CARBOplatin (AUC 6) and PACLitaxel 200mg/m^2 Therapy

Please refer to NCCP Regimen 00849 Nivolumab 360mg and Chemotherapy for relevant information when used in combination with nivolumab

INDICATIONS FOR USE:

INDICATION	ICD10	Regimen Code	HSE approved reimbursement status*
Adjuvant Treatment of Stage I,II and IIIA Non Small Cell Lung Cancer (NSCLC)[i]	C34	00304a	N/A
Treatment of locally advanced, recurrent or metastatic NSCLC[i]	C34	00304b	N/A
In combination with nivolumab for the neoadjuvant treatment of resectable NSCLC at high risk of recurrence in adult patients whose tumours have PD-L1 expression ≥ 1% **(3 cycles only)** **(This combination is available in NCIS (00849.1))**	C34	00304c	Nivolumab: ODMS 01/05/2024 Chemotherapy: N/A

*For post 2012 indications only

TREATMENT:

The starting dose of the drugs detailed below may be adjusted downward by the prescribing clinician, using their independent medical judgement, to consider each patients individual clinical circumstances.

CARBOplatin and PACLitaxel are administered once every **21 days** for 4 cycles or until disease progression or unacceptable toxicity develops.

Facilities to treat anaphylaxis MUST be present when systemic anti-cancer therapy (SACT) is administered.

Admin. Order	Day	Drug	Dose	Route	Diluent & Rate	Cycle
1	1	PACLitaxel	200mg/m^2	IV infusion	500mL 0.9% NaCl over 3 hours	Every 21 days for 4 cycles
2	1	CARBOplatin	AUC 6	IV infusion	500mL glucose 5% over 30 minutes	Every 21 days for 4 cycles
PACLitaxel must be supplied in non-PVC containers and administered using non-PVC giving sets and through an in-line 0.22 µm filter with a microporous membrane.						
PACLitaxel should be diluted to a concentration of 0.3-1.2mg/mL.						

CARBOplatin dose:

The dose in mg of CARBOplatin to be administered is calculated as follows:

Dose (mg) = target AUC (mg/mL x min) x (GFR mL/min +25)

- **Measured GFR** (e.g. nuclear renogram) is preferred whenever feasible.
- **Estimation of GFR** (eGFR) can be done by using the Wright formula or using the Cockcroft and Gault formula to measure creatinine clearance.

- The GFR used to calculate the AUC dosing should not exceed 125mL/min
- For obese patients and those with a low serum creatinine, for example, due to low body weight or post-operative asthenia, estimation using formulae may not give accurate results; measured GFR is recommended
  - where obesity (body mass index [BMI] ≥ 30 kg/m2) or overweight (BMI 25-29.9) is likely to lead to an overestimate of GFR and isotope GFR is not available the use of the adjusted ideal body weight in the Cockcroft and Gault formula may be considered
  - where serum creatinine is less than 63 micromol/L, the use of a creatinine value of 62 micromol/L or a steady pre-operative creatinine value may be considered
- These comments do not substitute for the clinical judgement of a physician experienced in prescription of CARBOplatin

WRIGHT FORMULA

There are two versions of the formula depending on how serum creatinine values are obtained, by the kinetic Jaffe method or the enzymatic method. The formula can be further adapted if covariant creatine kinase (CK) values are available (not shown).

1. *SCr measured using enzymatic assay.*

$$\text{GFR (mL/min)} = \frac{(6230 - 32.8 \times \text{Age}) \times \text{BSA} \times (1 - 0.23 \times \text{Sex})}{\text{SCr (micromol/min)}}$$

2. *SCr measured using Jaffe assay*

$$\text{GFR (mL/min)} = \frac{(6580 - 38.8 \times \text{Age}) \times \text{BSA} \times (1 - 0.168 \times \textit{Sex})}{\text{SCr (micromol/min)}}$$

Key: Sex = 1 if female, 0 if male; Age in years; BSA= DuBois BSA

COCKCROFT-GAULT FORMULA

$$\text{GFR (mL/min)} = \frac{S \times (140 - \text{age in years}) \times \text{wt (kg)}}{\text{serum creatinine (micromol/L)}}$$

S= 1.04 for females and 1.23 for males

ELIGIBILITY:

- Indications as above
- Life expectancy > 3months
- ECOG status
  - Adjuvant: 0-1
  - Advanced/metastatic: 0-2

EXCLUSIONS:

- Hypersensitivity to CARBOplatin, PACLitaxel or any of the excipients.
- Pregnancy or breastfeeding
- Severe hepatic impairment (PACLitaxel)
- Baseline neutrophil count < 1.5 x 10^9 cells/L

PRESCRIPTIVE AUTHORITY:

The treatment plan must be initiated by a Consultant Medical Oncologist.

TESTS:

Baseline tests:

- FBC, renal and liver profile
- Audiometry and creatinine clearance as clinically indicated
- Isotope GFR measurement (preferred) or GFR / Cr Clearance estimation

Regular tests:

- FBC with differential, renal and liver profile before each cycle

Disease monitoring:

Disease monitoring should be in line with the patient's treatment plan and any other test/s as directed by the supervising Consultant.

DOSE MODIFICATIONS:

- Any dose modification should be discussed with a Consultant.

Haematological:

Table 1: Dose modifications for haematological toxicity

ANC (x 10^9/L) On Treatment Day	
0.5 to < 1.0	Delay treatment until recovery
< 0.5	Delay treatment until recovery and consider reducing PACLitaxel and CARBOplatin by 25% for subsequent cycles
Febrile neutropenia	Delay treatment until recovery and consider reducing PACLitaxel and CARBOplatin by 25% for subsequent cycles
Platelets (x 10^9/L) at any stage in cycle	
50 to < 100	Delay treatment until recovery
< 50	Delay treatment until recovery and consider reducing PACLitaxel and CARBOplatin by 25% for subsequent cycles

For some patients especially ECOG 2 or 3, treatment thresholds may be higher.

Table 2: Dose Modification of CARBOplatin and PACLitaxel in renal and hepatic impairment

Drug	**Renal Impairment**	**Hepatic Impairment**	
CARBOplatin	See note below*	No dose modification required	
PACLitaxel	No dose modification required	**Category**	**Dose modification**
		Mild	Reduce PACLitaxel by 25%
		Moderate	Reduce PACLitaxel by 50%
		Severe	Omit PACLitaxel

***Renal dysfunction and CARBOplatin:**

- Patients with creatinine clearance values of < 60mL/min are at greater risk to develop myelosuppression.
- In case of GFR ≤ 20mL/min CARBOplatin should not be administered at all.
- If Cockcroft & Gault or Wright formula are used, the dose should be calculated, as required, per cycle based on a serum creatinine obtained within 48 hrs of drug administration.
- If isotope GFR is used, the dose should remain the same provided the serum creatinine is ≤110% of its value at the time of the isotope measurement. If the serum creatinine is higher than this, consideration should be given to remeasuring the GFR or to recalculating using Cockcroft & Gault or Wright formulae.

Management of adverse events:

Table 3: Dose Modifications for Adverse Events

Adverse reactions	Recommended dose modification
Motor or sensory neuropathy Grade 2 Grade ≥ 3	 Reduce PACLitaxel by 25% If persists, reduce PACLitaxel by 50% Omit PACLitaxel
Mucositis and Stomatitis Grade 2 • 1st occurrence • 2nd occurrence • 3rd occurrence • 4th occurrence Grade ≥ 3 • 1st occurrence • 2nd occurrence	Delay treatment until toxicity resolved to ≤ Grade 1 and reduce dose for subsequent cycles as follows • No dose reduction • Reduce CARBOplatin and PACLitaxel by 25% • Reduce CARBOplatin and PACLitaxel by 50% • Omit CARBOplatin and PACLitaxel Delay treatment until toxicity resolved to ≤ Grade 1 and reduce dose for subsequent cycles as follows • Reduce CARBOplatin and PACLitaxel by 50% • Omit CARBOplatin and PACLitaxel

SUPPORTIVE CARE:

EMETOGENIC POTENTIAL:

CARBOplatin High **(Refer to local policy).**
PACLitaxel Low **(Refer to local policy).**

PREMEDICATIONS:

- All patients must be premedicated with corticosteroids, antihistamines, and H_2 antagonists prior to first dose of PACLitaxel treatment.
- The H_2 antagonist, famotidine, can potentially be omitted from the pre-medication requirements for PACLitaxel but the risk of hypersensitivity with this approach is unknown.

- Caution is advised particularly for patients receiving PACLitaxel every 3 weeks. It is recommended that if famotidine is omitted that patients are monitored closely for any signs of hypersensitivity. Any hypersensitivity should be managed as per local policy.
- Where a patient experiences hypersensitivity, consider the use of alternative H_2 antagonists **(Refer to local policy).**

Table 4: Suggested premedications prior to treatment with PACLitaxel

Drug	Dose	Administration prior to PACLitaxel
Dexamethasone	20mg oral or IV[a,b]	For oral administration: approximately 6 and 12 hours or for IV administration: 30 minutes
Chlorphenamine	10mg IV	30 minutes
Famotidine[c]	20mg IV	30 minutes
[a]Dose of dexamethasone may be reduced or omitted in the absence of hypersensitivity reaction according to consultant guidance.		
[b]If aprepitant is added to the anti-emetic regimen, consideration should be given to reducing the dose of dexamethasone to 12mg on the day of treatment.		
[c]Dose of famotidine may be omitted in the absence of hypersensitivity reaction according to consultant guidance.		

OTHER SUPPORTIVE CARE:

Myalgias and arthralgias may occur with PACLitaxel. Analgesic cover should be considered.

ADVERSE EFFECTS / REGIMEN SPECIFIC COMPLICATIONS

The adverse effects listed are not exhaustive. Please refer to the relevant Summary of Product Characteristics for full details.

CARBOplatin:

- **Neutropenia:** This is the dose limiting toxicity. Fever or other evidence of infection must be assessed promptly and treated appropriately.
- **Hypersensitivity:** Reactions to CARBOplatin may develop in patients who have been previously exposed to platinum therapy. However allergic reactions have been observed upon initial exposure to CARBOplatin. Severe hypersensitivity reactions characterised by dyspnoea and hypotension requiring treatment, angioedema and generalised urticaria have occurred in <1% of patients receiving PACLitaxel after adequate premedication. In the case of severe hypersensitivity reactions, PACLitaxel infusion should be discontinued immediately, symptomatic therapy should be initiated and the patient should not be re-challenged with the drug.
- **Neurotoxicity and ototoxicity:** Neurological evaluation and an assessment of hearing should be performed on a regular basis, especially in patients receiving high dose CARBOplatin. Neurotoxicity, such as parasthesia, decreased deep tendon reflexes, and ototoxicity are more likely seen in patients previously treated with CISplatin, other platinum treatments and other ototoxic agents. Frequency of neurologic toxicity is also increased in patients older than 65 years.

PACLitaxel:

- **Peripheral neuropathy:** Occurs frequently but the development of severe symptoms is rare. Dose reduction or discontinuation may be necessary.
- **Arthralgia/myalgia:** May be severe in some patients; however, there is no consistent correlation between cumulative dose and infusion duration of PACLitaxel and frequency or severity of the arthralgia/myalgia. Symptoms are usually transient, occurring within 2 or 3 days after PACLitaxel administration, and resolving within days.

- **Hepatic Dysfunction:** Patients with hepatic impairment may be at increased risk of toxicity, particularly grade 3-4 myelosuppression.
- **Extravasation:** PACLitaxel causes pain and tissue necrosis if extravasated. **(Refer to local policy).**
- **Cardiac conduction abnormalities:** If patients develop significant conduction abnormalities during PACLitaxel administration, appropriate therapy should be administered and continuous cardiac monitoring should be performed during subsequent therapy with PACLitaxel. Hypotension, hypertension, and bradycardia have been observed during PACLitaxel administration; patients are usually asymptomatic and generally do not require treatment. Frequent vital sign monitoring, particularly during the first hour of PACLitaxel infusion, is recommended.

DRUG INTERACTIONS:

- Avoid concurrent use with nephrotoxic drugs (e.g. aminoglycosides, furosemide, NSAIDS) due to additive nephrotoxicity. If necessary, monitor renal function closely.
- Avoid concurrent use with ototoxic drugs (e.g. aminoglycosides, furosemide, NSAIDS). When necessary perform regular audiometric testing
- Risk of drug interactions causing increased concentrations of PACLitaxel with CYP3A inhibitors.
- Risk of drug interactions causing decreased concentrations of PACLitaxel with CYP3A inducers.
- Current drug interaction databases should be consulted for more information.

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Version	Date	Amendment	Approved By
1	08/04/2016		Prof Maccon Keane
2	18/04/2018	Updated with new NCCP regimen template. Treatment table updated for standardization. Updated emetogenic status as per NCCN and adverse events	Prof Maccon Keane
3	10/07/2019	Standardization of hepatic dose modification for PACLitaxel	Prof Maccon Keane
4	29/04/2020	Exclusion criteria updated Updated emetogenic potential Standardised table for suggested premedications prior to treatment. Update to adverse event section. Updated references	Prof Maccon Keane
5	19/08/2020	Updated pre-medications table to include consideration of dexamethasone dosing where aprepitant is included as an anti-emetic	Prof Maccon Keane
6	30/09/2022	Updated CARBOplatin infusion time. Updated standard wording for CARBOplatin dosing and creatinine value. Updated baseline tests. Updated Dose modification of CARBOplatin in haematological toxicity Updated PACLItaxel pre medications table.	Prof Maccon Keane
7	01/05/2024	New indication for nivolumab in the neoadjuvant setting and reference to relevant nivolumab regimen added.	Prof Maccon Keane

Comments and feedback welcome at oncologydrugs@cancercontrol.ie.

[i] This regimen is outside its licensed indication in Ireland. Patients should be informed of the unlicensed nature of this indication and consented to treatment in line with the hospital's policy on the use of unlicensed medication and unlicensed or "off label" indications. Prescribers should be aware of their responsibility in communicating any relevant information to the patient and also in ensuring that the unlicensed or "off label" indication has been acknowledged by the hospital's Drugs and Therapeutics Committee, or equivalent, in line with hospital policy.