

Gemcitabine (1000mg/m²) and CARBOplatin (AUC 5) Therapy- 21 day

INDICATIONS FOR USE:

INDICATION	ICD10	Regimen Code	Reimbursement Status
Treatment of patients with locally advanced or metastatic transitional cell carcinoma (TCC) of the urothelium where CISplatin is contraindicated ⁱ	C67	00310a	Hospital
Treatment of patients with locally advanced, recurrent or metastatic non-small cell lung cancer (NSCLC) ⁱ	C34	00310b	Hospital

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.

Gemcitabine is administered on day 1 and day 8 and CARBOplatin on day 1 of a 21 day cycle for 4-6 cycles or until disease progression or unacceptable toxicity develops

Facilities to treat anaphylaxis MUST be present when the chemotherapy is administered.

Admin. Order	Day	Drug	Dose	Route	Diluent & Rate	Cycle
1	1 and 8	Gemcitabine	1000mg/m ²	IV infusion	250ml NaCl 0.9% over 30mins	Every 21 days
2	1	CARBOplatin	AUC5	IV infusion	500ml glucose 5% over 60 min	Every 21 days

CARBOplatin dose:

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

$$\text{Dose (mg)} = \text{target AUC (mg/ml x min)} \times (\text{GFR ml/min} + 25)$$

- **Measured GFR** (e.g. nuclear renogram) is preferred whenever feasible.
- Estimation of GFR may be performed using the Wright formula or the Cockcroft and Gault formula to measure creatinine clearance.
- The GFR used to calculate the AUC dosing should not exceed 125ml/min (3).
- For obese patients and those with a low serum creatinine due to low body weight and post-operative asthenia, estimation using formulae may not give accurate results; measured GFR is recommended.
 - Where obesity (body mass index [BMI] $\geq 30 \text{ kg/m}^2$) 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 for Cockcroft and Gault may be considered (4).

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- Where serum creatinine is less than 63 micromol/L, the use of a creatinine value of 63 micromol/L or a steady pre-operative creatinine value may be considered (5).
- 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 (6). 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*

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

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
- ECOG 0-2
- Adequate marrow reserve (ANC > 1.5 x 10⁹/L, platelets > 100x10⁹/L)

EXCLUSIONS:

- Hypersensitivity to gemcitabine, CARBOplatin or any of the excipients
- Pregnancy or Breast Feeding

PRESCRIPTIVE AUTHORITY:

The treatment plan must be initiated by a Consultant Medical Oncologist

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TESTS:

Baseline tests:

- FBC, renal and liver profile
- Audiometry and creatinine clearance as clinically indicated

Regular tests:

- Day 1: FBC, renal and liver profile
- Day 8: FBC, renal profile

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:

Prior to commencing a new treatment cycle (i.e. day 1), ANC must be $>1 \times 10^9/L$ and platelets $>100 \times 10^9/L$

Dose modifications for **gemcitabine within a cycle (i.e. day 8)**

Table 1: Dose modifications for gemcitabine within a cycle (i.e. day 8)

ANC ($\times 10^9 /L$)		Platelet count ($\times 10^9 /L$)		Other toxicity	Recommended dose of Gemcitabine
>1	And	> 100			100 %
0.5- 1	Or	50-100			75%
< 0.5	or	<50			Omit. Do not restart treatment until ANC > 0.5 and platelets > 50
ANC < 0.5 for > 5 days or ANC < 0.1 for > 3 days or Any incidence of febrile neutropenia	Or	< 25	Or	cycle delay of >1 week due to any toxicity	Reduce dose to 75% of the original cycle initiation dose for all subsequent cycles.

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Renal and Hepatic Impairment:

Table 2: Dose modification of CARBOplatin and Gemcitabine in renal and hepatic impairment

Drug	Renal Impairment		Hepatic Impairment
CARBOplatin	<ul style="list-style-type: none"> Patients with creatinine clearance values of < 60ml/min are at greater risk to develop myelosuppression. In case of GFR \leq20ml/min carboplatin should not be administered at all. If Cockcroft & Gault or Wright formula are used, the dose should be adjusted 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 \leq110% 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 taking care this does result in a dose reduction. 		Probably no dose modification required
Gemcitabine	CrCl (ml/min)	Dose	Hepatic Impairment
	>30	100%	If bilirubin \geq 27 micromol/L, use dose of 800 mg/m ² and increase dose to full dose if tolerated.
	<30	Consider dose reduction. Clinical decision.	

Management of adverse events:

Table 3: Dose Modification schedule for Adverse Events

Adverse reactions	Recommended dose modification
Grade \geq 3 non-haematological toxicity (except nausea/vomiting)	Therapy with gemcitabine and CARBOplatin should be withheld (until toxicity has resolved to grade \leq 1) and may be resumed with dose reduction at discretion of prescribing consultant.
Grade \geq 2 pneumonitis	Discontinue gemcitabine

SUPPORTIVE CARE:

EMETOGENIC POTENTIAL:

Gemcitabine: Low (Refer to local policy).

CARBOplatin: High (Refer to local policy).

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PREMEDICATIONS: None usually required **OTHER SUPPORTIVE CARE:** No specific recommendations

ADVERSE EFFECTS / REGIMEN SPECIFIC COMPLICATIONS:

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

- **Neutropenia:** Fever or other evidence of infection must be assessed promptly and treated appropriately.

Gemcitabine:

- **Renal Toxicity:** Irreversible renal failure associated with hemolytic uremic syndrome may occur (rare) with gemcitabine. Use caution with pre-existing renal dysfunction.
- **Pulmonary Toxicity:** Acute shortness of breath may occur with gemcitabine. Discontinue treatment with gemcitabine if drug-induced pneumonitis is suspected.
- **Cardiovascular:** Due to the risk of cardiac and/or vascular disorders with gemcitabine, particular caution must be exercised with patients presenting a history of cardiovascular events.
- **Infusion time:** Infusion time prolonged beyond 60 minutes has been shown to increase volume of distribution and has been associated with an increase in toxicity. However, given in the context of a fixed dose rate (FDR) regimen, prolonged infusions have also been reported to produce a higher response rate than standard regimens in association with a higher intracellular accumulation of its active metabolite (dFdCTP) (11-14).

CARBOplatin:

- **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.
- **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.

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). If necessary perform regular audiometric testing.
- Current drug interaction databases should be consulted for more information.

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Version	Date	Amendment	Approved By
1			Prof Maccon Keane
2	15/11/2017	Updated title and dosing in renal and hepatic impairment. Emetogenic status of CARBOplatin amended from moderate to moderate to high Applied new NCCP regimen template	Prof Maccon Keane

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3	06/11/2019	Reviewed. Treatment table standardised, updated emetogenic potential and management of adverse events	Prof Maccon Keane
4	18/11/2021	Reviewed. Updated Carboplatin Dose wording. Updated Dose modification in hepatic impairment, Adverse effects and Drug interactions.	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.

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