The National Cancer Institute (NCI) announced in January 2006 the use of intraperitoneal (IP) combined with IV chemotherapy postoperatively as the preferred treatment method for advanced ovarian cancer. The announcement stimulated the need for oncology nurses to become familiar with IP chemotherapy administration and patient management guidelines. IP administration allows a high concentration of chemotherapy to come into direct contact with tumors and surrounding tissues and organs. IP chemotherapy also is administered in clinical trials and some clinical settings for other histologies, such as low-grade gastrointestinal carcinoma and appendiceal carcinoma, which tend to spread locally before invading the bloodstream. Local-regional chemotherapy potentially is an ideal treatment for local spread of those peritoneal carcinomas. Overall side effects from regional treatment are less severe than with systemic treatment. Oncology nurses can help minimize and alleviate discomfort associated with IP chemotherapy administration. This article focuses on nursing management strategies for patients receiving IP chemotherapy for ovarian cancer and other peritoneal carcinomatosis.

Intraperitoneal Chemotherapy: Implications Beyond Ovarian Cancer

Keith Marin, RN, BSN, OCN®, Karen Oleszewski, RN, MS, AOCN®, and Paula Muehlbauer, RN, MSN, OCN®

The National Cancer Institute (NCI) announced in January 2006 the use of intraperitoneal (IP) combined with IV chemotherapy postoperatively as the preferred treatment method for advanced ovarian cancer. The announcement stimulated the need for oncology nurses to become familiar with IP chemotherapy administration and patient management guidelines. IP administration allows a high concentration of chemotherapy to come into direct contact with tumors and surrounding tissues and organs. IP chemotherapy also is administered in clinical trials and some clinical settings for other histologies, such as low-grade gastrointestinal carcinoma and appendiceal carcinoma, which tend to spread locally before invading the bloodstream. Local-regional chemotherapy potentially is an ideal treatment for local spread of those peritoneal carcinomas. Overall side effects from regional treatment are less severe than with systemic treatment. Oncology nurses can help minimize and alleviate discomfort associated with IP chemotherapy administration. This article focuses on nursing management strategies for patients receiving IP chemotherapy for ovarian cancer and other peritoneal carcinomatosis.

Background

IP administration of chemotherapy is a method of cancer treatment that allows for a high concentration of chemotherapy to be in direct contact with tumors, surrounding tissues, and adjacent organs. By 1978, the use of IP chemotherapy had gradually changed as guidelines developed by NCI were instituted with the help of the advances in pharmacokinetics (Hoff, 1991).

At A Glance

- Intraperitoneal (IP) chemotherapy is used for histologies other than ovarian cancer that seed the peritoneal surfaces such as low-grade gastrointestinal and appendiceal carcinoma.
- IP chemotherapy requires knowledge of treatment rationale, procedure for administration, and possible side effects.
- Oncology nurses can help minimize discomfort and maximize IP therapy by using key patient management strategies.

NCI (2006) has recommended IP chemotherapy for treatment of ovarian cancer (Almadrones, 2007). IP chemotherapy also is used in other peritoneal carcinomas and may be administered...
during a surgical procedure, postoperatively, or with a combination for nonovarian cancers. Oncology nurses need to increase their knowledge of IP chemotherapy to decrease potential and actual adverse events. Oncology nurses should be knowledgeable about the indications for IP chemotherapy, patients’ medical histories, and potential complications.

At the National Institutes of Health (NIH), IP chemotherapy currently is used in clinical trials for patients with peritoneal carcinomatosis from low-grade gastrointestinal (GI) adenocarcinoma who undergo intraoperative continuous hyperthermic peritoneal perfusion with cisplatin (Park et al., 1999; Seidel, Locklin, & Muehlbauer, 2006). Primary low-grade GI adenocarcinoma has a tendency to invade locally and develop into peritoneal carcinomatosis. Peritoneal carcinomatosis is characterized by significant biologic changes in which extracellular mucin accumulates intra-abdominally. The result is uncomfortable symptoms, such as ascites. Spread of cancer outside the peritoneum in these cases is rare and local tumor progression is the major cause of death (Sugarbaker, Zhu, Sese, & Shmookler, 1993; Yan, Esquivel, Carmignani, & Sugarbaker, 2005). Currently, no standard treatment exits for peritoneal carcinomatosis secondary to GI cancers such as gastric, appendiceal, and colorectal. Patients are offered a variety of choices, ranging from no treatment to peritoneal debulking with or without systemic or IP chemotherapy.

Regardless of treatment modality, a study by Ronnett et al. (1995) demonstrated that the median survival of patients with malignant peritoneal mucinous carcinomatosis was only 16 months. Sugarbaker and Chang (1999) reported a five-year survival of only 25% for patients with low-grade mucinous appendiceal cancer undergoing peritoneal debulking surgery.

Gilly (2006) reported results from multiple phase II studies of patients with colorectal cancer with peritoneal carcinomatosis undergoing cytoreductive surgery and perioperative IP chemotherapy. Those studies show an overall median survival of 32.4 months in patients who completed cytoreductive surgery and 8.4 months of median survival for patients who were unable to receive complete cytoreductive surgery. At NIH, clinical trials are being conducted to evaluate a strategy of laparotomy and tumor debulking with continuous hyperthermic peritoneal perfusion followed by an IP dwell of 5-fluorouracil and paclitaxel one time only between postoperative days 7–12. IP dwell is administration of chemotherapy into the peritoneal space where the chemotherapy is left to be absorbed into the tissue. Toxicities from the treatments have been minimal and manageable. Although agents suitable for colorectal adenocarcinomas are often used for appendiceal cancer, the biology of the latter disease is different with tumor progression frequently limited to the peritoneal cavity (Alexander, Buell, & Fraker, 1995).

Other clinical trials using IP chemotherapy as part of the protocol regimen include those for malignant peritoneal mesothelioma, appendiceal malignancy, and sarcomatosis and in patients with peritoneal dissemination from primary gastric, duodenal, or pancreatic cancer (Brenner et al., 2003; Feldman et al., 2003; Gilly, 2006; Kianmanesh et al., 2007; Yan et al., 2003). Complications of IP chemotherapy for peritoneal carcinomatosis include postoperative issues, such as wound infection; anastomotic leak sepsis; enterocutaneous fistula; and abdominal wound dehiscence (Gilly; Kianmanesh et al.; Levine et al., 2007; Sugarbaker, 2005; Zanon et al., 2007).

<table>
<thead>
<tr>
<th>Carboplatinum</th>
<th>Mephalan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisplatinum</td>
<td>Methotrexate</td>
</tr>
<tr>
<td>Doxorubicin</td>
<td>Mitomycin-C</td>
</tr>
<tr>
<td>Etoposide</td>
<td>Mitoxantrone</td>
</tr>
<tr>
<td>5-fluorouracil</td>
<td>Paclitaxel</td>
</tr>
<tr>
<td>Gemcitabine</td>
<td>Streptozotocin</td>
</tr>
<tr>
<td>Interferon-alpha</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 1. Chemotherapy Drugs Used for Intraperitoneal Administration**

*Note. Based on information from Karlan et al., 2005; Markman, 2001; Sugarbaker, 2005.*

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**Figure 2. Steps to Administer Intraperitoneal Chemotherapy via a Tenckhoff Catheter**

*Note. Illustration courtesy of Keith Marin, RN, BSN, OCN®. Used with permission.*

1. Ensure all chemotherapy and premedication orders are written. Verify weights and accurate chemotherapy calculation. Provide patient education on treatment and possible side effects.
2. Obtain vital signs and encourage patient to void.
3. Attach Tenckhoff catheter to drainage bag and empty peritoneal contents. If drainage is greater than 600 cc or is abnormal in appearance, call the physician.
4. Administer premedications when chemotherapy arrives on unit.
5. Don personal protective equipment.
6. Set up the chemotherapy infusion line using an in-line warmer.
7. Administer chemotherapy 30 minutes after premedications are given.
8. Ensure proper disposal of waste into an approved chemotherapy waste container.
Intraperitoneal Chemotherapy

National Cancer Institute Announcement

Epithelial ovarian cancer ranks second in incidence and first in deaths of gynecologic malignancies. In the United States, an estimated 22,430 new cases will be diagnosed and 15,280 women will die from the disease in 2007 (Jemal et al., 2007). Ovarian cancer is known as the “silent killer” because of difficulties in early diagnosis, lack of good screening methods, and symptoms that are not evident until tumors have spread beyond the pelvis. Ovarian cancers tend to spread by peritoneal dissemination and nodule formation. The spreading occurs via direct tumor extension to pelvic structures, seeding of serosal surfaces in the abdominal cavity, and lymphatic spread to pelvic and para-aortic nodes in the retroperitoneum (Hoff, 1991; Morrissey et al., 2000). Throughout most of its natural history, ovarian cancer tends to remain confined in the peritoneal cavity, making it an excellent target for IP chemotherapy.

IP chemotherapy has been studied in ovarian cancer since 1986. Seven randomized clinical trials have compared various regimens of chemotherapy administration via IV to combined IV and IP administration (Alberts et al., 1996; Armstrong et al., 2006; Gadducci et al., 2000; Kirmani et al., 1994; Markman et al., 2001; Polyzos et al., 1999; Yen et al., 2001). The population of women who have been studied in the trials include those with different stages of disease and at various lines of therapy. Three consecutive randomized trials have demonstrated the effectiveness of postoperative IP chemotherapy in patients with optimally debulked stage III ovarian cancer (Sarmaik, Sussman, Ahmad, & Lowy, 2003). The most recent study conducted by the Gynecologic Oncology Group (GOG) showed an increase in median overall survival of 16 months for women who received combined IP and IV chemotherapy versus IV chemotherapy alone (Armstrong et al.). The increase in survival also was associated with an increase in morbidity for those women. Although quality-of-life (QOL) data collected before cycle 4 and at weeks 3–6 after treatment were significantly worse for the IP chemotherapy group, at one year after treatment, QOL ratings were similar between the two groups (Armstrong et al.). Based on that data, NCI (2006) encouraged physicians to follow surgery with a combination two-drug delivery method of IV and IP chemotherapy.

Patient selection remains the key to optimize outcomes in the ovarian cancer population. Current recommendations include patients with stage III disease and less than 1 cm residual disease after debulking surgery. Contraindications to therapy are women who have adhesions in the abdomen, malnutrition, hypovolemia, GI dysfunction, presence of massive ascites, or postoperative infection (GOG, n.d.; NCI, 2006).

Theoretical Basis

The goal of IP chemotherapy is to effectively destroy tumor cells while sparing healthy cells. Compared to IV chemotherapy, IP chemotherapy offers several advantages. Studies have shown that higher drug levels are necessary for a therapeutic effect on many peritoneal cavity cancers such as ovarian cancer and mesothelioma. Higher drug concentrations at the disease site are not possible with IV administration (Brenner et al., 2006; Hoff, 1991; Levine et al., 2007; Sugarbaker, 1995; Swenson & Erikson, 1986; Zanon et al., 2006). Cellular enclosure of the peritoneal cavity acts as a barrier, preventing systemic chemotherapy from adequately reaching the cavity. Administering IP chemotherapy bypasses that problem by instilling chemotherapy directly into the peritoneal cavity (Pingpank, 2005; Young, Gilbert, Sherman, Chatwin, & Budden, 1996). IP chemotherapy has a slower clearance than IV chemotherapy, allowing for greater drug exposure in the peritoneal cavity (Swenson & Erikson; Zook-Enck, 1990). Most peritoneal fluid is detoxified by the liver, thus less drug is released into systemic circulation, resulting in lower systemic toxicities (Pingpank; Swenson & Erikson). Chemotherapy agents that have been administered via IP administration are listed in Figure 1.

Principles

Factors to consider when IP chemotherapy is recommended are the stage and extent of residual disease as well as the choice of drug and adequate intratumoral drug distribution (Los & McVie, 1990). Multiple research studies have demonstrated that the residual tumor size needs to be small enough to ensure adequate drug penetration (Alexander et al., 1995; da Silva & Sugarbaker, 1990).

Theoretically, the three key principles for IP chemotherapy are:

1. Effective and sufficient drug delivery to the tumor site
2. Adequate drug penetration
3. Drug distribution at the disease site

To achieve these principles, several factors need to be considered:

- Adequate drug concentration
- Adequate drug exposure
- Drug distribution at the disease site

Figure 3. Procedure for Accessing an Implanted Peritoneal Port

Note. Illustration courtesy of Paul Hoernes, DA. Used with permission.
2006; Farma et al., 2005; Feldman et al., 2003; Los & McVie, 1990; Ozols et al., 1979). In fact, evidence has shown that IP diffusion of most drugs to serosal nodules, regardless of drug concentration or dose, is approximately 1–3 mm (Morrissey et al., 2000). Data also support the use of IP chemotherapy early in the postoperative setting because abdominal adhesions have formed and tumor cells have colonized on injured surfaces (Elias & Ouellet, 2001). Uniform distribution of chemotherapy throughout the peritoneal cavity is key and was only seen when the fluid volume was greater than 1,500 ml and sufficient to cause abdominal distention (Los & McVie). Therefore, two guiding principals for IP chemotherapy are small volume of residual disease and a chemotherapeutic agent that is mixed in a large volume of fluid.

**Administration**

As with all chemotherapy administration methods, proper personal protective equipment must be donned, including a chemotherapy impervious gown and gloves. If splashing is possible, goggles and a mask also should be worn. Chemotherapy waste containers and hazardous drug spill kits should be available in the clinical area. IP chemotherapy doses need to undergo the same rigorous safety measures, including independent double-check systems, prior to administration as with other routes of chemotherapy administration (National Institute for Occupational Safety and Health, 2004; Polovich, 2003; Polovich, White, & Kelleher, 2005).

Administration of IP chemotherapy begins with the method of how the peritoneal cavity will be accessed. The peritoneal space most commonly is accessed through the use of one of two devices: the Tenckhoff peritoneal dialysis catheter and the implanted subcutaneous transperitoneal catheter. The Tenckhoff catheter is a silicon rubber catheter with two Dacron felt cuffs to maintain placement and prevent sepsis. The intra-abdominal portion has many small holes that allow for drainage of peritoneal fluid prior to chemotherapy administration (Swenson & Erikson, 2006; Farma et al., 2005; Feldman et al., 2003; Los & McVie, 1990; Coles & Williams, 2000; Zook-Enck, 1990). Based on information from Camp-Sorrell, 2004; Coles & Williams, 2000; Zook-Enck, 1990.

### Table 1. Managing Intraperitoneal Catheter Complications

<table>
<thead>
<tr>
<th>COMPLICATION</th>
<th>ETIOLOGY</th>
<th>PREVENTIVE MEASURES</th>
<th>MANAGEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slow infusion rate of solution</td>
<td>Kinks in catheter or tubing</td>
<td>Check administration of tubing for kinks.</td>
<td>Increase height of bag, irrigate catheter with 20 ml normal saline (NS). Change patient’s position. If using a port, check needle placement and gauge. Flush with 10 ml heparin, 100 units/ml after completion of treatment, and let dwell until next treatment.</td>
</tr>
<tr>
<td></td>
<td>Fibrin sheath formation</td>
<td></td>
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<tr>
<td></td>
<td>Obstruction of catheter by adhesions, omentum, or tumor</td>
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<td></td>
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<tr>
<td>Inflow failure</td>
<td>Catheter kinks</td>
<td>Irrigate catheter well before and after administering chemotherapy and NS. Ensure that administration and drainage tubing is free of kinks.</td>
<td>Reposition patient. Flush vigorously with NS, repeat with 20 ml heparinized saline 100 units/ml if necessary. Prepare for dye study to check catheter position. If catheter is in place but unable to irrigate, instill tissue plasminogen activator (tPA). Let dwell for two to four hours. If still unsuccessful, catheter may need to be removed and therapy reevaluated.</td>
</tr>
<tr>
<td></td>
<td>Blood or fibrin clots in catheter</td>
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<tr>
<td></td>
<td>Obstruction of catheter by abdominal adhesions or omental blockage</td>
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<tr>
<td></td>
<td>Catheter migration</td>
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<td></td>
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<tr>
<td></td>
<td>Tumor progression</td>
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<tr>
<td>Outflow failure</td>
<td>Fibrin sheath formation creating a one-valve effect</td>
<td>When draining, ensure drainage bag is below insertion site.</td>
<td>Reposition patient, attempt to flush with 20 ml NS. If still unsuccessful, flush with 10 ml heparin, 100 units/ml. Attempt to withdraw a fluid sample after 30 minutes. Notify physician if no improvement occurs. Ensure patient that fluid will absorb at a rate of 1 L per 24 hours. Prepare patient for dye study to diagnose the problem. If catheter still infuses, future treatments may continue as ordered without the drainage of contents. TPA may be ordered.</td>
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<tr>
<td></td>
<td>Omental adhesion or tumor causing outflow blockage of catheter</td>
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<tr>
<td>Exit site infection</td>
<td>Break in aseptic technique when performing treatments, dressing changes, and catheter care</td>
<td>Maintain aseptic technique when accessing catheter.</td>
<td>Culture exudates. Administer oral or IV antibiotics as ordered. Increase local measures; clean exit site once or twice a day, and apply new sterile dressing. Teach patients and families how to care for the dressing at home. Allow patients to perform a return demonstration.</td>
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<tr>
<td></td>
<td>Contamination of open area at exit site (usually from skin flora)</td>
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<td></td>
<td>Immunosuppressed patient</td>
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<tr>
<td>Leakage of chemotherapy</td>
<td>Separation of port from catheter</td>
<td>Layer absorbent material around tubing connections.</td>
<td>Stop intraperitoneal infusion. Refer to institution policy or standard of practice for management of hazardous drug spill. Provide skin care around site of leakage if necessary.</td>
</tr>
<tr>
<td></td>
<td>Dislodgement of port needle from septum</td>
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<tr>
<td></td>
<td>Migration of catheter out of the peritoneum</td>
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<tr>
<td></td>
<td>Incomplete healing of tunneled tract</td>
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</tbody>
</table>

*Note. Based on information from Camp-Sorrell, 2004; Coles & Williams, 2000; Zook-Enck, 1990.*
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To prevent peritonitis, the catheter exit site must be kept sterile by daily sterile dressing changes. For a detailed step-by-step procedure for the administration of IP chemotherapy via a Tenckhoff catheter, see Figure 2. When using a Tenckhoff catheter to administer IP chemotherapy in the early postoperative period, the peritoneal space should be drained of fluid. The Tenckhoff catheter is attached to a gravity drainage system, such as the Tru-Close® drainage bag (UreSil Corporation), and left to gravity drainage for about 30 minutes prior to IP chemotherapy instillation. The measure promotes comfort and helps chemotherapy adequately coat peritoneal spaces.

The second device is an implanted peritoneal port. The port is placed in a subcutaneous pocket and typically is anchored to the fascia over the lower rib cage at the midclavicular line. The catheter is attached to the titanium port and tunneled subcutaneously with the distal end entering the peritoneal cavity. The catheter can be placed at the time of the initial debulking surgery, laparoscopically under general anesthesia, or during a separate procedure under local anesthesia. More research is needed to determine what brand of port, what type of tubing (fenestrated or single lumen), and which placement technique would result in optimal patient outcomes. A workshop held by GOG (n.d.) recommended the use of the Bard 9.6 French silicone venous access port with single lumen placed at the time of the original laparotomy in absence of a bowel resection (Alberts et al., 2002; Makhiija et al., 2001).

An implanted port is accessed with a 19–20 gauge, 90°, non-coring Huber needle, using sterile technique. The length of the needle used ranges from 1–2 in, depending on the amount of adipose tissue and depth of the port placement. Using the proper needle length is important to ensure the needle does not dislodge from the port. The catheter is checked for patency by flushing with normal saline. Correct placement of the needle is confirmed by recognition of the needle against the base of the port, ease of flushing, and inspection of site, assessing for swelling or fullness around the port. If correct placement is a concern, a catheter flow study can be done. Because of the placement of the catheter into the peritoneal cavity, no blood will return as with venous ports; recommendations are not to attempt to aspirate when accessing the port. For a detailed step-by-step procedure for accessing a peritoneal port, see Figure 3. Recommendations for managing complications of an implanted port are in Table 1. Advantages and disadvantages of using a Tenckhoff catheter and an implanted port for treatment can be found in Figure 4.

**Nursing Management of Side Effects**

Regional chemotherapy generally does not carry the same toxicities as systemic chemotherapy administration (Malloy, 1991; Pingpank, 2005). However, IP chemotherapy administration, or IP dwell, may cause some side effects, such as nausea and vomiting. Hence, patients should be premedicated with antiemetics as indicated by the emetic potential of the IP chemotherapy agent (Hydzik, 2007; Markman & Walker, 2006). Patients should avoid prior to drug administration because the IP dwell will feel more comfortable with an empty bladder. Effective nursing management is key in assisting patients to receive adequate IP chemotherapy and helping them to achieve the best clinical outcome (Hydzik). Recommendations in this article are based on methods nurses have implemented during clinical trials and in practice as well as manufacturer guidelines (Camp-Sorrell, 2004; GOG, n.d.; Hydzik; Malloy). Many of the recommendations are derived from trial and error.

To increase patients’ comfort during the IP dwell or infusion, the authors suggest warming the fluid to body temperature using an inline fluid warmer or warming the bags in a water bath. One device available is the Level 1® HOTLINE® fluid warmer (Smiths Medical), which is a single-use device that uses a temperature-controlled circulating water-heating system to warm chemotherapy to normal body temperature actively in a patient line. Another more common method of warming IP chemotherapy and bags of normal saline includes placing the bag with outer wrap intact into a warm water bath, onto a heating pad, or onto a warming blanket for 15 minutes prior to infusion. The solution is warmed to body temperature. Never place solutions in a microwave.

A frequent concern is the use of warmed IV fluid and the leaching of di (2-ethylhexyl) phthalate (DEHP) from IV bags and tubing into IV fluids. DEHP is a chemical used in IV bags and tubing that makes the plastic less stiff and more malleable. Studies have shown DEHP is a toxicant that affects the male reproductive

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**Implanted Port**

**Advantages**
- Allows for cyclic treatments over a long period of time because it is a completely implanted system
- No requirements for flushing and dressing changes at home
- Decreased risk of infection compared to an external catheter
- Decreased risk of inadvertent bowel damage because manipulation of the catheter is eliminated with this system compared to an external catheter
- No risk of accidental removal
- No restrictions on activity such as bathing or swimming
- Decreased patient anxiety and increased acceptance because of lack of external component

**Disadvantages**
- Requires surgical placement and removal
- Requires a needle stick to access
- Decrease in the infusion rate of the treatment because of the size of the needle (2 L in 30–45 min)
- Difficult to dislodge fibrin clot

**Tenckhoff Catheter**

**Advantages**
- Decreased risk of infection when temporary
- Decreased risk of bowel or visceral perforation when implanted intraoperatively
- Permits rapid instillation of fluid
- Easy to remove at bedside after IP chemotherapy dwell
- Provides easy access to drain peritoneal cavity of ascites prior to IP dwell; this may increase comfort for patients during IP dwell

**Disadvantages**
- Increased risk of infection from the external catheter component
- Requires sterile dressing
- Patients may not take a tub bath
- Must be fully covered with plastic before patient showers and dressing changed after shower completed

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*Figure 4. Advantages and Disadvantages of an Implanted Port and Tenckhoff Catheter for Intraperitoneal (IP) Chemotherapy*

*Note. Based on information from Zook-Enck, 1990.*
system. As a result, the U.S. Food and Drug Administration issued a notification to healthcare providers recommending DEHP-free medical devices to be used on high-risk patients, including male infants and pregnant women carrying male fetuses (U.S. Food and Drug Administration, 2002; Sattler, 2006).

At the completion of the IP infusion, patients should turn from side to side every 15 minutes for one to two hours. Although no research evidence to support the practice exists, it is believed to increase the distribution of chemotherapy in the peritoneal cavity. Changing patients’ positions during and after IP chemotherapy instillation and encouraging ambulation after receiving IP chemotherapy may help distribute chemotherapy and coat all peritoneal surfaces as well as promote comfort (Almadrones, 2007; Camp-Sorrell, 2004; Hydzik, 2007; GOG, n.d.; Malloy, 1991). The authors have found that encouraging patients to change positions also alleviates discomfort. Table 2 outlines symptoms and symptom management strategies for IP chemotherapy administration.

### Table 2. Nursing Management of Side Effects

<table>
<thead>
<tr>
<th>SIDE EFFECTS</th>
<th>PREVENTION</th>
<th>MANAGEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiety</td>
<td>Ensure patients adequately understand procedure and agents involved.</td>
<td>Administer antianxiety medication. Provide educational and emotional support for patients.</td>
</tr>
<tr>
<td>Shortness of breath</td>
<td>Elevate the head of the bed.</td>
<td>Administer supplemental oxygen if severe.</td>
</tr>
<tr>
<td>Anorexia, nausea, or vomiting</td>
<td>Administrator scheduled antiemetics based on chemotherapy agent. Instruct patients to eat smaller, frequent meals. Assess patients’ risk factors.</td>
<td>Have patients eat a high-calorie and high-protein diet. Administer antiemetics for delayed nausea and vomiting.</td>
</tr>
<tr>
<td>Abdominal pain or discomfort</td>
<td>Ensure peritoneal space has been drained prior to infusion.</td>
<td>Evaluate possible causes of pain. Administer ordered pain and antianxiety medications. Encourage frequent position changes during infusion and ambulation after infusion. Ensure patient is wearing nonrestrictive clothing.</td>
</tr>
<tr>
<td>Constipation</td>
<td>Conduct a thorough gastrointestinal assessment.</td>
<td>Increase fluid intake. Administer stool softeners or laxatives. Encourage ambulation.</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>Consult dietitian; a low-residue diet may help.</td>
<td>Increase intake of fluids. Administer antidiarrheal agents.</td>
</tr>
<tr>
<td>Infection</td>
<td>Monitor for symptoms of infection (e.g., fever, chills, elevated white blood cell count). Use aseptic technique when accessing intraperitoneal (IP) catheter.</td>
<td>Obtain cultures. Administer antibiotic therapy. Remove catheter if necessary. Instruct patients to report signs and symptoms of infection.</td>
</tr>
<tr>
<td>Dehydration or electrolyte imbalance</td>
<td>Monitor laboratory work for hypomagnesemia, hypocalcemia, and hypokalemia. Emphasize fluid intake of 2 L for three days. Assess for signs and symptoms of electrolyte imbalance.</td>
<td>Administer supplemental IV fluids and electrolytes. Provide symptom management as with IV chemotherapy.</td>
</tr>
<tr>
<td>Chemical peritonitis</td>
<td>Warm IP solution prior to treatment. Administer analgesics prior to treatment.</td>
<td>Increase dilution of drugs. Use a slow rate of infusion. Obtain IP fluid specimen for culture to rule out microbial peritonitis.</td>
</tr>
</tbody>
</table>

*Note. Based on information from Almadrones, 2007; Hydzik, 2007; Swenson & Erikson, 1986; Zook-Enck, 1990.*

Staff and Patient Education

Nursing plays an integral role in the education, administration, and coordination of care for patients who are receiving IP hyperthermic chemotherapy and IP chemotherapy. The key to successful implementation of IP chemotherapy in a hospital or clinic is the development of procedures and standards of care. Guidelines provide a basis for the specialized nursing care that is required for patients who are receiving IP chemotherapy and promote continuity of care. To reduce errors, guidelines should include the development of standard physician order sets for IP chemotherapy that are preprinted and in chronological order. Many resources exist to aid nurses in the development of standards of care from organizations such as the Oncology Nursing Society, Infusion Nurses Society, and GOG. See Figure 5 for a list of resources. Standards of care become the basis from which to educate all staff in the safe administration of IP chemotherapy. Senior staff can be enlisted to mentor and monitor new staff.

Patients and families also are an essential part of the team. Ideally, conducting an educational session prior to the first IP infusion would assist patients in being prepared for the first treatment and alleviate some anxiety. Patients’ abdomens will be enlarged because of IP fluid; instructing patients to wear loose-fitting clothes, such as pants with an elastic or drawstring waist, will ensure they are able to dress in their own clothes when they leave the clinic. Key components in patient education include:

- Rationale for treatment
- Information on the insertion of a peritoneal implanted port or Tenckhoff catheter
Gynecologic Oncology Group: www.gog.org
• Patient educational materials
• Educational materials for healthcare professionals
• Guides for intraperitoneal (IP) port placement
• PowerPoint® (Microsoft Corporation) presentations on IP chemotherapy
• Published articles
• National Cancer Institute announcement
• Recent statements by professional societies on IP chemotherapy
• Frequently asked questions

Infusion Nurses Society: www.ins1.org
• Infusion Nursing Standards of Practice

Johns Hopkins Ovarian Cancer Center: www.ovariancancercenter.org
• Intraperitoneal Chemotherapy for Ovarian Cancer: A Nursing Management Perspective

Oncology Nursing Society: www.oncs.org
• Access Device Guidelines: Recommendations for Nursing Practice and Education

Society of Gynecologic Oncologists: www.sgo.org
• Position statement on use of IP chemotherapy

Figure 5. Resources for Nursing and Patient Education

• Chemotherapeutic agents being used, including dosing and schedule
• Potential side effects
• Management of side effects
• Reportable signs and symptoms of complications
• Contact numbers for the healthcare team.

Instructions should be given verbally and in writing. Patient information sheets or brochures that have been developed by the team are an excellent resource for patients and their families. Detail and pace of instructions will vary depending on patients’ readiness to learn and their ability to comprehend. Patients and family members should be provided the opportunity to practice any skills, such as dressing changes, prior to leaving the hospital or clinic. Conducting support groups or pairing of patients who are receiving IP chemotherapy provides an excellent resource for new patients and their families. Nurses should be encouraged to share best practices and ideas regarding patient education. By providing education, nurses can help alleviate anxiety about treatments, increase patient adherence, reduce complications from the side effects of treatment, and assist in ensuring positive outcomes.

Conclusion

The goal of IP chemotherapy is to effectively destroy tumor cells while sparing healthy cells. IP administration allows for administration of higher concentrations of chemotherapy with decreased systemic toxicities (Otto, 1995; Pingpank, 2005; Swenson & Erikson, 1986). The January 2006 NCI clinical recommendation for the use of IP chemotherapy in ovarian cancer has implications for oncology nurses. Additionally, IP chemotherapy is used with some frequency in nonovarian peritoneal cancers. Hence, nurses need to be familiar with the treatment modality to decrease the risk of adverse events, promote patient comfort, and administer IP chemotherapy safely. To accomplish those goals, standardization of nursing clinical care is essential. Effective nursing management of IP therapy and its side effects can decrease potential complications and impact the QOL of patients receiving this treatment modality.

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References


Feldman, A.L., Libutti, S.K., Pingpank, J.F., Bartlett, D.L., Beresneva,


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**STATEMENT OF OWNERSHIP, MANAGEMENT, AND CIRCULATION**

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