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Management of malignant bowel obstruction

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ABSTRACT

Malignant bowel obstruction (MBO) is a common and distressing outcome particularly in patients with bowel or gynaecological cancer. Radiological imaging, particularly with CT, is critical in determining the cause of obstruction and possible therapeutic interventions. Although surgery should be the primary treatment for selected patients with MBO, it should not be undertaken routinely in patients known to have poor prognostic criteria for surgical intervention such as intra-abdominal carcinomatosis, poor performance status and massive ascites. A number of treatment options are now available for patients unfit for surgery. Nasogastric drainage should generally only be a temporary measure. Self-expanding metallic stents are an option in malignant obstruction of the gastric outlet, proximal small bowel and colon. Medical measures such as analgesics according to the W.H.O. guidelines provide adequate pain relief. Vomiting may be controlled using anti-secretory drugs or/and anti-emetics. Somatostatin analogues (e.g. octreotide) reduce gastrointestinal secretions very rapidly and have a particularly important role in patients with high obstruction if hyoscine butylbromide fails.

A collaborative approach by surgeons and the oncologist and/or palliative care physician as well as an honest discourse between physicians and patients can offer an individualised and appropriate symptom management plan.

1. Introduction

A recent consensus conference defined MBO using the following criteria: clinical evidence of bowel obstruction (history/physical/ radiological examination); bowel obstruction beyond the ligament of Treitz, in the setting of a diagnosis of intra-abdominal cancer with incurable disease, OR a diagnosis of non-intra-abdominal primary cancer with clear intraperitoneal disease.[1]

Retrospective reviews show that 10-28% of patients with colorectal cancer will develop a MBO in the course of their disease whereas 20-50% of patients with ovarian cancer present with symptoms of bowel obstruction.[2] Intestinal involvement of metastatic cancer commonly presents as diffuse peritoneal carcinomatosis or more rarely as an isolated gastrointestinal metastasis in 10% of cases.[8] Breast cancer or melanoma are the most common non-gastrointestinal causes and can occur many years from primary presentation.[3]

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Tumour causes of obstruction by many mechanisms are shown in Table 1.

Patients with MBO usually describe a pattern of gradual worsening of symptoms that include episodes of abdominal cramps, nausea and vomiting and abdominal distension that resolve with the passage of gas or loose stool (Fig. 1). Symptoms become more frequent and last longer until near to complete obstruction results. Initial management includes a clinical assessment to rule out acute causes of obstruction and to ensure that the patient does not have a surgical emergency. The patient is resuscitated with fluid to replace any losses from vomiting and a nasogastric tube may be placed to decompress the proximal bowel and alleviate the patient's acute symptoms. Table 2 shows the radiological examinations required.[4–9] Although the location of the obstruction can often be determined by the nature and presentations of symptoms (Table 3), it is recommended that further imaging, primarily with CT scan, be performed in order to determine the management plan.[1] MRI may also be used if necessary.[10] Clinically, radiological imaging with CT (and/or potentially MRI) has become indispensable in the decision-making process when deciding whether a surgical or medical management plan would be most effective to relieve obstructive symptoms in patients with a MBO.

Table 1 – Pathophysiology of bowel obstruction

Mechanical obstruction

Extrinsic occlusion of the lumen: enlargement of the primary tumour or recurrence, mesenteric and omental masses, abdominal or pelvic adhesions, postirradiation fibrosis that cause bowel compression

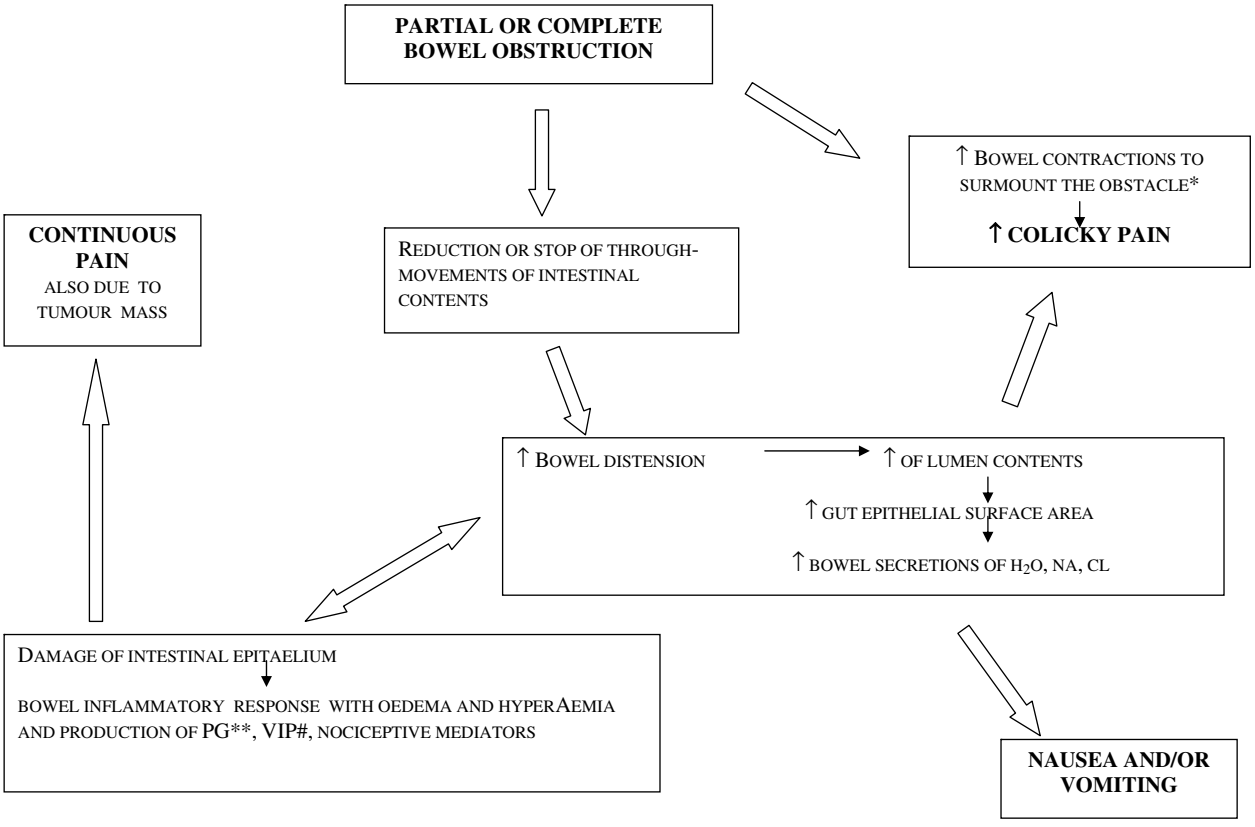
Intra-luminal occlusion of the lumen: results from tumour growth from within the bowel

Intramural occlusion of the lumen: intestinal linitis plastica, tumour within the wall of the bowel resulting in poor motility

Adynamic ileus or functional obstruction

Intestinal motility disorders: tumour infiltration of the mesentery or bowel wall muscle and nerves, or malignant involvement of the coeliac plexus

Intestinal motility disorders: paraneoplastic neuropathy particularly in patients with lung cancer, chronic intestinal pseudo-obstruction (CIP), paraneoplastic pseudo-obstruction.



- *Mechanical obstruction only, ** Prostaglandins , # Vasoactive Intestinal Polypeptide

Fig. 1 – Pathophysiology of bowel obstruction.

Table 2 – Radiological investigations

PLAIN Rx: Abdominal radiography taken is supine and standing position when small bowel obstrucion is suspected to document the dilated loops of bowel, air-fluid interfaces, or both

CONTRAST Rx: Help to evaluate dysmotility, partial obstruction and to define the site and extent of obstruction. Barium provides excellent radiological definition (in particular when the obstruction is in the distal small bowel) but, as it is not absorbed, it can interfere with subsequent endoscopic studies or cause severe impaction, especially in patients with a complete and inoperable bowel obstruction. Gastrografin (diatrizoate meglumine) is useful in such cases; moreover, it often provides excellent visualisation of proximal obstructions and can reduce luminal oedema and help to resolve partial obstructions. Contrast studies of the stomach, gastric outlet and small bowel can distinguish obstructions from metastases, radiation injury or adhesions. The diagnosis of a motility disorder is revealed by the slow passage of barium through undilated bowel with no demonstrable point of obstruction.

Retrograde, transrectal contrast studies (barium or water-soluble medium enema) serve to rule out and diagnose isolated or concomitant obstruction of the large bowel.

Computed Tomography: Abdominal CT is useful to evaluate the global extent of disease, to perform staging and to assist in the choice of surgical, endoscopic or simple pharmacological palliative intervention for the management of the obstruction. CT has a sensitivity of 93%, a specificity of 100% and an accuracy of 94% in determining cause of bowel obstruction, that is much better than U/S and plain x-ray. Carcinomatosis may be missed on CT. In colorectal and ovarian cancer the diagnostic accuracy of CT for deposits less than 0.5 cm or deposits located in the pelvis, on the mesentery or on small bowel is poor (<20%). The use of CT scans alters management plans in 21% of cases.

Endoscopy: once a site of obstruction is identified in either the gastric outlet or colon, endoscopic studies may be helpful to evaluate the exact cause of the obstruction. This is particularly important when endoscopic treatment approaches, such as stent placement, are considered.

Table 3 – Differentiating the location of a bowel obstruction based on history and symptoms

Symptom	Gastric or proximal small bowel	Distal small bowel or large bowel
Vomiting	Bilious, watery, Large amounts No to little odour	Particulate Small volumes Foul odour May be absent
Pain	Early symptom Peri-umbilical Short intermittent cramps	Late symptom Localized, deep visceral pain, Long intervals between cramps Often described as crampy
Abdominal distention	May be absent	Present
Anorexia	always	May not be present

2. Decision-making in MBO

Although MBOs are commonly encountered in clinical medicine, there are few prospective studies and no randomized trials that compare the success of palliation and the effects of treatment on the patient's quality of life with different management plans, such as surgery, stenting or medical management. The lack of a consistent definition of MBO has meant that most series in the literature combine patients at different points along their disease trajectory, making the interpretation of outcomes difficult. Another problem is the lack of consensus as to what constitutes a successful palliative outcome. Survival (30 or 60 days) after intervention, the rate of hospital discharge, and the ability to tolerate oral supplementation for a given length of time (30 or 60 days) have all been used as outcome measures. These outcomes however do not address meaningfully the important patient-centred outcomes in palliation such as symptom relief, improvements in quality of life and ultimately the quality of death.[11,12] It is hoped that future trials that use patient perceived outcomes as the primary outcome measure will help better define what constitutes a successful intervention.

A careful assessment of the patient will determine which patients can be helped and, by selecting among the available options, recommendations for the best approach for an individual patient can be made. The management of patients with MBO is influenced by the level of obstruction, pattern of disease, clinical stage of cancer and overall prognosis, and prior and potentially future anti-cancer treatments, as well as the patient's health and performance status. Treatment of these patients can be one of the most challenging of clinical scenarios, balancing the pros and cons of intervention with patients' prognosis, tumour biology and most of all quality of life.

Because the management of MBO is rarely an emergency, time can and should be taken to come up with an appropriate treatment plan.

3. Surgery in MBO

Surgery may be of benefit for selected patients with MBO. There are a number of options available to the surgeon when considering operative intervention. In the case of distal obstruction, a stoma can be created out of the most distal unaffected bowel segment. Proximal stomas have a propensity to have a high output and may cause significant fluid balance problems for the patient; this must be considered before the creation of a proximal jejunal stoma.

There are a number of patient factors to consider in the decision-making. These include advanced age, both physiological and chronological, nutritional status, performance status, concurrent illness and co-morbidities, previous and future anticancer treatment as well as psychological health and social support.[13,14] In addition, patients with persistent ascites are also at risk of a poor outcome. Higashi found ascites of 100 cc or more was predictive of a poor outcome.[14] Exposure to previous adjuvant therapy is also related to prognosis post surgical palliation. Treatment with chemotherapy

does not impact on surgical complications, unless the patient is malnourished or frail from this treatment. However, the overall exposure to chemotherapy limits its successful use after surgical intervention for a MBO and ultimately impacts on patients' overall survival.

There is much debate on the role of psychological health and societal support on oncology patient's survival, however a decreased survival and an increased rate of mortality is reported in patients who report feeling socially isolated or who have severe recurrent depression.[15] Randomized trials in oncology patients evaluating the role of psychotherapy on survival, report conflicting data, however there is a trend showing an improved survival with participation in psychotherapy interventions and no evidence of a detrimental effect.

Absolute and relative contraindications to proceeding with palliative surgery have been identified from retrospective case series examining characteristics associated with high rates of mortality and morbidity and translated into prognostic criteria.[16] It is becoming increasingly clear that a MBO from generalized carcinomatosis is a distinct entity that responds poorly, or not at all, to surgical intervention. These obstructions are usually partial, intermittent and do not involve strangulated or twisted bowel at risk of perforation. They are caused by blockage of the bowel at multiple levels of the small and/or large bowel, possibly complicated by motility disorders secondary to bowel wall infiltration by tumour and/or compromise of the parasympathetic and sympathetic nerves responsible for peristalsis. Symptoms may resolve temporarily with nasogastric decompression but will recur. When such patients are taken to the operating room, the results are generally poor, with a high 30-day mortality (21-40%) and a high complication rate (20-40%) and, even more discouraging, most will re-obstruct within a short period of time.[16] Although anaesthesia and surgical practices have evolved over the last 50 years, recent reports of morbidities and mortalities from patients treated surgically for MBO remain high, even with good patient selection.[17,18]

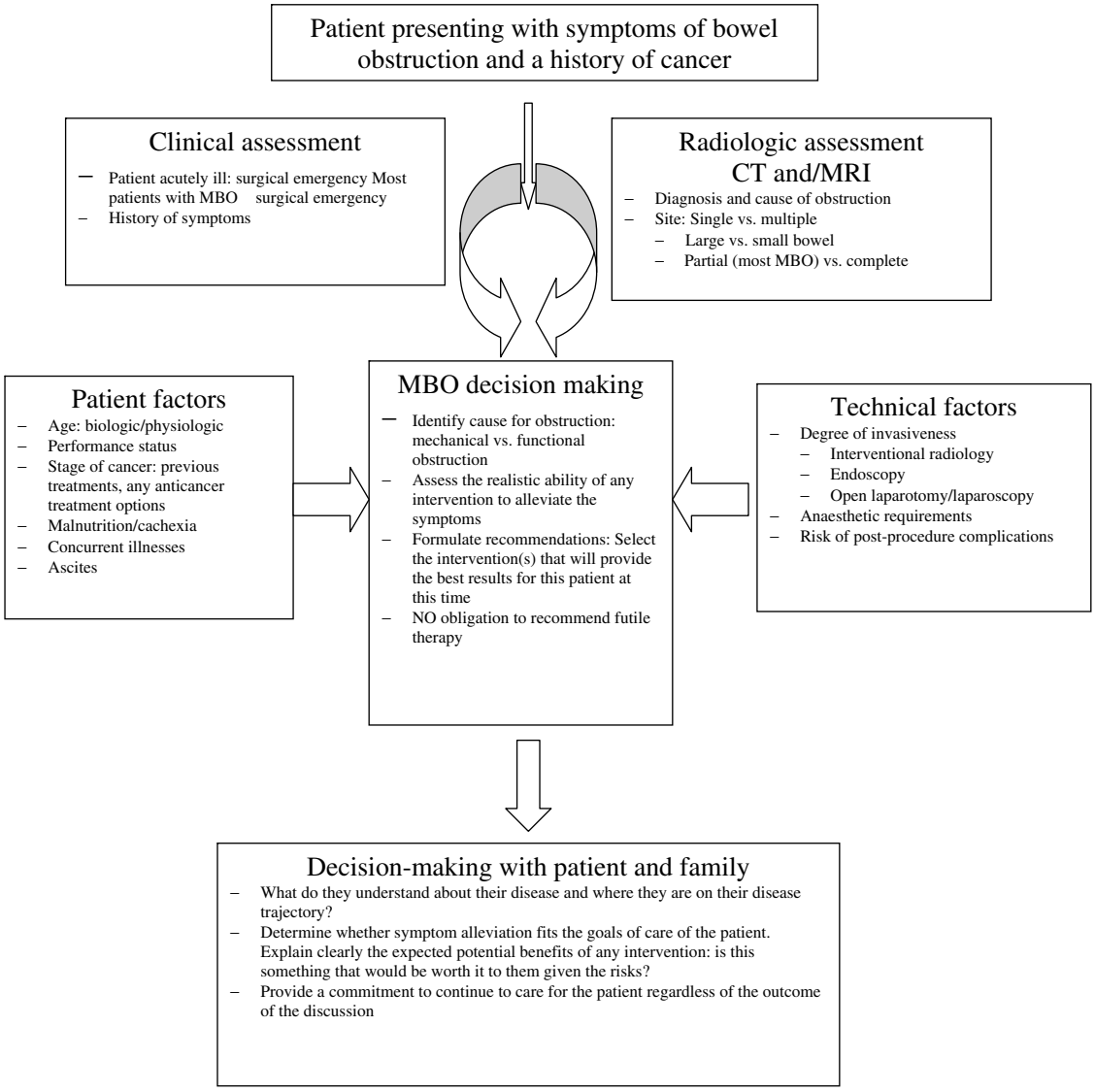


Fig. 2 – Algorithm for assessing and managing a patient with malignant bowel obstruction.

Patients facing incurable cancer are extremely vulnerable. Because of this, the lines between informing, persuading and manipulating can become blurred and obtaining truly informed consent can be difficult.[19] Involved well-meaning family members and clinicians may cloud the decision-making process and supersede the patient's wishes. In the face of an incurable, progressive illness the balance between honesty and maintaining hope and optimism can be difficult to achieve but it is necessary to avoid the use of futile treatments and harm to the patient.[20] A treatment is considered futile if a response is physiologically impossible, if it is non-beneficial, or if it is unlikely to produce the desired benefit. However, there is little guidance on what should be considered a futile treatment as the definition may vary from patient-to-patient and/or clinician-to-clinician based on previous personal experiences and expectations. Most clinicians agree, however, palliative surgery in oncology patients should not be offered to meet emotional, existential and/or psychological needs.[21] The decision to consider palliative or supportive care can be regarded by both clinicians and patients as a reflection of their personal failure and may signify the absence of hope and loss of optimism about the disease and the future.[22] In this circumstance, the physician may feel obliged to offer treatment even if it is futile and the patient obliged to accept it or be considered a failure. To maintain and achieve a better balance of honesty, hope and avoidance of a futile procedure, the patient, the family and the clinicians should first address the patient's realistic goals of treatment. These are usually directed towards relief of suffering, improving quality of life and may vary between similar patients as they are based on the patients' perceptions and life experiences. Secondly, all treatment options including surgery, interventional radiology and medications should be discussed, including the expected realistic benefits of each proposed intervention and associated risks. We propose that each patient should be assessed considering the above factors, the risks and benefits of proceeding with surgery, considering all non-surgical options as well as the patient's goals and expectations in order to come up with the optimal treatment plan for each individual patient. (Fig. 2).

4. Endoscopic management of gastro-duodenal obstruction

Gastric outlet obstruction (GOO) and proximal small bowel obstruction are common complications in patients with pancreatic cancer, distal gastric cancer, gall bladder cancer and cholangiocarcinoma, but may also result from metastases from ovarian cancer and non-abdominal malignancies such as lung cancer and breast cancer. Over the past decade advances in endoscopic technology have accomplished good results in the relief of obstruction and reduction of symptoms with the endoscopic insertion of a self-expanding metal stent (SEMS), or gastric venting via a percutaneously placed gastrostomy (drainage PEG). These approaches are particularly useful for patients with poor short-term prognosis.

The technical success rates for placement of a stent have been reported to be >90% and clinical success with resolution of nausea and vomiting and improved ability to consume food orally is reported over 75%.[23–26] Late complications or delayed stent failure can occur, including stent obstruction by food impaction, and reobstruction caused by tumour ingrowth. Stent migration also can occur, sometimes in association with cancer treatment, if there is reduction in the size of the tumour. In most cases, re-obstruction due to tumour ingrowth can be managed with placement of a second stent or tumour ablation by Nd:YAG LASER or argon plasma coagulator.[27]

In the limited comparative studies published, endoscopic stent placement has been associated with shorter hospital stay and lower peri-procedural mortality in patients with gastric outlet obstruction secondary to pancreatic cancer,[28,29] and with more rapid food intake compared to surgical bypass.[28,30] Those managed with stent however have a greater need for re-intervention compared with surgically-treated patients as a result of delayed stent occlusion.[30,31]

Assessments of the patient's quality of life (QOL) after palliative stenting for malignant GOO have been limited or absent from most studies.[32,33] In one prospective study examining QOL in patients with malignant GOO, Mehta and coauthors randomized 27 patients to receive laparoscopic gastrojejunostomy or endoscopic stent placement for malignant GOO. Stent placement was associated with less pain and shorter hospital stay, with a greater improvement in physical health following stent placement relative to those managed surgically.[32]

We consider surgical bypass the preferred option for patients with a good performance status, a slowly progressive disease and a relatively longer life expectancy (>60 days). Furthermore, if the site of obstruction is more distal in the jejunum or if there are multiple sites of obstruction, endoscopic stenting is likely to have a lower rate of technical success, so surgical intervention or drainage gastrostomy should be considered. We estimate that the patients who are best suited for endoscopic stenting are those with a short length of tumour, a single site of obstruction that is located at the pylorus or in the proximal duodenum, with an intermediate to high performance status and an intermediate life expectancy of greater than 30 days. Patients with a poor performance status, rapidly progressive disease, carcinomatosis, malignant ascites, a very short life expectancy of less than 30 days, or multiple levels of obstruction are best served by medical palliation of symptoms or the insertion of a drainage PEG.

5. Endoscopic management of malignant colorectal obstruction

The technical success rates for insertion of metallic stents range from 80% to 100%, and clinical improvement in symptoms reportedly occurs in more than 75% of patients.[34–36] Many patients treated with stents have a durable relief of symptoms until death from progression of disease, but restenosis is relatively common, usually caused by tumour ingrowth through the interstices of the stent. This can usually be managed with insertion of another stent, endoscopic dilation or laser ablation.[34,35,37,38]

Two analyses of pooled data from the multiple reported case series have been published.[39,40] (Table 4). Both report clinical success rates of 88% and 91% defined as resolution of obstructive symptoms following the insertion of stents.

Table 4 – Results of systematic reviews of efficacy and safety of colorectal stenting in the management of acute malignant colorectal obstruction

	Khot et al.[39]	Sebastian et al.[40]
Technical success	551 (92%)	1198 (94%)
Clinical success	525 (88%)	1198 (91%)
Palliative success	301/336 (90%)	791 (93%)
Deaths	3 (1%)	7 (0.6%)
Perforation	22 (4%)	45 (3.8%)
Stent migration	54 (10 %)	132 (11.8%)
Re-obstruction	53 (10%)	82 (7.3%)

The limitations to success are a very proximal location of obstruction with a higher rate of failure in the proximal colon in some reported series, and the ability to traverse a tightly obstructing tumour with the endoscope or a guide wire. A greater success with stenting primary colorectal cancer has been noted, with lesser success for obstruction caused by extrinsic compression from metastatic or locally invasive pelvic tumours such as ovarian cancer. Limited data on cost effectiveness of colorectal stenting are available in published reports, with some calculations suggesting a potential reduction in the estimated cost of palliation for such patients of approximately 50% compared to surgical patients. This is predominantly attributed to a reduced hospital stay with stenting.[39]

The proper evaluation of the efficacy of palliative treatments requires a careful assessment of the effect of the treatment on symptoms and the quality of life, and less attention on survival.

6. Drainage percutaneous endoscopic gastrostomy in bowel obstruction

Percutaneous endoscopic gastrostomy (PEG) tube placement is an option for palliation of nausea and vomiting due to gastrointestinal obstruction in patients with abdominal malignancies. The alternative is long-term venting with nasogastric tubes, but patients managed with NG tubes become more uncomfortable with time as the tubes interfere with cough for clearing pulmonary secretions, can be cosmetically unacceptable and confine patients at home.

PEG tube placement, provides a rapid and safe method of achieving symptomatic relief without the risks of a surgical procedure or the discomfort of a nasogastric tube. Initial guidelines suggested that patients with advanced abdominal malignancies were contraindicated for PEG placement due to the presence of ascites and tumour infiltration of the stomach, but the data have shown that PEGs can be safely inserted and can provide meaningful palliation of the severe nausea and vomiting occurring with irreversible forms of bowel obstruction.

In an early series, Campagnutta et al.[41] reported on 34 patients with bowel obstruction from gynaecological malignancies that were palliated with drainage PEG. Using

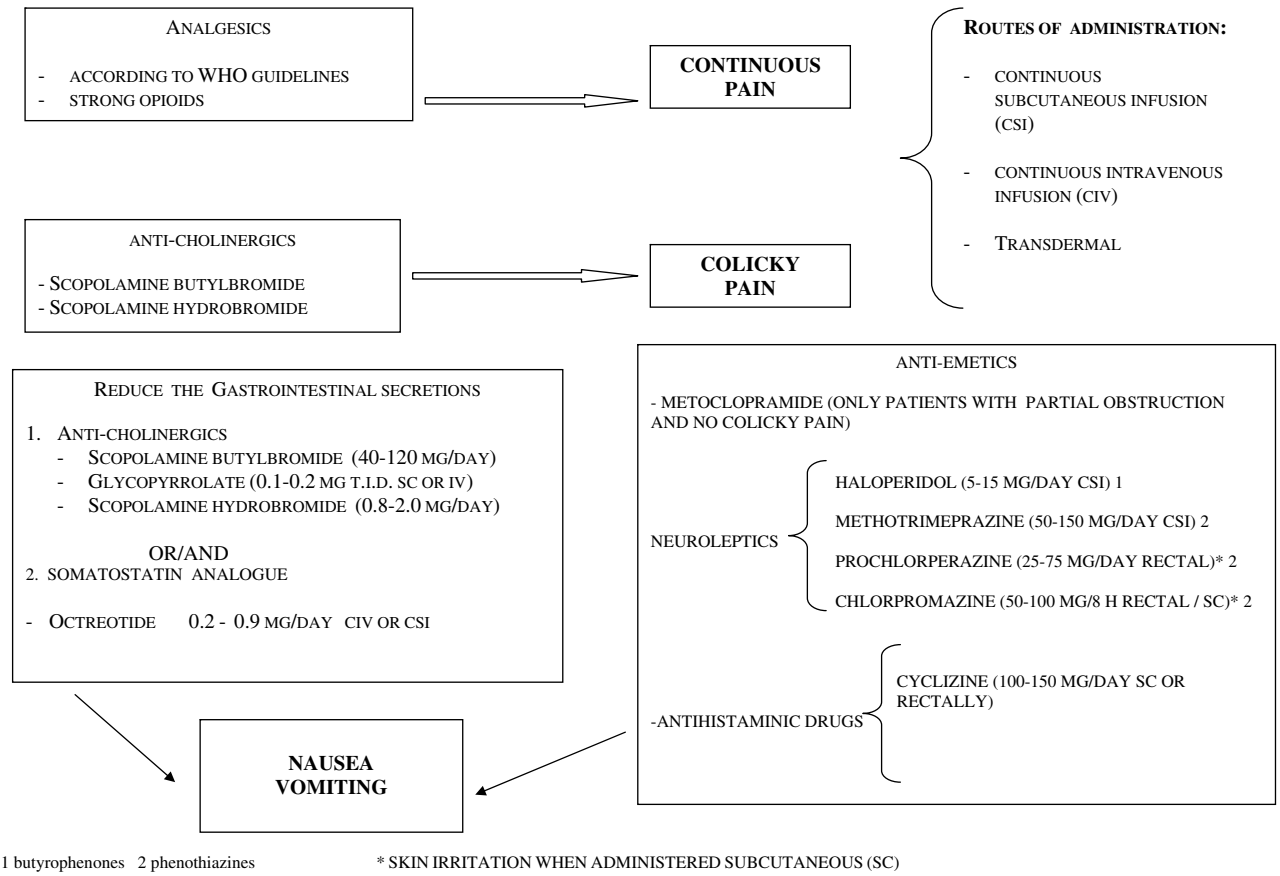


Fig. 3 – Symptomatic pharmacological approach.

15 and 20 Fr. Tubes, 94% had PEGs successfully placed and 84.4% had resolution of symptoms, with return of the ability to consume liquids or soft food for a median of 74 days.

In a retrospective study,[42] 28 Fr. PEG tube placement was feasible in 98% of patients with advanced recurrent ovarian cancer, even in patients with tumour encasing the stomach, diffuse carcinomatosis and ascites.

Pharmacological symptomatic treatment should be used in inoperable patients with the following aims:

1. to relieve continuous abdominal pain and intestinal colic
2. to reduce vomiting to an acceptable level for the patient (e.g. 1-2 times in 24 hours) without the use of the NGT,
3. to relieve nausea,
4. to achieve hospital discharge, and to allow for home/hospice care.

Clinical practice recommendations for the management of MBO in patients with end-stage cancer have been published by the Working Group of the European Association for Palliative Care.[16]

Fig. 3 shows the pharmacological approach to symptom control.

The administration of analgesics, mainly strong opioids, according to the W.H.O guidelines[43] allows adequate pain relief in most patients.[16,44,45] The dose of opioids should be titrated against the effect and most usually be administered parenterally (Table 5; Ref.[46–51]).

Table 5 – More suitable routes of opioid administration in MBO patients

Subcutaneous route	Main factors determining the subcutaneous absorption: drug solubility, site of the injection, surface exposed, blood pressure, presence of cutaneous vasoconstriction, oedema or inflammatory processes.	Subcutaneous (SC) opioid administration can be performed both intermittently and continuously. Continuous subcutaneous infusion (CSI) via a PCA device or via a syringe pump is recommended CSI of drugs allows a parenteral administration of different drug combinations, produces minimal discomfort for the patient and is easy to use in a home setting.	The average relative potency ratio of oral morphine to subcutaneous morphine is between 1:2 and 1:3 (i.e. 20–30 mg of morphine by mouth is equianalgesic to 10 mg by s.c. injection).
Intravenous-route	Although morphine is the drug of choice, clinical experience has shown that other drugs, such as, hydromorphone, oxycodone, fentanyl and methadone can also be used successfully	Intravenous (IV) administration of opioids permits complete systemic absorption, and produces rapid analgesia that is correlated to lipidic solubility (10-15 minutes for morphine, 2-5 minutes for methadone) but of short duration. This makes it necessary to repeat infusions at least every 4 hours. Bolus administration can be substituted by continuous intravenous infusion (CIVI) using a pump. This is very frequent in the cancer population during hospitalisation, above all in those with central venous catheters. PCA is also possible by IV route.	IV infusion of morphine may be preferred in patients: a. who already have an indwelling intravenous line; b. with generalized oedema; c. who develop erythema, soreness or sterile abscesses with subcutaneous administration; d. with coagulation disorders; e. with poor peripheral circulation. The average relative potency ratio of oral to intravenous morphine is between 1:2 and 1:3.
Transdermal route	Among opioids, the potent synthetic drugs are particularly suitable for transdermal administration and in stable, chronic cancer pain TTS is an alternative to oral strong opioids. The patches should be applied to a flat and hairless area of non-inflamed skin, preferably on the upper back, subclavicular region or chest.	Transdermal fentanyl is an effective alternative to oral morphine but is best reserved for patients whose opioid requirements are stable. It may have particular advantages for such patients if they are unable to take oral morphine, as an alternative to subcutaneous infusion Transdermal fentanyl systems (TTS) are available in four strengths: programmes 25, 50,75, 100 μg/h, and the drug is released continuously for 72 hours maximum corresponding to a daily dose of 0.6, 1.2, 1.8, 2.4 mg respectively In 11 to 43% of patients during long term treatment, the patch had to be changed every 48 h. The permeability coefficient for fentanyl is affected by temperature. A rise in body temperature to 40 °C may increase the absorption rate by about one-third. In patients with fever the TTS should be avoided.	The partial agonist buprenorphine is another candidate for delivery via a transdermal patch which is available in three dosage strengths. The patches are loaded with 20, 30 or 40 mg of buprenorphine and are designed to release the opioid at a controlled rate of 35, 52.5 and 70 μg/h, corresponding to a daily dose of 0.8, 1.2 and 1.6 mg, respectively. Buprenorphine patches are designed for a 72-hour application period.

References.[46–51]

If colic persists despite the use of an opioid, hyoscine butylbromide or hyoscine hydrobromide[21,38] should also be administered in association.[52–55]

Nausea and vomiting can be managed using two different pharmacological approaches:

1. administration of drugs that reduce gastrointestinal (GI) secretions such as anticholinergics (hyoscine hydrobromide, hyoscine butylbromide, glycopyrrolate) and/ or somatostatin analogues (octreotide)[53,55–57]
2. administration of anti-emetics acting on the central nervous system, alone or in association with drugs to reduce GI secretions.

There are no comparative studies on the efficacy of these different approaches. Generally, physicians are guided by drug availability and costs. Fig. 3 describes the drugs used to control nausea and vomiting, their possible association and the doses reported to be effective.[52,55–66]

Octreotide is a synthetic analogue of somatostatin with greater specificity and a longer duration of action (12 hours). Octreotide has been shown to inhibit the release and activity of GI hormones, modulate GI function by reducing gastric acid secretion, slow intestinal motility, decrease bile flow, increase mucous production, and reduce splanchnic blood flow. It reduces GI contents and increases absorption of water and electrolytes at intracellular level.[67,68] These effects may be due to the inhibition of vasoactive intestinal polypeptide (VIP).[69–71]

Octreotide also may be effective in relieving partial bowel obstruction because it can reduce the hypertensive state in the lumen that causes the distension-secretion-distention cycle, which can lead to total obstruction if not treated.[72,73]

Table 6 – Role of Octreotide in Malignant Bowel Obstruction (single cases and prospective series)

Author	No. of patients	Site of Cancers / Site of Obstruction	Symptoms	Octreotide dose/ route and other drugs	Outcomes
Mercadante et al.[60]	2	Intra-abdominal/ small and/or large bowel and carcinomatosis	Abdominal pain and vomiting (1°) Colic pain and vomiting despite the use of NGT and haloperidol (2°)	0.2–0.3 mg/day + 0.9 mg buprenorphine via CSI 0.9 mg/day + 3 mg haloperidol	Pain and vomiting disappeared within 24 hours. No adverse effects were reported. NGT secretions decreased from 2,600 mL/day to 350 mL/day and vomiting disappeared within 24 hours. NGT was removed; no further need for analgesics or intravenous fluids. No adverse effects were reported.
Khoo et al.[62]	5	Various intra-abdominal sites/small bowel	Intractable vomiting, unresponsive to conventional therapy	0.1–0.5 mg/day via SCB to start, then CSI	Vomiting stopped within 1 hour of start of treatment. The only patient with a NGT presented a reduction in aspirate from 2,000 mL/day to <300 mL/day. No important toxicity was reported.
Steadman et al.[74]	1	pancreas/small bowel	Vomiting and drowsiness with diamorphine, cyclizine, and hyoscine	0.2 mg/ day + diamorphine	Switching to octreotide produced good symptom relief without causing unwanted uncomfortable drowsiness. NGT was removed.
Mercadante et al.[61]	14	Various intra-abdominal sites/ small and/or large bowel	Nausea, vomiting unresponsive to haloperidol or chlorpromazine	0.3–0.6 mg/day via SCB or CSI + haloperidol + analgesics	Vomiting was controlled in 12 patients and reduced in 2 patients. In 2 of 3 patients NGT was removed and symptoms were controlled. No important toxicity was reported.
Riley et al.[63]	24	Various intra-abdominal sites/ small and/or large bowel	Intractable vomiting not responsive to a combination of anti-emetics, steroids and/ or NGT drainage for 24 hours	0.1–1.2 mg/day via SCB or CSI	Fourteen patients had no further vomiting, and 4 pts showed some improvements on 0.1–0.6 mg/day of octreotide. Aspirate was reduced in all 5 pts with a NGT. Six patients did not respond, despite dosages of 0.6–1.2 mg/day. No adverse effects were reported, even at higher doses.
Mangili et al.[65]	13	Ovary/ small and/ or large bowel	Vomiting not responsive to metoclopramide and haloperidol	0.3–0.6 mg/day via SCB or CSI ± analgesics	Vomiting was controlled in all cases within 3 days (range, 1–6 days). In eight patients with an NGT there was a significant reduction of secretions and the NGT was removed. No adverse effects were reported.

CSI = continuous subcutaneous infusion; NGT = nasogastric tube; SCB = subcutaneous bolus.

Table 6 summarizes the case reports[60,62,74] and prospective studies[61,63,65] showing the efficacy of octreotide in the control of GI symptoms due to bowel obstruction. Reported effective doses range from 0.1 to 0.6 mg/day, given either as a continuous parenteral infusion or as intermittent subcutaneous or intravenous boluses.

Two randomized prospective studies were carried out to compare the anti-secretory effects of octreotide (0.3 mg/day) and scopolamine butylbromide (60 mg/day), administered by continuous subcutaneous infusion in patients with inoperable bowel obstruction.[56,57]

Octreotide was shown to reduce significantly the volume of GI secretions and the number of daily episodes of vomiting and alleviated nausea better than scopolamine butylbromide. When one of these drugs is ineffective by itself, combining the two may improve the GI secretions.

In one recent study of patients with advanced cancer, octreotide combined with metoclopramide, dexamethasone and an initial bolus of amidotrizoate allowed the recovery of intestinal transit within 1–5 days and prevented bowel obstruction until death in most of the patients studied.[75]

The perioperative use of octreotide in bowel obstruction is indicated to improve the obstructed patient's condition, along with intravenous replacement of fluids and electrolytes, placement of a nasogastric tube and use of antibiotics.[72,76]

Among the anti-emetic drugs, parenteral metoclopramide, can be considered the drug of choice in patients with mainly functional bowel obstruction but it is not recommended in the presence of complete bowel obstruction because of its prokinetic effect.[16]

If metoclopramide fails to relieve the vomiting or there is associated colic, other anti-emetics to consider are the butyrophenones, an antihistaminic anti-emetic or phenothiazine.[16] Haloperidol, a dopamine antagonist and a potent suppressor of the chemoreceptor trigger zone (CTZ), is considered to be the anti-emetic drug of first choice, in the presence of a complete obstruction. It can be administered subcutaneously as a bolus or as a continuous infusion and may be combined with scopolamine butylbromide and opioid analgesic in the same syringe. Among the phenothiazines, methotrimeprazine (levomepromazine), chlorpromazine and prochlorperazine,[58] are all used and can be effective.

A combination of anti-emetics with different sites of action may be more effective than a single agent.[77]

The corticosteroids could reduce peritumoural inflammatory oedema and increase water and salt absorption; however their role in MBO is unclear.[78]

Octreotide, can be administered in association with either morphine or hyoscine butylbromide or haloperidol in the same syringe driver.[16] Some authors report the results of stability and/or compatibility testing for interactions between the recommended drugs.[16]

The use of total parenteral nutrition (TPN) in advanced cancer patients with incurable cancer is still a controversial issue in both oncology as well as in the palliative care setting. The role of TPN in the management of patients with inoperable bowel obstruction should be considered carefully on the basis of several factors and the routine use should be avoided. It is predicated on the expectation of demonstrable benefit for the patients.[79] TPN should only be used in selected patients.[80]

Most patients with bowel obstruction are dehydrated, due to an accumulation of water and electrolytes at intestinal level and poor oral intake of fluids. The correction of this status usually does not have any effect on dry mouth and thirst, as the intensity of these symptoms seems to be independent of the amounts of fluids administered either by the oral or parenteral routes.[16,56,81] A high level of hydration may result in more bowel secretions.[56,57] However, administration of 1-1.5 litre/day of solution containing electrolytes and glucose may be useful in preventing symptoms due to metabolic derangement. Hypodermoclysis is a valid alternative to intravenous administration of fluids for patients with poor vein availability of without a central venous catheter.[82] Providing sips of fluids orally, frequent mouth care, sucking ice cubes are of paramount importance for relieving dry mouth, commonly associated with the use of anticholinergics.[16,83]

7. Conclusion

The management of MBO requires a very careful assessment by an experienced multidisciplinary team. It rarely requires an acute decision and time should be dedicated to the decision-making process, during which medical management can be instituted as appropriate.

Conflict of interest statement

None declared.

REFERENCES

1. Anthony T, Baron T, Mercadante S, et al. Report of the clinical protocol committee: development of randomized trials for malignant bowel obstruction. *J Pain Symptom Manage* 2007;**34**:S49–59.
2. Ripamonti C, Bruera E. Palliative management of malignant bowel obstruction. *Int J Gynecol Cancer* 2002;**12**:135–43.
3. Krouse RS. The international conference on malignant bowel obstruction: a meeting of the minds to advance palliative care research. *J Pain Symptom Manage* 2007;**34**:S1–6.
4. Legendre H, Vanhuyse F, Caroli-Bosc FX, et al. Survival and quality of life after palliative surgery for neoplastic gastrointestinal obstruction. *Eur J Surg Oncol* 2001;**27**:364–7.
5. Suri S, Gupta S, Sudhakar PJ, et al. Comparative evaluation of plain films, ultrasound and CT in the diagnosis of intestinal obstruction. *Acta Radiol* 1999;**40**:422–8.
6. Thompson WM, Kilani RK, Smith BB, et al. Accuracy of abdominal radiography in acute small-bowel obstruction: does reviewer experience matter? *AJR Am J Roentgenol* 2007;**188**:W233–8.
7. De Bree E, Koops W, Kroger R, et al. Peritoneal carcinomatosis from colorectal or appendiceal origin: correlation of preoperative CT with intraoperative findings and evaluation of interobserver agreement. *J Surg Oncol* 2004;**86**:64–73.
8. Jacquet P, Jelinek JS, Steves MA, et al. Evaluation of computed tomography in patients with peritoneal carcinomatosis. *Cancer* 1993;**72**:1631–6.
9. Taourel PG, Fabre JM, Pradel JA, et al. Value of CT in the diagnosis and management of patients with suspected acute small-bowel obstruction. *AJR Am J Roentgenol* 1995;**165**:1187–92.

10. Beall DP, Fortman BJ, Lawler BC, et al. Imaging bowel obstruction: a comparison between fast magnetic resonance imaging and helical computed tomography. *Clin Radiol* 2002;**57**:719–24.
11. Easson AM, Lee KF, Brasel K, et al. Clinical research for surgeons in palliative care: challenges and opportunities. *J Am Coll Surg* 2003;**196**:141–51.
12. McCahill LE, Krouse RS, Chu DZ, et al. Decision making in palliative surgery. *J Am Coll Surg* 2002;**195**:411–22.
13. Bryan D, Radbod R, Berek J. An analysis of surgical versus chemotherapeutic intervention for the management of intestinal obstruction in advanced ovarian cancer. *Int J Gynecol Cancer* 2004;**16**:125–34.
14. Higashi H, Shida H, Ban K, et al. Factors affecting successful palliative surgery for malignant bowel obstruction due to peritoneal dissemination from colorectal cancer. *Jpn J Clin Oncol* 2003;**33**:357–9.
15. Spiegel D. Effects of psychotherapy on cancer survival. *Nat Rev Cancer* 2002;**2**:383–9.
16. Ripamonti C, Twycross R, Baines M, et al. Clinical-practice recommendations for the management of bowel obstruction in patients with end-stage cancer. *Support Care Cancer* 2001;**9**:223–33.
17. Helyer LK, Law CH, Butler M, et al. Surgery as a bridge to palliative chemotherapy in patients with malignant bowel obstruction from colorectal cancer. *Ann Surg Oncol* 2007;**14**:1264–71.
18. Abbas SM, Merrie AE. Resection of peritoneal metastases causing malignant small bowel obstruction. *World J Surg Oncol* 2007;**5**:122.
19. Hofmann B, Heheim LL, Soreide JA. Ethics of palliative surgery in patients with cancer. *Br J Surg* 2005;**92**:809.
20. Tattersall MH, Butow PN, Clayton JM. Insights from cancer patient communication research. *Hematology Oncology Clinics of North America* 2002;**16**:731–43.
21. Hofmann B, Haheim LL, Soreide JA. Ethics of palliative surgery in patients with cancer. *Br J Surg* 2005;**92**:802–9.
22. Tattersall MH, Butow PN, Clayton JM. Insights from cancer patient communication research. *Hematol Oncol Clin North Am* 2002;**16**:731–43.
23. Lowe AS, Beckett CG, Jowett S, et al. Self-expandable metal stent placement for the palliation of malignant gastroduodenal obstruction: experience in a large, single, UK centre. *Clin Radiol* 2007;**62**:738–44.
24. Telford JJ, Carr-Locke DL, Baron TH, et al. Palliation of patients with malignant gastric outlet obstruction with the enteral Wallstent: outcomes from a multicenter study. *Gastrointest Endosc* 2004;**60**:916–20.
25. Dormann A, Meisner S, Verin N, et al. Self-expanding metal stents for gastroduodenal malignancies: systematic review of their clinical effectiveness. *Endoscopy* 2004;**36**:543–50.
26. Nassif T, Prat F, Meduri B, et al. Endoscopic palliation of malignant gastric outlet obstruction using self-expandable metallic stents: results of a multicenter study. *Endoscopy* 2003;**35**:483–9.
27. Holt AP, Patel M, Ahmed MM. Palliation of patients with malignant gastroduodenal obstruction with self-expanding metallic stents: the treatment of choice? *Gastrointest Endosc* 2004;**60**:1010–7.
28. Espinel J, Sanz O, Vivas S, et al. Malignant gastrointestinal obstruction: endoscopic stenting versus surgical palliation. *Surg Endosc* 2006;**20**:1083–7.
29. Lillemoe KD, Cameron JL, Hardacre JM, et al. Is prophylactic gastrojejunostomy indicated for unresectable periampullary cancer? A prospective randomized trial. *Ann Surg* 1999;**230**:322–8. discussion 328-30.
30. Jeurnink SM, Steyerberg EW, Hof GV, et al. Gastrojejunostomy versus stent placement in patients with malignant gastric outlet obstruction: a comparison in 95 patients. *J Surg Oncol* 2007.
31. Wong YT, Brams DM, Munson L, et al. Gastric outlet obstruction secondary to pancreatic cancer: surgical vs endoscopic palliation. *Surg Endosc* 2002;**16**:310–2.
32. Mehta S, Hindmarsh A, Cheong E, et al. Prospective randomized trial of laparoscopic gastrojejunostomy versus duodenal stenting for malignant gastric outflow obstruction. *Surg Endosc* 2006;**20**:239–42.
33. Schmidt C, Gerdes H, Hawkins W, et al. Palliation for malignant gastric outlet obstruction: A prospective quality of life study. Manuscript in Preparation.
34. Camunez F, Echenagusia A, Simo G, et al. Malignant colorectal obstruction treated by means of self-expanding metallic stents: Effectiveness before surgery and in palliation. *Radiology* 2000;**216**:492–7.
35. Law WL, Chu KW, Ho JW, et al. Self-expanding metallic stent in the treatment of colonic obstruction caused by advanced malignancies. *Dis Colon Rectum* 2000;**43**:1522–7.
36. Mainar A, De Gregorio MA, Tejero E, et al. Acute colorectal obstruction: Treatment with self-expandable metallic stents before scheduled surgery—Results of a multicenter study. *Radiology* 1999;**210**:65–9.
37. Nash CL, Markowitz AJ, Schattner M, et al. Colorectal stents for the management of malignant large bowel obstruction. *Gastrointest Endo* 2002;**55**:AB216.
38. Pothuri B, Guiguis A, Gerdes H, et al. The use of colorectal stents for palliation of large bowel obstruction due to recurrent gynecologic cancer. *Gynecol Oncol* 2004;**95**:513–7.
39. Khot UP, Wenk Lang A, Murali K, et al. Systematic review of the efficacy and safety of colorectal stents. *Br J Surg* 2002;**89**:1096–102.
40. Sebastian S, Johnston S, Geoghegan T, et al. Pooled analysis of the efficacy and safety of self-expanding metal stenting in malignant colorectal obstruction. *Am J Gastro* 2004;**99**:2051–7.
41. Campagnutta E, Cannizzaro R, Gallo A, Zarrelli A, Valentini M, De Cicco M, et al. Palliative Treatment of Upper Intestinal Obstruction by Gynecological Malignancy: The Usefulness of Percutaneous Endoscopic Gastrostomy. *Gynecologic Oncology* 1996;**62**:103–5.
42. Pothuri B, Montemarano M, Gerardi M, Shike M, Ben-Porat L, Sabbatinin P, et al. Percutaneous endoscopic gastrostomy tube placement in patients with malignant bowel obstruction due to ovarian carcinoma. *Gynecologic Oncology* 2005;**96**:330–4.
43. World Health Organization. *Cancer Pain Relief*. second ed. Geneve: WHO; 1996.
44. Mercadante S. What is the opioid of choice? Progress Palliat Care, in press.
45. Mercadante S, Sapio M, Serretta R. Treatment of pain in chronic bowel subobstruction with self-administration of methadone. *Support Care Cancer* 1997;**5**:327–9.
46. Hanks GW, De Conno F, Cherny N, et al. Expert Working Group of the Research Network of the European Association for Palliative Care. Morphine and alternative opioids in cancer pain: the EAPC recommendations. *British Journal of Cancer* 2001;**84/5**:587–93.
47. Anderson SL, Shreve ST. Continuous subcutaneous infusion of opiates at the end-life. *Ann Pharmacother* 2004;**38**:1015–23.
48. Ripamonti C, Bruera E. Current status of patient-controlled analgesia in cancer patients. *Oncology* 1997;**11**:373–84.
49. Grond S, Radbruch L, Lehmann KA. Clinical pharmacokinetics of transdermal opioids: focus on transdermal fentanyl. *Clin Pharmacokin* 2000;**38**:59–89.
50. Muijsers RBR, Wagstaff AJ. Transdermal fentanyl. An updated review of its pharmacological properties and therapeutic efficacy in chronic cancer pain control. *Drugs* 2001;**61**:2289–307.
51. Böhme K. Buprenorphine in a transdermal therapeutic system – a new option. *Clin Rheumatol* 2002;**Suppl 1**:S13–6.

52. Fainsinger RL, Spachynski K, Hanson J, et al. Symptom control in terminally ill patients with malignant bowel obstruction. *J Pain Symptom Manage* 1994;**9**:12–8.
53. Ventafridda V, Ripamonti C, Caraceni A, et al. The management of inoperable gastrointestinal obstruction in terminal cancer patients. *Tumouri* 1990;**76**:389–93.
54. Mercadante S. Pain in inoperable bowel obstruction. *Pain Digest* 1995;**5**:9–13.
55. De Conno F, Caraceni A, Zecca E, Spoldi E, Ventafridda V. Continuous subcutaneous infusion of hyoscine butylbromide reduces secretions in patients with gastrointestinal obstruction. *J Pain Sympt Manage* 1991;**6**:484–6.
56. Ripamonti C, Mercadante S, Groff L, Zecca E, De Conno F, Casuccio A. Role of octreotide, scopolamine butylbromide and hydration in symptom control of patients with inoperable bowel obstruction having a nasogastric tube. A prospective, randomized clinical trial. *J Pain Symptom Manage* 2000;**19**:23–34.
57. Mercadante S, Ripamonti C, Casuccio A, Zecca E, Groff L. Comparison of octreotide and hyoscine butylbromide in controlling gastrointestinal symptoms due to malignant inoperable bowel obstruction. *Supportive Care in Cancer* 2000;**8**:188–91.
58. Baines M, Oliver DJ, Carter RL. Medical management of intestinal obstruction in patients with advanced malignant disease: a clinical and pathological study. *Lancet* 1985;**2**:990–3.
59. Isbister WH, Elder P, Symons L. Non-operative management of malignant intestinal obstruction. *J R Coll Surg Edinb* 1990;**35**:369–72.
60. Mercadante S, Maddaloni S. Octreotide in the management of inoperable gastrointestinal obstruction in terminal cancer patients. *J Pain Symptom Manage* 1992;**7**(8):496–8.
61. Mercadante S, Spoldi E, Caraceni A, Maddaloni S, Simonetti MT. Octreotide in relieving gastrointestinal symptoms due to bowel obstruction. *Palliative Medicine* 1993;**7**:295–9.
62. Khoo D, Riley J, Waxman J. Control of emesis in bowel obstruction in terminally ill patients. *The Lancet* 1992;**339**:375–6.
63. Riley J, Fallon MT. Octreotide in terminal malignant obstruction of the gastrointestinal tract. *European J Palliative Care* 1994;**1/1**:20–2.
64. Stiefel F, Morant R. Vapreotide, a new somatostatin analogue in the palliative management of obstructive ileus in advanced cancer. *Supportive Care Cancer* 1993;**1**:57–8.
65. Mangili G, Franchi M, Mariani A, Zanaboni F, Rabaiotti E, Frigerio L, et al. Octreotide in the management of bowel obstruction in terminal ovarian cancer. *Gynecologic Oncology* 1996;**61**:345–8.
66. Davis MP, Furste A. Glycopyrrolate: a useful drug in the Palliation of Mechanical Bowel Obstruction. *J Pain Symptom Manage* 1999;**18**:153–4.
67. Ripamonti C, Panzeri C, Groff L, Galeazzi G, Boffi R. The role of somatostatin and octreotide in bowel obstruction: pre-clinical and clinical results. *Tumouri* 2001;**87**:1–9.
68. Anthone GJ, Bastidas JA, Orlandle MS, Yeo CJ. Direct proabsorptive effect of octreotide on ionic transport in the small intestine. *Surgery* 1990;**108**:1136–42.
69. Basson MD, Fielding LP, Bilchik AJ, et al. Does vasoactive intestinal polypeptide mediate the pathophysiology of bowel obstruction? *Am J Surg* 1989;**157**:109–15.
70. Neville R, Fielding P, Cambria RP, Modlin I. Vascular responsiveness in obstructed gut. *Dis Colon Rectum* 1991;**34**:229–35.
71. Nellgard P, Bojo L, Cassuto J. Importance of vasoactive intestinal peptide and somatostatin for fluid losses in small-bowel obstruction. *Scand J Gastroenterol* 1995;**30**:464–9.
72. Mercadante S, Kargar J, Nicolosi G. Octreotide may prevent definitive intestinal obstruction. *J Pain Symptom Manage* 1997;**13**:352–5.
73. Mercadante S, Ferrera P, Villari P, Marrazzo A. Aggressive pharmacological treatment for reversing malignant bowel obstruction. *J Pain Symptom Manage* 2004;**28**:412–6.
74. Steadman K, Franks A. A woman with malignant bowel obstruction who did not want to die with tubes. *Lancet* 1996;**347**:944.
75. Mercadante S, Avola G, Maddaloni S, et al. Octreotide prevents the pathological alterations of bowel obstruction in cancer patients. *Support Care Cancer* 1996;**4**:393–4.
76. Sun X, Li X, Li H. Management of intestinal obstruction in advanced ovarian cancer: an analysis of 57 cases [in Chinese]. *Zhonghua Zhong Liu Za Zhi* 1995;**17**:39–42.
77. Twycross R, Back I, et al. Nausea and vomiting in advanced cancer. *European J of Palliative Care* 1998;**5**(2):39–45.
78. Feuer DJ, Broadley KE. Systematic review and meta-analysis of corticosteroids for the resolution of malignant bowel obstruction in advanced gynaecological and gastrointestinal cancers. Systematic Review Steering Committee. *Ann Oncol* 1999;**10**:1035–41.
79. Cozzaglio L et al. Outcome of cancer patients receiving home parenteral nutrition. *J Parenteral Enteral Nutrition* 1997;**21**:339–42.
80. Hoda D, Jatoi A, Burnes J, Loprinzi C, Kelly D. Should patients with advanced, incurable cancers ever be sent home with Total parenteral nutrition? *Cancer* 2005;**103**:863–8.
81. Burge FI. Dehydration symptoms of palliative care cancer patients. *J Pain Symptom Manage* 1993;**8**:454–64.
82. Fainsinger RL, MacEachern T, Miller MJ, et al. The use of hypodermoclysis for rehydration in terminally ill cancer patients. *J Pain Sympt Manage* 1994;**9**:298–302.
83. Ventafridda et al. (2003) Mouth care. In: Doyle D, Hanks GWC, Cherny N, et al., editors. Oxford Textbook of palliative medicine, 3rd ed. Oxford: Oxford University Press; 2005.