Clinical Practice Guidance for Nurses

Cancer Therapy-Induced Nausea & Vomiting in Adults

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Contents

1. Introduction

The aim of this brochure is to share knowledge, and support and empower nurses in the optimal management of cancer treatment-associated nausea and vomiting in adults (referred to throughout the booklet as N&V).

N&V is most frequently a symptom of cancer treatment, mainly associated with chemotherapy, although it can also be due to other causes, including the disease itself. Patients with nausea can present a variety of other symptoms, including sweating, increased heart rate and dizziness. In addition to vomiting, patients may also experience retching (or dry heaving).

Although great strides have been made in controlling N&V, it is still one of the most common, and distressing, symptoms of cancer treatment. In a survey of 212 European oncology nurses, only 19% reported that most of their patients had their N&V controlled optimally.[1] If not managed properly, N&V can compromise a patient's health and quality of life and may lead to the interruption of cancer treatment.

Nurses play a pivotal role in the assessment, prevention and management of N&V. With a good understanding of the pathophysiology of N&V, international treatment guidelines and drugs available locally, nurses can offer important support to patients and caregivers, effectively manage N&V and influence the outcome of therapy and patients' quality of life.

Key Points

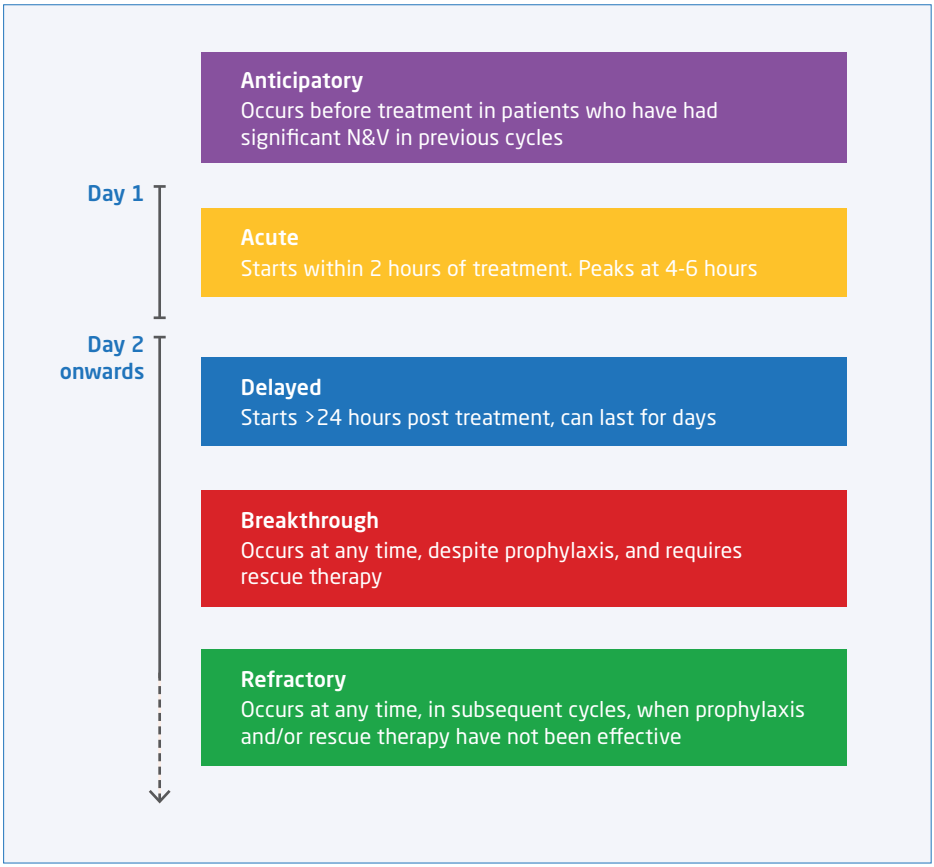
1. Only 19% of nurses think that most of their patients receiving cancer treatment have their N&V controlled optimally
2. N&V can compromise patients' health, quality of life and cancer treatment
3. With a better understanding of therapy principles, nurses can make a real difference and improve the prevention of N&V in cancer patients

2. Classification and pathophysiology

Classifications

There are five main classifications of N&V in patients receiving cancer treatment (Figure 1).[2,3]

Figure 1. The main classifications of N&V[2,3]



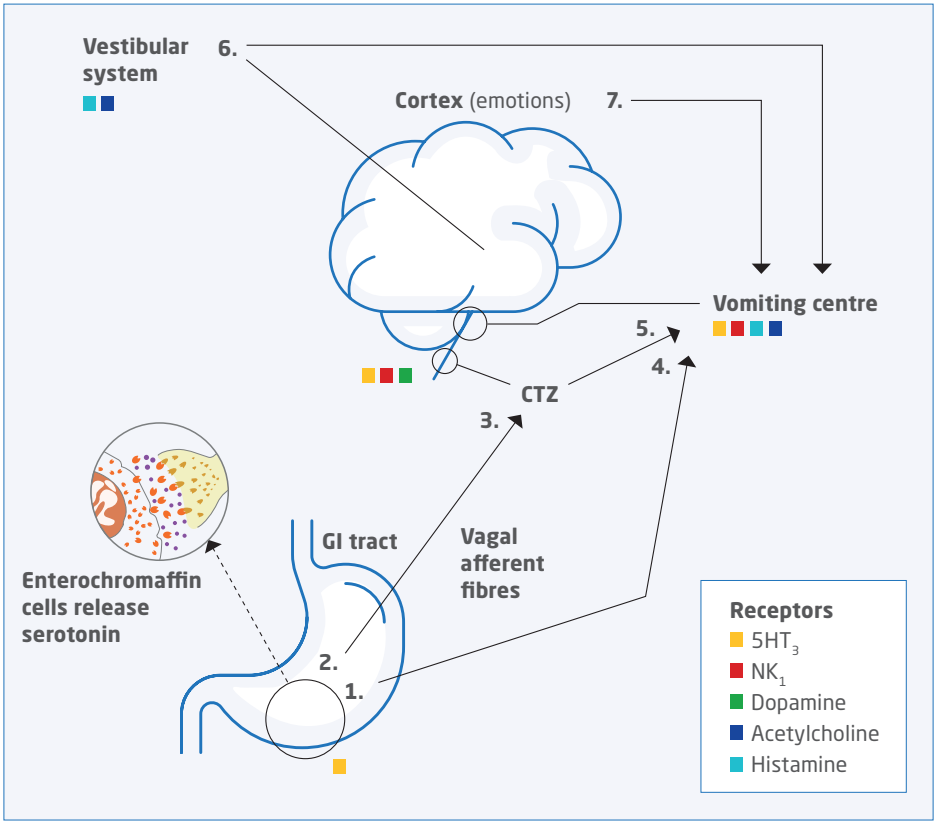
According to nurses, delayed symptoms are particularly challenging to treat.[1,4] Anticipatory symptoms usually occur before the start of a new cycle of chemotherapy and are experienced by patients who have not received effective antiemetic treatment in a previous cycle or course of cancer therapy, and they can be very difficult to manage.

Pathophysiology

N&V is a normal physiological process and the pathways involved in cancer treatment-associated symptoms are the same pathways that are involved in any type of N&V, such as food poisoning or motion sickness. It is only the trigger, in this case cancer treatment, that is different. The process involves the release of neurotransmitters that bind to specific receptors in different areas of the gut and brain.[3,5-7]

Figure 2 shows the pathways involved in chemotherapy-associated N&V and where various neurotransmission signals are active. A similar process is thought to occur in patients receiving radiotherapy due to cancer treatment.[8] For more information on the antiemetic agents used in the management of N&V, see Chapter 4.

Figure 2. The pathophysiology of N&V and site of activity of antiemetic agents



Enterochromaffin cells in the walls of the intestines release chemical mediators, mainly serotonin **(1)**. Serotonin binds to $5HT_3$ receptors on afferent vagus fibres **(2)** causing nerve impulses to be sent to the chemoreceptor trigger zone (CTZ) **(3)** and directly to the vomiting centre (central pattern generator) **(4)**, both in the brain stem. The CTZ and vomiting centre contain receptors for a variety of neurotransmitters, including serotonin ($5HT_3$ receptors), substance P (NK_1 receptors) and dopamine (dopamine D_2 receptors). The CTZ relays signals to the vomiting centre **(5)**, which is also activated by impulses coming from the vestibular system **(6)** and the cerebral cortex **(7)**. The vomiting centre sends signals to other areas of the brain, including the salivation and respiratory centres, and stimulates efferent fibres to activate the organs involved in vomiting.

Acute N&V occurs mainly via a $5HT_3$-dominated peripheral pathway, whereas delayed N&V is driven primarily by a central NK_1 receptor-mediated pathway.[6,9]

Key Points

1. The N&V pathway is a normal physiological pathway
2. Cancer treatment is a main trigger for inducing N&V
3. The main neurotransmitters involved in the N&V pathway are serotonin, substance P and dopamine

Optimise Your Clinical Practice

1. Plan regular, up-to-date information exchange on pathophysiology. Coordinate information sessions with the oncologist or advanced nurse practitioner

3. Risk factors

A patient's risk of developing N&V is related to cancer treatment (Table 1).[2,3,6,7,9,10] It is also linked to individual patient characteristics, and factors commonly associated with an increased risk of developing N&V include: being female, age <60 years, a history of N&V in pregnancy or motion sickness, anxiety, low alcohol consumption, higher pre-treatment expectation of developing N&V and <7 hours of sleep on the night before chemotherapy. By accurately assessing the likelihood of a patient developing N&V and modifying the antiemetic prophylaxis accordingly, nurses can increase the chance that antiemetic therapy will be effective. There is a wide range of risk-assessment tools available for this purpose. It is also important to rule out any other causes of N&V, which can include, for example, liver metastases, ileus, brain metastases or oedema and metabolic complications. As characteristics will vary between patients, tailoring antiemetic prophylaxis to meet the characteristics and needs of each individual is vital.

Table 1. Systemic cancer therapy-related risk factors[2,3,6,7,9,10]

Type of N&V	Risk factors
Acute	• Emetic potential of cancer treatment • Use of non-prescribed antiemetics at home • Initial cycle/s of chemotherapy • Chemotherapy dose • Route of administration • Anticipatory N&V • N&V in a previous cycle of chemotherapy
Delayed	• Emetic potential of cancer treatment • Guideline-inconsistent prophylaxis • No use of secondary antiemetics • Anticipatory nausea • Acute N&V
Breakthrough	• Inappropriate antiemetic prophylaxis
Anticipatory	• N&V in cycle 1 of chemotherapy

Systemic cancer treatment-related risk factors

The main treatment-related factors are the type and dose of therapy, its likelihood of causing N&V (emetogenicity) and the type of antiemetic prophylaxis used. Combining different drugs, or combining these with radiotherapy, can increase the emetogenicity of treatment.

Chemotherapy

Cisplatin is the most emetogenic parenteral agent (Table 2).[2,3,10] In general, the majority of immunotherapy and monoclonal antibody therapies can be considered to have a low or minimal risk of causing N&V. Nurses can check the emetic risk by using the emetogenic risk table. Most regimens associated with delayed emesis have high emetogenicity, although there are also some moderately emetogenic agents in this category.[2] It must, however, be remembered that patients can experience N&V regardless of the classification.

Table 2. Risk of acute emesis with cancer drugs[2,3,10]

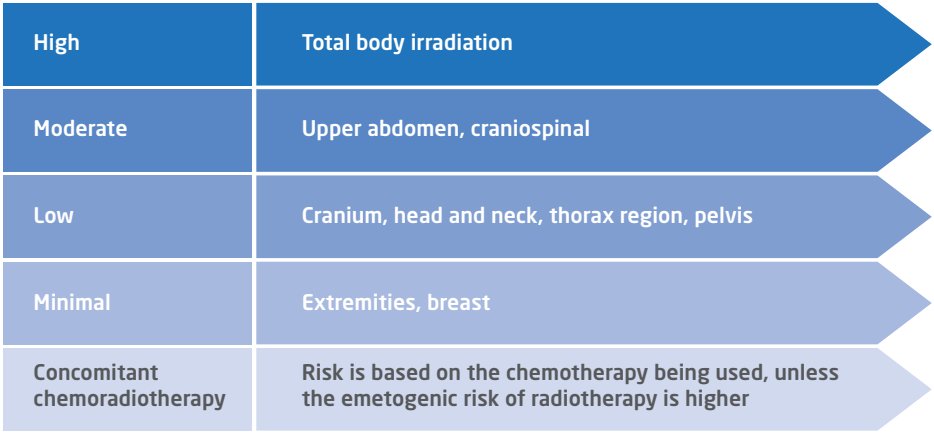
		Examples*	
Degree of emetogenicity	**Risk of N&V, %**	**Parenteral**	**Oral**
High	>90	**Cisplatin** Anthracycline/cyclophosphamide Cyclophosphamide ≥1500 mg/m^2 Dacarbazine	Procarbazine
Moderate	>30–90	Bendamustine Carboplatin Cyclophosphamide <1500 mg/m^2 Doxorubicin Oxaliplatin	Bosutinib Crizotinib Cyclophosphamide Temozolomide Vinorelbine
Low	10–30	Aflibercept Cetuximab Docetaxel 5-fluorouracil Gemcitabine Methotrexate Pemetrexed Topotecan	Afatinib Capecitabine Etoposide Everolimus Lapatinib Regorafenib Tegafur uracil Vandetanib
Minimal	<10	Bleomycin Fludarabine Nivolumab Trastuzumab Vincristine Vinorelbine	Chlorambucil Erlotinib Gefitinib Melphalan Methotrexate Sorafenib

*These are just a few common examples. For a more complete list, see NCCN 2019[3] and Roila et al. 2016.[10] Adapted from Hesketh et al. 2018,[2] NCCN 2019[3] and Roila et al. 2016.[10]

Radiotherapy

Radiotherapy-induced N&V can occur in 50–80% of patients undergoing treatment.[8] The risk depends not only on the treatment site and the volume of tissue irradiated (Figure 3)[11] but also on patient characteristics, as outlined earlier in the chapter.

Figure 3. Risk of N&V with radiotherapy. Adapted from Ruhlmann et al. 2017[11]



Key Points

1. The main risk factor for N&V is the drug classification and dose of cancer therapy
2. Antiemetic prophylaxis and control should be tailored to meet the characteristics and needs of each individual patient

Optimise Your Clinical Practice

1. Create a classification list showing the emetogenic potential of the agents. Because there are many drugs in use, concentrate on those drugs used in your clinical setting, including high-level combinations. A pocket format may be helpful
2. Capture important information for risk assessment as a prompt card

4. Management

There has been a considerable amount of progress in the management of N&V. At one time, almost all patients receiving cancer therapy could expect to suffer N&V. These days, much more is known about how to control N&V and there are many more effective agents available. Nurses should reassure patients that N&V is not an inevitable consequence of cancer therapy.

The aim of management is to achieve a **complete response** to treatment, with no emesis and no rescue medication for nausea or vomiting needed. The key to effective management is prevention[6] and so it is vital to use the most effective prophylaxis from the very first cycle of therapy. There is no evidence for the benefit of a 'wait-and-see' approach, and it may actually make it more difficult to manage later episodes of N&V.

Poor management of N&V symptoms can have disastrous consequences, including dehydration, anorexia, a reduction in quality of life, self-care and participation in daily activities, and, most significantly, cancer treatment interruptions that could compromise treatment outcome.[3,6,9,12]

Pharmacological treatment

The main drugs used to manage N&V act by blocking (antagonising) the binding of chemical mediators, released in response to cancer treatment, to receptors involved in the transmission of nerve impulses along the N&V signalling pathways (Tables 3–5)[2,10,13] (see Chapter 2 for the pathophysiology of N&V).

There may be regional differences in the availability of the drugs and formulations discussed here.

Table 3. $5HT_3$ receptor antagonists[2,10]

Agent	Recommended dosing*	Adverse events
1st-generation:		
Ondansetron	IV: 8 mg or 0.15 mg/kg Oral: 16 mg Also available as an orally disintegrating formulation	• Generally well tolerated • Main side effects: low-grade headache, malaise, constipation • First-generation agents can be associated with cardiac side effects; these are not seen with palonosetron
Granisetron	IV: 1 mg or 0.01 mg/kg Oral: 2 mg (or 1 mg) Also available as a patch	
Tropisetron	IV: 5 mg Oral: 5 mg	
Dolasetron	Oral: 100 mg	
2nd-generation:		
Palonosetron	IV: 0.25 mg Oral: 0.5 mg	• Generally well tolerated • Main side effects: low-grade headache, malaise, constipation

*From Roila et al. 2016.[10] Consult treatment practice guidelines for full details of recommended dosing.

$5HT_3$ receptor antagonists (RAs) have been used in the management of N&V since the 1990s.[6] Compared with other $5HT_3$ RAs, palonosetron is better at preventing acute and delayed N&V[2,6] as well as encouraging adherence to chemotherapy and avoiding treatment delays.[6]

Table 4. NK_1 receptor antagonists[2,10,13]

Agent	Recommended dosing*	Adverse events/comments
Aprepitant	Oral: 125 mg (acute) + 80 mg (delayed)	• With all NK_1 RAs, except for rolapitant, the dose of dexamethasone needs to be adjusted
Fosaprepitant	IV: 150 mg	
Rolapitant	Oral: 180 mg	
NEPA (netupitant + palonosetron) - Combined $5HT_3$ RA/NK_1 RA	Oral: 300 mg netupitant/ 0.5 mg palonosetron	

*From Roila et al. 2016.[10] Consult treatment practice guidelines for full details of recommended dosing.

The introduction of the NK_1 RAs in the early 2000s was a leap forward for N&V prophylaxis, particularly in terms of delayed symptoms.[6]

NEPA, which combines netupitant with the $5HT_3$ RA palonosetron in a single oral capsule, is the first fixed-combination antiemetic for the prevention of acute and delayed N&V associated with cisplatin-containing highly and moderately emetogenic chemotherapy. All NK_1 RA-based three-drug regimens have demonstrated superiority over a two-drug regimens.[6,14]

Table 5. Other agents[2,10,13]

Class of agent	Name	Recommended dosing*	Adverse events/comments
Corticosteroids	Dexamethasone Methylprednisolone	IV, oral	• Widely used, generally in combination with other agents
Dopamine RAs	Metoclopramide	Oral: 10 mg (up to three-times a day)	• Be aware of higher doses of metoclopramide according to the recommendations from EMA. Increased neuropathy has been reported as a severe side effect
Benzodiazepines and derivatives	Lorazepam	Oral: 1 mg	• May be a useful adjunctive agent (not for single-agent use)
Other	Olanzapine	Oral: 5-10 mg	• Sedation is a problem with the 10 mg/day dose, particularly in older patients

*Consult treatment practice guidelines for full details of recommended dosing.
EMA - European Medicines Agency

Corticosteroids, particularly dexamethasone, are widely used, generally in combination with other agents. The mechanism of action of corticosteroids is not well understood but is thought to involve a receptor-blocking effect.

Dopamine RAs, such as metoclopramide, may be useful with treatment that has a low emetogenic potential. It is also valued as a rescue medication for moderate-to-low emetogenic agents.

Benzodiazepines, like lorazepam, may be useful in the management of anticipatory emesis or for very fearful patients.[2,10]

Olanzapine blocks a variety of receptors, including 5HT and dopamine receptors, and is particularly useful for the treatment of delayed and breakthrough symptoms.[13,15]

Synthetic cannabinoids, e.g. nabilone and dronabinol, may be useful in some situations, such as in patients unable to tolerate, or refractory to, first-line agents.[2] Cannabinoids are not readily available in many countries but a number of clinical trials are ongoing.

Non-pharmacological treatments and behavioural therapy

While pharmacological agents form the mainstay of N&V management, non-pharmacological and behavioural interventions can be considered for some patients, particularly those with anticipatory symptoms.[2,7,10] They are to be used supplementary to, not instead of, the antiemetic agents. Some evidence-based examples include: acupuncture/acupressure, cognitive distraction (e.g. video games, music), muscle relaxation training, exercise and hypnosis. If a patient is using any over-the-counter medications, the clinical team should be consulted.

Key Points

1. Nurses should reassure patients that N&V is not an inevitable consequence of cancer therapy
2. The aim of management is to achieve a complete response to treatment (no emesis and no rescue medication needed for nausea or vomiting)
3. The key to effective management is prevention and the most effective prophylaxis should be used from the very first cycle of cancer therapy
4. There is no evidence for the benefit of a 'wait-and-see' approach
5. Pharmacological agents are the first choice of treatment for N&V; the clinical team should be consulted if a patient is using any over-the-counter medications

Optimise Your Clinical Practice

1. Enquire about your institution's strategy for N&V with the interprofessional team or individual oncologist. Is one of the guidelines in use? Which one? Document this for all to consult
2. Develop a plan to communicate changes in management strategy. The team can be notified via short notes or education sessions
3. Develop a basic plan with the team for giving advice to educate patients about therapy-induced N&V
4. Create a simple, printed overview for patients of their prescribed antiemetic drug schedule, including pictures of the drugs. Provide patients with contact details for healthcare personnel for use in the evenings and at weekends

5. Guidelines help

High-quality clinical practice guidelines produced by a number of oncology societies and associations (Multinational Association of Supportive Care in Cancer/European Society for Medical Oncology [MASCC/ESMO], American Society of Clinical Oncology [ASCO], National Comprehensive Cancer Network [NCCN]) provide management recommendations based on evidence from the latest clinical trials with the aim of improving patient outcomes (Table 6).[3,10,16] The recommendations of these guidelines are broadly similar.

Table 6. Summary of clinical practice guideline recommendations for the management of N&V[3,10,16]

Chemotherapy-associated acute N&V

Risk group	ESMO	ASCO	NCCN (parenteral cancer treatment)		
High, non-AC	5HT$_3$ RA + NK$_1$ RA + Dexamethasone	5HT$_3$ RA + NK$_1$ RA + Dexamethasone + Olanzapine	5HT$_3$ RA + NK$_1$ RA + Dexamethasone	5HT$_3$ RA + Olanzapine + Dexamethasone Palonosetron	5HT$_3$ RA + NK$_1$ RA + Dexamethasone + Olanzapine
High, AC					
Moderate, carboplatin	5HT$_3$ RA + NK$_1$ RA + Dexamethasone	5HT$_3$ RA + NK$_1$ RA + Dexamethasone	5HT$_3$ RA + Dexamethasone	5HT$_3$ RA + Olanzapine + Dexamethasone Palonosetron	5HT$_3$ RA + NK$_1$ RA + Dexamethasone
Moderate, non-carboplatin	5HT$_3$ RA + Dexamethasone	5HT$_3$ RA + Dexamethasone			
Low	Dexamethasone or 5HT$_3$ RA or Dopamine RA	5HT$_3$ RA or Dexamethasone	Dexamethasone or Dopamine RA or 5HT$_3$ RA or prochlorperazine		
Breakthrough	Addition of an agent with a mechanism different to that used prophylactically				
Anticipatory	The best approach is the optimal control of acute and delayed N&V				
	± Benzodiazepines ± Behavioural therapy	± Behavioural therapy	± Benzodiazepines ± Behavioural therapy		

Key 5HT$_3$ RA; NK$_1$ RA; Dexamethasone; Olanzapine; Dopamine RA; Benzodiazepines; Behavioural therapy

Chemotherapy-associated delayed N&V

Risk group	ESMO	ASCO	NCCN (parenteral cancer treatment)		
High, non-AC	🟥 + 🟩	🟥 + 🟩 ± 🟦	🟥 + 🟩	🟦	🟥 + 🟩 ± 🟦
High, AC	🟥 + 🟩	🟥 ± 🟦			
Moderate, carboplatin	🟥	Not specified	🟨 or 🟩	🟦	🟥 ± 🟩
Moderate, non-carboplatin	🟩	🟩			

Key 🟨 $5HT_3$ RA 🟥 NK_1 RA (aprepitant) 🟩 Dexamethasone 🟦 Olanzapine

Radiotherapy-associated N&V

Risk group	ESMO/ASCO
High	🟨 + 🟩
Moderate	🟨 ± 🟩
Low	Brain 🟩
	Other 🟩 or 🟨 or 🟪
Rescue	🟩 or 🟨 or 🟪
Chemoradiotherapy	Base treatment on the agent/treatment mode (chemotherapy or radiotherapy) with the highest risk of emesis

Key 🟨 $5HT_3$ RA 🟩 Dexamethasone 🟪 Dopamine RA

AC, doxorubicin + cyclophosphamide. Treatment for delayed N&V is guided by the choice of agents for acute N&V. For NCCN, the order of options for acute and delayed N&V does not imply preference. Consult individual guidelines for full details of recommendations and dosing.

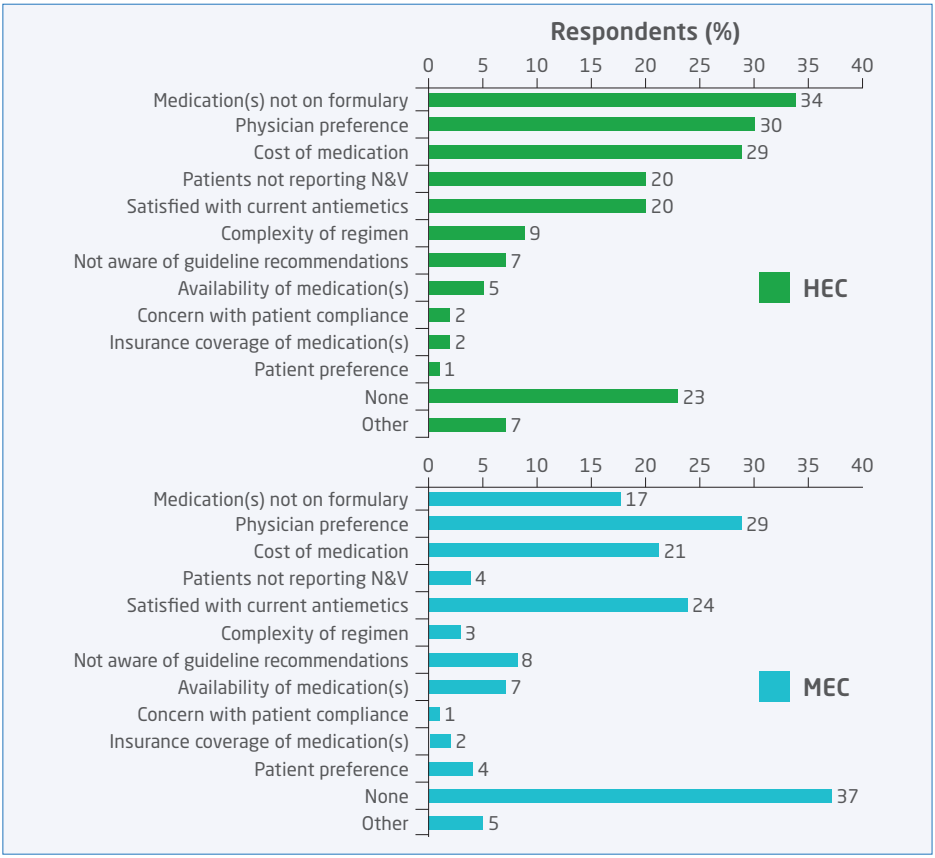
Refractory N&V

If, in spite of all optimal treatment regimens, N&V is still present, the following should be reviewed:

- Was the emetogenicity correctly assessed?
- Was the dosing of the antiemetic prophylaxis optimal (dose/interval)?
- Are other factors beside the drug or radiotherapy involved?
- Did the patient take the antiemetics and rescue medication as prescribed?

While effective antiemetic treatments and evidence-based guidelines are available, N&V continues to be a significant problem for patients, largely due to suboptimal management strategies. A key reason for this is that international management guidelines are often not followed. Barriers to adherence include medications not on formulary, medication cost and physicians' preference for non-guideline-recommended therapy (Figure 4).[1,4] In a European survey of oncology nurses, 40% of respondents reported that physician preference was the greatest barrier to guideline use.

Figure 4. Barriers preventing guideline-consistent use of antiemetics[1]



N&V – chemotherapy-induced nausea and vomiting; HEC – highly emetogenic chemotherapy; MEC – moderately emetogenic chemotherapy

Encouraging the multidisciplinary team to adopt international treatment guidelines wherever possible is an important role of the nurse.

Key Points

1. International treatment guidelines provide evidence-based management recommendations with the aim of improving patient outcomes, but are often not used
2. In a survey of European oncology nurses, 40% reported that physician preference was the greatest barrier to the use of international treatment guidelines
3. Nurses should encourage the multidisciplinary team to adopt international treatment guidelines wherever possible

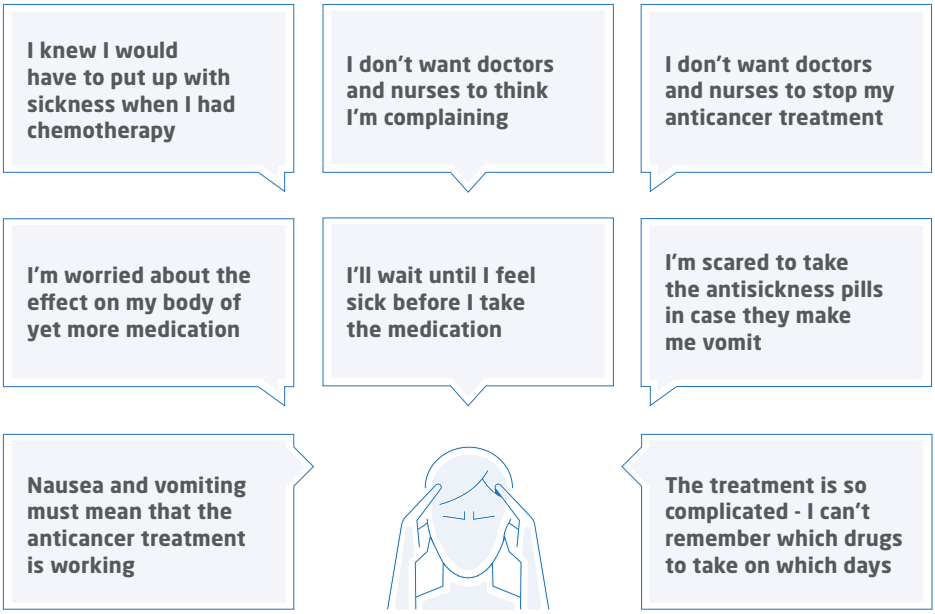
Optimise Your Clinical Practice

1. Together with the oncologists, prepare an overview of the currently used guidelines in your clinic and have it available for all to consult. A pocket format may be helpful
2. Provide links or hyperlinks to direct healthcare professionals to current best practice guidelines and information

6. Nurses make a difference

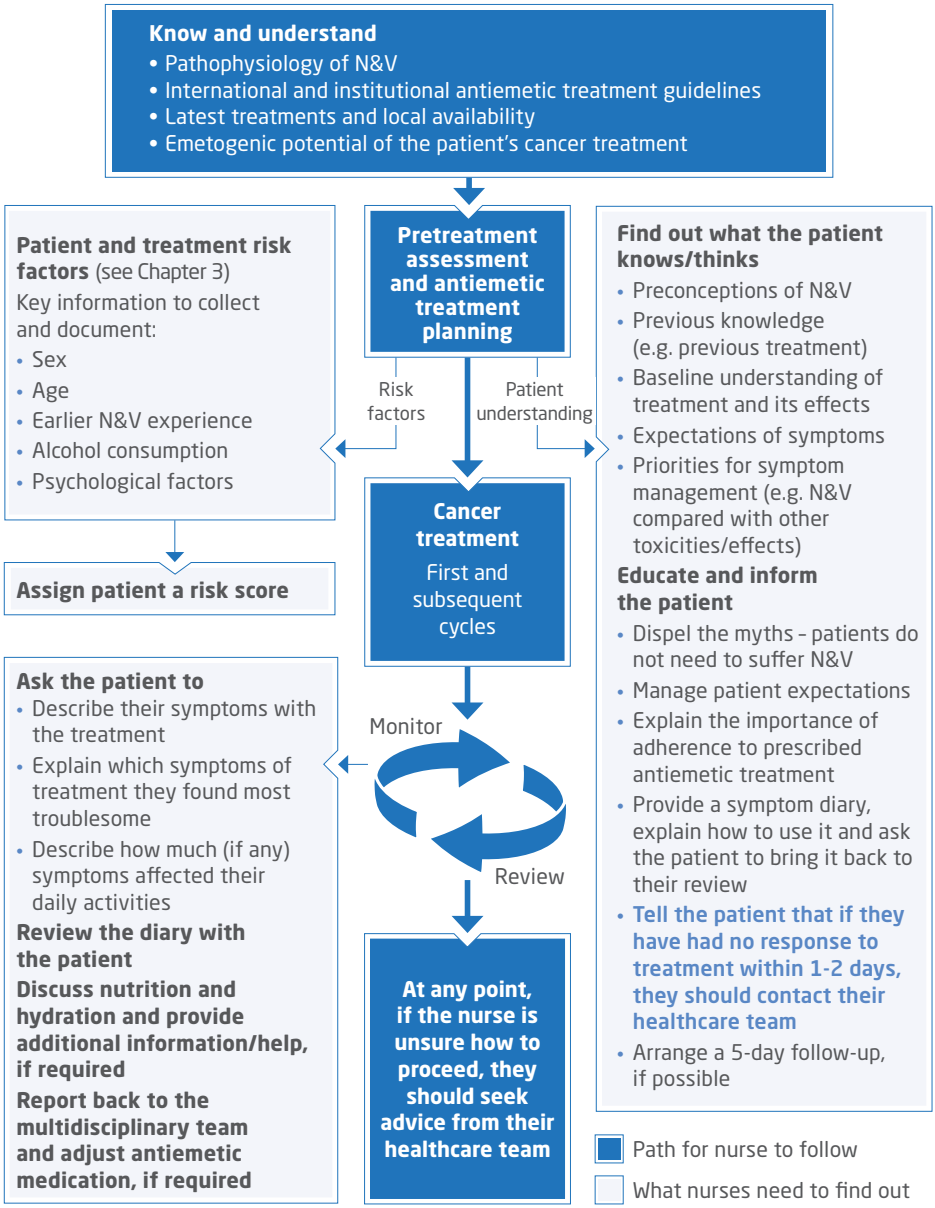
The management of N&V should be patient centred. Patients can have many fears and preconceptions about N&V, but they may be reluctant to share their thoughts with their healthcare provider (Figure 5).[6,17] In addition, healthcare providers have different perceptions of N&V[12,17] and may underestimate the impact of symptoms, particularly delayed N&V.

Figure 5. Patients' perceptions and fears about N&V and antiemetic medication[6,17]



Nurses are in an ideal position to reduce the chances of a patient developing N&V. They should listen to, support and educate patients and caregivers about N&V and its management. Using their knowledge of international guidelines, nurses will help to plan antiemetic management programmes and then prescribe and/or administer the appropriate medication. They are integral to assessing a patient's risk of N&V and then reviewing and monitoring antiemetic treatment efficacy (Figure 6).

Figure 6. The role of the nurse in assessing risk, planning treatment and monitoring the patient



Today, most patients are treated in the outpatient setting and it is likely that the nurse will have only a very short amount of time to discuss a patient's N&V. Asking patients open questions in the right way (for example, "Can you describe your symptoms?" rather than "Did you feel sick?") is crucial to getting the information needed. There is no 'one-size-fits-all' approach that can be adopted. Instead, questions should be tailored to the patient, taking into account their medical history, age, education and cognitive ability. Nurses should be aware that there may be cultural variation in responses. Sometimes, using a scale of 1–10 helps the patient to rank the severity or impact of their symptoms and can be used each day or several times per day if needed. This type of scoring (Likert Scale) has been identified as providing an accurate and consistent score over time. The MASCC Antiemesis Tool© (MAT) (www.mascc.org/mat), which is freely available in 16 languages and as a mobile app version, can be used to monitor N&V and is particularly useful as a diary for outpatient treatment settings.

Nutrition during N&V

Problems with foods and liquids during episodes of N&V are frequent and are important quality of life issues not only for the patient but also for the caregiver. Resentment, frustration and differences of opinion can arise if the patient cannot, or is fearful to, eat. Patients also abstain from eating before their therapy. Along with the many published suggestions, well-meaning friends and neighbours also give recommendations and the pros and cons of all of these should be discussed with the patient. Inclusion of a dietician is highly recommended and cultural and individual habits must also be considered and integrated.

Patients often have a huge amount of information to deal with, so nurses should remind the patient of important details at *each visit*. Nurses should also provide patient-friendly, written information on N&V and, if possible, a contact name and telephone number for patients who need help managing symptoms at home.

Nurses are in the privileged position of being a patient's main point of contact for much of their cancer treatment. By working with the patient to understand their symptoms of N&V, to get the best treatment for their needs and so help them to lead as normal a life as possible despite their cancer, nurses can really improve the physical and emotional well-being of patients.

Key Points

1. By correctly assessing risk, planning antiemetic treatment and effectively monitoring response, nurses can reduce a patient's chances of developing N&V
2. Patients have a lot to remember! Nurses need to remind them of important details at *each* visit
3. Patients should be told that if their N&V does not respond to treatment within 1-2 days, they should contact their healthcare team

Optimise Your Clinical Practice

1. Develop a short, interprofessional presentation using information from the brochure's 'Key Points'. This presentation can be used either as a refresher or as an introduction for new members of the oncology service
2. As a team project, develop a risk assessment guide, incorporating the different steps and providing advice on encouraging patient adherence. Guidance on documentation and follow-up evaluation should be included
3. Make a list of suggestions for recommended patient information sites to ensure the coordination of information between staff and patients/caregivers. For ideas and information, review both locally and internationally recommended websites for N&V
4. Some symptoms occur only when the patient has returned home; plan a coordination strategy with the inpatient team about information required by the patient at discharge

7. References and further reading

References

1. **Dielenseger P, et al.** Evaluation of antiemetic practices for prevention of chemotherapy-induced nausea and vomiting (CINV): results of a European oncology nurse survey. Support Care Cancer 2019 Feb 19.[Epub ahead of print].
2. **Hesketh PJ, et al.** https://www.uptodate.com/contents/prevention-and-treatment-of-chemotherapy-induced-nausea-and-vomiting-in-adults. Accessed December 2018.
3. **NCCN Clinical Practice Guidelines in Oncology.** National Comprehensive Cancer Network. Antiemesis. Version 1.2019 – February 28, 2019. http://www.nccn.org. Accessed March 2019.
4. **Clark-Snow R, et al.** Chemotherapy-induced nausea and vomiting (CINV) and adherence to antiemetic guidelines: results of a survey of oncology nurses. Support Care Cancer 2018;26:557–64.
5. **Hesketh PJ.** Chemotherapy-induced nausea and vomiting. N Engl J Med 2008;358:2482–94.
6. **Clark-Snow RA, et al.** Fixed combination antiemetic: a literature review on prevention of chemotherapy-induced nausea and vomiting using netupitant/palonosetron. Clin J Oncol Nurs 2018;22:E52–63.
7. **Aapro M.** CINV: still troubling patients after all these years. Support Care Cancer 2018;26(Suppl 1):5–9.
8. **Feyer P, et al.** Prophylactic management of radiation-induced nausea and vomiting. Biomed Res Int 2015;2015:893013.
9. **Rapoport BL.** Delayed chemotherapy-induced nausea and vomiting: pathogenesis, incidence and current management. Front Pharmacol 2017;8:19.
10. **Roila F, et al.** 2016 MASCC and ESMO guideline update for the prevention of chemotherapy- and radiotherapy-induced nausea and vomiting and of nausea and vomiting in advanced cancer patients. Ann Oncol 2016;27(Suppl 5):v119–33.
11. **Ruhlmann CH, et al.** 2016 updated MASCC/ESMO consensus recommendations: prevention of radiotherapy-induced nausea and vomiting. Support Care Cancer 2017;25:309–16.
12. **McCullough SW.** Chemotherapy-induced nausea and vomiting: roles of pharmacists and formulary decision makers. Am J Manag Care 2017;23(14 Suppl):S266–71.
13. **Schwartzberg L.** Getting it right the first time: recent progress in optimizing antiemetic usage. Support Care Cancer 2018;26(Suppl 1):19–27.

14. **Navari RM, et al.** Rolapitant for the prevention of nausea in patients receiving highly or moderately emetogenic chemotherapy. Cancer Med 2018;7:2943–50.
15. **Nakagaki M, et al.** A randomized trial of olanzapine versus palonosetron versus infused ondansetron for the treatment of breakthrough chemotherapy-induced nausea and vomiting in patients undergoing hematopoietic stem cell transplantation. Support Care Cancer 2017;25:607–13.
16. **Hesketh PJ, et al.** Antiemetics: American Society of Clinical Oncology Clinical Practice Guideline Update. J Clin Oncol 2017;35:3240–61.
17. **Vidall C, et al.** Impact and management of chemotherapy/radiotherapy-induced nausea and vomiting and the perceptual gap between oncologists/oncology nurses and patients: a cross-sectional multinational survey. Support Care Cancer 2015;23:3297–305.

Further reading

Aapro M. Searching for perfection: further progress in management of chemotherapy-induced nausea and vomiting-introduction. Support Care Cancer 2018;26(Suppl 1):1-37.

CINV Risk Assessment. Available from: http://www.riskcinv.org.

Dranitsaris G, et al. The development of a prediction tool to identify cancer patients at high risk for chemotherapy-induced nausea and vomiting. Ann Oncol 2017;28:1260–7.

Hesketh PJ, et al. Preventing chemotherapy-induced nausea and vomiting in patients with lung cancer: efficacy of NEPA (netupitant-palonosetron), the first combination antiemetic. Support Care Cancer 2018;26:1151–9.

Zhang L, et al. A randomized phase III study evaluating the efficacy of single-dose NEPA, a fixed antiemetic combination of netupitant and palonosetron, versus an aprepitant regimen for prevention of chemotherapy-induced nausea and vomiting (CINV) in patients receiving highly emetogenic chemotherapy (HEC). Ann Oncol 2018;29:452–8.

MASCC – Multinational Association of Supportive Care in Cancer – www.mascc.org

ESMO – European Society for Medical Oncology – www.esmo.org

NCCN – National Comprehensive Cancer Network – www.nccn.com

EONS – European Oncology Nursing Society – www.cancernurse.eu

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