Managing Side Effects of Cancer Therapy

Diagnosis, Management and Clinical Pearls

FLASCO Fall Session

October 30, 2021

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Hematology and Medical Oncology

Moffitt at International Plaza

MOFFITT CANCER CENTER

Objectives

To understand how cancer therapy kills cancer based on cell growth physiology, cell function and immune system physiology

Define Cancer Therapy: Chemo, immunotherapy, targeted therapy, radiation therapy, surgery, monoclonal antibodies, vaccines, IMIDs, cytokines, Allogeneic HSCT, CAR-T

To manage sequelae of therapy by employing medication adjustments and/ or add new medications

Discuss coordination of care with primary medical team, PMD, and consultants

Will focus on chemotherapy, immunotherapy and targeted therapy during this talk

Cell Cycle

- The Cell Cycle is an ordered set of events by which cells grow and divide into two daughter cells.
- In solid tumors cancer occurs when cellular DNA is damaged, and that damage gets replicated during the cell cycle creating a neoplasm.
- Tumor cells will continue to divide if our suppressor genes don’t pick up the error in production.

Cell Cycle

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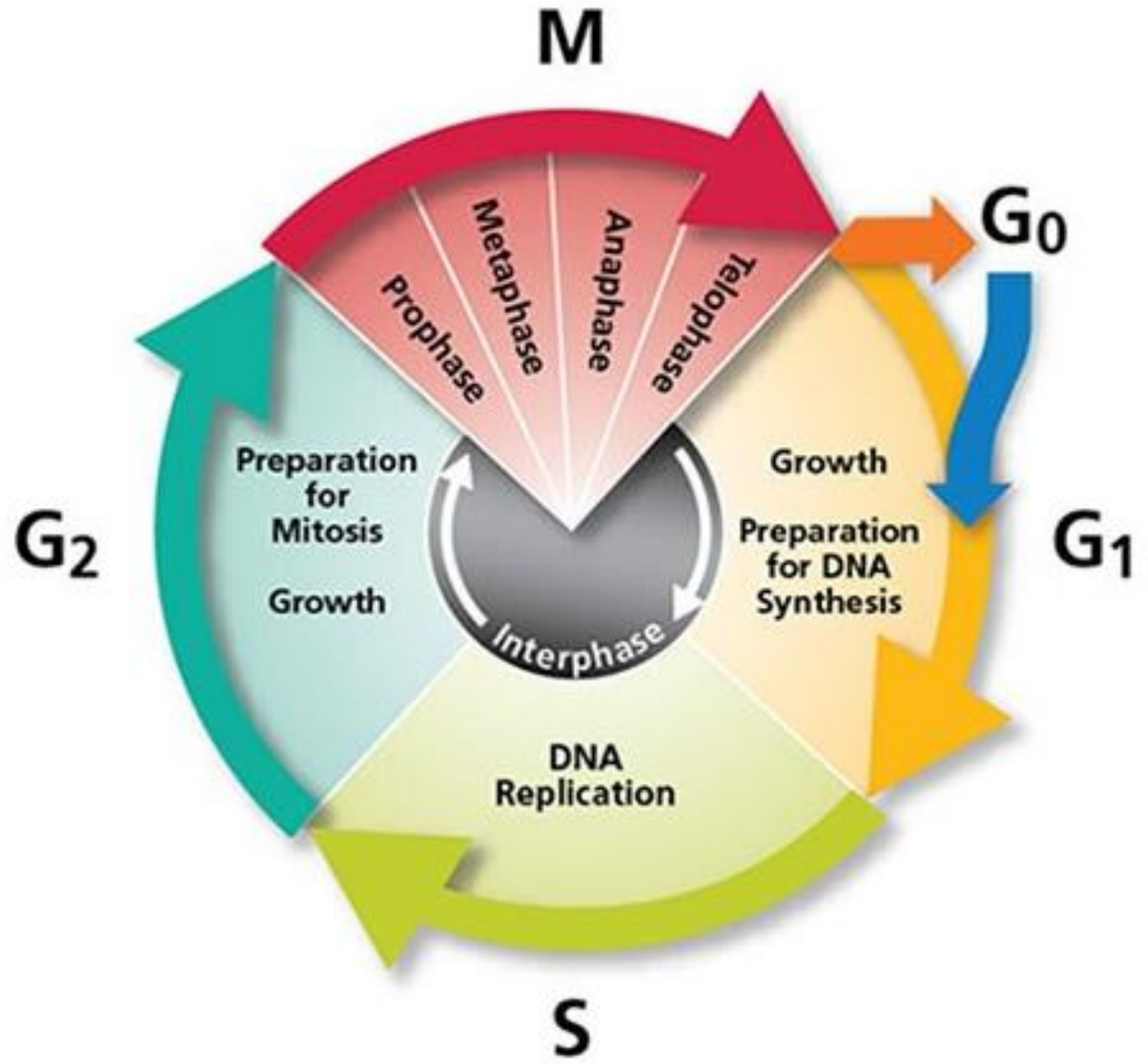
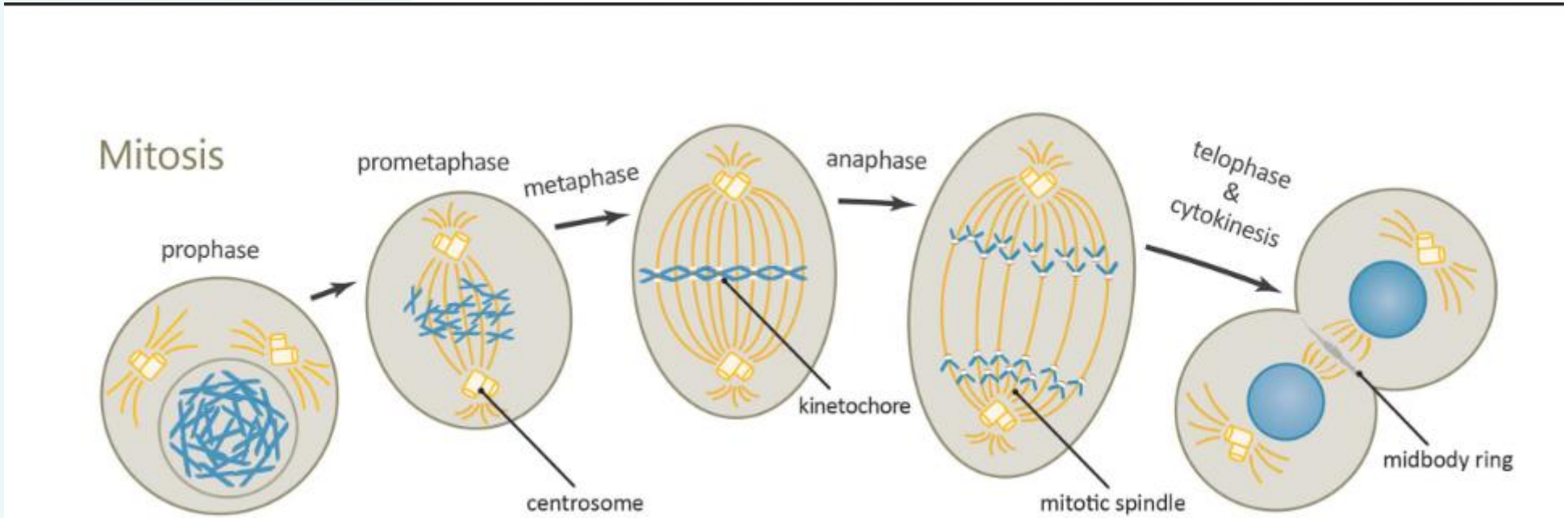


Cell Cycle



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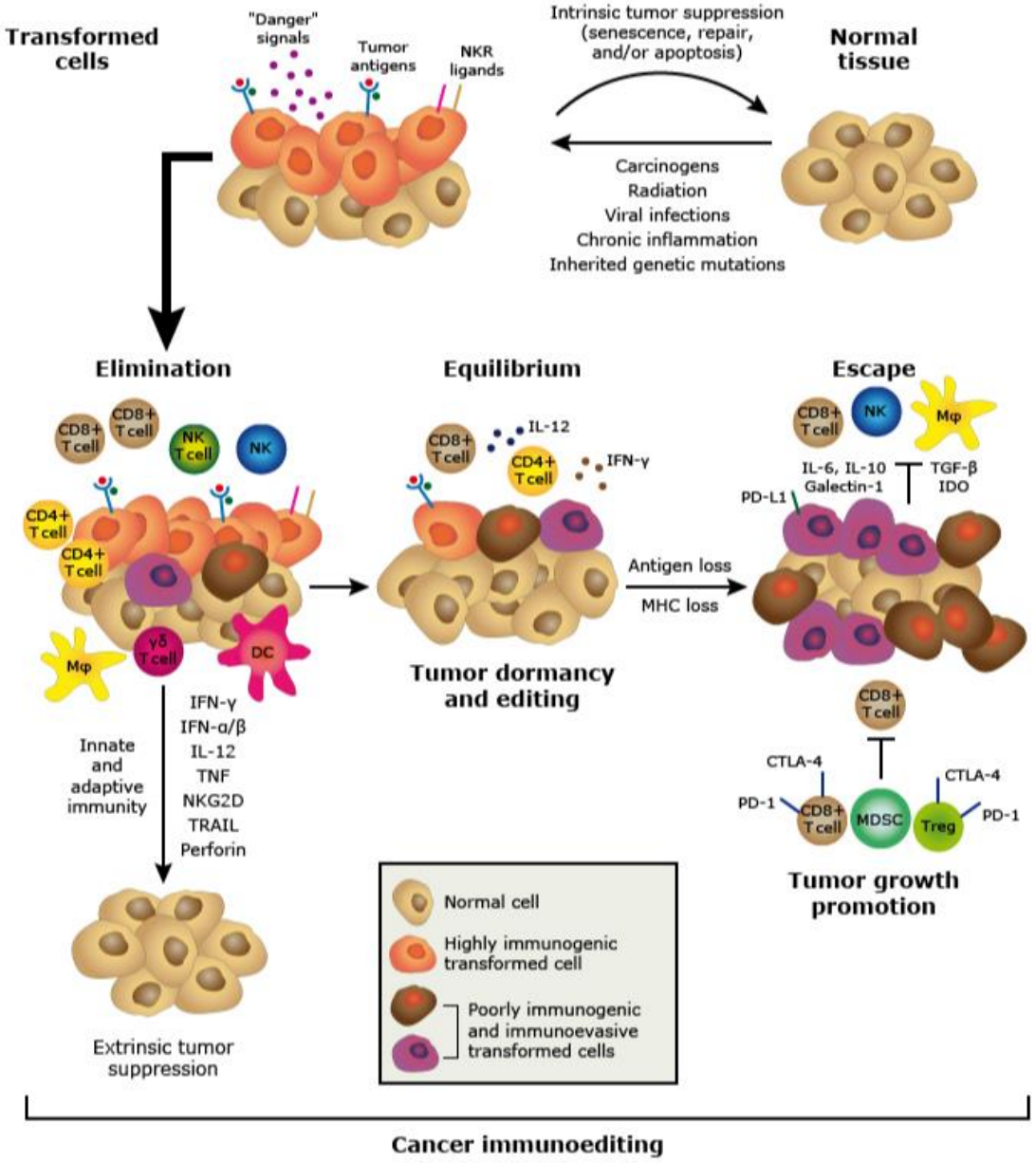
Cancer Immunoediting



Basic Principles of Chemotherapy

- Chemo is most active on cells that divide quickly. i.e. Burkitt's vs TB
- Different chemo agents/ classes of agents work at different points during a cell cycle
- Combination chemotherapy works by interrupting the cell cycle at different points. i.e. carboplatin/ paclitaxel, doxorubicin/ carboplatin, CHOP, etc.

How Conventional Chemo Affects the Cell Cycle

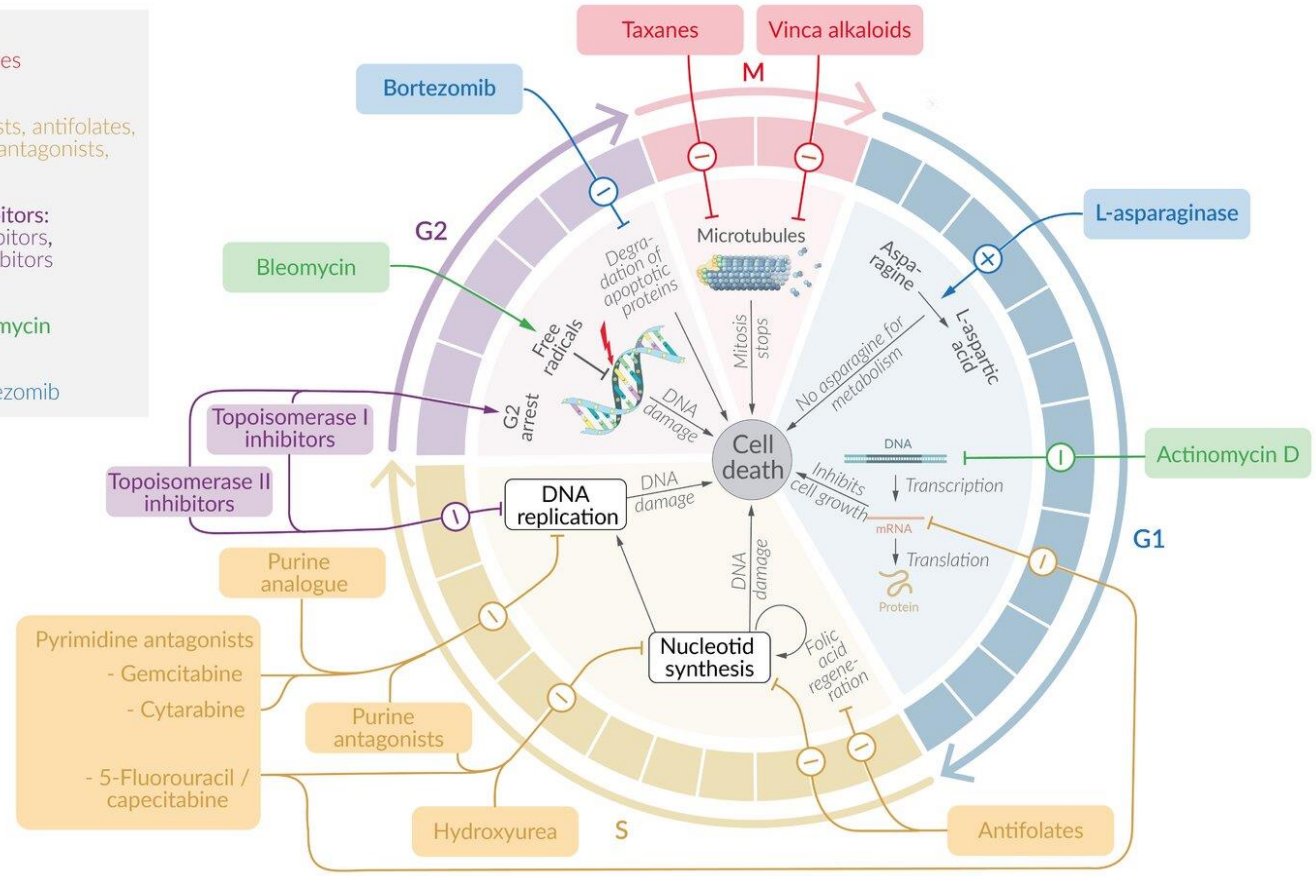
Mitotic inhibitors:
vinca alkaloids, taxanes

Antimetabolites:
pyrimidine antagonists, antifolates, hydroxyurea, purine antagonists, purine analogues

Topoisomerase inhibitors:
topoisomerase I inhibitors, topoisomerase II inhibitors

Antibiotics:
actinomycin D, bleomycin

Other:
L-asparaginase, bortezomib



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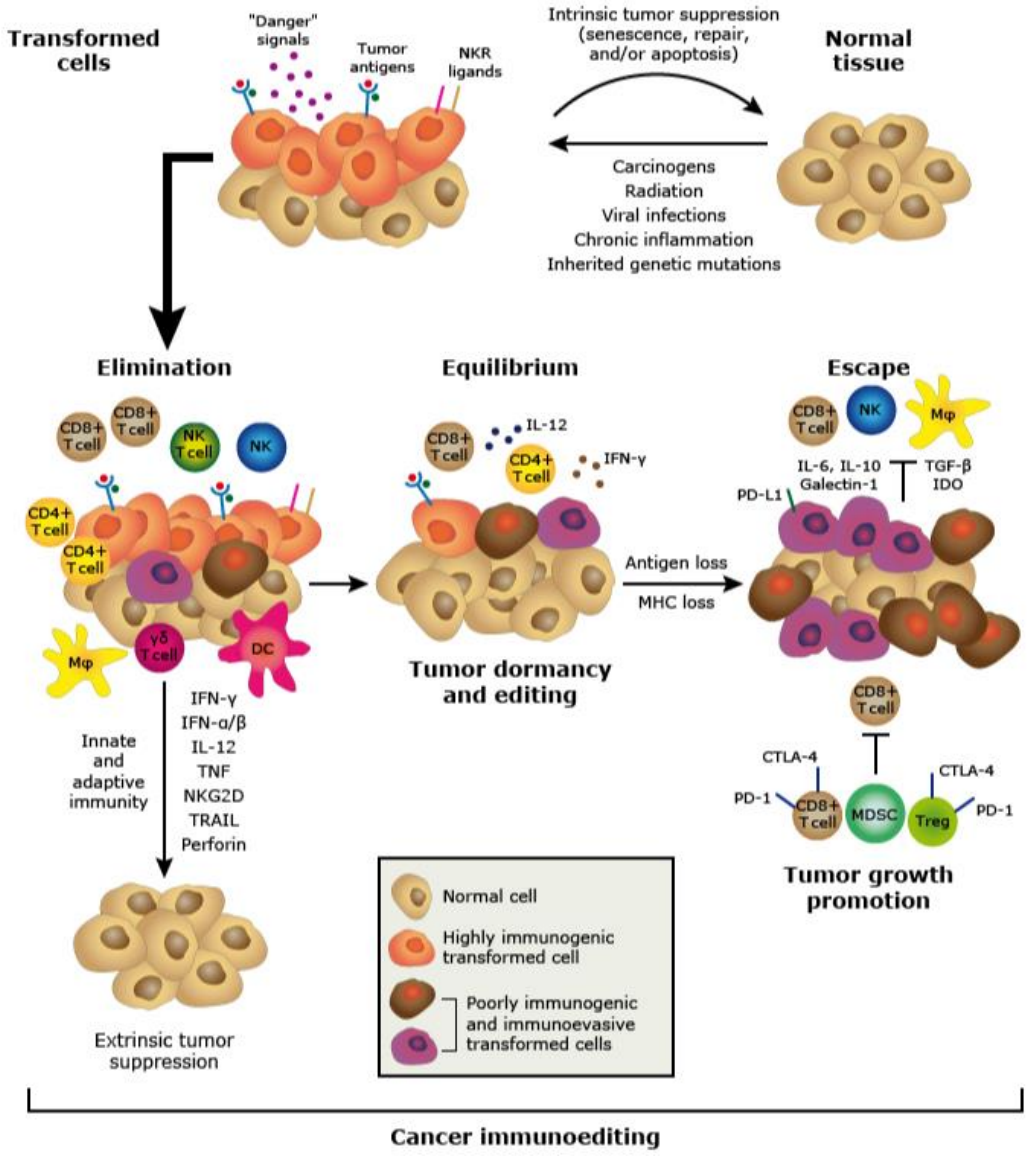
Understanding Checkpoints

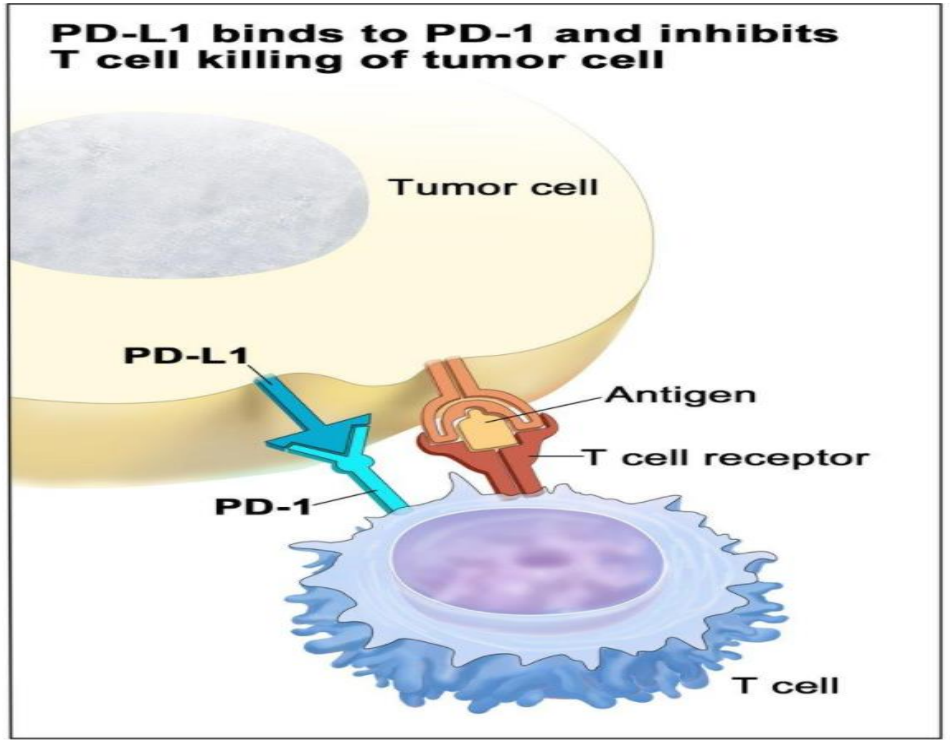
- Checkpoints are transmembrane proteins present on T-cell, B- cells, NK cells, and multiple tissue types (normal cells, tumors, hematopoietic cells)
- PD-1 (programmed cell death protein) is on our immune cells (T, B and NK cells)
- PDL-1 (programmed death ligand) is on tissues and tumor cells. PDL-2 is on hematopoietic cells
- CTLA-4 (cytotoxic T-lymphocyte associated protein) is present on the surface of CD4+ and CD8+ T lymphocytes. CTLA-4 A.K.A CD152
- Neoplastic cells can be invisible to the immune system

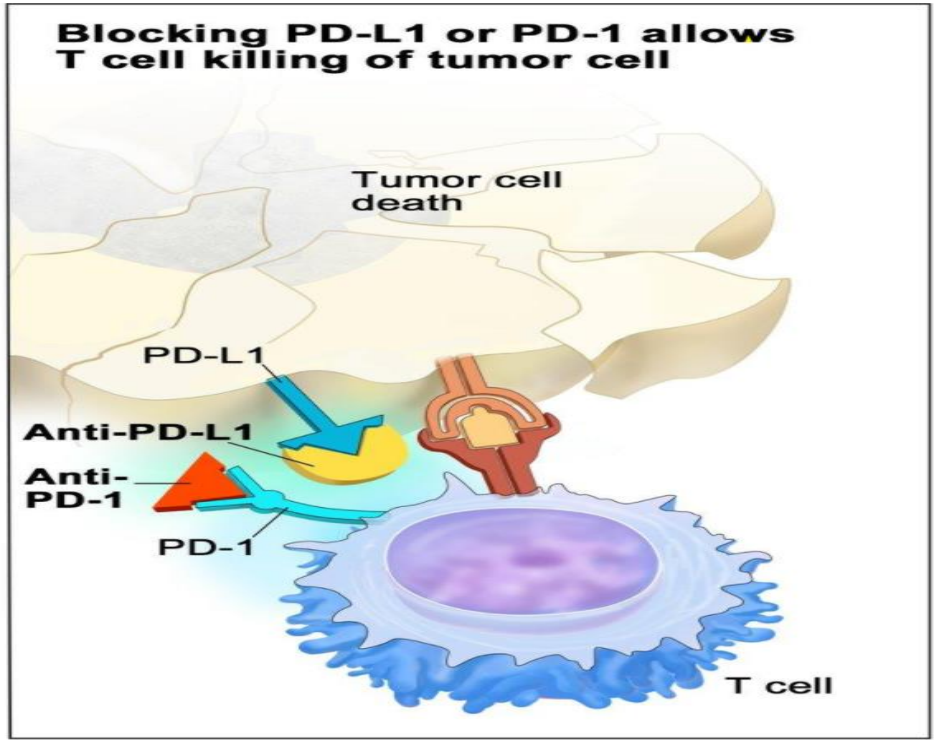
Explaining Immune System Failure to “see” Tumor Cells



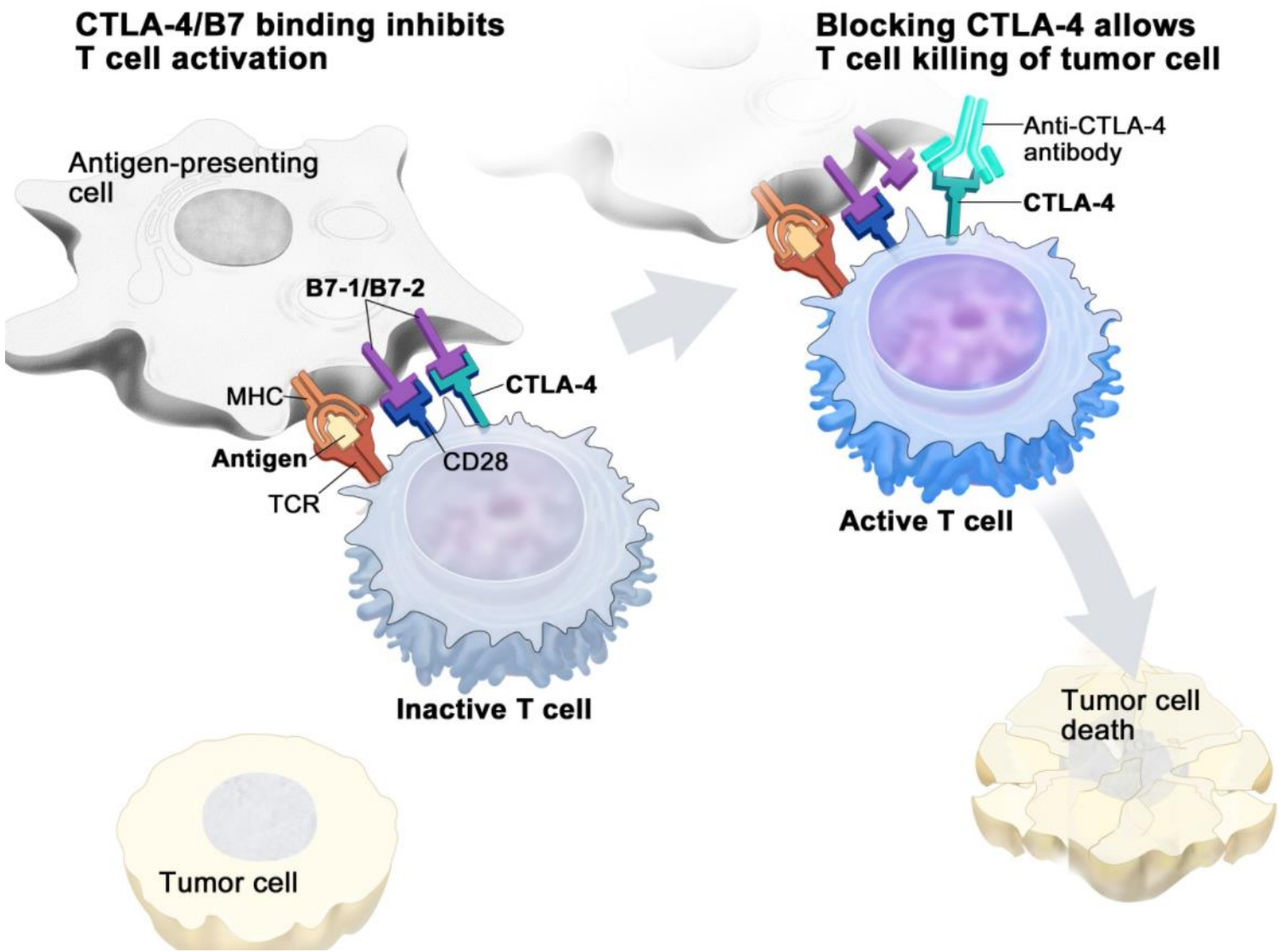
Commonly Used Checkpoint Inhibitors

- PD-1: pembrolizumab, nivolumab, and cemiplimab
- PDL-1: atezolizumab, avelumab, durvalumab
- CTLA-4: ipilumumab (monoclonal antibody)





CTLA-4 Binding and Inhibition



Chemo plus check point inhibitor

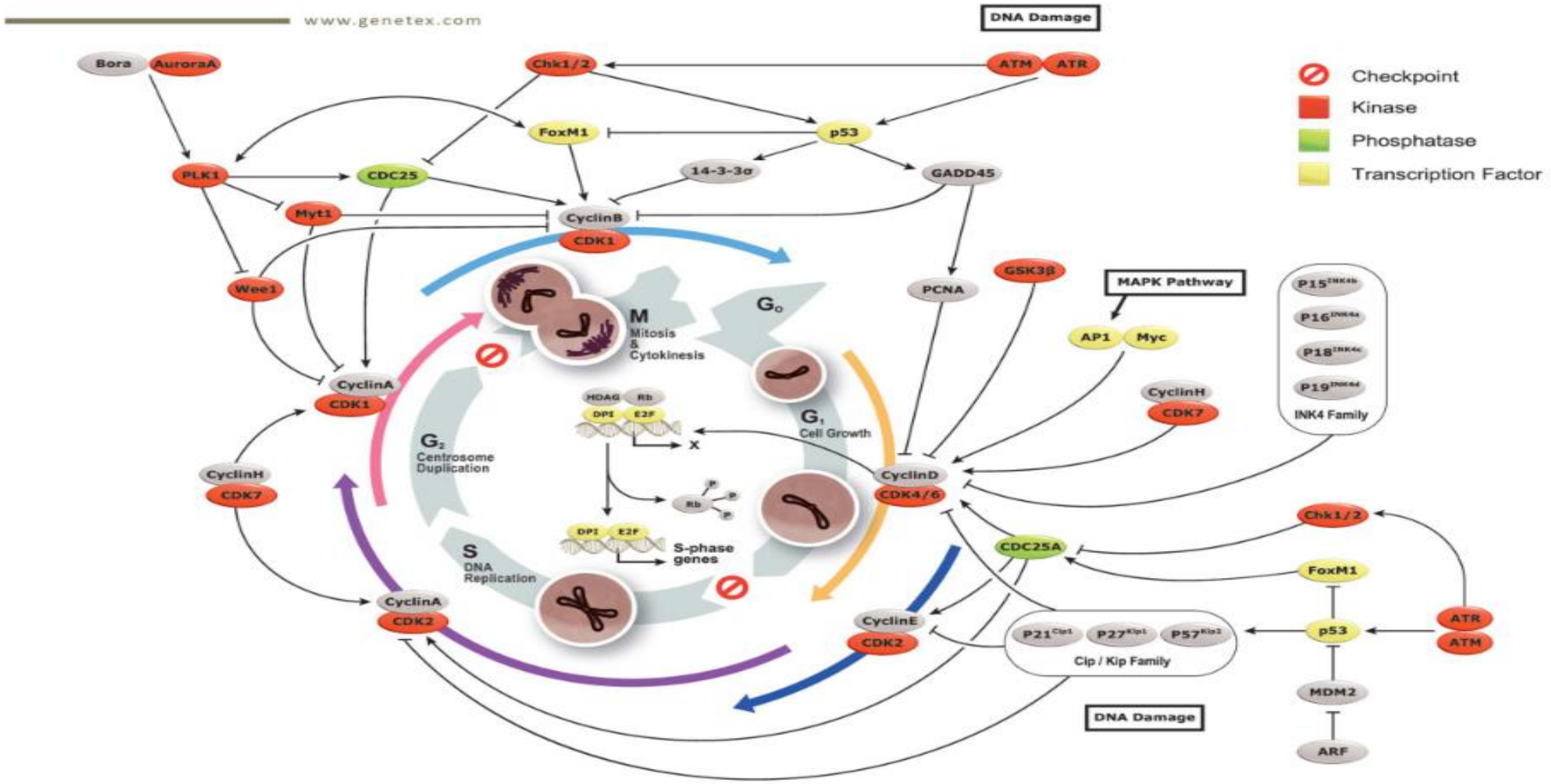
- Combination therapy to kill cancer different ways
- Chemo kills by disrupting the cell cycle and immunotherapy induces the immune system to attack
- For example, Lung cancer regimen: etoposide plus carboplatin/ cisplatin and durvalumab.

Targeted Therapy: Kinase Inhibition

- Kinases are enzymes that deliver a phosphate to a protein
- Approximately 538 known kinases encoded in human genome. AKA “Kinome”
- Most protein kinases promote cellular proliferation and migration
- Overexpression is associated with oncogenesis

- Bhullar et al. Molecular Cancer (2018) 17:48
- https://doi.org/10.1186/s12943-018-0804-2

Cell Cycle



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VEGF

- VEGF – Vascular Endothelial Growth Factor is a kinase primarily responsible for neovascularization/ angioneogenesis
- VEGF stimulates vascular endothelium to secrete nitric oxide (NO). NO is responsible for naturesis and vasodilation
- Common VEGF inhibitors : bevacizumab (monoclonal antibody), sorafenib, sunitinib, lenvantinib
- VEGF involved in normal physiologic functions. Side effects occur when targeting oncogenic processes and the normal VEGF function is blocked

Chemo plus targeted therapy

- Combination therapy to kill cancer different ways
- Chemo kills by disrupting the cell cycle and targeted therapy disrupts normal cell function by blocking the physiologic function of a target
- For Example: Breast: Taxane plus trastuzumab (HER-2 targeted agent)
- For example: Gastric: FOLFOX/FOLFIRI plus trastuzumab or bevicizumab

Immunotherapy Plus Targeted Therapy

- Combination therapy to kill cancer different ways
- Immunotherapy recruits the immune system and targeted therapy disrupts normal cell physiology by blocking a target in the physiologic pathway
- For Example: Endometrial Cancer: pembrolizumab plus lenvatinib
- For Example: Renal Cell: cabozantinib and nivolumab

Tumor Agnostic

- A type of therapy that uses drugs or other substances to treat cancer based on the cancer's genetic and molecular features without regard to the cancer type or where the cancer started in the body. A type of therapy that uses drugs or other substances to treat cancer based on the cancer's genetic and molecular features without regard to the cancer type or where the cancer started in the body.

- Conventional therapies usually target a particular molecule in the tumor cells, in which most tumor responses last until the cancer develops a way to bypass the blocked pathway, whereas PD-1 blockade releasing negative regulators of immune checkpoints is applicable to a wide range of malignancies as well as provides long-lasting responses.

- Comput Struct Biotechnol J. 2019; 17: 661–674. Published online 2019 May 23. doi: 10.1016/j.csbj.2019.03.006

Chemotherapy side effects

- Nausea, vomiting, diarrhea (colitis), skin changes, secondary skin cancers (hematologic malignancies), weight loss, anorexia, dehydration, cytopenias, pneumonitis (i.e. methotrexate, bleomycin), hypotension/ hypertension, adrenal insufficiency, anemia
- Organ function decline: liver, kidneys, heart, bone marrow function, muscle
- Exacerbation of co-morbid conditions
- Decreased functional reserve, decreased performance status, “chemo brain”
- Infusion reactions

Clinical Pearl

- Never accept these three words:
- Tired
- Dizzy
- Nauseous
- Explain the sensation of feeling tired/ dizzy/ nauseous without using the word in your explanation.

Chemotherapy related MDS/ AML

- The incidence of t-MDS/AML following conventional therapy ranges from 0.8% to 6.3% at 20 years. The median time to development of t-MDS/AML is 3 to 5 years, with the risk decreasing markedly after the first decade.

- Distinctly different from MDS/ AML De Novo with worse prognosis

- **Therapy-related myelodysplasia and acute myeloid leukemia**
- Semin Oncol. 2013 Dec; 40(6): 10.1053/j.seminoncol.2013.09.013.
- doi: 10.1053/j.seminoncol.2013.09.013

Immunotherapy side effects – The “-itises”

- According to the NCCN guidelines* the potential immune related conditions are:

- Myocarditis, dermatitis, pruritis, hyperglycemia related DKA, asymptomatic/ subclinical hypothyroidism, overt hypothyroidism, thyrotoxicosis, primary adrenal insufficiency, colitis, pancreatitis, transaminitis, inflammatory arthritis, myositis, polymyalgia rheumatica and giant cell arteritis, aseptic meningitis, Guillain-Barre, myasthenia Gravis, peripheral neuropathy, transverse myelitis, vision changes, pneumonitis and acute kidney injury
- Not mentioned in the guidelines – infusion reactions

- NCCN Guidelines Version 4.2021 Management of Immune Checkpoint Inhibitor-Related Toxicities

Targeted Therapy – side effects of VEGF inhibition

- Read package insert to identify specific target
- Research the target in terms of pathology of overexpression and the physiology/ side effects of inhibition
- VEGF is responsible for neovascularization, wound healing, secretion of nitrous oxide (vasodilation and naturesis)
- Can’t do surgery if on this ~6 weeks?? (institution standards), impaired wound healing
- hypertension (most common side effect), thyroid dysfunction, colitis, nephritis

Primary Cancer Related Sequelae

- Many patients may never be symptomatic (at least initially) from their cancers. For example, many cancers found on screening, lab review, and / or physical exam

- Cancer related pain, mechanical effects of tumor (i.e. hydronephrosis, urethral obstruction, skin breakdown), physiologic effects of tumor (thermoregulation, dyspnea, malabsorption), emotional impact, inability to work, decreased performance status, change in appearance.

- Is disease and/ or disease progression causing sequelae or is it the treatment?

Common Terminology Criteria for Adverse Events

- Current version 5.0 published Nov 2017 by US Dept of Health and Human Service (155 page document)
- Grade 1 Mild; asymptomatic or mild symptoms; clinical or diagnostic observations only; intervention not indicated
- Grade 2 Moderate; minimal, local or noninvasive intervention indicated; limiting age-appropriate instrumental ADL
- Grade 3 Severe or medically significant but not immediately life-threatening; hospitalization or prolongation of hospitalization indicated; disabling; limiting self care ADL.
- Grade 4 Life-threatening consequences; urgent intervention indicated.
- Grade 5 Death related to AE.

- Common Terminology Criteria for Adverse Events (CTCAE) v5.0

Side Effects

- What is the difference between:
- Diarrhea from chemo versus immune therapy versus targeted therapy?
- Pneumonitis caused by bleomycin versus immunotherapy?
- Skin changes from chemo versus immunotherapy?
- Transaminase increase from chemo versus immunotherapy?
- Thyroid dysfunction with immunotherapy versus target therapy (i.e. VEGF inhibitor)?

NCCN Guidelines for Management of Immune Checkpoint Inhibitor-Related Toxicities

- Provides guidance on pre-therapy assessment, monitoring frequency for possible toxicities and evaluation for abnormal findings.

- Current guidelines by NCCN is version 4.2021 (104 page document)

Dermatologic Adverse Events – Maculopapular Rash

- G1 Continue treatment, topical emollient, antihistamine for sx
- G2 Continue treatment, topical emollient, antihistamine for sx, moderate to high potency topical steroids. If unresponsive to topical consider prednisone 0.5 mg/kg/day – taper length not mentioned
- G3-4 Hold treatment, high potency topical steroids, prednisone 0.5 – 2 mg/kg/day until Gr 1 then taper over 4-6 weeks, urgent derm consult
- Clinical Pearl: If you are not familiar/comfortable with high dose steroid tapers discuss this with BMT colleagues. Many providers consult endocrine for taper management.
- Consider TMP/SMX prophylaxis. For Gr2 reassess weekly.
- NCCN Guidelines Version 4.2021 Management of Immune Checkpoint Inhibitor-Related Toxicities V4.2021

Case Study

- 69 male born in India with metastatic bladder cancer s/p MVAC with progression.
- Pembrolizumab 6/2020 – 1/21/2021 then progression on scans but had G1 rash starting in 1/2021. Pt placed on emollients and hydroxyzine then progressed to G2 – added triamcinolone and ultimately a methylprednisolone dose pack x2
- Started enfortumab 3/18/21 when rash was at G1. By 4/13/21 rash progressed quickly to Gr 3 after 3rd dose with almost 100% BSA, severe pruritis and desquamation. I added prednisone 1 mg/ kg with prophylactic TMP/SMX. Treatment held and then resumed 5/20/21
- Gr 3 rash returned by 6/3 after second dose. Repeated steroid taper. D/C treatment
- Started Sacituzumab 7/22/2021 – G1 rash persists and is treated supportively
- Pt has limited treatment options.

Hypothyroidism

- If asymptomatic/ subclinical monitor TSH, free T4 Q 4-6 weeks or each cycle
- Subclinical hypothyroidism = elevated TSH with normal T4
- If elevated TSH (>10) with normal free T4 continue immunotherapy, consider levothyroxine
- Clinical (overt) Hypothyroidism – Continue treatment. Consider endocrine Consult. Initiate levothyroxine therapy (1.6 mcg/kg/day – with consideration of comorbid conditions. Always safer to dose lower.

- Guidelines recommend TSH monitoring Q 4-6 weeks to guide adjustments

- Consider waiting 10 weeks for adjustments

- NCCN Guidelines Version 4.2021 Management of Immune Checkpoint Inhibitor-Related Toxicities V4.2021

Diarrhea/ Colitis

- Consider the timeframe from treatment start and trend
- Clinical Pearl – Review patient diet!
- Use CTCAE grading
- Initial assessment – stool testing: C.Diff, O & P, etc then supportive care
- OTC label on loperamide is different then Rx dosing. Use the correct dosing
- Adding diphenoxylate/ atropine or tincture of opium. Need DEA license to Rx

Diarrhea/ Colitis continued

- The incidence of grade 3 and 4 colitis was 9.1% with CTLA-4 monotherapy, 1.3% with PD-1/L1 therapy, and 13.6% with combination therapy [1]

- Fecal calprotectin and lactoferrin are used to dx IBD in general population. If positive while using immunotherapy research shows high likelihood (up to 90%) of involvement with histologic inflammation and/or ulcers [2]

- 1- Wang DY, Ye F, Zhao S, Johnson DB. Incidence of immune checkpoint inhibitor-related colitis in solid tumor patients: a systematic review and meta-analysis. *Oncoimmunology*. 2017;6(10):e1344805. doi: 10.1080/2162402X.2017.1344805.
- 2-**Importance of endoscopic and histological evaluation in the management of immune checkpoint inhibitor-induced colitis** J Immunother Cancer. 2018; 6: 95.
- Published online 2018 Sep 25. doi: 10.1186/s40425-018-0411-1

Diarrhea/ Colitis continued

- G1- Consider holding immunotherapy. Add loperamide or diphenoxalte/atropine x 2-3 days. Supportive care. If progressive check lactoferrin/calprotectin → if positive treat as Gr 2.

- G2 Hold immunotherapy. Start prednisone 1-2 mg/kg/day. If no response consider infliximab or vedolizumab. GI Consult

- G3 Same as G2 then discontinue anti-CTLA-4: consider resuming anti PD1/ PDL-1 after resolution of toxicity

- G4 Same as G2. Permanently discontinue immunotherapy agent responsible for toxicity. Inpatient care. IV methylprednisolone 1-2mg/kg/day. If no response continue steroids and consider infliximab or vedolizumab

Diarrhea/ Colitis continued

- How do you know the agent responsible if there is more than one agent? i.e. ipilimumab/ nivolumab, pembrolizumab and lenvatinib, nivolumab and sunitinib
- Acute sx most likely not due to either agent. Review Diet!
- With immunotherapy sx usually come on slowly over weeks and then progress. Read package inserts for timing/ onset data. With ipilimumab /nivolumab d/c ipilimumab first if Gr2. If sx resolve then proceed with reduced dose ipilimumab. No resolution hold nivolumab and follow guidelines.
- With immunotherapy and VEGF agent (i.e. pembrolizumab/lenvatinib or nivolumab sunitinib) hold the VEGF agent as this is a daily med. If diarrhea resolves proceed with dose reduction per package insert. If no response then treat as Gr2 per guidelines. There is no reduction in immunotherapy. If progression of diarrhea then will need to D/C

Transaminitis

- Will be asymptomatic. Found with routine monitoring.
- Consider other etiologies: viral, mets, medications, CBD, supplements
- G1 < 3X ULN Increase frequency of monitoring
- G2 3-5X ULN. Hold immunotherapy. Monitor labs Q 3-5 days. Consider prednisone 0.5 – 1 mg/kg/day
- G3 >5-20X ULN. Hold immunotherapy. Prednisone 1-2 mg/kg/day. Consider inpatient care with daily LFTs. If steroid refractory consider mycofenolate. Hepatology consult
- G4 > 20X ULN Permanently discontinue. Hospitalized Pt. Beyond the scope of this talk

Transaminitis continued

- With immunotherapy sx usually come on slowly over weeks and then progress. Read package inserts for timing/ onset data. With ipilimumab /nivolumab d/c ipilimumab first if Gr2. If sx resolve then proceed with reduced dose ipilimumab. No resolution hold nivolumab and follow guidelines.

- With immunotherapy and VEGF agent (i.e. pembrolizumab/lenvatinib or nivolumab sunitinib) hold the VEGF agent as this is a daily med. If diarrhea resolves proceed with dose reduction per package insert. If no response then treat as Gr2 per guidelines

Clinical Pearls for Practice

- Understand the physiology first
- Understand CTCAEs – You should be able to manage all G1 and G2 yourself
- Know the guidelines for dose modifications
- Review package inserts
- Know your supportive care drugs and have resources at arms' length!

Approach to the Clinic Patient with Hypotension

- It is possible to have very low BP and be asymptomatic.
- Is the patient stable?
- Consider underlying issues/ Comorbid conditions
- Hematologic status (Anemia, Bleeding?, Spleen size?)
- Vasovagal reaction
- Dehydration/ lack of intake
- Medication induced
- Adrenal axis – have they been on steroids?
- What is the current therapy? Is the patient heavily pre-treated?
- Note changes in Hgb, serum creatinine, albumin, body weight
- Review the treatments of other co-morbid conditions

Blood Pressure

- The pressure of circulating blood against the walls of the blood vessels.
- Measured in mg/Hg
- Regulated by the autonomic nervous system
- Can be affected by many factors

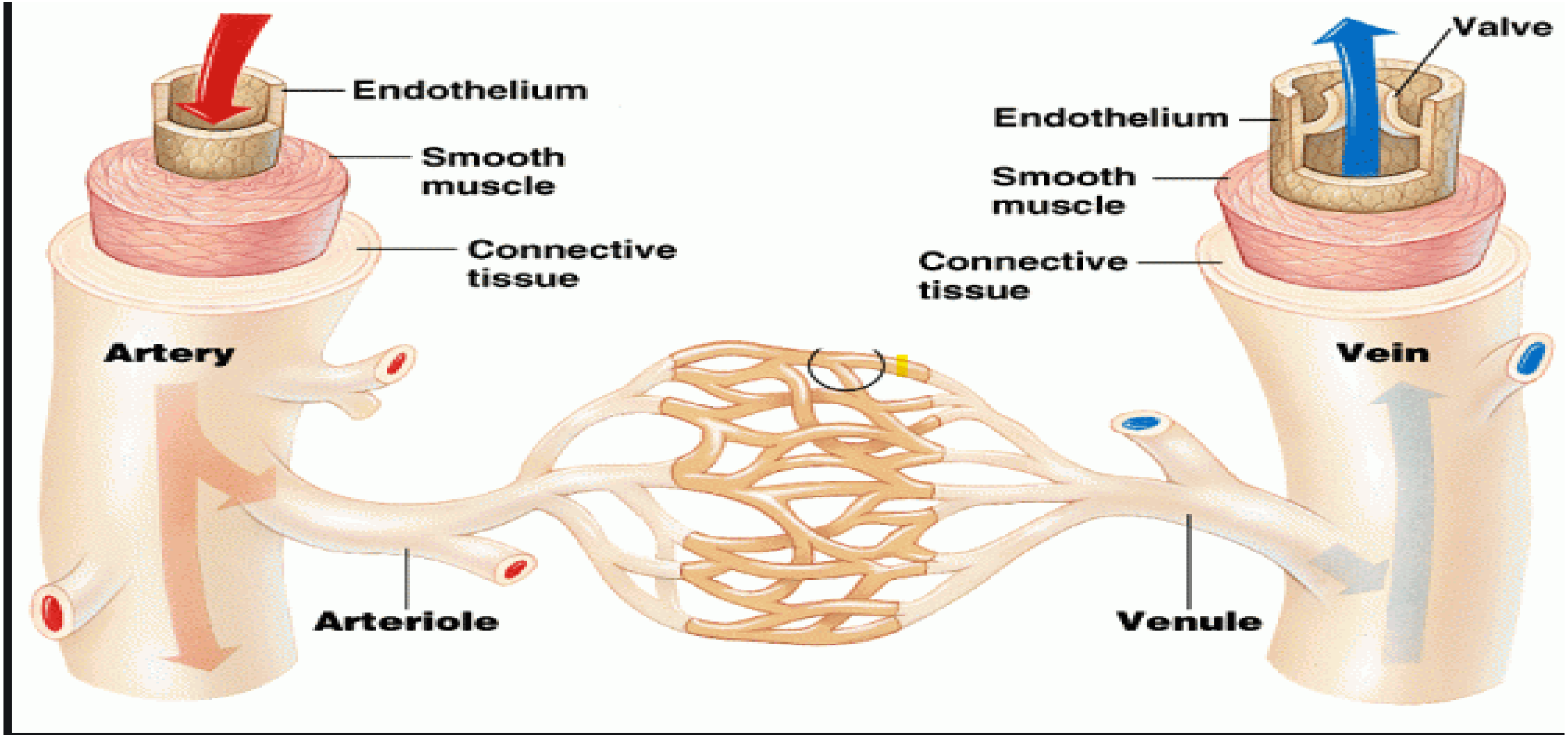
Fancy Plumbing Circuit

- Heart is the pump (2 pumps in 1)
- Blood vessels are the pipes
- The pipes have the ability to expand and contract in relation to physiologic, pathologic or iatrogenic changes
- Controlled by the autonomic nervous system

Blood Vessels

- Blood vessels have three layers : Intima, Media and Adventitia
- The adventitia or outer layer which provides structural support and shape to the vessel
- The tunica media or a middle layer composed of elastic and muscular tissue which regulates the internal diameter of the vessel
- The tunica intima or an inner layer consisting of an endothelial lining which provides a frictionless pathway for the movement of blood

Anatomy


Endothelium
Smooth muscle
Connective tissue
Artery
Arteriole
Valve
Endothelium
Smooth muscle
Connective tissue
Vein
Venule

Case Presentation

- Baseline Data: 75 W male with pancreatic cancer established with Moffitt on 12/2019
- 191 lbs after recent 15 lb weight loss (baseline weight 206 lbs)
- PMHx: HTN, HLD, glaucoma
- Meds: metoprolol succinate 25 mg QD, lisinopril 20 mg QD, lovastatin 40 mg daily, temazepam 15 mg QHS, timolol eye gtts
- Labs : WBC 6, Hgb 12, plts 188. Cr 0.5 CMP otherwise unremarkable
- Gemcitabine and nabpaclitaxel regimen ordered by MD

12/18/2019 11:15 EST	12/18/2019 11:20 EST	12/18/2019 11:25 EST	12/18/2019 11:30 EST	12/18/2019 11:35 EST	12/18/2019 11:40 EST	12/18/2019 11:45 EST	12/18/2019 11:50 EST	12/18/2019 11:55 EST	12/18/2019 12:00 EST	12/19/2019 10:13 EST	12/19/2019 10:15 EST	1/8/2020 13:04 EST	1/8/2020 13:05 EST	1/8/2020 13:09 EST	1/22/2020 12:57 EST
131	117	98	111	122	123	133	132	140	134		131		124		134
72	62	58	76	71	99	79	83	75	91		72		78		69

Case Presentation

- 2/26/2020 Intervisit note stating Pt has become “severely weak”
- IVF and labs ordered for 2/27
- Pt presents to lab draw and feels like he is “going to pass out”
- V/S: BP – 92/51, Pulse – 65, Temp – 37 c , RR – 18, Sa02 -96% Weight 186 lbs

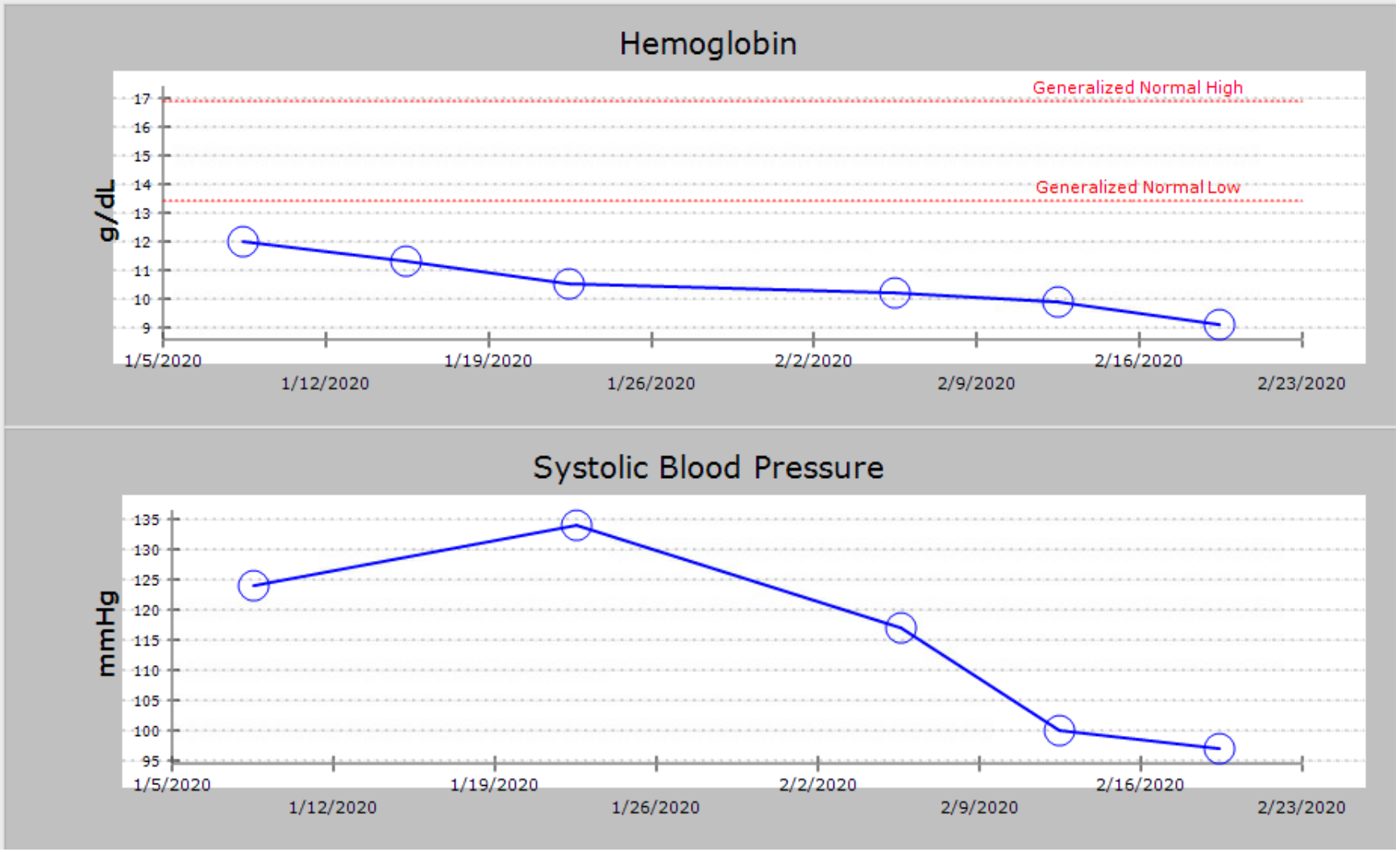
2/5/2020 14:14 EST	2/12/2020 11:05 EST	2/19/2020 10:16 EST	2/27/2020 8:57 EST	2/27/2020 8:59 EST	2/27/2020 9:49 EST	2/27/2020 10:55 EST	2/27/2020 11:34 EST	2/27/2020 11:35 EST	3/4/2020 11:11 EST	3/4/2020 11:12 EST	3/4/2020 11:21 EST	3/18/2020 13:07 EDT
117	100	97	92		103	103	99		118			
70	63	57	51		62	61	54		80			
	75	70	65		76	75	69		92			96

Why is this patient hypotensive and how are you going to fix it?

- The assumption based on the triage call is that he is dehydrated
- He is eating and drinking well. Taking all meds as prescribed
- Labs available at presentation:
- 2/19/2020 WBC 3.29, ANC 1840, Hgb 9.1 (Hgb on 12/19 was 12)
- TAKING ALL MEDS AS PRESCRIBED!

- Is this patient dehydrated?

Diagnosis and Management



Diagnosis

- Hypotension is due to 3 major factors
- 1- anemia secondary to chemo (Baseline Hgb 12, now 9.1)
- 2- persistent administration of antihypertensive meds
- 3- weight loss (206 to 186 lb)

- His intake is adequate and he is not dehydrated
- He is hypovolemic from anemia
- His beta blocker is knocking out his compensatory mechanism for tachycardia
- His ACE inhibitor is contributing to the hypotension
- What is the reversal agent for beta blockers?
- Does he need a blood transfusion?

Management

- Thorough Hx and PE
- Review of entire chart including Serial BP measurements, current treatment, med list review, questioning caregiver about Pt intake.
- Glucagon given (1 mg IM)
- IVF given (2 liters)
- Type and Cross specimen drawn
- D/C Beta blocker (ONLY DO THIS IF THIS IS USED FOR HYPOTENSION – IF USED FOR AFIB DOSE REDUCE AND COORDINATE WITH PRESCRIBING MD)
- D/C ACEi until BP normalizes
- Pt advised to keep a BP diary and bring it to clinic.

Follow up

- Sx resolved after fluids
- Did not take meds the next day and sx did not return
- Did not need to resume antihypertensive meds over the next month – he became normotensive after weight loss
- He did not need blood

What is the Difference Between a Medicine and a Poison?

Dosage!

Fun Fact

- In 1968, studies carried out in the Royal College of Surgeons laboratories of Nobel prize winner, John Vane, showed that peptides from a Brazilian viper's (*Bothrops jararaca)* venom inhibited the activity of ACE from dog lung. *
- Snake envenomation causes pathologic hypotension (and DIC)
- Years later this research led to the first modern ACE inhibitor, captopril.

- *Bakhle YS. Conversion of angiotensin I to angiotensin II by cell-free extracts of dog lung. Nature 1968;220:919–21.

Bothrops Jararaca Medical Herpetology

Clinical Considerations and Pearls

- Med list review: enlarged prostate treatment? Diuretics? Recent Steroids?
- Always ask care giver about the patient's oral intake
- Ask about "Nausea". Describe the sensation of nausea without using the word nausea
- Trend body weight, albumin, Hgb and creatinine
- Vasovagal Syncope most common in blood draw from a needle stick. Also common from straining on the toilet when constipated.

Clinical Considerations and Pearls

- Diuretics: I almost always D/C these on Pts getting cytotoxic chemo. Chronic use while on therapy often leads to hypovolemia and electrolyte imbalance. Add KCl when using a diuretic. **If K is low Mag is low**

- Albumin status. If the albumin is low and the pt has edema a diuretic will not work. Attempted diuresis with low albumin will result in hypovolemia with (likely) unchanged peripheral edema and hypotension

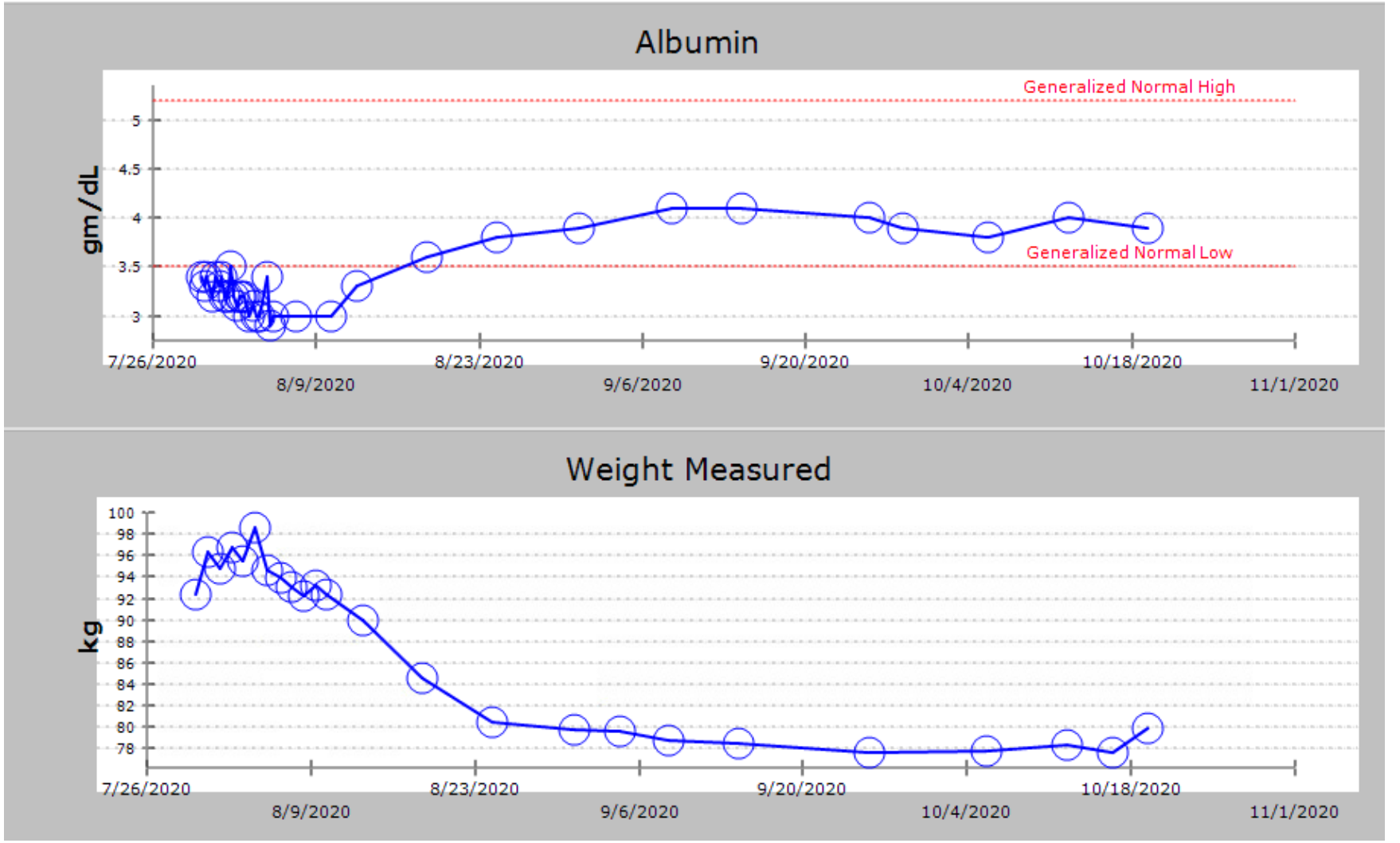
Clinical Pearl: Relationship between Albumin and Body Weight

- **Albumin** — Albumin is quantitatively the most important plasma protein. Synthesized in the liver
- The serum albumin concentration reflects the rate of synthesis, rate of degradation, and volume of distribution. Albumin synthesis and function are regulated by a variety of factors, including nutritional status, serum oncotic pressure, cytokines, and hormones. How these factors operate on a cellular level is not precisely known
- inhibitory substances associated with **inflammatory states**, such as tumor necrosis factor and interleukin-1, **impede albumin synthesis** and may affect nononcotic (eg, antioxidant, scavenging, immune-modulating, endothelial protective) functions of albumin.
- Little is known about the clearance of albumin, which is primarily by catabolism. The half-life of albumin in serum is approximately 20 days, with 4 percent of the total albumin pool being degraded daily.

Diuretics and low albumin - The Edematous Patient

- Diuretics can cause hypovolemia in an edematous patient with low albumin.
- Trend Weight vs albumin.
- In the outpatient setting add compression stockings, D/C the diuretic and WAIT!
- Albumin will improve as the patient heals.

Trend Albumin Versus Weight



Hypotension from Anemia

ClinSum	9/22/2020 10:11 EDT	9/22/2020 11:01 EDT	9/22/2020 11:02 EDT	9/22/2020 11:14 EDT	9/22/2020 11:25 EDT	9/22/2020 12:25 EDT	9/22/2020 12:26 EDT	9/22/2020 12:52 EDT	9/22/2020 12:53 EDT	9/22/2020 12:54 EDT	9/24/2020 14:39 EDT
Education and Medication Leaflets				Education a							
Hemogram											
WBC	(H) 15.33										
Preliminary ANC	* > 1.5 K/uL										
RBC	(L) 2.67										
Hemoglobin	(L) 7.9										
Hematocrit	(L) 23.6										
Mean Cell Volume	88.4										
MCH	29.6										
MCHC	33.5										
RDW	(H) 52.1										
Platelet Count	(L) 13										
MPV	Instrument										
Transfusion Summary											
TRANSFUSED										TRANSFUSE	
Blood Bank Tests											
BB Hold	Hold Sampl										
XM IS Interp											
Antibody Screen Interp											
ABORh Type											
Vital Signs											
Systolic Blood Pressure		102			114	106		108			139
Diastolic Blood Pressure		60			71	64		70			79

Anemia

- Regarding anemia, many providers state “Transfuse RBCs <7”
- I disagree. The statement should read : “Transfuse RBCs for symptoms related to anemia”
- Hgb < 7 = inpatient guidelines: Guidelines per AABB, “Choosing wisely campaign”. NCCN recommends Tx when symptomatic
- My barometer for transfusions: Can the patient go to Publix without sx?

Anemia

Table 2. Guidelines on Transfusion Practices

Guidelines	Inpatient vs. outpatient	Transfusion threshold	How many units?
NCCN	Not specified	When symptomatic	Minimum to achieve symptomatic relief
ASH Choosing Wisely	Inpatient	< 7 g/dL hemoglobin	Minimum to get to 7–8 g/dL hemoglobin
AABB[a]	Inpatient	< 7 g/dL hemoglobin	One unit at a time

Note. NCCN = National Comprehensive Cancer Network; ASH = American Society of Hematology.
[a]Formerly American Association of Blood Banks.

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Fun Facts!

- There is 1 MEq of potassium per inch of a banana!
- Most electrolytes can be purchased OTC (and in large quantities)
- Why isn’t KCl sold OTC?
- KCl overdose = arrythmia (tall T waves on EKG)

Summary

- Oncology patients may develop hypotension during their treatment which may be iatrogenic, due to illness, due to a new physiologic process, or as sequelae to treatment.
- Thoroughly review outside medications.
- Consider adjusting meds (remember medicine versus poison concept)
- Coordinate care if a Pt is on an anti-arrhythmic.
- Although IV fluids are often indicated initially the provider should research the etiology of hypotension
- Consider blood transfusions when pt develops symptoms of anemia as opposed to using a specific level of Hgb.

Summary

- Consider endocrine referral if adrenal insufficiency is suspected with positive cosyntropin stim test
- Trend albumin versus weight in patients who are edematous
- If Pt remains hypotensive after removing meds and administering blood and / or fluids, consider autonomic neuropathy as a diagnosis
- When Clinic MA, triage team member or Lab Draw personnel bring hypotension to your attention make sure you thoroughly investigate it

Summary

- Diuretics are dangerous if the patient's clinical status changes (weight loss, decreased intake, cytotoxic chemotherapy). If diuretics are considered give Pt an Rx for enough tablets just to get you to the next appt (i.e. Rx for 7 tablets). Always give KCl tabs with diuretics
- Pearl - If the K is low the Mag is low
- Trend albumin status in all patients with BP issues. Will improve as Pt heals. Albumin is always lowest when a Pt gets admitted
- Investigate orthostasis
- Ask caregiver about Pt symptoms and oral intake
- Get a BP diary on all patients with BP issues

Thank You!

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