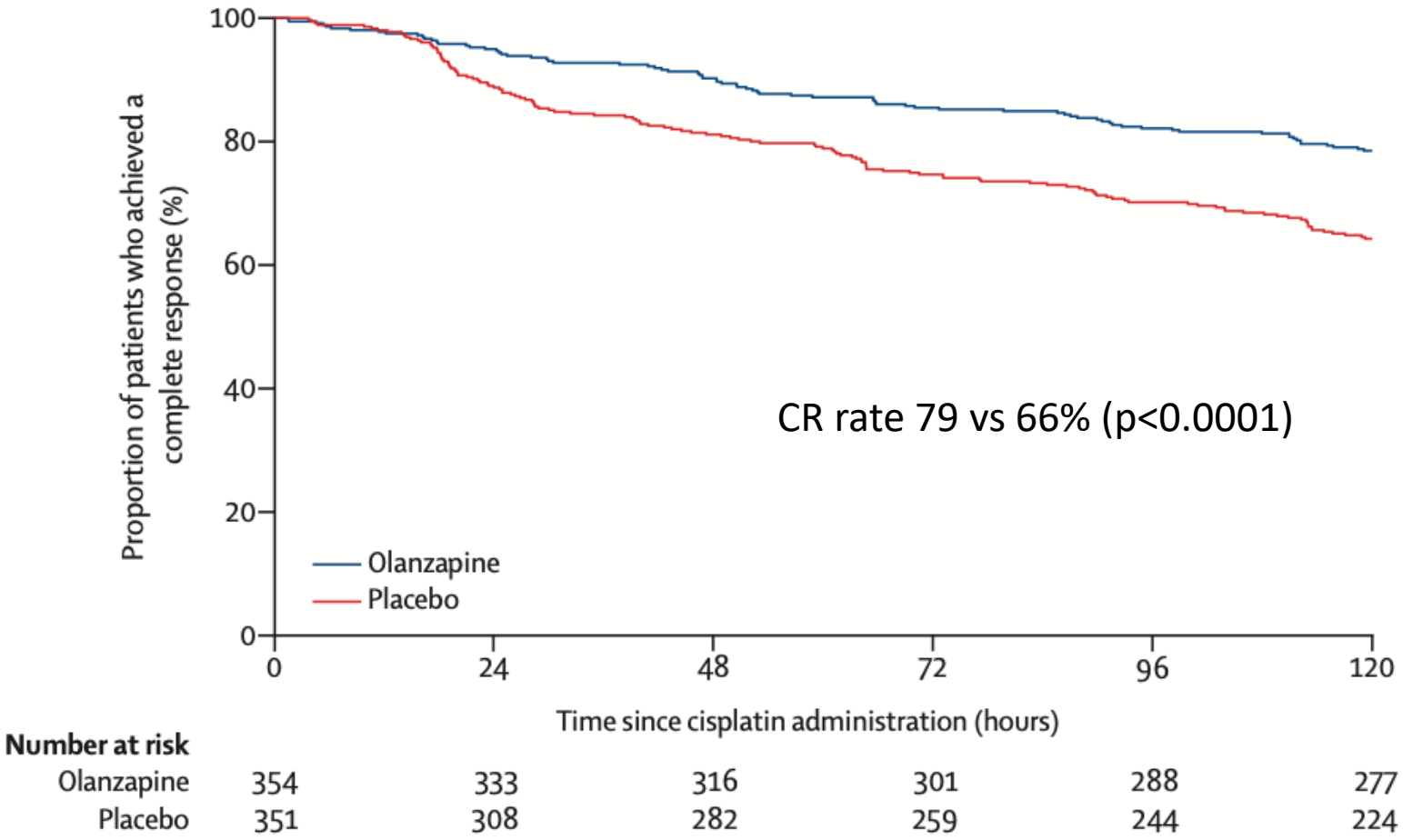
	CR Rate=no emesis or rescue(%)		No nausea (%) = primary endpt	
	Olanz	PCO	Olanz	PCO
0-24 hr	86	65	74	55
0-120 hr	64	40	37	22

All $P < 0.01$, N= 380

Side Effects: mild increase in **sedation** at day 2 (2/10 vs. 1/10) and increased appetite

Navari RM et al. NEJM 2016: 375: 134-142

Olanzapine 5 mg plus standard antiemetic therapy for the prevention of chemotherapy-induced nausea and vomiting (J-FORCE):



CR rate 79 vs 66% (p<0.0001)

cisplatin (≥50 mg/m2)
age 20 - 75 years,
ECOG 0–2.

oral olanzapine 5 mg or placebo d1–4
aprepitant, palonosetron, and dexamethasone

Less sedation than 10mg
mixed effect on sleep

Meta-analysis suggests
5mg ~ 10 mg
Chow R. PMID: 34613472

Hashimoto H. Lancet Oncol. 2020;21(2):242-249

Principles

- Prophylactic therapy should be given before chemotherapy to prevent adverse outcomes
- Routes of administration: PO, PR, IV, IM
- PO route is preferred as it is most convenient /cost effective
- Often IV is needed due to inability to take PO
- Lowest maximally effective dose should be used
- Once daily dosing
- Delayed N/V therapy incorporated proactively
- Avoid using concomitant drugs in same class

Guidelines – see NCCN website

- In contrast to other guidelines that are often based on expert opinion - there is a significant amount of clinical trials data supporting the recommendations

- USE THE GUIDELINES

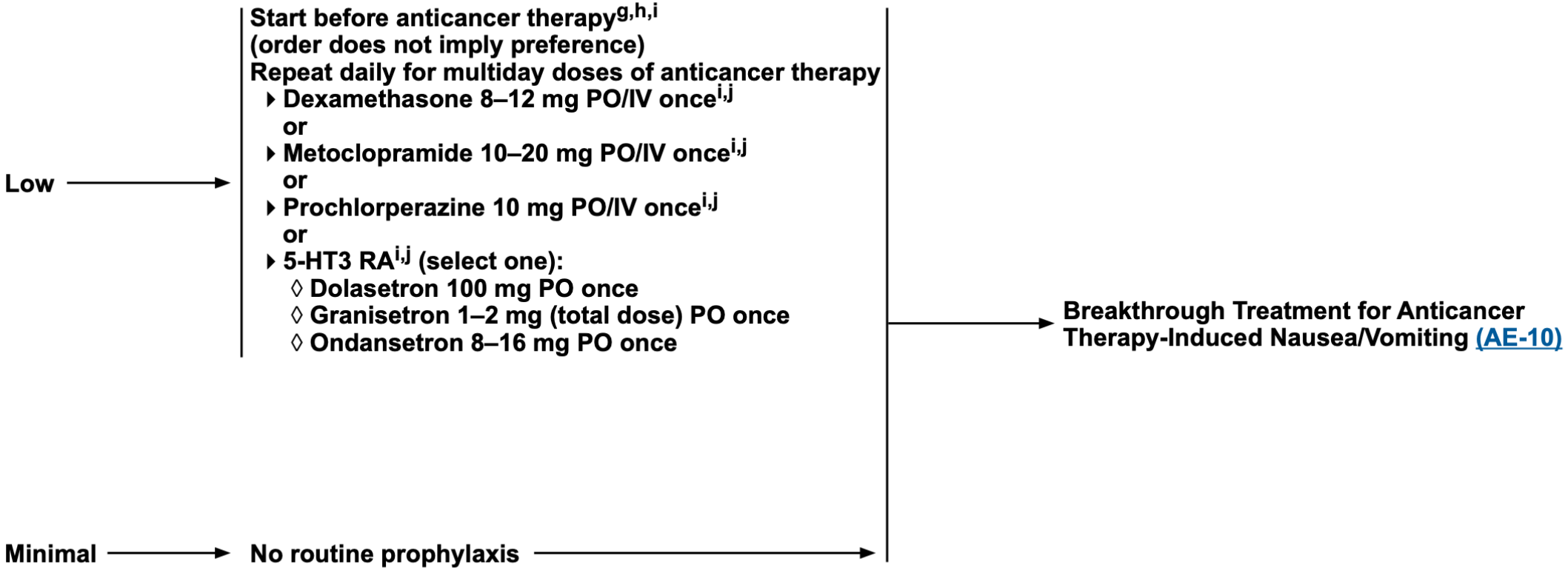
HIGH EMETIC RISK PARENTERAL ANTICANCER AGENTS — ACUTE AND DELAYED EMESIS PREVENTION[f,g,h,i,j]

DAY 1: Select treatment option A, B, or C All treatment options are category 1 and should be started before anticancer therapy[h]	DAYS 2, 3, 4:
Treatment option A (preferred), use the following combination[k]: 1. Olanzapine 5–10 mg PO once[l] 2. NK1 receptor antagonist (RA) (choose one): ◊ Aprepitant 125 mg PO once ◊ Aprepitant injectable emulsion 130 mg intravenous (IV) once[m] ◊ Fosaprepitant 150 mg IV once ◊ Netupitant 300 mg / palonosetron 0.5 mg (available as fixed combination product only) PO once ◊ Fosnetupitant 235 mg / palonosetron 0.25 mg (available as fixed combination product only) IV once ◊ Rolapitant 180 mg PO once[n] 3. 5-HT3 RA (choose one)[o,p]: ◊ Dolasetron 100 mg PO once ◊ Granisetron 10 mg subcutaneous (SQ) once,[q] or 2 mg PO once, or 0.01 mg/kg (max 1 mg) IV once, or 3.1 mg/24-h transdermal patch applied 24–48 h prior to first dose of anticancer therapy ◊ Ondansetron 16–24 mg PO once, or 8–16 mg IV once ◊ Palonosetron 0.25 mg IV once 4. Dexamethasone 12 mg PO/IV once[r,s]	**Treatment option A:** • Olanzapine 5–10 mg PO daily on days 2, 3, 4[l] • Aprepitant 80 mg PO daily on days 2, 3 (if aprepitant PO is used on day 1) • Dexamethasone 8 mg[r,s] PO/IV daily on days 2, 3, 4
Treatment option B, use the following combination: 1. Olanzapine 5–10 mg PO once[l] 2. Palonosetron 0.25 mg IV once 3. Dexamethasone 12 mg PO/IV once[r,s]	**Treatment option B:** • Olanzapine 5–10 mg PO daily on days 2, 3, 4[l]
Treatment option C, use the following combination: 1. NK1 RA (choose one): ◊ Aprepitant 125 mg PO once ◊ Aprepitant injectable emulsion 130 mg IV once[m] ◊ Fosaprepitant 150 mg IV once ◊ Netupitant 300 mg / palonosetron 0.5 mg (available as fixed combination product only) PO once ◊ Fosnetupitant 235 mg / palonosetron 0.25 mg (available as fixed combination product only) IV once ◊ Rolapitant 180 mg PO once[n] 2. 5-HT3 RA (choose one)[o,p]: ◊ Dolasetron 100 mg PO once ◊ Granisetron 10 mg SQ once,[q] or 2 mg PO once, or 0.01 mg/kg (max 1 mg) IV once, or 3.1 mg/24-h transdermal patch applied 24–48 h prior to first dose of anticancer therapy ◊ Ondansetron 16–24 mg PO once, or 8–16 mg IV once ◊ Palonosetron 0.25 mg IV once 3. Dexamethasone 12 mg PO/IV once[r,s]	**Treatment option C:** • Aprepitant 80 mg PO daily on days 2, 3 (if aprepitant PO is used on day 1) • Dexamethasone 8 mg[r,s] PO/IV daily on days 2, 3, 4

MODERATE EMETIC RISK PARENTERAL ANTICANCER AGENTS — ACUTE AND DELAYED EMESIS PREVENTION[f,g,h,i,j]

DAY 1: Select treatment option D, E, or F All treatment options are category 1 and should be started before anticancer therapy[h]	DAYS 2, 3:
Treatment option D, use the following combination: 1. 5-HT3 RA (choose one): ◊ Dolasetron 100 mg PO once ◊ Granisetron 10 mg SQ once[q] (preferred), or 2 mg PO once, or 0.01 mg/kg (max 1 mg) IV once, or 3.1 mg/24-h transdermal patch applied 24–48 h prior to first dose of anticancer therapy ◊ Ondansetron 16–24 mg PO once, or 8–16 mg IV once ◊ Palonosetron 0.25 mg IV once (preferred) 2. Dexamethasone 12 mg PO/IV once[r,s]	**Treatment option D:** • Dexamethasone 8 mg[r,s] PO/IV daily on days 2, 3 OR • 5-HT3 RA monotherapy[t]: ◊ Granisetron 1–2 mg (total dose) PO daily or 0.01 mg/kg (max 1 mg) IV daily on days 2, 3 ◊ Ondansetron 8 mg PO twice daily or 16 mg PO daily or 8–16 mg IV daily on days 2, 3 ◊ Dolasetron 100 mg PO daily on days 2, 3
Treatment option E, use the following combination[u]: 1. Olanzapine 5–10 mg PO once[l] 2. Palonosetron 0.25 mg IV once 3. Dexamethasone 12 mg PO/IV once[r,s]	**Treatment option E:** • Olanzapine 5–10 mg PO daily on days 2, 3[l]
Treatment option F, use the following combination[u]: 1. NK1 RA (choose one): ◊ Aprepitant 125 mg PO once ◊ Aprepitant injectable emulsion 130 mg IV once[m] ◊ Fosaprepitant 150 mg IV once ◊ Netupitant 300 mg/palonosetron 0.5 mg (available as fixed combination product only) PO once ◊ Fosnetupitant 235 mg / palonosetron 0.25 mg (available as fixed combination product only) IV once ◊ Rolapitant 180 mg PO once[n] 2. 5-HT3 RA (choose one)[o,p]: ◊ Dolasetron 100 mg PO once ◊ Granisetron 10 mg SQ once,[q] or 2 mg PO once, or 0.01 mg/kg (max 1 mg) IV once, or 3.1 mg/24-h transdermal patch applied 24–48 h prior to first dose of anticancer therapy. ◊ Ondansetron 16–24 mg PO once, or 8–16 mg IV once ◊ Palonosetron 0.25 mg IV once 3. Dexamethasone 12 mg PO/IV once[r,s]	**Treatment option F:** • Aprepitant 80 mg PO daily on days 2, 3 (if aprepitant PO used on day 1) • ± Dexamethasone 8 mg[r,s] PO/IV daily on days 2, 3

LOW AND MINIMAL EMETIC RISK PARENTERAL ANTICANCER AGENTS - EMESIS PREVENTION[f,g,h,j]



ORAL ANTICANCER AGENTS - EMESIS PREVENTION[g,h,z,aa]

Moderate to high emetic risk (prophylaxis required) →

Start before anticancer therapy and continue daily (order does not imply preference)
- **5-HT3 RA (choose one)[j,v]:**
  - **Dolasetron 100 mg PO daily**
  - **Granisetron 1–2 mg (total dose) PO daily or 3.1 mg/24-h transdermal patch every 7 days**
  - **Ondansetron 8–16 mg (total dose) PO daily**

→ **Breakthrough Treatment for Anticancer Therapy-Induced Nausea/Vomiting (AE-10)**

Minimal to low emetic risk and Moderate to high (PRN dosing initially appropriate) → **PRN recommended** → **Nausea/vomiting (Breakthrough Treatment for Anticancer Therapy-Induced Nausea/Vomiting [AE-10] and consider escalating to a higher level of antiemetic prevention [ie, Moderate-High and consider prophylaxis] for the next cycle)** →

Start before anticancer therapy and continue daily (order does not imply preference)
- **Metoclopramide 10–20 mg PO and then every 6 h PRN[j]**
  or
- **Prochlorperazine 10 mg PO and then every 6 h PRN (maximum 40 mg/day)[j]**
  or
- **5-HT3 RA (choose one)[j]:**
  - ◊ **Dolasetron 100 mg PO daily PRN**
  - ◊ **Granisetron 1–2 mg (total dose) PO daily PRN**
  - ◊ **Ondansetron 8–16 mg (total dose) PO daily PRN**

→ **Breakthrough Treatment for Anticancer Therapy-Induced Nausea/Vomiting (AE-10) and Consider changing antiemetic therapy to higher level primary therapy for the next cycle**

Breakthrough Treatment

- assess what was taken (medication reconciliation)
- add agents from a different drug class
  - Additional steroid for prolonged nausea in delayed phase
  - (don’t use additional 5HT3 for 3 days post-palonosetron)
  - (5HT3 likely minimally effective in delayed phase)
- use multiple concurrent agents
- IV therapy often needed (drugs, IVF)
- round-the-clock administration
- remember this for the next cycle, assess for other causes

Consider non-CINV causes

- bowel obstruction
- constipation
- vestibular dysfunction
- brain metastases
- electrolytes, dehydration
- uremia
- other drugs (opiates)
- gastro paresis (tumor or vincristine)
- anxiety, anticipatory N/V
- Cannabis hyperemesis syndrome
- Rapid opioid withdrawal

Take Home Points

- 5-HT3 agents are the mainstay for the prevention of acute CINV in moderate to highly emetogenic regimens
- The benefit of the 5-HT3 agents (except palonset.) in delayed CINV is debated
- Steroids significantly augment 5-HT3s and should almost always be used
- NCCN recommends avoiding steroids in immunotherapy
- Aprepitant and/or olanzapine (~5mg) are indicated for highly emetogenic chemotherapy
- High therapeutic index agents: 5HT3, NK1, olanzapine
- CW: Don’t give patients starting on a chemotherapy regimen that has a low or moderate risk of causing nausea and vomiting antiemetic drugs intended for use with a regimen that has a high risk of causing nausea and vomiting.

Erythropoiesis-Stimulating Agents (ESA)

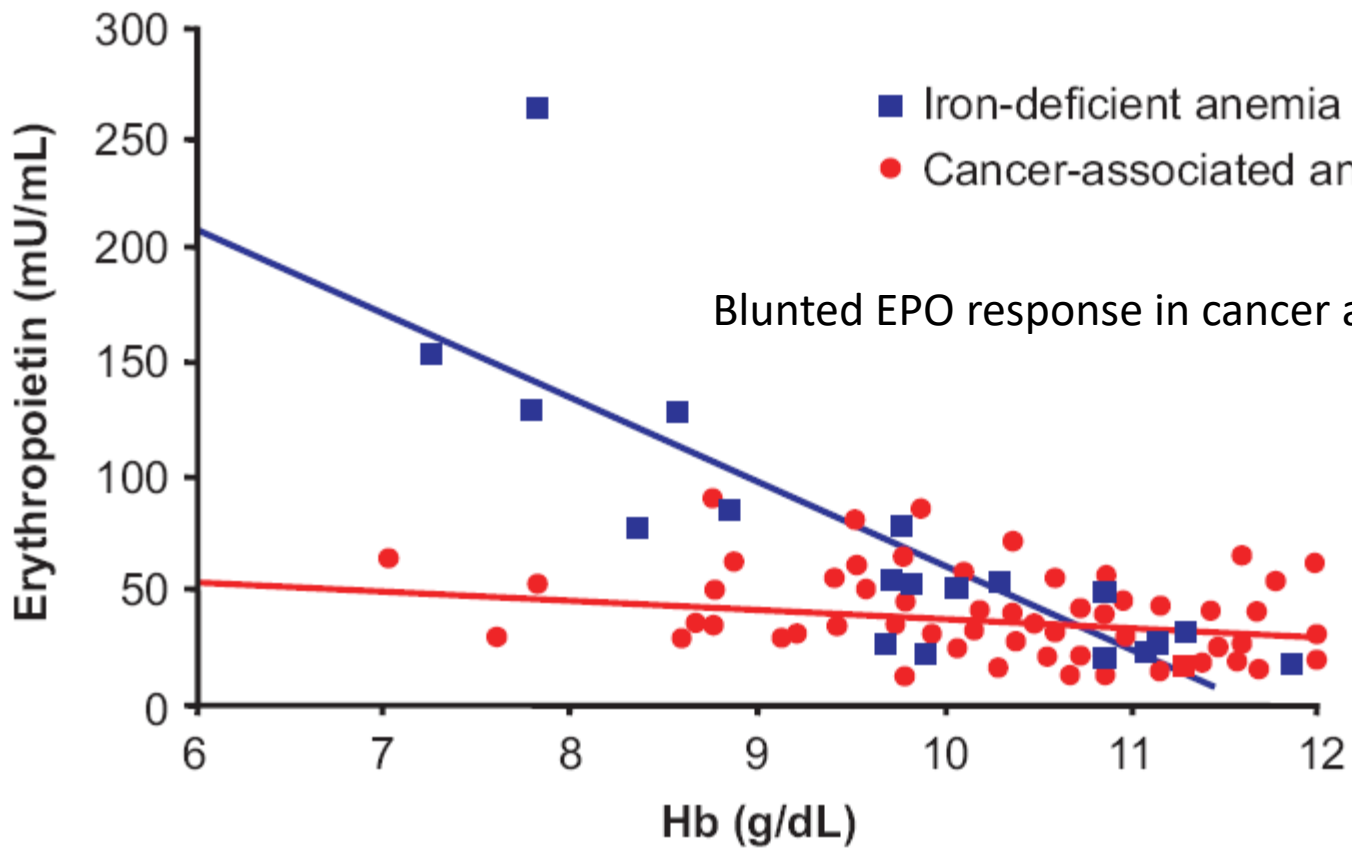
Cancer Related Anemia

- High prevalence among cancer patients
- Multifactorial
  - Inflammatory state related to cancer
  - Treatment related myelosuppression
  - BM infiltration
  - Paraneoplastic
  - Other (bleeding, nutritional, hemolysis, congenital,…)

Workup of Anemia in Cancer Patients

- Screen for anemia in cancer patients
- Complete workup not always needed
- Consider: smear, BM, B12, folate, guaiac, Creat, retics
- EPO levels not recommended as they are not predictive of response
- Screening iron studies: ferritin, Fe, TIBC, TSAT

Erythropoietin Response to Anemia



Blunted EPO response in cancer associated anemia

Miller et al. *N Engl J Med*. 1990;322:1689-1692.

ESAs in solid tumor oncology

- Anemia is very common in cancer
- Linked to worse prognosis
- Worse outcomes with radiation
  - hypoxia leads to radio-resistance

- ESAs initially used in CRF, use extended to oncology
  - Reduction of transfusions, HR =0.64 in chemo patients
  - Difference between placebo was ~1 unit, NNT = 6
  - Marginal effects on QOL and fatigue
  - Utilization was quite high, but has decreased due to safety concerns

This is a controversial subject, with a vast literature

ESAs: Risks/Benefits

COMPARISON OF RISKS AND GOALS OF ESA USE VERSUS RBC TRANSFUSION[h]

Discuss the following risks and goals with patients when considering anemia treatment options:

	ESA in the Cancer Setting	RBC Transfusion
Risks	• Increased thrombotic events • Possible decreased survival • Time to tumor progression shortened	• Transfusion reactions (eg, hemolytic, febrile, non-hemolytic, lung injury) • Transfusion-associated circulatory overload (TACO) • Virus transmission (eg, hepatitis, HIV) • Bacterial contamination • Iron overload • Increased thrombotic events • Possible decreased survival • Alloimmunization • Increased risk of poor response to future platelet transfusions due to HLA immunization
Goals	• Transfusion avoidance • Gradual improvement in anemia-related symptoms	• Rapid increase of Hb and hematocrit levels • Rapid improvement in anemia-related symptoms

See Erythropoietic Therapy - Dosing, Titration, and Adverse Effects (ANEM-A)

When considering ESAs:

- **Discuss the risks of ESAs with patients including the potential for tumor growth, death, blood clots, and serious heart problems.**
- **Refer patients to the following medication guides for more information on the benefits and risk of ESAs: Epoetin Alfa Medication Guide, Epoetin Alfa-epbx Medication Guide and Darbepoetin Alfa Medication Guide**

When considering RBC transfusion, see AABB Clinical Practice Guidelines: Tobian AA, Heddle NM, Wiegmann TL, Carson JL. Red blood cell transfusion: 2016 clinical practice guidelines from AABB. Transfusion 2016;56:2627-2630.

Iron deficiency

National Comprehensive Cancer Network®

NCCN Guidelines Version 3.2024
Hematopoietic Growth Factors

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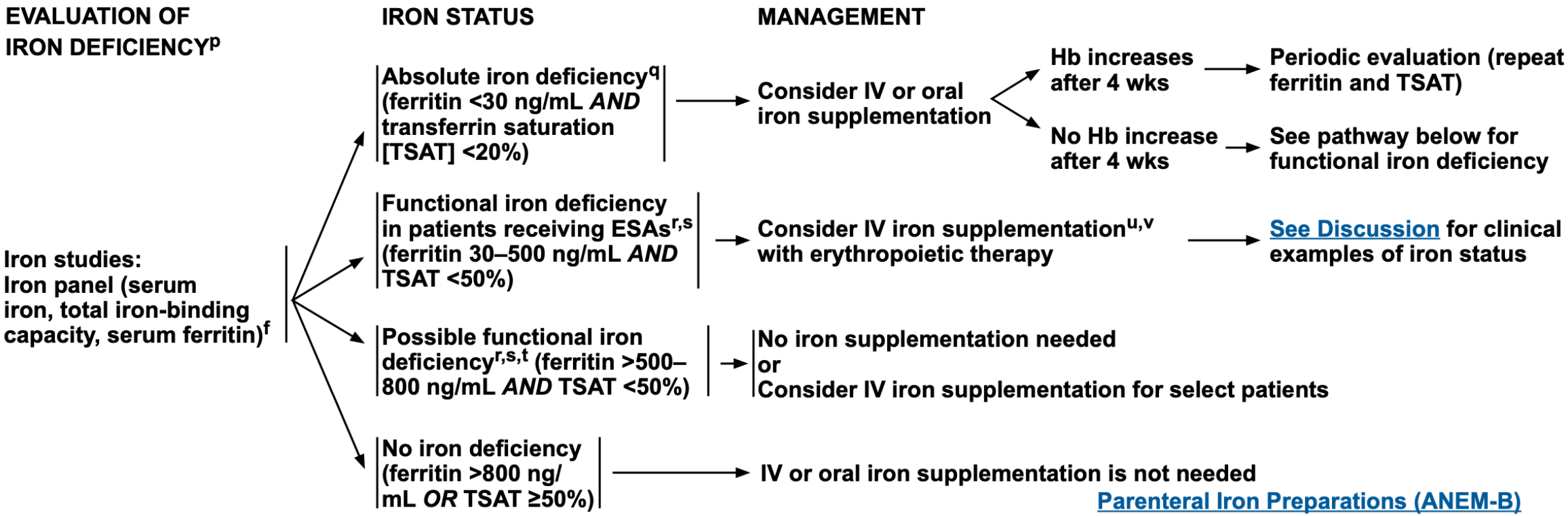
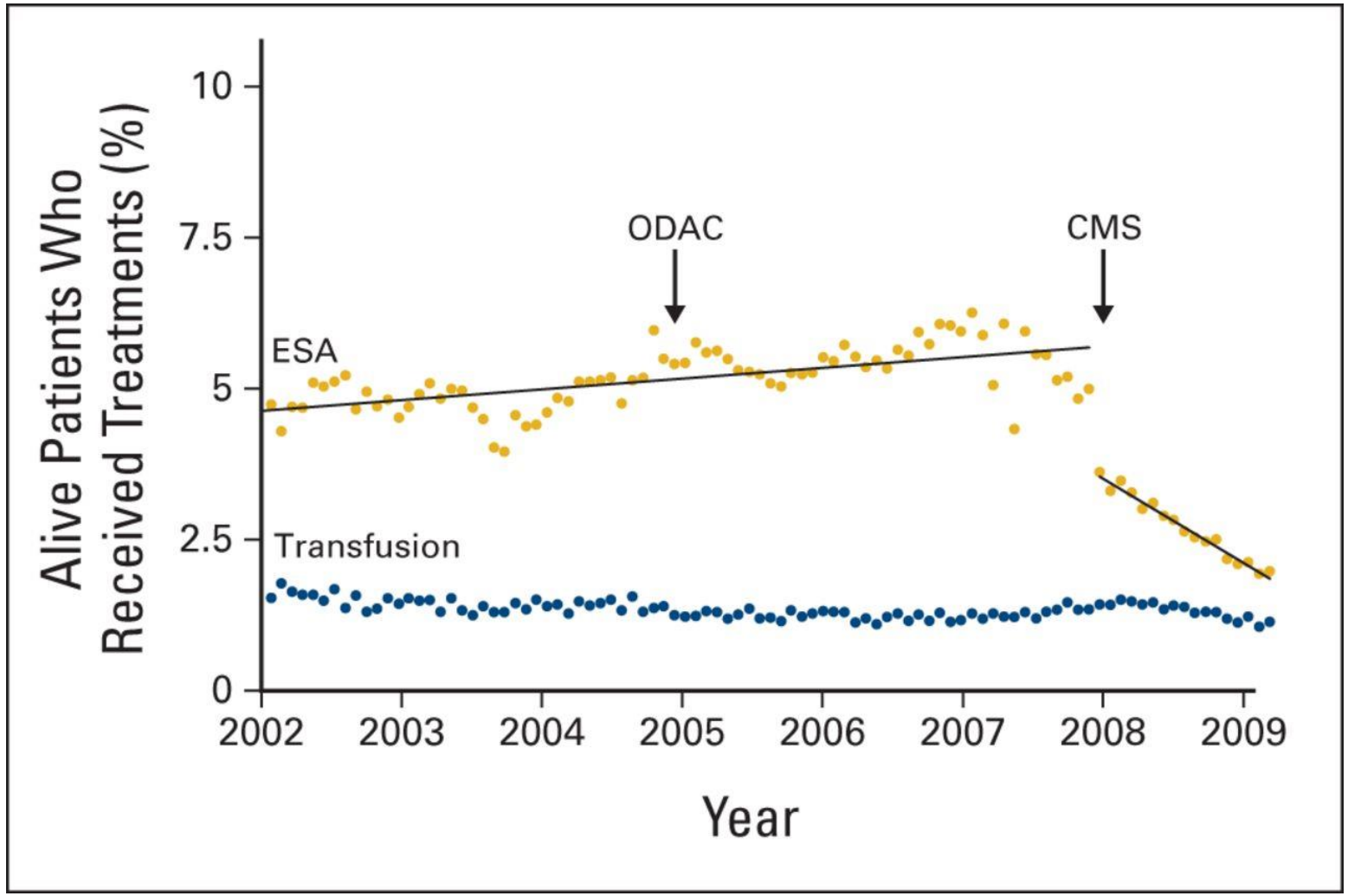


Recommendations

- No use of ESA for anemia not associated with chemotherapy
- For chemotherapy related anemia, weigh risks/benefits
- Start Hgb < 10, goal = avoid transfusion, increase < 1gm/2w
- CMS start Hgb < 10, DC for >10
- FDA indications and dosing should be used, NCCN lists alternative regimens
- 5 of 6 studies show that Fe supplantation in absolute or functional Fe deficiency improves response to ESAs

Percentage of patients with cancer who received erythropoiesis-stimulating agents (ESAs) per month in relation to regulatory changes.



Hershman D L et al. JOP 2014;10:264-269

Myeloid Growth Factors

Myeloid Growth Factors

- Neutropenia is a common DLT of chemotherapy
- Febrile neutropenia (FN) results in hospitalization, IV antibiotic use, decreased QOL, and morbidity
- FN risk is highest with first two cycles of a regimen
- Neutropenia may result in reductions in dose-density and intensity which can compromise outcomes
- This all can be reduced with use of myeloid CSFs

Myeloid CSFs

- Reduce risk (by ~50% for FN), severity and duration of neutropenia
- Cost-benefit threshold is now at 20% risk of FN, previously was at 40%
- Many common regimens have 25-40% FN risk in treatment naïve patients

Risk of FN – chemotherapy

- Risk is hard to define precisely
- Published trials are informative
- Guidelines (NCCN) have been published which estimate risk for regimens

Patient risk factors for neutropenia

Treatment-related

- Previous history of severe neutropenia with similar chemotherapy
- Type of Chemotherapy (anthracyclines)
- Planned relative dose intensity > 80%
- Preexisting neutropenia (< 1000) or lymphocytopenia
- Extensive prior chemotherapy
- Concurrent or prior radiation therapy to marrow containing bone

Patient-related

- Age (> 65 y)
- Female gender
- Poor performance status (ECOG ≥ 2)
- Poor nutritional status (eg, low albumin)
- Decreased immune function

Cancer-related

- Bone marrow involvement with tumor
- Advanced or uncontrolled cancer
- Elevated Lactate Dehydrogenase (Lymphoma)
- Leukemia
- Lymphoma
- Lung cancer

Conditions associated with risk of serious infection

- Open wounds
- Active tissue infection

Comorbidities

- COPD
- Cardiovascular disease
- Liver disease (elevated bilirubin, alkaline phosphatase)
- Diabetes mellitus
- Low baseline hemoglobin

From NCCN guidelines

Use of myeloid CSFs

- Risk of FN
  - >20% recommended
  - 10-20% consider
  - <10% generally not recommended
  - CW: Don’t use white cell stimulating factors for primary prevention of febrile neutropenia for patients with less than 20 percent risk for this complication.
- Also consider intent of treatment: curative, adjuvant, palliative
- Prior FN is an indication for CSFs
- Prior FN w/CSF-> dose reduction or change regimen
- Do not use with chemoradiation
- (antibiotics not recommended)

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Hematopoietic Growth Factors

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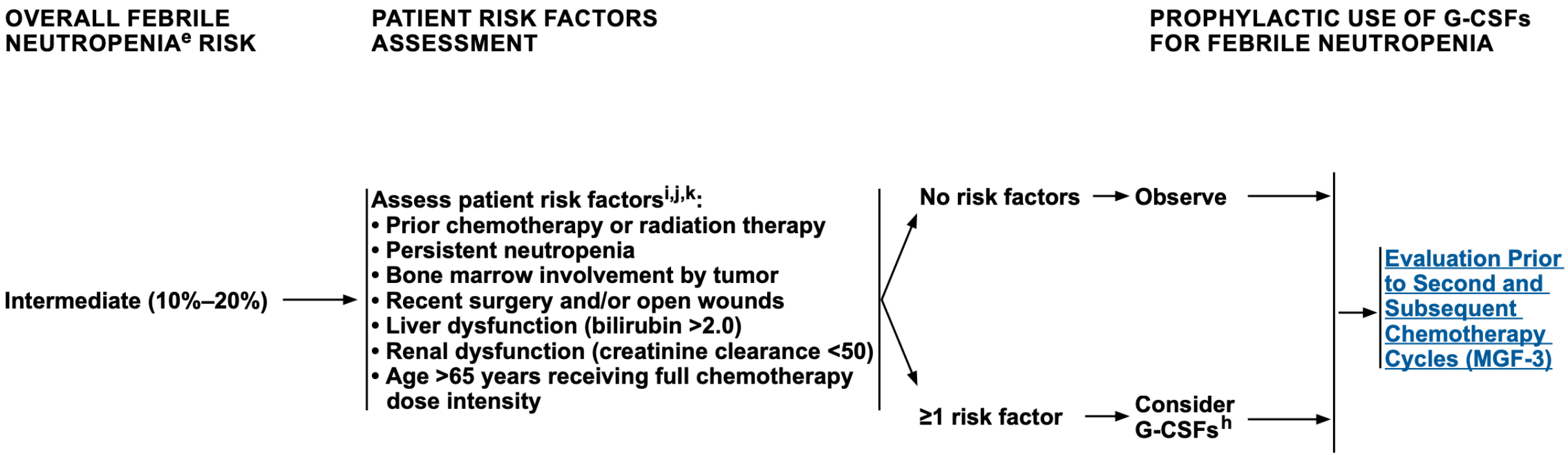


Myeloid CSF regimens

- Filgrastim
  - 5mcg/kg/d rounded to 300 or 480mcg
  - Start 1-3 days after chemo
  - Treat through post-nadir recovery
- Tbo-filgrastim, filgrastim-sndz, other biosimilars
- Pegfilgrastim, other biosimilars, OnPro®
  - 6mg/cycle
  - Start 1-3 days after chemo
  - Data for q3wk regimens, phase II data for q2wk
  - Dosing on day 1 safe, but less efficacious*
  - NCCN recommends administration on day 2

*Lyman, GH. Support Care Cancer (2017) 25:2619–2629

Adverse Effects

- Bone pain (common)
- Allergic reactions
- ARDS
- Splenic rupture (transplant setting)
- Precipitate sickle cell crisis
- MDS/AML* (increased AR 0.4%, RR 1.9)
- Cutaneous vasculitis (Sweet’s syndrome)

Bone Supportive Care

Skeletal Morbidity

- Cancer treatment induced bone loss
  - Androgen deprivation
  - Estrogen deprivation
  - Corticosteroids, TSH suppression
  - These will not be discussed further
- Bone metastases
  - Common in many cancer
  - Lung, breast, and prostate are most common

Measuring Skeletal Morbidity

- “Skeletal related event” – SRE
  - Fracture, spinal cord compression
  - Need for surgery or radiation
  - (some definitions) hypercalcemia
- QOL and pain are other outcomes of interest
- SREs are quite common, estimates are > 50% of metastatic breast cancer patients will have a SRE

Bisphosphonates

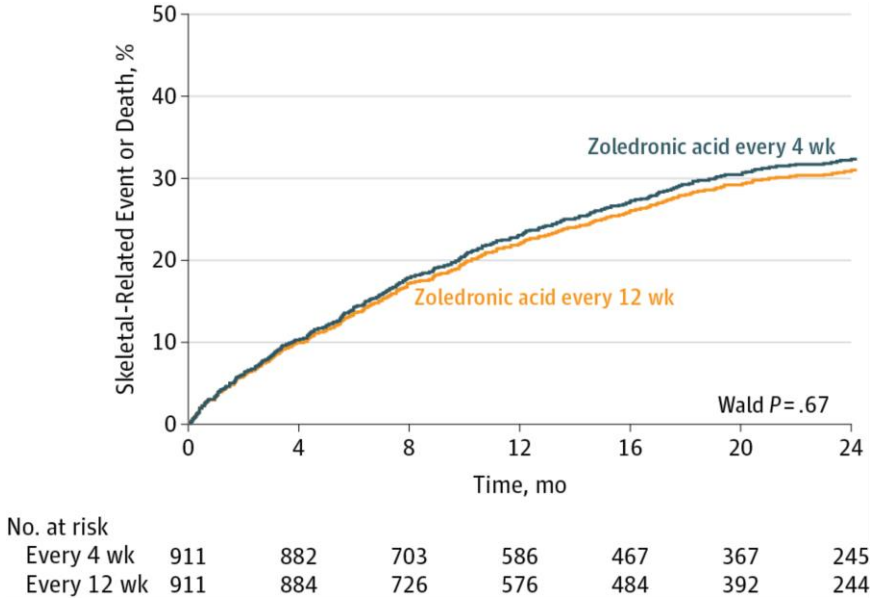
- Analogs of pyrophosphate – a major constituent of bone
- Decrease bone resorption and increase mineralization by inhibiting osteoclast activity
- Induce apoptosis in osteoclasts
- Zoledronic acid (ZA) and pamidronate are potent bisphosphonates

Bisphosphonates in solid tumors with established bone metastases

- Positive data is primarily for zoledronic acid (ZA)
- ZA vs. placebo in AR-prostate cancer
  - Incidence of SRE 38% vs. 49% median FU 2yrs
  - TTE was 488 vs. 321 days, benefit in pain control
- ZA vs. placebo in solid tumor
  - (no breast/prostate, mostly NSCLC)
  - Incidence of SRE 38% vs. 47%
  - TTE was 230 vs. 163 days

From: **Effect of Longer-Interval vs Standard Dosing of Zoledronic Acid on Skeletal Events in Patients With Bone MetastasesA Randomized Clinical Trial**

JAMA. 2017;317(1):48-58. doi:10.1001/jama.2016.19425



Cause-Specific Cumulative Incidence of Skeletal-Related EventsThere were 256 patients with skeletal-related events in the zoledronic acid every 4-week dose group and 246 patients in the every 12-week dose group (hazard ratio, 0.96 [95% CI, 0.81-1.15]).

Denosumab

- Monoclonal antibody targeting the RANKL which is involved in osteoclast formation and activation
- Has indications for osteoporosis and prevention of SREs in solid tumors
- Denosumab does not have renal toxicity
- Given as 120mg SQ injection q 4 weeks
- Emerging data for q 12 weeks, Ongoing trial: NCT02051218
- Goodrx: $2400 vs $33 for ZA

Denosumab efficacy

- All have ZA as comparator arm
- Three positive trials: breast, AR-prostate, “other”
- Denosumab vs. ZA
- Other (N=1176) MM and solid tumors (not breast or prostate), 40% were NSCLC)
  - TTE 20.6m vs. 16.3 mo.
  - P=0.03, but 0.06 after correction for multiple comparisons

ONJ - osteonecrosis of the jaw

- Presents as infection with exposed necrotic maxillary or mandibular bone
- Risks: poor dental hygiene, dental extractions/implants, chemotherapy?, anti-angiogenics?
- Incidence is ~2% for both ZA and denosumab
- Most patients who get ONJ have a risk factor (~80%)
- “Dental” exam prior to initiation
- Avoid invasive dental procedures

Comparison

Denosumab

- Expensive
- Monthly
- Ok in renal dysfunction
- Mildly improved SRE
- Rebound vertebral fractures after DC
- Hypersensitivity, neutralizing Abs
- Mild increase in infections (skin, UTI)

ZA

- Cheap
- Q 3 month
- Avoid if CrCl < 30, dose adjust; potential for renal injury
- Acute phase reaction – flu like ~50%
- conjunctivitis, uveitis, scleritis, and orbital inflammation
- Afib/flutter , stroke – RR~1.3 in SEER
- MSK pain

Common to both: hypocalcemia , ONJ, atypical fractures

Conclusions

- Use agents in patients with established bone metastases
- Aggregate data favors denosumab over ZA, but cost is high
- Among bisphosphonates ZA is the preferred agent
- Screen for ONJ risk factors prior to use
- Adverse events are similar between agents
- Supplement Ca, D, replete if deficient prior to therapy

Fatigue

- High symptom burden among cancer patients
- Some nihilism regarding treatment
- I will focus on NCCN guidelines and trials data
- “Cancer-related fatigue is a distressing, persistent, subjective sense of physical, emotional, and/or cognitive tiredness or exhaustion related to cancer or cancer treatment that is not proportional to recent activity and interferes with usual functioning.”

Sources – NCCN Guidelines and Cancer-related fatigue; UpToDate

Fatigue Evaluation

- Medications
- Pain
- Emotional distress -depression
- Anemia
- Sleep disturbance
- Comorbidities – endocrine disorders, organ dysfunction
- Assessment on 0-10 scale

Interventions: non – pharmacologic

- Different interventions for different milestones in cancer treatment
- Management strategies (delegation, prioritize)
- physical activity (cat 1)
- massage therapy, CBT, educational therapies (cat 1)
- Sleep hygiene – structure, naps

Pharmacologic Interventions

- Stimulants – methylphenidate
- Modafinil
- Corticosteroids
- Ginseng

- Overall evidence is weak or mixed for these interventions

Methylphenidate

- Of 8 RCTs, only 2 have demonstrated benefit
- Most rigorous studies were negative
- Trials were small and populations heterogeneous
- Suggestion of greater benefit with
  - Higher levels of fatigue
  - More advanced disease
  - Opioid related fatigue
  - Higher dose

Simulants for fatigue

- Cancer related fatigue is not a lawful indication for use of stimulants under Washington state law WAC 246-945-045
- This is a class C felony
- Professional Guidelines
- ESMO panel 6/9 do not Rx; 3/9 psychostimulants could be considered in thoroughly selected patients and their usefulness and safety should be evaluated after a very short time period - similar comments applied to ginseng and mistletoe
- NCCN recommends only after ruling out other treatment or disease specific morbidities while acknowledging use is investigational without agreed upon dose or schedule

Modafinil

- “Wake-promoting” agent for narcolepsy
- Initial pilot studies were encouraging
- Subsequent studies did not show overall benefit
  - N=631 evaluable, any level of fatigue, only patients with score ≥ 7 showed benefit
  - N=160 in ITT, NSCLC no benefit over placebo

Corticosteroids

- Studied in terminal stage of cancer
- Long-term side effects limit utility in patients with longer life expectancy
- N=84 RCT of advanced cancer patients with fatigue(≥4) and high symptom burden, dexamethasone 4mg bid vs. placebo
- Improved QOL and fatigue scores

J Clin Oncol. 2013 Sep 1;31(25):3076-82.

Ginseng

- N=364 cancer patients with curative intent therapy and fatigue(≥4) , RCT of ginseng 2000mg vs. PCO
- Improved fatigue at 8 week (but not 4 week)
- No discernable toxicities
- Potential for drug interactions, inhibitor of CYP3A4

J Natl Cancer Inst. 2013 Aug 21;105(16):1230-8.

Chemotherapy Induced Peripheral Neuropathy (CIPN)

- Common side effect of many agents
  - Most common in breast and colon cancer
  - Platins, taxanes, vincas, bortezomib
- Can be dose-limiting
- Potential for significant impact on QOL

CIPN

- Prevention – despite some reports demonstrating benefit, NO agent has been useful for prevention of CIPN
- Possible beneficial effect of limb cooling/compression/exercise
- Prevention strategies are dose reduction, dose delays, and treatment breaks
- Bortezomib: Weekly vs. 2x/week and SQ vs IV is preferred
- Treatment – the only agent that has demonstrated efficacy is duloxetine
- 59% vs 38% (PCO) reported pain decrease
- Difference in decrease of pain was modest: 0.7 on a 1-10 scale
- RCT: Smith EM. JAMA. 2013 Apr 3;309(13):1359-67. PMID: 23549581

Cancer Cachexia

- Pharmacologic interventions:
- Olanzapine 2.5-5 mg daily has emerged as preferred option
- RCT looked at >5% wt gain (60% vs 9% PCO) PMID 36977285
- corticosteroids and progesterone analogs have demonstrated benefit
- Increased appetite, modest weight gain
- No effect on survival or overall QOL

Treatment of Cancer Cachexia

Olanzapine

For patients with short life expectancy (~weeks) dexamethasone (4mg daily)

- Side effects: myopathy, Cushingoid, PUD

Megestrol 400-800mg daily for longer term

- Side effects: edema, VTE, increased mortality with doses >800mg/d
- Effect is weak, 16% of patients with >15# gain

No benefit of dronabinol in RCTs

Sources for further study

- ASCO Guidelines: Supportive Care and Treatment Related Issues; Patient and Survivor Care
- NCCN Guidelines for Supportive Care
- ESMO Clinical Practice Guidelines: Supportive and Palliative Care
- MASCC, Multinational Association for Supportive Care in Cancer
- UpToDate – multiple topics covered

Fred Hutch Cancer Center

Thank you

UW Medicine

Supportive Care

NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) are posted with the latest update date and version number.

Adult Cancer Pain
Version: 2.2024

Antiemesis
Version: 1.2024

Cancer-Associated Venous Thromboembolic Disease
Version: 2.2024

Cancer-Related Fatigue
Version: 2.2024

Distress Management
Version: 2.2024

Hematopoietic Cell Transplantation
Version: 2.2024

Hematopoietic Growth Factors
Version: 3.2024

Management of Immunotherapy-Related Toxicities
Version: 1.2024

Palliative Care
Version: 1.2024

Prevention and Treatment of Cancer-Related Infections
Version: 2.2024

Smoking Cessation
Version: 1.2024

Survivorship
Version: 1.2024