How to screen a chemotherapy prescription: understanding dosing and protocols

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Health New Zealand
Te Whatu Ora

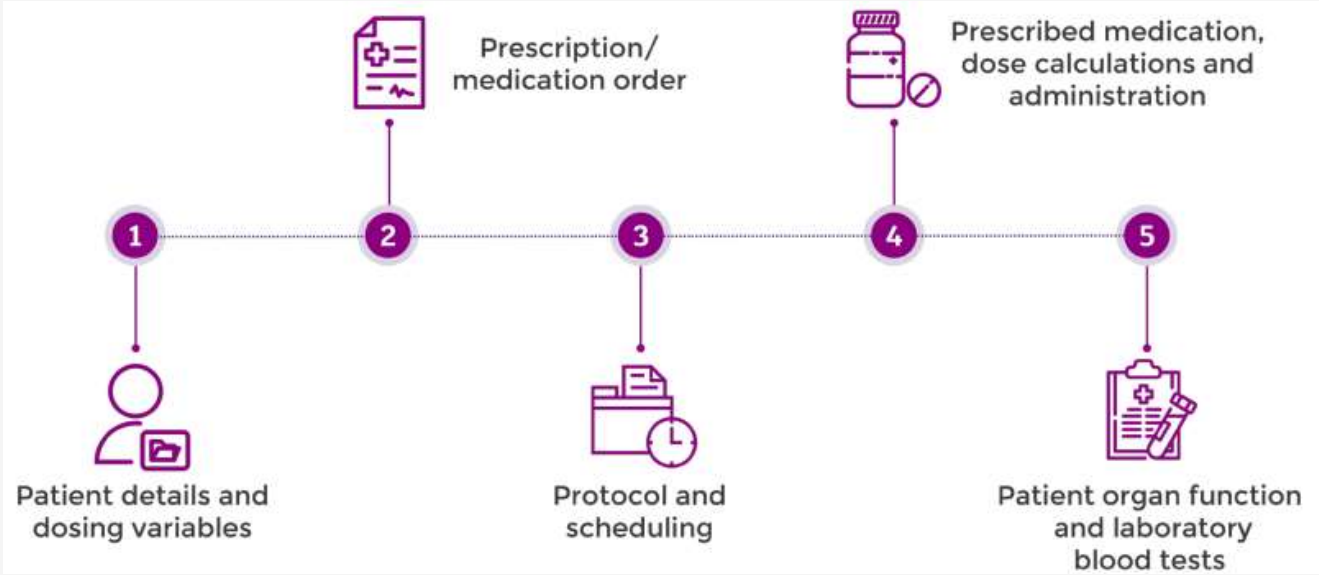
Learning Objectives

- List the key steps in the process of clinically screening a chemotherapy prescription
- Understand how to calculate doses based on weight, BSA or other methods (e.g. carboplatin dosing)
- Describe the basic principles of combination chemotherapy
- Understand how laboratory tests influence a patient's treatment
- Give advice on dose adjustments for renal and/or hepatic dysfunction
- Understand the importance of correct administration rates and orders of drug administration for specific combination therapies
- Check prescribed chemotherapy doses and frequencies against a written protocol

Pharmacist Verification of Chemotherapy: The five ‘P’s

COSA guidelines for the safe prescribing, dispensing and administration of systemic cancer therapy

1. Patient details and dosing variables
2. Prescription / medication order
3. Protocol and scheduling
4. Prescribed medication, dose calculations, and administration
5. Patient organ function and laboratory blood tests



COSA (Clinical Oncology Society of Australia)

1) Patient details and variables

- Patient identity (full name, gender, DOB, NHI)
- Documented ADRs/allergies
- Patient dosing variables (height, weight, BSA)
- Regular medications
- Cancer diagnosis and treatment plan
- Does the patient have an appointment booked to receive treatment?

2) Prescription / medication order

- Prescription / protocol
  - Documented on the appropriate form / e-prescribing system
  - Meets legal requirements
- Prescriber details
  - Name and signature/e-signature
  - Prescriber is authorised to prescribe anti-cancer treatments
- Date of prescribing and intended date(s) of treatment
- Prescription is complete and contains a list of all medication to be administered and their routes

3) Protocol and scheduling

- Does the protocol name and treatment arm match the treatment plan?
- Is the protocol appropriate based on patient factors and diagnosis?
- Is the cycle quantity and cycle interval appropriate?
- For each drug:
  - Is it charted on the correct day(s)?
  - Is the correct dose calculation charted?
    - e.g. Pembrolizumab 200mg q3weeks vs 400mg q6weeks
    - e.g Oxaliplatin 130 mg/m^2 for CAPOX regimen vs 85mg/m^2 for FOLFOX regimen

Where to find protocols?

- Local protocols – hospital intranet
- eviQ (NSW Cancer Institute)
- British Columbia Cancer Agency (BC Cancer)
- Systemic Anti-Cancer Therapy (SACT) Regimen Library
  - Act Now accessed via NZF
- NSSG Haematology (Thames Valley Cancer Alliance)
- If you can’t find it in the usual places, try Google...

Non-Hodgkin lymphoma R-CHOP21 (rituximab CYCLOPHOSPHamide DOXOrubicin vinCRISTine prednisolone)

Name of protocol

Non-Hodgkin lymphoma R-CHOP21 (rituximab CYCLOPHOSPHamide DOXOrubicin vinCRISTine prednisolone)

Patients with lymphoma should be considered for inclusion into clinical trials. Link to ALLG website, ANZCTR website and Lymphoma Australia website.

Related pages:

- Non-Hodgkin lymphoma R-CHOP14 (rituximab CYCLOPHOSPHamide DOXOrubicin vinCRISTine prednisolone)

Treatment schedule

Overview | Detail

Cycle 1 to 6

Drug	Dose	Route	Day
Prednisolone	100 mg ONCE a day	PO	1 to 5
Rituximab	375 mg/m^2	IV infusion	1
DOXOrubicin	50 mg/m^2	IV	1
vinCRISTine	1.4 mg/m^2 (Cap dose at 2 mg)	IV infusion	1
CYCLOPHOSPHamide	750 mg/m^2	IV infusion	1

Frequency: 21 days

Cycles: 6 to 8

Indications and patient population

- CD20 positive B-cell lymphomas

Indications for using regimen

4) Prescribed medication, dose calculations, and administration

- Are the drugs appropriate?
  - Prescribed dose and units
  - Do the drugs match the protocol? Any discrepancies - Intentional or unintentional?
- Are the pre-meds, concurrent-meds, and post-meds appropriate?
  - Consider the protocol (drugs, number of days of treatment)
  - E.g. anti-emetics, hydration
  - Always follow local guidelines
- Are the administration details appropriate?
  - Route, volume, diluent, infusion time/rate
  - Order of administration
- Has the regimen been prescribed correctly in terms of days?
  - Are there consecutive or non-consecutive treatment days?
  - E.g. Day 1, 2 & 3 or Day 1, 8 & 15
- Are there any drugs with maximum lifetime cumulative doses?
  - Ensure this will not be exceeded during the cycle (e.g. anthracyclines, bleomycin)
- Are there any potential drug interactions?
- Funding?

How to calculate chemotherapy doses

- BSA based dose (mg/m^2)
  - DuBois + DuBois
  - Mostellar

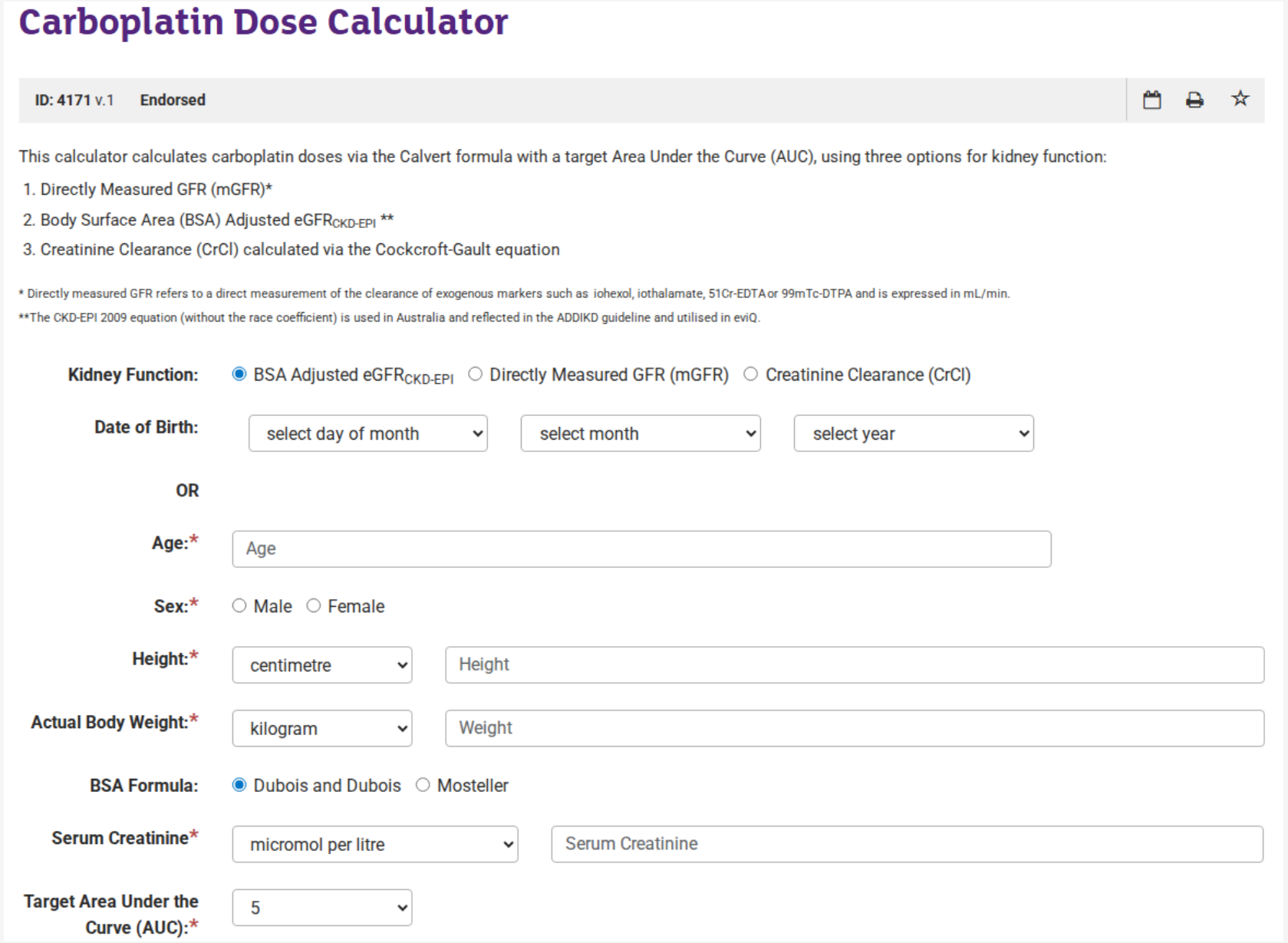
$$\text{BSA } (m^2) = \sqrt{\frac{\text{Height (cm)} \times \text{Weight (kg)}}{3{,}600}}$$

- Weight based dose (mg/kg)

- AUC based dose
  - Carboplatin only
  - eviQ carboplatin dose calculator

- Capped dose
  - Vincristine capped at 2mg

- Flat dose
  - Pembrolizumab 200mg every 21 days or 400mg every 42 days



Carboplatin Dose Calculator

ID: 4171 v.1 Endorsed

This calculator calculates carboplatin doses via the Calvert formula with a target Area Under the Curve (AUC), using three options for kidney function:

1. Directly Measured GFR (mGFR)*
2. Body Surface Area (BSA) Adjusted $eGFR_{CKD\text{-}EPI}$ **
3. Creatinine Clearance (CrCl) calculated via the Cockcroft-Gault equation

* Directly measured GFR refers to a direct measurement of the clearance of exogenous markers such as iohexol, iothalamate, 51Cr-EDTA or 99mTc-DTPA and is expressed in mL/min.

**The CKD-EPI 2009 equation (without the race coefficient) is used in Australia and reflected in the ADDIKD guideline and utilised in eviQ.

Kidney Function: (•) BSA Adjusted $eGFR_{CKD\text{-}EPI}$ ( ) Directly Measured GFR (mGFR) ( ) Creatinine Clearance (CrCl)

Date of Birth: select day of month | select month | select year

OR

Age:* Age

Sex:* ( ) Male ( ) Female

Height:* centimetre | Height

Actual Body Weight:* kilogram | Weight

BSA Formula: (•) Dubois and Dubois ( ) Mosteller

Serum Creatinine* micromol per litre | Serum Creatinine

Target Area Under the Curve (AUC):* 5

Carboplatin Considerations

Kidney function

- BSA adjusted eGFR
- Directly Measured GFR

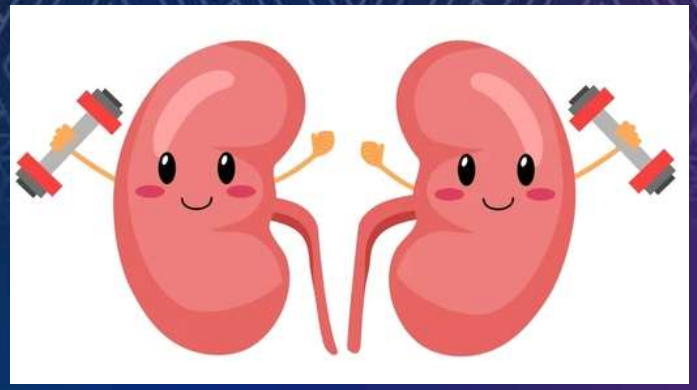
Serum Creatinine

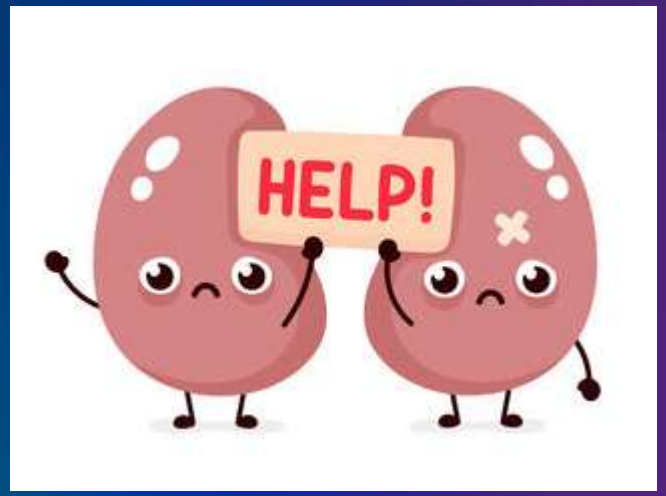
AUC target

- Guided by regimen

5) Patient organ function and laboratory blood tests

- Relevant laboratory tests are available and recent
- Are absolute neutrophil count (ANC) and platelet count within an acceptable range?
- Are renal and hepatic function appropriate for the prescribed drugs?
- Are any other tests required? Are they within normal parameters?
  - Electrolytes
  - Cardiac tests (LVEF, ECG)
  - Respiratory tests
  - Hearing tests



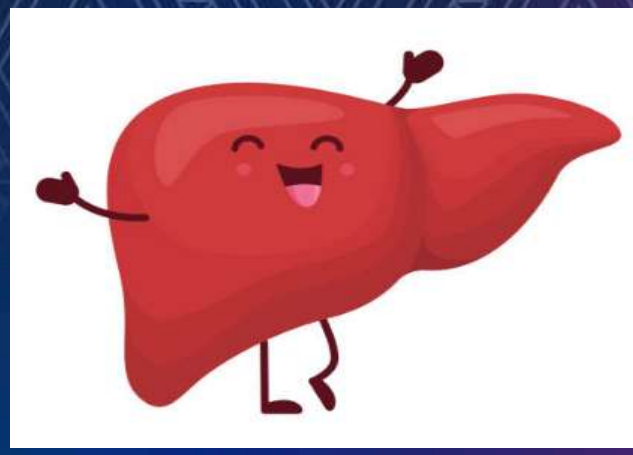


Renal Function

- Check serum creatinine and eGFR / CrCl at the start of each cycle
- Any trends in the creatinine?
- Does the drug need to be dose adjusted in renal impairment?

- Directly measured glomerular filtration rate (mGFR)
  - Gold standard for carboplatin dosing
  - Accurate picture of kidney function
  - Limited resourcing and wait lists means most patients don’t have a mGFR
  - Prioritise curable ovarian cancer patients where carboplatin is the primary treatment

- EDTA clearance
  - Commonly used for dosing carboplatin (AUC 7) in germ cell seminoma adjuvant treatment



Liver Function

- Check LFTs at the start of each cycle
- Any trends in the LFTs?
- Does the drug need to be dose adjusted in hepatic impairment?
- LFT derangement could be caused by the cancer itself
  - E.g. Liver metastases
- Gilbert's syndrome
  - Genetic liver disease the causes high bilirubin
  - Reduce dose of irinotecan

Dose modifications and delays

- Dose modifications
  - Treatment toxicities
  - Initial dose reduction for frailty or poor performance status
  - Renal or hepatic impairment
    - ADDIKD guideline, accessed via eviQ
    - ASCO guidelines, ESMO guidelines
    - The Lancet Onology “Dose recommendations for anticancer drugs in patients with renal or hepatic impairment”

- Dose delays
  - Patient preference, e.g. holiday or important event
  - Slow recovery of neutrophils or other blood counts
  - Surgery

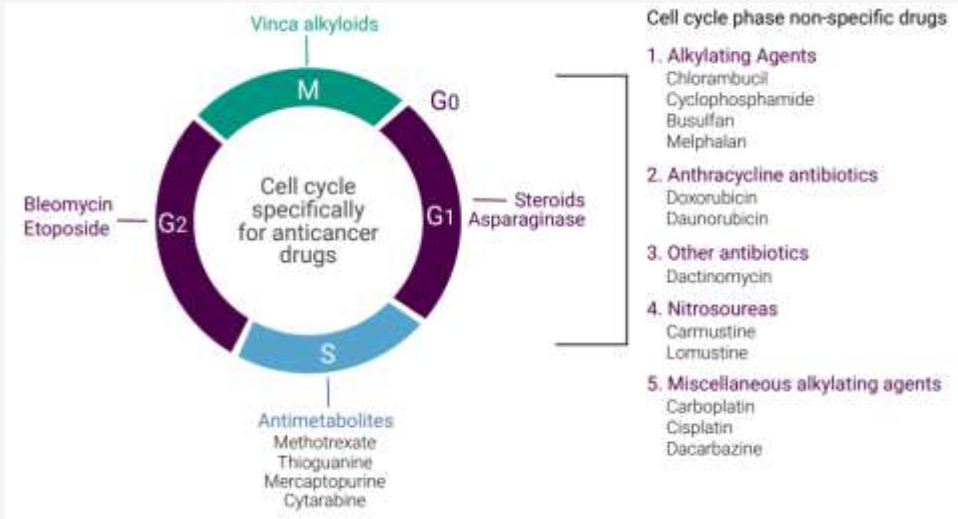
Chemotherapy cycle timings

- Intermittent treatment allows for recovery of healthy cells
  - Most common are 14 or 21 day cycles

- Cell cycle phase non-specific (CCPNS)
  - Effective regardless of the phase of the cell cycle
  - Have a direct effect on the DNA molecule and are considered to be more toxic than CCPS drugs

- Cell cycle phase-specific chemotherapy (CCPS)
  - Act at specific phases within the cell cycle
    - Frequent small doses, e.g. paclitaxel, vinorelbine
    - Continuous infusion, e.g. fluorouracil

- Dose dense chemotherapy
  - Shortened intervals between cycles
  - Aims to minimise cell regrowth between cycles
  - GCSF (filgrastim) is used to maintain white cell count
  - Potential for more acute toxicities



What to think about with combination protocols?

- Different mechanisms of action
  - Reduces chance of cancer cell resistance
  - Often combine CCPS and CCPNS drugs
- Synergistic effect
  - Cisplatin with radiation therapy
  - Folinic acid with 5FU (fluorouracil)
- ‘Rescue drugs’ to reduce toxicity and allow use of larger doses
  - Folinic acid rescue after methotrexate
- Avoid overlapping toxicities
  - Anthracyclines and trastuzumab given sequentially
  - E.g. Breast adjuvant doxorubicin + cyclophosphamide 4 cycles THEN paclitaxel + trastuzumab 4 cycles

Administration rate

- Administration rate and infusion time affects systemic drug exposure and pharmacokinetic profile
- Efficacy and tolerability can change depending on how the drugs is administered

Why is administration order important?

- To protect veins and minimise extravasation risk
  - Give vesicants first while veins are in best condition
- To help avoid PK interactions
  - Give nephrotoxic drugs (e.g. platinums) after renally cleared drug
- For synergistic effect
  - For example, give folinic acid before 5FU
- Practical considerations
  - Filter requirements, 5FU infusion pump attachment

Dose banding and rounding

- Dose rounding
  - Optimise vial numbers needed / minimise drug waste
  - Easier volumes to measure

- Dose banding
  - Better enables outsources (external compoundings)
  - Doses are more likely to be re-used

Band Range (mg)			Band Dose (mg)	Variance (percent)	
From ≥	To (A) <	To (B) ≤		Below	Above
7.59	8.49	8.48	8	5	-6
8.49	9.49	9.48	9	6	-5
9.49	10.49	10.48	10	5	-5
10.49	11.49	11.48	11	5	-4
11.49	12.49	12.48	12	4	-4
12.49	13.49	13.48	13	4	-4
13.49	14.49	14.48	14	4	-3
14.49	15.49	15.48	15	4	-3
15.49	16.49	16.48	16	3	-3
16.49	17.49	17.48	17	3	-3
17.49	18.97	18.96	18	3	-5
18.97	20.98	20.97	20	5	-5
20.98	22.98	22.97	22	5	-4
22.98	24.98	24.97	24	4	-4
24.98	26.98	26.97	26	4	-4

Dosing in obesity

- ASCO guidelines for dosing in obesity suggest using full weight-based dosing, regardless of obesity status

Recommendation 1

Full weight-based dosing of cytotoxic chemotherapy should be offered regardless of obesity status (type: evidence-based; evidence quality: low; strength of recommendation: moderate).

- Some clinicians may choose to use adjusted body weight or cap doses
  - Risk of under dosing
  - Consider treatment intent, e.g. curative?

- The protocol may specify if adjusted body weight should be used

Appropriate Systemic Therapy Dosing for Obese Adult Patients With Cancer: ASCO Guideline Update. 2021

References

- Cancer Therapy Medication Safety Working Group. COSA guidelines for the safe prescribing, dispensing and administration of systemic cancer therapy. Sydney: Clinical Oncology Society of Australia. [Version URL: https://wiki.cancer.org.au/australiawiki/index.php?oldid=215352 , cited 2023 Sept 7]. Available from: https://wiki.cancer.org.au/australia/COSA:Cancer_chemotherapy_medication_safety_guidelines.
- eviQ. International Consensus Guideline for Anticancer Drug Dosing in Kidney Dysfunction (ADDIKD): https://www.eviq.org.au/clinical-resources/addikd-guideline/4174-anticancer-drug-dosing-in-kidney-dysfunction
- eviQ. Body surface area calculator - https://www.eviq.org.au/clinical-resources/eviq-calculators/3198-body-surface-area-calculator
- Appropriate Systemic Therapy Dosing for Obese Adult Patients With Cancer: ASCO Guideline Update. 2021

Reviewing cases

Spend 30 minutes screening two cases

- 15 minutes for each case
- 5 to 10 minutes to go over each case as a whole group

Case 1:Carboplatin + Paclitaxel

Date	22/8/25	14/8/25	4/9/25
Creatinine (45-90) umol/L	76	74	79
eGFR (>90) ml/min/1.73m2	81	84	78

Date	22/8/25	14/8/25	4/9/25
Hb (115-155) g/L	125	158	143
Platelets (150-400)x10^9/L	200	192	254
Neutrophils (1.9-7/5)x10^9/L	4.2	6.5	3.6

Date	22/8/25	14/8/25	4/9/25
Bilirubin (2-20 umol/L	3	2	2
ALT (5-30) U/L	22	18	20

Clinic Letter
Oncology - Medical
Blood and Cancer Centre Wellington Hospital

Date seen: 15 August 2025
Re: Betty Boop NHI: ABC1234
DOB: 10 June 1974

Dear Doctor

Problem List:

1. Stage IV high grade serous ovarian cancer (supraclavicular lymph nodes)
   a. For upfront chemotherapy

Reason for attendance:

Cycle three carboplatin and paclitaxel 3 weekly

Progress:

It was lovely to see Betty today. She appears to be doing very well on chemotherapy with minimal side effects. She is very tired in the first week, but then this resolves. She has no peripheral neuropathy. Her weight is increasing, which is good news. Her blood tests are satisfactory.
Her nuclear medicine GFR is reported as 100ml/min.

I will plan to see her again in 3 weeks time

Yours sincerely
Dr Jimmy Neutron
Medical Oncologist

Case 1: Carboplatin + Paclitaxel

1. Patient details and dosing variables
2. Prescription / medication order
3. Protocol and scheduling
4. Prescribed medication, dose calculations, and administration
5. Patient organ function and laboratory blood tests

Case 2: Trastuzumab

Date	22/8/25	14/8/25	4/9/25
Creatinine (45-90) umol/L	81	79	110
eGFR (>90) ml/min/1.73m2	71	65	42

Date	22/8/25	14/8/25	4/9/25
Hb (115-155) g/L	126	132	129
Platelets (150-400)x10^9/L	320	354	342
Neutrophils (1.9-7/5)x10^9/L	2.3	3.3	3.5

Date	22/8/25	14/8/25	4/9/25
Bilirubin (2-20 umol/L	4	3	4
ALT (5-30) U/L	34	30	32

Clinic Letter
Oncology - Medical
Blood and Cancer Centre Wellington Hospital

Date seen: 15 August 2025
Re: Snow White NHI: ZYX9876
DOB: 4 November 1981

Dear Doctor

Problem List:

1. Right breast 22mm grade 3 infiltrating ductal carcinoma –for adjuvant treatment

a. **February 2025: Surgery:** Right sided wide local excision of the breast.

b. **Treatment plan:** Adjuvant chemotherapy with paclitaxel weekly 3 weekly Trastuzumab

Reason for Attendance: Cycle 5 trastuzumab

Progress: It was lovely to see Snow today. She seems to be doing very well. She has had no problems with her bowels, no difficulty breathing, no chest pain and no issues with pleurisy.
We plan to see her scan in 6 months time.
We will plan to proceed today with her trastuzumab.

Yours sincerely
Dr Jimmy Neutron
Medical Oncologist

Case 2: Trastuzumab

1. Patient details and dosing variables
2. Prescription / medication order
3. Protocol and scheduling
4. Prescribed medication, dose calculations, and administration
5. Patient organ function and laboratory blood tests

Thank you