

Dose Dense DOXOrubicin, cycloPHOSphamide (AC 60/600) 14 day followed by PACLitaxel (175) 14 day and Trastuzumab Therapy (DD AC-TH)

Note: There is an option for Dose Dense DOXOrubicin, cycloPHOSphamide followed by weekly PACLitaxel and Trastuzumab (AC-TH) therapy described in regimen NCCP 00433.

INDICATIONS FOR USE:

INDICATION	ICD10	Regimen Code	HSE approved reimbursement status*
Adjuvant Treatment of High Risk Node Negative or Node Positive Breast Cancer.	C50	00316a	N/A
Neoadjuvant Treatment of High Risk Node Negative or Node Positive Breast Cancer.	C50	00316b	N/A

*This is for post 2012 indications

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.

DOXOrubicin and cycloPHOSphamide are administered once every 14 days for four cycles (one cycle = 14 days) followed by PACLitaxel once every 14 days for 4 cycles (8weeks) to start **14 days after** final cycle of DOXOrubicin and cycloPHOSphamide. Trastuzumab treatment is administered once every 7 days for 8 weeks unless unacceptable toxicity or disease progression develops. Following completion of the 8 weeks, trastuzumab 6mg/kg (ref [NCCP regimen 00200](#) Trastuzumab monotherapy-21days) every 21 days to complete one year of trastuzumab therapy may be given.

G-CSF support (using standard or pegylated form) is required with all cycles of dose dense chemotherapy.

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

Cycle 1-4:

Admin. Order	Day	Drug	Dose	Route	Diluent & Rate	Cycle
1	1	DOXOrubicin	60mg/ m ²	IV push	Slow IV push over 15 minutes	Every 14 days for 4 cycles
2	1	cycloPHOSphamide	600mg/m ²	IV infusion*	250mL NaCl 0.9% over 30 minutes	Every 14 days for 4 cycles
*cycloPHOSphamide may also be administered as an IV bolus over 5-10mins						
Lifetime cumulative dose of DOXOrubicin is 450mg/m ² In establishing the maximal cumulative dose of an anthracycline, consideration should be given to the risk factors outlined below¹ and to the age of the patient.						

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Cycle 5-8:

Day	Drug	Dose	Route	Diluent & Rate	Cycle
1	^{a,b} PACLitaxel	175mg/m ²	IV infusion	500mL NaCl 0.9% over 3 hours	5
1	^{c,d} Trastuzumab	4mg/kg	IV infusion Observe post infusion	250mL NaCl 0.9% over 90 minutes	5
8	^{c,d} Trastuzumab	2mg/kg	IV infusion Observe post infusion	If no adverse reactions use 250mL NaCl 0.9% over 30 minutes	5
1	^{a,b} PACLitaxel	175mg/m ²	IV infusion	500mL NaCl 0.9% over 3 hours	Every 14 days for cycle 6-8
1, 8	^{c,d} Trastuzumab	2mg/kg	IV infusion Observe post infusion	If no adverse reactions use 250mL NaCl 0.9% over 30 minutes	Every 14 days for cycle 6-8
^a 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.					
^b PACLitaxel should be diluted to a concentration of 0.3-1.2mg/mL.					
^c Recommended observation period: Patients should be observed for at least six hours after the start of the first infusion and for two hours after the start of the subsequent infusions for symptoms like fever and chills or other infusion-related symptoms. Any deviation should be noted in local policies.					
^d Trastuzumab is incompatible with Glucose 5%					

Note: Administration volumes and fluids have been standardised to facilitate electronic prescribing system builds.

Following completion of the 8 weeks of PACLitaxel/trastuzumab treatment, trastuzumab 6mg/kg (Reference [NCCP regimen 00200](#) Trastuzumab monotherapy-21 days) every 21 days to complete one year of trastuzumab therapy should be given.

ELIGIBILITY:

- Indications as above.
- HER2 overexpression or HER2 gene amplification as determined by an accurate and validated assay.
Please see *Recommendations on Reporting on HER2 Status in Breast Cancer Patients* [Available on the NCCP website](#)
- ECOG status 0-2.

EXCLUSIONS:

- Hypersensitivity to DOXOrubicin, cycloPHOSphamide, PACLitaxel or any of the excipients.
- Congestive heart failure (LVEF < 50%) or other significant heart disease.
- Baseline neutrophil count < 1.5 x 10⁹/L
- Breastfeeding

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PRESCRIPTIVE AUTHORITY:

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

TESTS:

Baseline tests:

- FBC, renal and liver profile
- ECG

Regular tests:

- FBC, renal and liver profile prior to each cycle
- DOXOrubicin and cycloPHOSphamide: MUGA, ECHO, ECG, as clinically indicated
- Trastuzumab: Cardiac function (MUGA or ECHO) every 12 weeks. Where there are signs of cardiac impairment four to eight weekly checks may be more appropriate
- Assessment of peripheral neuropathy status as clinically indicated

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
- If the patient misses a dose of trastuzumab by one week or less, then the usual maintenance dose of 2 mg/kg should be given as soon as possible. Do not wait until the next planned cycle. Subsequent maintenance doses should then be given according to the previous schedule.
- If the patient misses a dose of trastuzumab by more than one week, a re-loading dose of trastuzumab (4 mg/kg) should be given over approximately 90 minutes, at the discretion of the clinician. Subsequent trastuzumab maintenance doses (2 mg/kg) should then be given weekly from that point

Haematological:

Table 1: Dose modifications for haematological toxicity

ANC ($\times 10^9/L$)		Platelets ($\times 10^9/L$)	Dose (All Drugs)
≥ 1	and	> 100	100%
< 1	and	≥ 100	Delay for 1 week (or longer if needed), then give 100% dose if ANC > 1 and platelets ≥ 100 .
≥ 1	and	< 100	Delay for 1 week (or longer if needed), then give 100% dose if ANC > 1.0 and platelets ≥ 100 . Dose reduce to 75% after a second delay.
Febrile Neutropenia: 75% of dose for current and subsequent cycles.			

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Renal and Hepatic Impairment:

Table 2: Dose modification of DOXOrubicin, cycloPHOSphamide and PACLitaxel in Renal and hepatic impairment

Drug	Renal Impairment		Hepatic Impairment	
DOXOrubicin	No dose reduction required. Clinical decision in severe impairment. In haemodialysis 75% of the original dose may be considered.		Serum Bilirubin (micromol/L)	Dose
			20-50	50%
			51-86	25%
			>86 or Child-Pugh C	Omit
cycloPHOSphamide	CrCL (mL/minute)	Dose	Mild and moderate: no need for dose adjustment is expected. Severe: not recommended, due to risk of reduced efficacy	
	≥ 30	100%		
	10-29	75%		
	<10	*Omit		
PACLitaxel	No need for dose adjustment is expected Haemodialysis: no need for dose adjustment is expected		See Table 3 below	
Trastuzumab	Probably no dose reduction necessary		Probably no dose reduction necessary	
DOXOrubicin: Renal and hepatic dose modifications from Giraud et al 2023 CycloPHOSphamide: Renal and hepatic dose modifications from Giraud et al 2023 PACLitaxel: Renal and hepatic dose modifications from Giraud et al 2023 Trastuzumab: Renal and hepatic dose modifications from Giraud et al 2023				

* Not recommended, if unavoidable consider 50% of the original dose

Table 3: Dose modification of PACLitaxel in hepatic impairment

ALT		Total bilirubin	Dose of PACLitaxel
< 10xULN	and	≤ 1.25xULN	175mg/m ²
< 10xULN	and	1.26-2xULN	135mg/m ²
< 10xULN	and	2.01-5xULN	90mg/m ²
≥10xULN	and/or	>5xULN	Not recommended

Non-Haematological Toxicity:

Table 4: Dose modification schedule for PACLitaxel based on adverse events

Adverse reactions	Recommended dose modification
Grade 2 motor or sensory neuropathy	Dose reduction or delay in treatment may be required.
All other grade 2 non-haematological toxicity	Hold treatment until toxicity resolves to ≤ grade 1. Decrease subsequent doses by 10mg/m ² .
≥ Grade 3 reaction	Discontinue

*Patients who cannot tolerate treatment after 2 dose reductions should be discussed with treating clinician regarding continuation of treatment.

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Table 5: Trastuzumab dose modification schedule based on adverse events

Adverse reactions	Recommended dose modification
LVEF drops ≥ 10 ejection fraction points	Withhold treatment. Repeat LVEF after 3 weeks. No improvement or further decline, consider discontinuation. Discuss with consultant and refer to cardiologist.
Symptomatic heart failure	Consider discontinuation – refer to cardiology for review. Clinical decision.
NCI-CTCAE Grade 4 hypersensitivity reactions	Discontinue
Haematological	Treatment may continue during periods of reversible, chemotherapy-induced myelosuppression. Monitor carefully for any complications of neutropenia.

SUPPORTIVE CARE:

EMETOGENIC POTENTIAL:

As outlined in NCCP Classification Document for Systemic Anti-Cancer Therapy (SACT) Induced Nausea and Vomiting-
[Available on the NCCP website](#)

DOXOrubicin cycloPHOSphamide cycles: High (**Refer to local policy**).

PACLitaxel: Low (**Refer to local policy**).

Trastuzumab: Minimal (**Refer to local policy**).

For information:

Within NCIS regimens, antiemetics have been standardised by Medical Oncologists and Haemato-oncologists and information is available in the following documents:

- NCCP Supportive Care Antiemetic Medicines for **Inclusion in NCIS** (Medical Oncology) - [Available on the NCCP website](#)
- NCCP Supportive Care Antiemetic Medicines for **Inclusion in NCIS** (Haemato-oncology) - [Available on the NCCP website](#)

PREMEDICATIONS:

DOXOrubicin / cycloPHOSphamide cycles: None usually required

PACLitaxel cycles:

- All patients must be premedicated with corticosteroids, antihistamines, and H₂ antagonists prior to first dose of PACLitaxel treatment.
- The H₂ 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 H₂ antagonists (**Refer to local policy**).

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Table 6: 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:

- Prophylactic G-CSF may be used to mitigate the risk of haematological toxicities. **(Refer to local policy)**
Patients should have an increased fluid intake of 2-3 litres on day 1 to prevent haemorrhagic cystitis associated with cycloPHOSphamide.
Myalgias and arthralgias may occur with PACLitaxel. Analgesic cover should be considered.

ADVERSE EFFECTS:

- Please refer to the relevant Summary of Product Characteristics (SmPC) for details.

DRUG INTERACTIONS:

- Current SmPC and drug interaction databases should be consulted for information.

REFERENCES:

- Citron ML, Berry DA, Cirincione C. Randomized trial of dose-dense versus conventionally scheduled and sequential versus concurrent combination chemotherapy as postoperative adjuvant treatment of node-positive primary breast cancer: first report of Intergroup Trial C9741/Cancer and Leukemia Group B Trial 9741. J Clin Oncol 2003; 21 (8): 1431-1439.
- Giraud E L, Lijster B D, et al. Dose recommendations for anticancer drugs in patients with renal or hepatic impairment: an update. Accessed March 2025. Available at: <https://pubmed.ncbi.nlm.nih.gov/37269847/>
- Uptodate infusion reactions to systemic chemotherapy. Available at: <https://www.uptodate.com/contents/infusion-reactions-to-systemic-chemotherapy#H37>
- NCCP Classification Document for Systemic Anti-Cancer Therapy (SACT) Induced Nausea and Vomiting. V6 2025. Available at: <https://www.hse.ie/eng/services/list/5/cancer/profinfo/chemoprotocols/nccp-classification-document-for-systemic-anti-cancer-therapy-sact-induced-nausea-and-vomiting.pdf>
- DOXOrubicin HCl 50mg Powder for Solution for Injection. Summary of Product Characteristics. Accessed March 2025 .Available at: https://assets.hpra.ie/products/Human/21049/Licence_PA0749-083-001_09112022152547.pdf

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7. PACLitaxel. Summary of Product Characteristics. Accessed March 2025. Available at:
https://assets.hpra.ie/products/Human/27560/Licence_PA2315-115-001_18102023131024.pdf
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Version	Date	Amendment	Approved By
1	15/11/2015		Dr Maccon Keane
2	07/02/2017	Updated title, clarified administration order, dosing in renal and hepatic impairment, premedication and applied new NCCP regimen template	Prof Maccon Keane
3	16/03/2018	Treatment table updated for standardisation	Prof Maccon Keane
4	22/04/2020	Standardisation of cyclophosphamide infusion volume and recommendations in hepatic impairment. Updated recommendations for trastuzumab in renal and hepatic impairment. Updated recommended pre-medications pre PACLitaxel administration Update of recommended dose modifications for symptomatic heart failure.	Prof Maccon Keane
5	04/10/2023	Updated pre medication table for PACLitaxel cycles.	Prof Maccon Keane
6	13/05/2025	Reviewed. Updated exclusions section. Updated testing section.Updated regimen in line with NCCP standardisation. Amended table 3 in line with Giraud (2023).	Prof Maccon Keane

Comments and feedback welcome at oncologydrugs@cancercontrol.ie.

ⁱⁱCardiotoxicity is a risk associated with anthracycline therapy that may be manifested by early (acute) or late (delayed) effects.

Risk factors for developing anthracycline-induced cardiotoxicity include:

- high cumulative dose, previous therapy with other anthracyclines or anthracenediones
- prior or concomitant radiotherapy to the mediastinal/pericardial area
- pre-existing heart disease
- concomitant use of other potentially cardiotoxic drugs

In establishing the maximal cumulative dose of an anthracycline, consideration should be given to the risk factors above and to the age of the patient

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