Individualized Colorectal Cancer Treatment in 2009: The Role of the Oncology Nurse in the Delivery of Quality Care

Release date: November 13, 2009 ▸ Expiration date: November 12, 2010 ▸ Estimated time to complete activity: 1 hour 13 mins ▸ Educational credits: 1.2 contact hours

Inside this issue ▸▸▸

Sponsored by:

IMER
INSTITUTE FOR MEDICAL EDUCATION & RESEARCH®

Target Audience
This activity has been designed to meet the educational needs of oncology nurses.

Purpose
To educate nurses on the latest treatment and nursing management strategies for patients with colorectal cancer (CRC).

Program Overview
Due to remarkable data presented in 2008, CRC is one of the first solid tumor types for which clinicians can individualize treatment approaches based on genetic features of the patient. A gastrointestinal oncology physician thought leader will present topics such as the influence of molecular diagnostics on treatment choices and the practical implications in the clinical setting. Following this section, gastrointestinal oncology nursing thought leaders will discuss four case studies of patients with metastatic CRC.

Learning Objectives
Upon completion of this program, participants should be better able to:

- Outline pathology and staging criteria for CRC
- Describe the latest research on the application of molecular biomarkers/genomics in clinical decision-making
- Outline evidence-based recommended treatment guidelines for adjuvant therapy for patients with high-risk stage II disease
- Evaluate emerging data on the use of neoadjuvant and adjuvant therapy for patients with liver- or lung-limited metastases
- Analyze nursing practice research relating to the administration of therapy as well as assessment and management of treatment-related toxicities of commonly used metastatic CRC regimens
- Incorporate performance/functional status assessment into the nursing care plan
- Plan patient education regarding participation in clinical trials

This activity is supported by an independent educational grant from Genentech BioOncology.

The Art of Individualized Colorectal Cancer Treatment

Heinz-Josef Lenz, MD, FACP
Norris Comprehensive Cancer Center, University of Southern California, Keck School of Medicine, Los Angeles

The use of adjuvant chemotherapy in patients with stage II colorectal cancer (CRC) remains controversial due to the relatively high baseline cure rate with resection alone (Chau & Cunningham, 2006). Although patients with stage II disease and no risk features do not appear to benefit from adjuvant chemotherapy, there is a subgroup of "high-risk" patients who demonstrate benefit. For patients with stage III CRC, treatment with leucovorin, fluorouracil, and oxaliplatin (FOLFOX) has emerged as the standard adjuvant chemotherapy based on original and 6-year updated data from the Multicenter International Study of Oxaliplatin/Fluorouracil/Leucovorin in the Adjuvant Treatment of Colon Cancer (MOSAIC) trial (Andre et al, 2004; de Gramont et al, 2007). In metastatic CRC, neoadjuvant therapy has been shown to be effective in downstaging select patients to resectable status and more favorable prognosis. The focus of recent clinical investigations has been on how to identify patients who are at risk for tumor recurrence such as those with MSI, 18q deletion, and others (Andre et al, 2009). Emerging novel molecular prognostic and predictive markers such as microsatellite instability, *KRAS* and epidermal growth factor receptor (EGFR) ligand expression are allowing clinicians to better characterize patients and determine who will benefit from a selected therapy (Adam et al, 2007).

Microsatellite Instability

Genetic instability has been recognized as an underlying cause of carcinogenesis. Mutations in *mismatch repair* (*MMR*) genes lead to the inability of the *MMR* system to correct DNA replication errors (Narayan & Roy, 2003). Deficient *MMR* results in the accumulation of mutations mainly at short, tandem-like repetitive sequences known as microsatellites, giving rise to microsatellite instability (MSI). Tumors with MSI have been associated with a decreased likelihood of metastasizing to lymph nodes and distant organs and a favorable survival profile (Gryfe et al, 2000; Ribic et al, 2003). However, adjuvant therapy has not demonstrated benefit for patients with high frequency MSI. Ribic and colleagues (2003) evaluated 570 tissue specimens (16.7% with MSI) from patients with stage II or III CRC. Results showed that MSI patients who did not receive adjuvant therapy had superior 5-year overall survival (OS) compared to MSI patients who did receive adjuvant therapy (88% vs. 70.7%, respectively). In patients without MSI, adjuvant chemotherapy improved 5-year OS (75.5% vs. 68.4%).

Koopman and colleagues (2007) evaluated MSI as a predictor of drug response and OS in previously untreated patients with advanced CRC. Patients were randomly assigned to first-line capecitabine, second-line irinotecan, and third-line capecitabine/oxaliplatin (CapOx) or first-line capecitabine/irinotecan (CapIri) and second-line CapOx therapy. Among the 461 patients involved in the study, disease control was 58% in the 12 patients with MSI and 83% in the 449 patients without MSI ($p = .03$). The median OS in patients with MSI was 7 months versus 18 months in patients without MSI (Koopman et al, 2007). These findings suggest that MSI is a predictor of treatment effectiveness and that MSI testing should be conducted routinely to direct rational choice of therapy.

Sargent and colleagues (2008) evaluated *MMR* deficiency as a predictor of survival benefit from adjuvant therapy in patients with stage II or III disease. Among the 341 tissue specimens examined, 47 (13.8%) demonstrated deficient *MMR*. Adjuvant therapy had a significant beneficial effect on OS (hazard ratio [HR] = .69; $p = .047$) and disease-free survival (DFS; HR = .59; $p = .004$) in patients with proficient *MMR* tumors. Patients with deficient *MMR* who received adjuvant therapy demonstrated no trend toward improved OS or DFS. Patients with stage II CRC and MSI had decreased 5-year OS compared to untreated patients (75% vs. 93%; Figures 1 and 2; Sargent et al, 2008). Among stage III patients, MSI was not a factor in response to chemotherapy and subsequent 5-year OS

(Sargent et al, 2008). Accordingly, the American Society of Clinical Oncology has issued a guideline recommending against chemotherapy in patients with stage II CRC with MSI (Ananda, 2009; Benson et al, 2004).

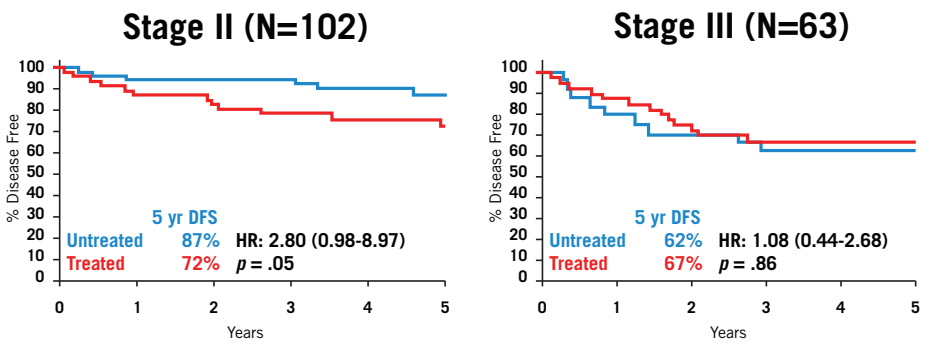
The Eastern Cooperative Oncology Group has initiated the E5202 trial, which defines high-risk stage II disease according to allelic loss of chromosome 18q and microsatellite stability (Figure 3). These characteristics are known to be prognostic markers in CRC, correlating with poorer outcome (Lurje, Zhang, & Lenz, 2007). The E5202 trial is evaluating patients with stage II disease for these two prognostic markers. Those patients with retention of chromosome 18q or MSI are considered low risk and receive no treatment. However, those with loss of 18q and microsatellite stability are randomly assigned to FOLFOX with or without bevacizumab.

KRAS

KRAS mutations occur in approximately 40% of patients with CRC (Fodde, Smits, & Clevers, 2001). *KRAS* status is either wild type (WT) or mutant type (MT). Across multiple clinical trials, *KRAS* WT disease has been associated with superior response rates, OS, and progression-free survival (PFS) compared to *KRAS* MT disease (Table; Lièvre et al, 2006; Di Fiore et al, 2007; De Roock et al, 2007; Lièvre et al, 2008). The identification of *KRAS* mutation status has become an important factor in treatment decision-making, particularly among patients who are candidates for EGFR inhibitors.

An analysis of the influence of *KRAS* mutation status on the outcomes of patients with advanced CRC was assessed in the Cetuximab Combined With Irinotecan in First-Line Therapy for Metastatic Colorectal Cancer (CRYSTAL) trial. Archived tumor material samples from 540 of 1,198 patients were stratified for *KRAS* mutation status. *KRAS* mutations were found in 35.6% of patients with evaluable samples (van Cutsem et al, 2008). The addition of cetuximab to leucovorin, fluorouracil, and irinotecan (FOLFIRI) in patients with *KRAS* WT produced superior PFS (HR = .68; p = .0167) and response rate (59.3% vs. 43.2%; p = .0025) compared to patients with *KRAS* MT (van Cutsem et al, 2008). Furthermore, patients with *KRAS* MT failed to show any benefit with cetuximab therapy. Thus, testing for *KRAS* mutations predicts who is not likely to benefit from treatment with cetuximab. Amado and colleagues (2008) demonstrated a similar relationship between the presence of *KRAS* mutation and lack of response with single-agent panitumumab.

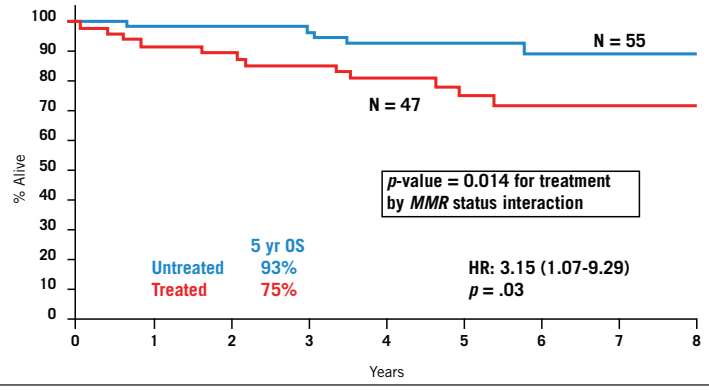
FIGURE 1 Microsatellite Stability and Chemotherapy: Disease-Free Survival



(Sargent et al, 2008)

Treated patients with stage II colorectal cancer and microsatellite instability had decreased 5-year DFS compared to untreated patients.
HR = hazard ratio; DFS = disease-free survival.

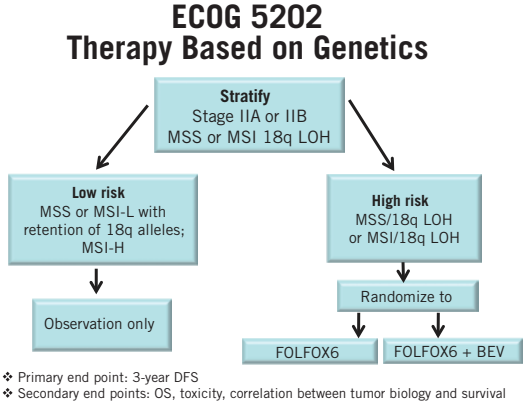
FIGURE 2 Microsatellite Stability and Chemotherapy: Overall Survival



(Sargent et al, 2008)

Patients with stage II colorectal cancer and microsatellite instability had decreased 5-year overall survival compared to untreated patients.
MMR = mutations in *mismatch repair*; OS = overall survival; HR = hazard ratio.

FIGURE 3 ECOG 5202 Trial Design



(Benson, 2007)

The E5202 trial is evaluating patients with stage II disease for allelic loss of chromosome 18q and microsatellite stability.
ECOG = Eastern Cooperative Oncology Group; MSI-L = microsatellite instability, low; MSS = microsatellite stability; LOH = loss of heterozygosity; DFS = disease-free survival; OS = overall survival; FOLFOX = leucovorin, fluorouracil, and oxaliplatin; BEV = bevacizumab; MSI-H = microsatellite instability high.

TABLE *KRAS* **Status: Predictive Value for Survival**

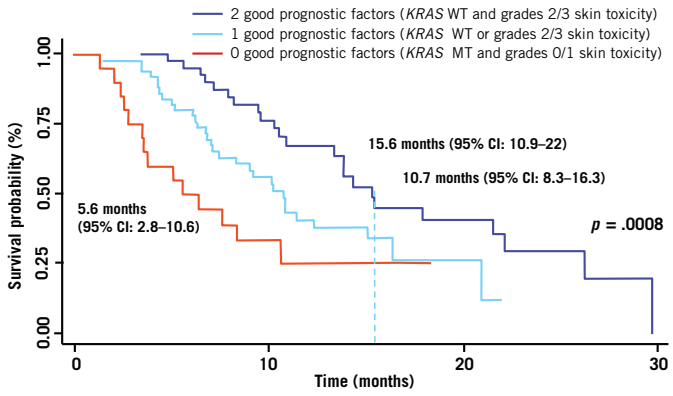
	n	*KRAS* MT (%)	ORR (all patients: %)	ORR (MT;%)	*KRAS* WT vs. *KRAS* MT (evaluable population) PFS weeks	OS (months)
Lièvre[a]	30	43	37	0	—	16 vs. 7 (p = .016)
Di Fiore	59	27	20	0	3.0 vs. 5.5 (p < .015)	—
De Roock	113	42	25	0	24 vs. 12 (p = .074)	10.7 vs. 6.8 (p = .020)
Lièvre[b]	89	27	29	0	31.4 vs. 10.1 (p = .0001)	14.3 vs. 10.1 (p = .026)

([a]Lièvre et al, 2006; Di Fiore et al, 2007; De Roock et al, 2007; [b]Lièvre et al, 2008)

The identification of *KRAS* mutation status has become an important factor in treatment decision-making, particularly among patients who are candidates for epidermal growth factor receptor inhibitors.

WT = wild type; MT = mutant type; ORR = overall response rate; PFS = progression-free survival; OS = overall survival.

FIGURE 4 **Overall Survival According to *KRAS* MT and Skin Toxicity**



(Lièvre et al, 2008)

The level of skin toxicity associated with epidermal growth factor receptor inhibitors has been shown to be predictive of overall survival.

WT = wild type; MT = mutant type; CI = confidence interval.

Patients with metastatic CRC were randomly assigned to either best supportive care (BSC) or panitumumab and BSC. Tumor DNA was used to determine *KRAS* status and was available in 208 patients who received panitumumab and 219 patients receiving BSC. Among patients who received panitumumab, those with *KRAS* MT were less likely to respond than those with *KRAS* WT (0% vs. 17%). Additionally, in patients with *KRAS* MT, PFS was not different among patients receiving panitumumab compared to BSC (7.4 weeks vs. 7.3 weeks, respectively). However, in patients with *KRAS* WT, PFS was longer in patients receiving panitumumab compared to BSC (12.3 weeks vs. 7.3 weeks, respectively). OS was also prolonged in patients with *KRAS* WT, regardless of therapy.

Hurwitz and colleagues (2009) evaluated phase III trial data to determine the clinical benefit of bevacizumab in metastatic CRC relative to *KRAS* mutation status. Patients had received the agent in combination with irinotecan and 5-FU/LV (IFL). The data suggested that bevacizumab also had some benefit in patients with *KRAS* MT.

EGFR

High levels of EGFR ligand expression have been shown to predict increased treatment response to EGFR inhibitors (Khambata-Ford et al, 2007). Tumors expressing high levels of EGFR ligands are highly dependent on the epidermal growth factor pathway; therefore, EGFR inhibitors are more effective. Tejpar and colleagues (2008) evaluated EGFR expression and *KRAS* status in patients receiving cetuximab. In patients with *KRAS* WT, tumors with high expression levels of EGFR were associated with increased OS and PFS compared to tumors with low expression levels of EGFR ligands. In *KRAS* MT, EGFR ligand expression did not have predictive value. *KRAS* WT with low EGFR ligand expression was associated with similar outcomes as *KRAS* MT.

In a subset of 58 patients from the panitumumab trial by Amado and colleagues (2008), the relationship between tumor response and EGFR gene copy (evaluated by either the number of EGFR copies/nucleus and/or the percentage of cells displaying chromosome 7 polysomy) was evaluated. Patients with 2.47 or more EGFR copies/nucleus and/or 43% of cells or higher displaying chromosome 7 polysomy had a 30% response rate compared to 0% with lower EGFR copies/nucleus and percentage of cells displaying chromosome 7 polysomy (Sartore-Bianchi et al, 2007). Germline polymorphisms in the EGFR gene may help to explain the difference in response (Graziano et al, 2008). Investigations are ongoing regarding further elucidating the importance of EGFR gene sequence and copy number.

The level of skin toxicity associated with EGFR inhibitors has been shown to be predictive of OS (Figure 4; Lièvre et al, 2008). Grades 2/3 skin toxicity and *KRAS* WT were shown to be predictive of longest survival (15.6 months; 95% CI: 10.9–22 months). Lowest survival was associated with *KRAS* MT and grade 0/1 skin toxicity (5.6 months; 95% CI: 2.8–10.6). As EGFR is expressed in the skin, increased skin toxicity suggests an increased likelihood that EGFR antibodies are effectively binding to the EGFR on the tumor cells.

CONCLUSION

CRC is now recognized to be a heterogenous disease in which molecular markers such as MSI, *KRAS*, and EGFR ligand status have implications in treatment outcomes. MSI testing may become important in determining the appropriate use of adjuvant chemotherapy in patients with stage II disease, whereas *KRAS* status has become essential in determining treatment for patients with metastatic disease. Ultimately, the goal of individualized CRC treatment-based molecular markers is to enhance treatment response rates so that more patients become candidates for curative resection and improved prognosis. ●

References

Adam R, Ajani JA, Alberts S, et al (2007). Accomplishments in gastrointestinal oncology in 2007. *Gastrointestinal Cancer, 2*(3), S37–S41.

Amado RG, Wolf M, Peeters M, et al (2008). Wild-type *KRAS* is required for panitumumab efficacy in patients with metastatic colorectal cancer. *J Clin Oncol, 26*(10), 1626–1634.

Ananda S (2009). Adjuvant chemotherapy for stage II and stage III colon cancer—What is happening in routine practice? [Abstract]. *J Clin Onc 27* 15S(May 20 Suppl.), Abstract e15046.

Andre T, Boni C, Mounedji-Boudiaf L, et al (2004). Oxaliplatin, fluorouracil, and leucovorin as adjuvant treatment for colon cancer. *New Eng J Med, 350,* 2343–2351.

Andre T, Boni C, Navarro M, et al (2009). Improved overall survival with oxaliplatin, fluorouracil, and leucovorin as adjuvant treatment in stage II or III colon cancer in the MOSAIC trial. *J Clin Onc, 27*(19), 3109–3116.

Benson AB (2007). E5202: The GI intergroup strategy for stage II colon cancer patients. *Onc Iss*, 20–21.

Benson AB III, Schrag D, Somerfield MR, et al (2004). ASCO recommendations on adjuvant chemotherapy for stage II colon cancer. *J Clin Onc 22*, 3408–3419.

Chau I, & Cunningham D (2006). Adjuvant therapy in colon cancer—what, when, and how? *Annals of Onc 17*, 1347–1359.

De Gramont A, Boni C, Navaroo M, et al (2007). Oxaliplatin/5-FU/LV in adjuvant colon cancer. Updated efficacy results of the MOSAIC trial, including survival, with a median follow-up of 6 years. *J Clin Onc, 25* (June 20 Suppl.) Abstract 4007.

De Roock W, Piessevaux H, De Schutter J, et al (2007). *KRAS* wild-type state predicts survival and is associated to early radiological response in metastatic colorectal cancer treated with cetuximab. *Ann Oncol, 19*(3), 1–8.

Di Fiore F, Blanchard F, Charbonnier F, et al (2007). Clinical relevance of *KRAS* mutation detection in metastatic colorectal cancer treated by cetuximab plus chemotherapy. *Br J Cancer, 96*(8), 1166–1169.

Fodde R, Smits R, & Clevers H (2001). APC, signal transduction and genetic instability in colorectal cancer. *Nat Rev Cancer, 1*(1), 56–67.

Graziano F, Ruzzo A, Loupakis F, et al (2008). Pharmacogenetic profiling for cetuximab plus irinotecan therapy in patients with refractory advanced colorectal cancer. *J Clin Oncol 26*(9), 1427–1434.

Gryfe R, Kim H, Hsieh ET, et al (2000). Tumor microsatellite instability and clinical outcome in young patients with colorectal cancer. *N Eng J Med 342*(2), 69–77.

Hurwitz HI, Yi J, Ince W, et al (2009). The clinical benefit of bevacizumab in metastatic colorectal cancer is independent of *KRAS* mutation status: Analysis of a phase III study of bevacizumab with chemotherapy in previously untreated metastatic colorectal cancer. *Oncologist, 14*(1), 22–28.

Khambata-Ford S, Garret CR, Meropol NJ, et al (2007). Expression of epiregulin and amphiregulin and K-Ras mutation status predict disease control in metastatic colorectal cancer patients treated with cetuximab. *J Clin Oncol, 25*(22), 3230–3237.

Koopman M, Kortman GA, Mekenkamp L, et al (2007). Use of microsatellite instability in non-hereditary advanced colorectal cancer to predict response to chemotherapy and overall survival: A study of the Dutch Colorectal Cancer Group [Abstract]. *J Clin Oncol, 25*(18 Suppl), Abstract 4118.

Lièvre A, Bachet JB, Boige V, et al (2008). *KRAS* mutations as an independent prognostic factor in patients with advanced colorectal cancer treated with cetuximab. *J Clin Oncol, 26*(3), 374–379.

Lièvre A, Bachet JB, Le Corre D, et al (2006). *KRAS* mutation status is predictive of response to cetuximab therapy in colorectal cancer. *Cancer Res, 66*(8), 3992–3995. Lurje G, Zhang W, & Lenz HF (2007). Molecular prognostic markers in locally advanced colon cancer. *Clin Colorectal Cancer 6*(10), 683–690.

Narayan S, Roy D. (2003). Role of APC and DNA *mismatch repair* genes in the development of colorectal cancer. *Mol Cancer 2*, 41.

Ribic C, Sargent D, Moore MJ, et al. (2003). Tumor microsatellite-instability status as a predictor of benefit from fluorouracil-based adjuvant chemotherapy for colon cancer. *N Engl J Med 349*(3), 247–257.

Sargent DJ, Marsoni S, Thibodeau N, et al (2008). Confirmation of deficient *mismatch repair* as a predictive marker for lack of benefit from 5-FU based chemotherapy in stage II and III colon cancer: A pooled molecular reanalysis of randomized chemotherapy trials. *J Clin Oncol, Proc Am Soc Clin Oncol, 26*(May 20 Suppl.), Abstract 4008.

Sartore-Bianchi A, Moroni M, Veronese S, et al (2007). Epidermal growth factor receptor gene copy number and clinical outcome of metastatic colorectal cancer treated with panitumumab. *J Clin Oncol 25*(22), 3238–3245.

Tejpar S, De Roock W, Biesmans S, et al (2008). High amphiregulin and epiregulin expression in *KRAS* wild type colorectal primaries predicts response and survival benefit after treatment with cetuximab and irinotecan for metastatic disease. *Proc Am Soc Clin Oncol GI Cancers Symp*, Abstract 411.

Van Cutsem E, Lang I, D'haens G, et al (2008). *KRAS* status and efficacy in the first-line treatment of patients with metastatic colorectal cancer treated with FOLFIRI with or without cetuximab: The CRYSTAL experience. *J Clin Oncol, 26*(May 20 Suppl.), Abstract 2.

Case Study

Case Presentation: High-Risk Stage II Colorectal Cancer

Bridget E. O'Brien, ND, APRN, FNP-BC, AOCNP®, Northwestern Medical Faculty Foundation, Chicago

Ms. S was a 61-year-old woman with a 2-month history of occasional blood in her stool. Colonoscopy showed a mass in the sigmoid colon but no metastatic disease. She underwent resection and pathological evaluation revealed a well-differentiated adenocarcinoma, close margins with vascular invasion, and 0/10 positive lymph nodes. Her carcinoembryonic antigen (CEA) level was 3.0. Due to these high-risk features, Ms. S was started on modified FOLFOX6 (oxaliplatin 85 mg/m^2 over 2 hours on Day 1, leucovorin [LV] 400 mg/m^2 on Day 1, and 5-fluorouracil [5-FU] 400 mg/m^2 intravenous bolus followed by 2,000 mg/m^2 continuously intravenously over 46 hours) every 2 weeks for 12 weeks. She tolerated therapy well but returned to the clinic after her first dose with complaints of persistent nausea and several mouth sores (National Comprehensive Cancer Network [NCCN], 2009a).

Treatment

Treatment of patients with stage II colorectal cancer may include observation, adjuvant therapy, or enrollment in a clinical trial (NCCN, 2009a). Observation following resection involves a history and physical examination every 3 months for 2 years, followed by every 6 months for 5 years total follow-up. CEA should be monitored at the same intervals. Computed tomography should be performed annually for the first 3 years after resection in patients at increased risk for recurrence. Colonoscopy should be performed 1 year after resection. If colonoscopy cannot be completed during surgery due to bowel obstruction or related factors, a full colonoscopy should be performed sooner at 3 to 6 months after resection.

Patients with high-risk factors for recurrence may be candidates for adjuvant therapy (Table 1). Grade 3 or 4 tumor histology is a marker for poorly differentiated tumors. Lymphatic or vascular invasion can indicate micrometastases. Inadequate sampling of lymph nodes can increase a patient's risk of recurrence (NCCN, 2009a), as evidenced by a recent study that demonstrated 5-year survival was 73% for removal of 1 to 10 lymph nodes compared to 87% for removal of more than 20 nodes (Table 2; Le Voyer et al, 2003). In addition, patients with loss of heterozygosity for 18q and low microsatellite instability have been shown to be at high risk for recurrence (Chan et al, 2008; Choi et al, 2002).

The American College of Pathologists has established consensus guidelines regarding prognostic factors for colorectal cancer (Table 3). Extent of tumor, nodal involvement, hematologic or lymphatic invasion, and postoperative residual tumors have the strongest evidence as prognostic factors (Compton et al, 2000; Zlobec & Lugli, 2008).

Side-Effect Management

Side effects commonly associated with the FOLFOX regimen include nausea and vomiting and stomatitis. Oncology nursing management of nausea and vomiting may involve the use of a 5-HT3 antagonist with dexamethasone, aprepitant, or fosaprepitant. (NCCN, 2009b; Kris et al, 2006). Follow-up with patients is necessary to assess for hydration and nutritional status and to assure symptom resolution. Adjunct modalities that may be effective include acupuncture, acupressure, guided imagery, music therapy, progressive muscle relaxation, and psychoeducational support (Tipton et al, 2007). Anecdotal evidence also supports the use of exercise, hypnosis, massage, acustimulation with wristbands, and ginger.

Table 1 High-Risk Factors for Colorectal Cancer Recurrence

Grade 3/4 histology
Lymphatic or vascular invasion
Presents with bowel obstruction
< 12 lymph nodes examined (inadequate sample)
Stage IIB (T4 N0 M0) – large mass
Stage IIA with localized perforation or close, indeterminate, or positive margins

(NCCN, 2009a)

Patients with high-risk factors for recurrence may be candidates for adjuvant therapy.

Table 2 Effect of Nodal Removal on Survival

Node Status	No. Removed	5-Year Overall Survival
N0	1–10 > 20	73 87
N1	1–10 > 40	67 90
N2	< 35 > 35	51 71

(Le Voyer et al, 2003)

Increased node removal improves survival status in colorectal cancer.

For stomatitis, oral care protocols are recommended. Typically, cryotherapy is recommended for use with bolus 5-FU, but because this patient is receiving FOLFOX, which includes oxaliplatin, cryotherapy is contraindicated. Iseganan, chlorhexidine, sucralfate, and granulocyte macrophage colony-stimulating factor mouthwash are not recommended (Harris et al, 2008). If mouth sores persist, chemotherapy should be withheld and subsequent doses reduced, particularly in the case of 5-FU. In addition, patients should be instructed to practice good oral hygiene including brushing all surfaces for 90 seconds and flossing daily, use bland mouth rinses four times daily (1 teaspoon salt and soda in 1 pint of water), maintain adequate hydration, and avoid alcohol, tobacco, and irritating foods.

CONCLUSION

Oncology nurses play a unique role in the management of patients with stage II CRC who are at high risk for recurrence. Patients with high-risk factors for recurrence may be candidates for adjuvant therapy. Prompt interventions for treatment-related side effects such as nausea and vomiting and stomatitis will help patients obtain the maximum benefit from a prescribed treatment. ●

TABLE 3 Evidence-Based Prognostic Factors in Colorectal Cancer: College of American Pathologists

Category I (definitely proved)	Category IIA (extensively studied)	Category IIB (promising in multiple studies)	Category III (not significantly studied)
• Local extent of tumor, pathologic nodes, blood or lymphatic invasion, positive margins	• Tumor grade • Radial margin status • Residual tumor status post neoadjuvant treatment	• Histologic type • Histologic feature associated with microsatellite instability (lymphoid response to tumor, mucinous histology) • Microsatellite instability high degree (MSI-H) • Loss of heterozygosity 18q • Tumor border (infiltrating vs. pushing)	• DNA content • Most molecular markers • Perineural invasion • Microvessel density • Tumor-associated proteins or carbohydrates • Peritumoral fibrosis • Peritumoral inflammatory response • Focal neuroendocrine differentiation • Proliferation indices

(Compton et al, 2000; Zlobec & Lugli, 2008)

The American College of Pathologists has established consensus guidelines regarding prognostic factors for colorectal cancer.

References

Chan JA, Meyerhardt JA, Niedzwiecki D, et al (2008). Association of family history with cancer recurrence and survival among patients with stage III colon cancer. *JAMA, 299*(21), 2515–2523.

Choi SW, Lee KJ, Bae YA, et al (2002). Genetic classification of colorectal cancer based on chromosomal loss and microsatellite instability predicts survival. *Clin Cancer Res, 8*(7), 2311–2322.

Compton CC, Fielding P, Burgart LJ, et al (2000). Prognostic factors in colorectal cancer. College of American Pathologists Consensus Statement 1999. *Arch Pathol Lab Med, 124*(7), 979–994.

Harris DJ, Eilers J, Harriman A, et al (2008). Putting evidence into practice: Evidence-based interventions for the management of oral mucositis. *Clin J Oncol Nurs, 12*(1), 141–152.

Kris MG, Hesketh PJ, Somerfield MR, et al (2006). American Society of Clinical Oncology guideline for antiemetics in oncology: Update 2006. *J Clin Oncol, 24*(18), 2932–2947.

Le Voyer TE, Sigurdson ER, Hanlon AL, et al (2003). Colon cancer survival is associated with increasing number of lymph nodes analyzed: A secondary survey of Intergroup Trial INT-0089. *J Clin Oncol, 21*(15), 2912–2919.

National Comprehensive Cancer Network (2009a). *Clinical practice guidelines in oncology. Colon cancer.v.2.2009*. Retrieved April 8, 2009, from http://www.nccn.org/

National Comprehensive Cancer Network (2009b). *Clinical practice guidelines in oncology. Antiemesis.v.3.2009*. Retrieved April 8, 2009, from http://www.nccn.org/

Tipton JM, McDaniel R, Barbour L, et al (2007). Putting evidence into practice: Evidence-based interventions to prevent, manage, and treat chemotherapy-induced nausea and vomiting. *Clin J Oncol Nurs, 11*(1), 69–78.

Zlobec I, & Lugli A (2008). Prognostic and predictive factors in colorectal cancer. *Postgrad Med J, 84*(994), 403–411.

Case Study

Case Presentation: Stage III Colorectal Cancer Treated With Curative Intent

Suzette C. Walker, MSN, RN, FNP, University of Michigan Comprehensive Care Center, Ann Arbor

Mr. T was a 68-year-old man with a history of stage III colorectal cancer (CRC) treated in 2006. He underwent resection in March 2006 followed by 6 months of leucovorin, fluorouracil, and oxaliplatin (FOLFOX) and completed treatment in October 2006. In April 2009, he presented with complaints of right upper quadrant discomfort. Laboratory testing revealed an increase in liver function tests and a carcinoembryonic antigen level of 15.2. A right lobe liver mass, 7.0 by 8.2 cm, was visible on computed tomography scan (Figure). The positron emission tomography scan showed uptake in the liver lesion.

The multidisciplinary team decided to proceed with liver resection followed by adjuvant chemotherapy. Mr. T received FOLFOX and bevacizumab starting 6 weeks after liver resection and treatment was planned for 6 months. After six cycles, Mr. T developed numbness and pain in his hands and feet lasting between treatments. He also began having difficulty buttoning his shirts.

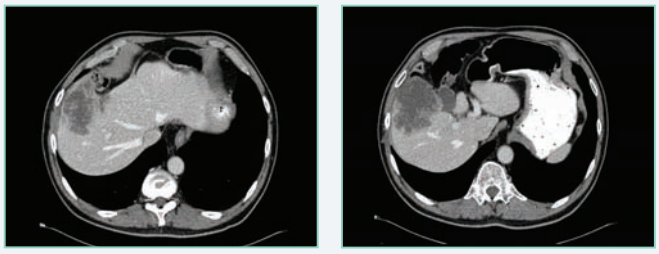
Hepatic Metastases in CRC

The liver is the most common site of metastases and cause of death in CRC (NCCN, 2009). Liver metastases are frequently asymptomatic and therefore many patients present with multiple tumors. Hepatic resection is the treatment of choice for resectable liver metastases from CRC. Resection criteria include: level of hepatic reserve, extent and distribution of disease, patient health status and comorbid conditions (eg, cirrhosis, hepatitis), condition of the parenchyma, prognosis if resected, prior chemotherapy and response, and status of primary colorectal tumor (Mullen & Vauthey, 2006). Up to 71% of tumors are unresectable due to location or inadequate hepatic reserve.

Five-year survival for patients who are candidates for resection is approximately 60%. The use of chemotherapy in metastatic disease has increased the number of patients with metastases who are able to undergo curative resection. After chemotherapy, an additional 10% of patients with widely metastatic CRC are able to undergo curative resection (Adam et al, 2004). Optimal care for patients with stage IV CRC includes frequent evaluation by surgeons for resection potential. NCCN guidelines for resectable metastases recommend three surgical approaches: colectomy with synchronous liver resection, neoadjuvant chemotherapy followed by synchronous or staged colectomy and resection of metastases, or colectomy followed by chemotherapy and staged resection of metastatic disease (NCCN, 2009).

Figure **CT Scan Reveals Right Lobe Liver Mass**

- A CT scan reveals a right lobe liver mass, 7.0 x 8.2 cm
- PET scan only shows uptake in colon mass and liver lesion



(Images courtesy of Bridget O'Brien, ND, APRN, FNP-BC, AOCNP®)
CT = computed tomography; PET = positron emission tomography.

Chemotherapy for Metastatic Disease

Neoadjuvant chemotherapy prior to resection is beneficial because it provides predictive and prognostic information and facilitates surgery by decreasing tumor burden. Clinical trials have shown that a response to chemotherapy prior to resection leads to superior postsurgery outcomes. Among patients with more than four liver metastases who underwent FOLFOX-based neoadjuvant therapy, those who experienced a response had superior 5-year survival (37%) compared to those who experienced stable disease (30%) or progression (8%; Adam et al, 2004). Chemotherapy for unresectable tumors can lead to a conversion to resectable status. Systemic chemotherapy for an additional 6 months postsurgery is recommended (NCCN, 2009). FOLFOX4 for six cycles presurgery and postsurgery has been associated with superior 3-year progression-free survival compared to surgery alone (42.4% vs. 33.2%, respectively; Nordlinger et al, 2008). Postresection chemotherapy options include FOLFOX with or without bevacizumab; leucovorin, fluorouracil, and irinotecan (FOLFIRI) with or without bevacizumab; and capecitabine/oxaliplatin with or without bevacizumab. Bevacizumab is associated with delayed surgical wound healing and therefore should not be introduced to the regimen until 6 weeks after surgery (Avastin® prescribing information, 2008).

Oxaliplatin-Induced Neurotoxicity

All patients undergoing treatment should have an assessment of neurologic function (including assessment of their ability to perform activities of daily living) at baseline and throughout treatment (Table 1). Patients often are not forthcoming about revealing toxicities, as it may limit their ability to receive future treatment. Acute neurotoxicity occurs in 85% to 95% of patients receiving oxaliplatin, appears during and up to 24 hours after administration, and generally resolves within 2 days

TABLE 1 Patient Neurotoxicity Questionnaire (PNQ)© Oxaliplatin

ITEM 1.

❑ A	❑ B	❑ C	❑ D	❑ E
I have no numbness, pain, burning, tingling, or change in my sense of touch in my hands/fingers, feet/toes, or mouth areas	I have mild numbness, burning, pain, tingling, or change in my sense of touch in my hands/fingers, feet/toes, or mouth area. This does not interfere with my activities of daily living.	I have moderate burning, numbness, pain, tingling, or change in my sense of touch in my hands/fingers, feet/toes, or mouth area. This does not interfere with my activities of daily living.	I have moderate to severe burning, numbness, pain, tingling, or change in my sense of touch in my hands/fingers, feet/toes, or mouth area. This interferes with my activities of daily living.	I have severe numbness, pain, tingling, or change in my sense of touch in my hands/fingers, feet/toes, or mouth area. It completely prevents me from doing most activities of daily living.

ITEM 2.

❑ A	❑ B	❑ C	❑ D	❑ E
I have no difficulty in swallowing, breathing, drinking or chewing food, or muscle spasms in my mouth/jaws, hands/fingers, or feet/toes	I have mild difficulty in swallowing, breathing, drinking or chewing food, or muscle spasms in my mouth/jaws, hands/fingers, or feet/toes. This does not interfere with my activities of daily living.	I have moderate difficulty in swallowing, breathing, drinking or chewing food, or muscle spasms in my mouth/jaws, hands/fingers, or feet/toes. This does not interfere with my activities of daily living.	I have moderate to severe difficulty in swallowing, breathing, drinking or chewing food, or muscle spasms in my mouth/jaws, hands/fingers, or feet/toes. This interferes with my activities of daily living.	I have severe difficulty in swallowing, breathing, drinking or chewing food, or muscle spasms in my mouth/jaws, hands/fingers, or feet/toes. It completely prevents me from doing most activities of daily living.

Please indicate by placing an X in the box or writing in the space provided which activity or activities have been interfered with as a result of therapy.

MY ABILITY TO:

❑ Button clothes	❑ Use zippers	❑ Fasten buckles	❑ Write	❑ Sew
❑ Use a knife	❑ Put in or remove contact lenses	❑ Sleep	❑ Walk	❑ Work
❑ Use a fork	❑ Dial or use telephone	❑ Climb stairs	❑ Put on jewelry	❑ Tie shoes
❑ Use a spoon	❑ Operate a remote control	❑ Type on a keyboard	❑ Knit	❑ Drive
❑ Swallow	❑ Use other eating utensils	❑ Eat/chew	❑ Drink liquids	❑ Breathe
❑ Open doors	❑ Work or perform activities of importance to me; specify:			

(Hausheer et al, 2006)
A patient neurotoxicity questionnaire may be used to assess neurologic function at baseline.

TABLE 2 Incidence/Resolution of Oxaliplatin-Induced Peripheral Neuropathy

GRADE	DURING TREATMENT (N = 1,106)	1-MONTH FOLLOW-UP (N = 1,092)	6-MONTH FOLLOW-UP (N = 1,058)	12-MONTH FOLLOW-UP (N = 1,018)	18-MONTH FOLLOW-UP (N = 967)
	Number (percent)				
0	87 (7.9)	424 (38.8)	624 (59.0)	718 (70.5)	738 (76.3)
1	533 (48.2)	439 (40.2)	338 (31.9)	240 (23.6)	191 (19.8)
2	349 (31.6)	174 (15.9)	82 (7.8)	49 (4.8)	33 (3.4)
3	137 (12.4)	55 (5.0)	14 (1.3)	11 (1.1)	5 (0.5)

(Andre et al, 2004)
Incidence, severity, and time course of peripheral neuropathy in metastatic patients is dependent on cumulative dose of oxaliplatin.

postinfusion (Table 2; Wickham, 2007). Acute neurotoxicity is not cumulative and is related to dose and infusion rates. Patients frequently report cold sensitivity, dysesthesias, and paresthesias in the hands and feet (Table 3). Pharyngolaryngeal dysesthesia is uncommon. When these symptoms occur, they can be very distressing to patients and cause great anxiety. Low-dose anxiolytics can help patients manage the effects of acute neurotoxicity by decreasing the symptoms and anxiety.

Long-term use of oxaliplatin can lead to chronic neuropathy, which may be debilitating and significantly impair activities of daily living. Upon initiation of treatment with oxaliplatin, patients should be monitored vigilantly for signs of neuropathy that do not resolve between treatments. The benefits of curative treatment must be weighed against the risks of permanent neuropathic symptoms. Chronic neurotoxicities occur most commonly in cumulative doses of 750 to 800 mg/m^3 and are characterized by impaired sensation, fine sensory-motor deficits, and dysesthesias/paresthesias in the extremities (Wickham, 2007). Chronic neuropathy is often reversible with time. Management strategies for chronic neurotoxicities include withholding oxaliplatin and continuing with the rest of the chemotherapy regimen; withholding oxaliplatin until the neuropathy resolves to grade 1 or 2 and then restarting at a reduced dose; administering calcium and magnesium; and discontinuing all chemotherapy (Goldberg et al, 2007; Grothey, 2005; Bidard et al, 2008; Hausheer et al, 2006). Stopping and restarting oxaliplatin at lower doses has been demonstrated to be effective (Grothey, 2005). Calcium and magnesium are effective in reducing long-term risk of neuropathy and do not reduce the efficacy of FOLFOX as previously reported. Oral dosing of calcium 1 g twice daily and 500 mg twice daily is recommended. In addition, neuromodulatory agents (eg, xaliproden, gabapentin, venlafaxin) may be effective in treating neuropathic pain (Grothey, 2005). Patients and their families should be instructed to monitor for the signs and symptoms of neurotoxicity; create a safe environment in the home to prevent injuries; adjust air and water temperatures as necessary (eg, to avoid scalding); wear gloves, scarves, and hats as necessary to protect from the cold; and drink fluids at room temperature, through straws (Wickham, 2007).

CONCLUSION

The use of chemotherapy in metastatic disease has increased the number of patients with metastases who are able to undergo resection. Neoadjuvant chemotherapy prior to resection is beneficial because it provides predictive and prognostic information and facilitates surgery by decreasing tumor burden. As the treatment landscape continues to evolve, oncology nurses must have a working knowledge of the potential toxicities associated with various regimens, as accurate assessment and prompt intervention can make a critical difference in patient outcomes. ●

References

Adam R, Pascal G, Castaing D, et al (2004). Tumor progression while on chemotherapy. A contradiction to liver resection for multiple colorectal metastases *Ann Surg*, 240(4), 1052N–1064.

Andre T, Boni C, Mounedji-Boudiaf L, et al (2004). Oxaliplatin, fluorouracil, and leucovorin as adjuvant treatment for colon cancer. *N Engl J Med 350*(23), 2343–2351.

Avastin® (prescribing information). South San Francisco, CA: Genentech Inc.; 2009.

Bidard FC, Salomon AV, Sigl-Zafrani B, et al (2008). Time to metastatic relapse and breast cancer cells dissemination in bone marrow at metastatic relapse. *Clin Exp Metastasis 25*, 871–875.

Goldberg RM, Rothenberg ML, Van Cutsem E, et al (2007). The continuum of care: a paradigm for the management of metastatic colorectal cancer. *Oncol, 12*, 38–50.

Grothey A, (2005). Clinical management of oxaliplatin-associated neurotoxicity. *Clin Colorectal Cancer*, 5(Suppl 1), S38–S46.

Hausheer FH, Schilskyb FL, Bain S, et al (2006). Diagnosis, management, and evaluation of chemotherapy-induced peripheral neuropathy. *Semin Oncol 33*(1), 15–49.

Mullen JT, & Vauthey JN (2006). Preoperative and intraoperative approaches to improve resectability of hepatic colorectal metastases. *Current Colon Cancer Reports 2*, 94–98.

National Comprehensive Cancer Network (2009). *Clinical practice guidelines in oncology. Colon cancer.v.2.2009.* Retrieved April 8, 2009, from http://www.nccn.org/

Nordlinger B, Sorbye H, Glimelius B, et al (2008). Perioperative chemotherapy with FOLFOX4 and surgery versus surgery alone for resectable liver metastases from colorectal cancer (EORTC Intergroup trial 40983): A randomized controlled trial. *Lancet, 371*(9617), 1007–1016.

Wickham R (2007). Chemotherapy-induced peripheral neuropathy: A review and implications for oncology nursing practice. *Clin J of Oncol Nurs, 11*(3), 361–376.

Winegarden JD, Mauer AM, Otterson GA, et al (2004). A phase II study of oxaliplatin and paclitaxel in patients with advanced non-small cell lung cancer. *Ann Oncol 15*(6), 915–920.

TABLE 3 Oxaliplatin-Specific Scale for Grading Peripheral Neuropathy

GRADE 0	GRADE 1	GRADE 2	GRADE 3	GRADE 4
Normal	Loss of deep tendon reflexes or paresthesia (including tingling) but not interfering with function	Objective sensory loss or paresthesia (including tingling), interfering with function, but not interfering with activities of daily living	Sensory loss or paresthesia interfering with activities of daily living	Permanent sensory loss that interferes with function

(Winegarden et al, 2004)
Appropriate grading of chemotherapy-induced peripheral neuropathy will facilitate choosing the most effective treatment option.

Case Study

Case Presentation: Stage IV CRC Treated With Cetuximab for Palliative Care

Bridget E. O'Brien, ND, APRN, FNP-BC, AOCNP®, Northwestern Medical Faculty Foundation, Chicago

Mr. J was a 58-year-old-man with metastatic colorectal cancer (CRC). He had multiple lesions in the liver, lymphadenopathy, and a left adrenal lesion. For 18 months, Mr. J received leucovorin, fluorouracil, and oxaliplatin (FOLFOX) plus bevacizumab and achieved stable disease. Oxaliplatin was withheld during the last 6 months of treatment due to the development of neuropathy. A computed tomography scan revealed new lung metastases and enlargement of the liver lesions (National Comprehensive Cancer Network [NCCN], 2009). As his *KRAS* status was wild type, he was a candidate for an epidermal growth factor receptor (EGFR) inhibitor. He began treatment with leucovorin, fluorouracil, and irinotecan (FOLFIRI) in addition to cetuximab. With the first cetuximab dose, Mr. J developed itchy eyes, nausea, vomiting, and dizziness. His infusion was stopped and the severity of his symptoms decreased immediately (NCCN, 2009; Erbitux® prescribing information, 2009). Mr. J was then premedicated with an antihistamine and a steroid, and his infusion time was doubled. As a result, he was able to receive subsequent doses of cetuximab without incident. After three cycles of FOLFIRI and cetuximab, he developed a grade 2 rash on his face and shoulders (NCCN, 2009; Lenz, 2007). Mr. J received doxycycline 100 mg twice daily and applied hydrocortisone cream 2.5% to the affected areas. He noted improvement within 2 weeks, with the rash decreasing to grade 1. After the next dose of chemotherapy, Mr. J reported diarrhea five to six times a day for the past 5 days. The oncology nurse noted that his usual bowel pattern is once a day (Lynch et al, 2007).

Palliative Treatment

Biologic therapies may provide benefit in the treatment of stage IV CRC with palliative intent. Cetuximab added to irinotecan has been shown to improve partial response and time to progression compared to cetuximab alone (Cunningham et al, 2004). Panitumumab has been shown to enhance progression-free survival compared to best supportive care, however it is not associated with improvement in overall survival (Van Cutsem et al, 2007). Combinations of biologic therapies (eg, bevacizumab + panitumumab or bevacizumab + cetuximab) are not recommended for stage IV CRC (NCCN, 2009). Worse outcomes and higher-grade toxicities have been associated with dual biologic therapy (Hecht et al, 2009; Punt et al, 2008).

Side-Effect Management

Hypersensitivity Reactions

A hypersensitivity reaction (HSR) is an exaggerated immune response to an antigen that results in local tissue injury or changes throughout the body and may cause anaphylaxis. Nearly all chemotherapeutic agents and targeted therapies have the potential to cause an HSR (Table 1). The incidence of grade 3/4 HSRs in CRC is approximately 1% to 3% (Lenz, 2007; Castells et al, 2008). The Southern region of the United States has a higher incidence of severe HSRs, with rates of up to 22%. Serum testing showed immunoglobulin E (IgE) antibodies against cetuximab present in pretreatment samples of many patients who experienced HSRs (Chung et al, 2008).

HSRs may be either true allergic reactions, which can result in anaphylaxis, or acute infusion reactions, which are also known as cytokine-release syndrome or anaphylactic reactions. True allergic reactions are mediated by IgE, whereas acute infusion reactions are secondary to the release of cytokines, such as tumor necrosis factor-alpha, interleukin-6, and interferon. Acute minor infusion reactions are more common with targeted therapies (Lenz, 2007). Patients who experience anaphylaxis as a result of a true allergic reaction should not be rechallenged with the administered agent, whereas patients who experience acute infusion reactions may be successfully

Table 1 Hypersensitivity Reactions

Mild Reactions	Severe Reactions
Pruritus (with or without rash)	Syncope
Metallic taste in mouth	Hoarseness
Itchy eyes or nose	Bronchospasm
Sneezing	Stridor
Watery eyes or nasal discharge	Wheezing
Angioedema (facial or lip swelling)	Dyspnea
Headache	Hypotension
Moderate Reactions	Arrhythmia
Dizziness, weakness	Tachycardia
Nausea, vomiting	
Sweating	

(Lenz, 2007; Castells et al, 2008)

Nearly all chemotherapeutic agents and targeted therapies have the potential to cause a hypersensitivity reaction.

rechallenged with the administered agent. Some HSRs involving true allergic reactions may manifest as slight, localized skin reactions and never progress. Others may begin with a slight skin reaction and progress to wheezing or even anaphylaxis.

There is no standard premedication regimen to prevent HSRs. However, there are several published premedication regimens that include histamine receptor antagonists. For example, diphenhydramine is recommended before each dose of cetuximab (Erbitux® prescribing information, 2009; Lenz, 2009). However, premedication is not recommended before therapy with bevacizumab, panitumumab, or oxaliplatin unless there has been a previous HSR (Erbitux® prescribing information, 2009; Gobel, 2007; Lenz, 2007). Before therapy is initiated, an assessment should be performed to identify patients at risk for an HSR, including those who have had a previous reaction to drugs or who have a history of allergies or asthma (Gobel, 2005). Most reactions occur within 15 to 30 minutes after initiation of therapy. Thus it is important to remain with the patient during this time, particularly when high-risk drugs are administered. Vital signs should be taken before, during, and after therapy (Lenz, 2007). The signs and symptoms of an HSR should be known as well as the drugs most likely to cause one. If an HSR occurs, an accurate assessment of the reaction is vital so that patients who have had a severe allergic reaction are not rechallenged with the agent, whereas patients who have had an acute mild infusion reaction are not inappropriately discontinued from what may otherwise be effective therapy (Lenz, 2007; Zanotti & Markman, 2001).

The management of an HSR requires that the infusion be stopped immediately. Supportive care should be provided if necessary, including hemodynamic support of a patient with hypotension (Gobel, 2005). If the incident is mild to moderate and deemed to be the result of a cytokine-release syndrome (eg, fever, chills, rigor), then the infusion may be restarted once the patient has been treated appropriately and the symptoms have resolved (Lenz, 2007). However, the infusion should be started at a slower rate (50%), and the patient should be premedicated with antihistamines and corticosteroids for future infusions. The combination of these agents for premedication has been found to be superior to monotherapy with either agent (Gobel, 2005; Gobel, 2007; Lenz, 2007). For some patients, desensitization may be necessary. This is accomplished by administering escalating doses of the drug over longer periods of time. There are no standard desensitization protocols, but case reports have demonstrated the success of this strategy with oxaliplatin-associated HSR. Desensitization should be considered for patients who have experienced a significant HSR to a drug that is vital to the treatment protocol (Lenz, 2007).

If a reaction is severe after the infusion has been stopped, the oncology nurse should remain with the patient, particularly if anaphylaxis is suspected. Staff should be prepared to deliver the basics of resuscitation; both emergency medications and a standing treatment protocol should be available. It is also important to know how to contact an emergency team (Gobel, 2005). First-line interventions for severe HSRs include: epinephrine, which improves blood pressure, decreases angioedema and urticaria, provides for bronchodilation, and inhibits inflammatory mediator release; aminophylline for wheezing and bronchospasm; and vasopressors for uncontrolled hypotension. The vasopressor of choice is generally dopamine, given 2 to 20 µg/kg/min and titrated to the patient's blood pressure. The offending drug should be permanently discontinued in the case of a severe reaction (Drain & Volchek, 2001; Gobel, 2005; Gobel, 2007; Lenz, 2007).

Dermatologic Toxicities

Rash is the most common dermatologic toxicity associated with EGFR inhibitors, occurring in 60% to 80% of patients (Lynch et al, 2007). Other dermatologic toxicities associated with EGFR inhibitors include paronychia and fissures, xerosis and pruritus, hair changes such as trichomegaly, and hypersensitivity (Table 2). Trichomegaly can cause corneal abrasion. Patients may need to see an ophthalmologist for eyelash trimming (Abdalla et al, 2008). Proactive rash management includes evaluation of patients every 2 weeks. Based on severity, topical hydrocortisone, clindamycin, or steroid creams and tetracycline antibiotics may be indicated to manage inflammation (Figure; Lynch et al, 2007). Sometimes a chemotherapy dose reduction is required. Patients should be instructed to avoid the sun and use SPF 30 sunscreen with zinc oxide, moisturize dry areas of the body twice daily, inspect skin daily and report any signs of infection, avoid scratching, and use antihistamines as necessary. Patients should also be informed that rash presence and severity correlates with treatment response (Lynch et al, 2007; Oishi, 2008).

Diarrhea

Successful management of diarrhea is dependent upon careful assessment and grading. Establishment of baseline bowel habits prior to chemotherapy should be performed at the first visit in order to accurately assess the impact of treatment. Patients should be asked how often they move their bowels, to describe the consistency of their stools, and whether they are experiencing nocturnal stooling, abdominal cramping, or fever. Grade 2

Table 2 Epidermal Growth Factor Receptor Inhibitor Side Effects

Manifestation	Incidence (%)
Papulopustular rash	60–80
Paronychia and fissures	6–12
Xerosis and pruritis	4–35
Hair changes (trichomegaly and hypertrichosis)	5–6
Hypersensitivity	2–3

(Lynch et al, 2007)

Rash is the most common dermatologic toxicity associated with epidermal growth factor receptor inhibitors, occurring in 60% to 80% of patients.

and higher diarrhea (increase of four or more stools above daily baseline) requires hydration therapy (Table 3; National Cancer Institute, 2009; O'Brien, Kaklamani, Benson, 2005). For mild-to-moderate cases, loperamide 4 mg orally at first dose may be administered followed by 2 mg every 2 to 4 hours until improvement (Benson et al, 2004). After 12 hours of being diarrhea-free, loperamide may be discontinued. Patients often discontinue treatment too early and diarrhea returns. If diarrhea persists for more than 24 hours, antibiotic therapy may be administered. In severe cases, aggressive management with intravenous fluids, octreotide, and hospitalization may be required. Patients should be instructed to recognize and report symptoms such as bloody stools, intense cramping, fever, and excessive thirst to the healthcare team, and to keep records on the duration and frequency of diarrhea. Patients should be educated on dietary habits, such as limiting intake of dairy products, alcohol, caffeine, and high-fat and spicy foods; and avoiding herbal supplements that can cause diarrhea, such as milk thistle, aloe, saw palmetto, and ginseng (O'Brien et al, 2005).

CONCLUSION

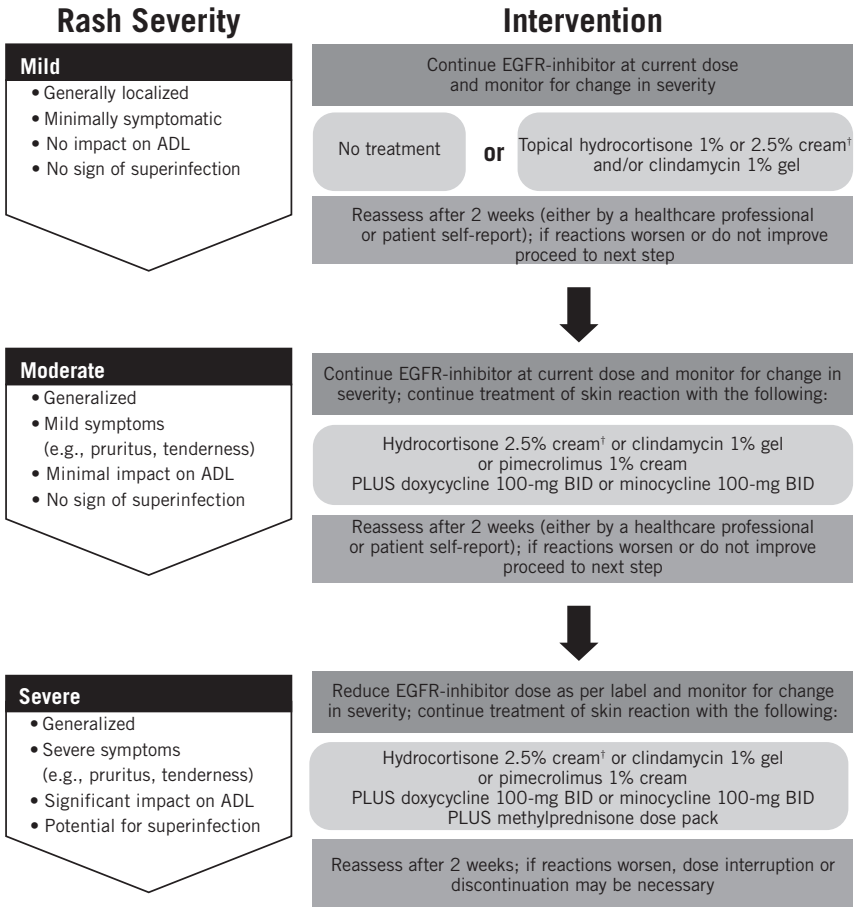
Palliative treatment options for patients with metastatic CRC have advanced considerably during the past decade. New chemotherapeutic agents and targeted therapies have increased the response to treatment and progression-free survival. However, these agents are associated with toxicities that present unique clinical challenges. Dermatologic toxicities, HSRs, and diarrhea have the potential to interrupt or discontinue treatment. Oncology nurses play a critical role in the assessment of these toxicities and providing the necessary interventions so that patients may receive optimal palliative care. ●

TABLE 3 Assessment of Diarrhea

	GRADE 0	GRADE 1	GRADE 2	GRADE 3	GRADE 4	GRADE 5
DIARRHEA	None	Increase of < 4 stools per day over baseline; mild increase in ostomy output over baseline	Increase of 4–6 stools per day over baseline; increase in ostomy output compared to baseline; not interfering with ADL	Increase of ≥ 7 stools per day over baseline; incontinence; hospitalization indicated; severe increase in ostomy output compared to baseline; limiting self-care ADL	Life-threatening consequences; urgent intervention indicated	Death

(National Cancer Institute, 2009)
IV = intravenous, ADL = activities of daily living.
Successful management of diarrhea is dependent upon careful assessment and grading.

FIGURE Rash Management Algorithm



(Lynch et al, 2007)
Proactive rash management includes evaluation of patients every 2 weeks.
IV = intravenous, ADL = activies of daily living, BID = twice a day; EGFR = epidermal growth factor receptor.

References

Abdalla YF, Elsahn AF, Cohen EJ, et al (2008). SynergEyes lenses for keratoconus. *Invest Ophthalmol Vis Sci*; 49, E-Abstract 4326.

Benson AB, Ajani JA, Catalano RB, et al (2004). Recommended guidelines for the treatment of cancer treatment-induced diarrhea. *J Clin Oncol, 22*(14), 2918–2926.

Castells MC, Tennant NM, Sloane DE, et al (2008). Hypersensitivity reactions to chemotherapy: Outcomes and safety of rapid desensitization in 413 cases. *J Allergy Clin Immunol, 122*(3), 574–580.

Chung CH, Mirakhur B, Chan E, et al (2008). Cetuximab-induced anaphylaxis and IgE specific for galactose -α-1,3-galactose. *N Engl J Med 358*, 1109–17.

Cunningham D, Humblet Y, Siena S, et al (2004). Cetuximab monotherapy and cetuximab plus irinotecan in irinotecan-refractory metastatic colorectal cancer. *N Engl J Med, 351*(4), 337–345.

Drain KL, & Volcheck GW (2001). Preventing and managing drug-induced anaphylaxis. *Practical Drug Safety 24*(11), 843–853.

Erbitux® prescribing information (2009). Bristol-Myers Squibb Company, Princeton, NJ.

Gobel BH (2007). Hypersensitivity reactions to biological drugs. *Seminars in Oncology Nursing, 23*(3), 191–200.

Gobel BH (2005). Chemotherapy-induced hypersensitivity reactions. *Oncology Nursing Forum 32*(5), 1027–1035.

Hecht JR, Mitchell E, Chidiac T, et al (2009). A randomized phase IIIB trial of chemotherapy, bevacizumab, and panitumumab compared with chemotherapy and bevacizumab alone for metastatic colorectal cancer. *J Clin Oncol, 26*(5), 672–680.

Lenz HJ (2007). Management and preparedness for infusion and hypersensitivity reactions. *Oncologist, 12*(5), 601–609.

Lynch TL, Kim ES, Eaby B, et al (2007). Epidermal growth factor receptor inhibitor-associated cutaneous toxicities: An evolving paradigm in clinical management. *Oncologist, 12*(5), 610–621.

National Comprehensive Cancer Network (2009). *Clinical practice guidelines in oncology. Colon cancer.v.2.2009.* Retrieved April 8, 2009, from http://www.nccn.org/

National Cancer Institute (2009). *Common terminology criteria for adverse events.v.3.0.* Retrieved October 27, 2009, from http://www.ctep.cancer.gov/

O'Brien BE, Kaklamani VG, & Benson AB (2005). The assessment and management of cancer treatment-related diarrhea. *Clin Colorectal Cancer, 4*(6), 375–381.

Oishi K (2008). Clinical approaches to minimize rash associate with EGFR inhibitors. *Oncol Nurs Forum, 35*(1), 103–111.

Punt CJ, Tol J, Rodenburg CJ, et al (2008). Randomized phase III study of capecitabine, oxaliplatin, and bevacizumab with or without cetuximab in advanced colorectal cancer (ACC), the CAIRO2 study of the Dutch Colorectal Cancer Group (DCCG). *J Clin Oncol 26*(May 20 Suppl), Abstract LBA4011.

Van Cutsem E, Peeters M, Siena S, et al (2007). Open label phase III trial of panitumumab plus best supportive care compared with best supportive care alone in patients with chemotherapy-refractory metastatic colorectal cancer. *J Clin Oncol, 25*(13), 1658–1664.

Zanotti KM, & Markman M (2001). Prevention and management of antineoplastic-induced hypersensitivity reactions. *Drug Safety 24*(10), 767–779.

CASE STUDY

CASE PRESENTATION: STAGE IV CRC TREATED WITH BEVACIZUMAB FOR PALLIATIVE CARE

Suzette C. Walker, MSN, RN, FNP, University of Michigan Comprehensive Care Center, Ann Arbor

Ms. C was a 57-year-old woman who presented with a 2-month history of 20-pound weight loss. She also complained of constant abdominal discomfort and indicated that she had struggled with constipation for many years. Ms. C indicated that she had never had a colonoscopy and was never told she needed one. To evaluate her symptoms, testing was ordered. Computed tomography (CT) scan revealed multiple liver lesions and lung lesions. She underwent a colonoscopy and a 3-cm circumferential tumor was found in the transverse colon. The biopsy of the colon lesion indicated adenocarcinoma. Ms. C was not a candidate for colon resection due to the location of the metastases and because she was not experiencing obstructive symptoms from the colon tumor. However, she was considered a candidate for intensive systemic chemotherapy (Table 1).

Ms. C was treated with leucovorin, fluorouracil, oxaliplatin (FOLFOX), and bevacizumab. After four cycles, her blood pressure increased to 152/100 mm Hg; however, she remained asymptomatic. She was prescribed an angiotensin-converting enzyme inhibitor and her blood pressure returned to normal. Ms. C experienced a dramatic CT response for the first 12 months of treatment. At 15 months, pulmonary disease was present on the CT scan. She then began treatment with leucovorin, fluorouracil, irinotecan (FOLFIRI), and bevacizumab. She experienced another response lasting 8 months prior to disease progression indicated on CT scan.

Ms. C underwent *KRAS* testing. Because she was *KRAS* wild type positive, treatment with irinotecan and cetuximab was initiated. Once again, she responded to the change in therapy for 6 months before progression of pulmonary disease was noted on CT scan. She chose to enter hospice and died 32 months after her diagnosis of stage IV colorectal cancer (CRC).

BEVACIZUMAB-ASSOCIATED VASCULAR TOXICITIES

Bevacizumab is a vascular endothelial growth factor (VEGF) inhibitor associated with several unique and

TABLE 1 Treatment Options for Patients Not Eligible for Resection

❖FOLFIRI with bevacizumab	If intensive therapy is tolerated
❖FOLFOX with bevacizumab	
❖CapeOX with bevacizumab	
❖5-FU/LV with bevacizumab	
❖Capecitabine +/- bevacizumab	If cannot tolerate intensive therapy
❖Infusional 5-FU/LV +/-bevacizumab	

(NCCN, 2009)

There are several treatment options available for patients with colorectal cancer who are not eligible for resection.

FOLFIRI = leucovorin, fluorouracil, irinotecan; FOLFOX = leucovorin, fluorouracil, oxaliplatin; CapeOX = capecitabine, oxaliplatin; 5-FU = fluorouracil; LV = leucovorin.

significant side effects. Grade 3/4 hypertension occurs in approximately 8% to 18% of patients receiving bevacizumab and can be managed with administration of antihypertensive agents. Blood pressure should be monitored every 2 weeks and bevacizumab should be held for severe hypertension (Avastin® prescribing information, 2009). Gastrointestinal perforation, although rare, requires the immediate discontinuation of therapy and surgical intervention. Monthly evaluation of urine is recommended to monitor for proteinuria. A 24-hour urine collection should be performed if there is greater than 2+ protein. Bevacizumab must be discontinued if nephrotic syndrome develops. Arterial thromboembolic events can occur with bevacizumab and requires cessation of therapy and appropriate intervention. Patients older than 65 years are at increased risk for the development of thromboembolic events. Hemorrhage may occur with bevacizumab use, ranging from mild epistaxis to more serious or fatal events. A rare toxicity known as reversible posterior leukoencephalopathy syndrome (RPLS) requires cessation of therapy, and may present as neurological abnormalities such as visual changes or stroke-like symptoms (Avastin® prescribing information, 2009).

Continuing Bevacizumab Beyond Progression

In the BRITE trial, bevacizumab with chemotherapy was used as second-line treatment for metastatic CRC (Grothey et al, 2008). After first disease progression and physician discretion, patients were either given no further treatment, chemotherapy only, or bevacizumab combined with chemotherapy. Second-line treatment with bevacizumab in combination with chemotherapy was shown to be beneficial with a median survival of 31.8 months compared to 19.9 months with chemotherapy alone (Table 2). When selecting second-line treatment for stage IV disease with palliative intent, the survival benefit associated with the addition of bevacizumab must be weighed against treatment tolerability and cost.

Table 2 BRITE Registry: Overall Survival

	No-PD post treatment (n = 253)	No BBP (n = 531)	BBP (n = 642)
Number of deaths, n (%)	168 (66)	305 (58)	260 (41)
Median OS (mos)	12.6	19.9	31.8
1-year OS rate (%)	52.5	77.3	87.7
OS after first PD (mos)	3.6	9.5	19.2

(Grothey et al, 2008)

OS = overall survival; PD = progressive disease; BBP = bevacizumab beyond progression.

Conclusion

With the expanding number of novel regimens available for patients with metastatic CRC, oncology nurses are playing an increasingly prominent role in disease management. In the treatment of metastatic disease with palliative intent, the goal is to preserve patient quality of life. Although targeted agents such as bevacizumab have been shown to provide benefit in this setting, oncology nurses must be aware of the unique toxicities associated with each in order to develop the most effective supportive care plans possible for all patients.

References

Avastin® (prescribing information). South San Francisco, CA: Genentech Inc.; 2009.

Grothey A, Sugrue MM, Purdie DM, et al (2008). Bevacizumab beyond progression is associated with prolonged overall survival in metastatic colorectal cancer: results from a large observational cohort study (BRiTE). *J Clin Oncol 26*, 5326–5334.

National Comprehensive Cancer Network (2009). *Clinical practice guidelines in oncology. Colon cancer.v.2.2009.* Retrieved April 8, 2009, from http://www.nccn.org/

Glossary

anaphylaxis: a severe, whole-body and life-threatening allergic reaction. After initial exposure, the immune system becomes sensitized to that allergen. On subsequent exposure, sudden and severe allergic reaction occurs.

microsatellite instability (MSI): a change that occurs in the DNA of certain cells in which the number of repeats of microsatellites (short, repeated sequences of DNA) differs from the number of repeats that was in the DNA when it was inherited

peripheral neuropathy: damage to the peripheral nervous system

trichomegaly: syndrome consisting of excessive growth of the eyelashes and brow hair

wild type: the most common phenotype of a gene; without mutation

This newsletter is based on a symposium that was presented during the 2008 ONS 9th Annual Institutes of Learning. The symposium is available for 2.0 FREE credit hours at http://www.IMERonline.com

Other IMER CE Programs

CML 2009: Critical Questions Among Hematology/Oncology Advanced Practice Nurses
http://old.IMERonline.com/416
1.5 FREE credit hours
Expiration date: May 2010

Oncology Nursing Practice Patterns in Multiple Myeloma
http://old.IMERonline.com/431
1.5 FREE credit hours
Expiration date: May 2010

Non-Hodgkin's Lymphoma: Expert Discussions of Oncology Nursing Practice Patterns
http://old.IMERonline.com/432
1.7 FREE credit hours
Expiration date: May 2010

Venous Thromboembolism: Recognize, Rescue, Report, Intervene
http://old.IMERonline.com/435
1.6 FREE credit hours
Expiration date: May 2010

Pharmaceutical Glossary

Generic Name	Trade Name
aminophylline	Phyllocontin® Truphylline® Minomal®
aprepitant	Emend®
bevacizumab	Avastin®
capecitabine	Xeloda®
cetuximab	Erbitux®
chlorhexidine	Peridex™
clindamycin	Cleocin T® ClindaMax®
dexamethasone	Decadron® Dexameth Dexone® Hexadrol®
diphenhydramine	Benadryl®
doxycycline	Doryx® Monodox®
epinephrine	Adrenalin®
fluorouracil	Carc®
fosaprepitant	Emend®
gabapentin	Neurontin®
hydrocortisone topical	Corticaine® Cortizone 10® Lanacort® 10
irinotecan	Camptosar®
leucovorin	Wellcovorin®
loperamide	Imodium®
octreotide	Sandostatin®
oxaliplatin	Eloxatin®
panitumumab	Vectibix™
sucralfate	Carafate®
venlafaxin	Effexor®

Accreditation (continued)

Faculty

Heinz-Josef Lenz, MD
University of Southern California, Los Angeles

Bridget E. O'Brien, ND, APRN, FNP-BC, AOCNP® (Chairperson)
Northwestern Medical Faculty Foundation

Suzette C. Walker, MSN, RN, FNP
University of Michigan Comprehensive Cancer Center

Accreditation Statements

GNA/ANCC

This educational activity for 1.2 contact hours is provided by the Institute for Medical Education & Research, Inc. (IMER). IMER is an approved provider of continuing nursing education by the Georgia Nurses Association, an accredited approver by the American Nurses Credentialing Center's Commission on Accreditation.

Disclosure of Conflicts of Interest

Institute for Medical Education & Research (IMER) assesses conflict of interest with its instructors, planners, managers, and other individuals who are in a position to control the content of CE activities. All relevant conflicts of interest that are identified are thoroughly vetted by IMER for fair balance, scientific objectivity of studies utilized in this activity, and patient care recommendations. IMER is committed to providing its learners with high quality CE activities and related materials that promote improvements or quality in healthcare and not a specific proprietary business interest of a commercial interest.

The faculty reported the following financial relationships or relationships to products or devices they or their spouse/life partner have with CE activity:

Heinz-Josef Lenz, MD, reported a financial interest/relationship or affiliation in the form of: *Grant Support*, National Cancer Institute and National Institutes of Health, Cancer Therapy Evolution Program, Southwest Oncology Group; *Consultant*, Response Genetics, Genentech BioOncology, Amgen Inc., Merck KG, Novartis AG, sanofi-aventis U.S. Inc., Pfizer Inc., Bristol-Myers Squibb Company, ImClone Systems Inc.; *Speaker's Bureau*, Roche Laboratories, Pfizer Inc., Eli Lilly and Company, sanofi-aventis U.S. Inc., and Merck KG; *Contracted Research*, Bristol-Myers Squibb Company, Celmed BioSciences, Novartis AG, Roche Laboratories, sanofi-aventis U.S. Inc., Genentech BioOncology, Eisai Inc., Taiho Pharmaceutical Co., Ltd., Pfizer Inc., National Cancer Institute, Cancer Therapy Evolution Program, Merck KG, American Academy of Clinical Psychiatrists, Inc.; *Ownership Interest*, Response Genetics; Clinical Trials, Roche Laboratories, Bristol-Myers Squibb Company, ImClone Systems Inc., Eli Lilly and Company, Novartis AG, sanofi-aventis U.S. Inc., Genentech BioOncology, Pfizer Inc., AstraZeneca plc.

Bridget O'Brien, ND, APRN, FNP-BC, AOCNP®, reported a financial interest/relationship or affiliation in the form of: *Consultant*, Amgen, Inc.; *Speakers' Bureau*, Novartis Pharmaceuticals Corporation, Amgen, Inc., sanofi-aventis U.S.

Suzette C. Walker, MSN, RN, FNP, reported a financial interest/relationship or affiliation in the form of: *Speaker's Bureau*, sanofi-aventis U.S., Roche Laboratories, Inc., Novartis Pharmaceuticals Corporation.

The planners and managers reported the following financial relationships or relationships to products or devices they or their spouse/life partner have with commercial interests related to the content of this CE activity:

The following IMER planners and managers, Michael Bramwell; Lourdes Briz, BS; Timothy J. DiChiara, PhD; Ninotchka Doleyres, MPH; Dorothy Dulko, PhD, RN, AOCNP-C®; Elisheva Hertz, BSN, RN, OCN®; Madelyn T. Herzfeld, BSN, RN, OCN®; Davecia Ragoonath-Cameron, MS; Matthew Weeks, BA, hereby state that they or their spouse/life partner do not have any financial relationships or relationships to products or devices with any commercial interest related to the content of this activity of any amount during the past 12 months.

Method of Participation

There are no fees for participating and receiving nursing contact hours for this activity.

During the period November 13, 2009 through November 12, 2010, participants must 1) read the learning objectives and faculty disclosures; 2) study the educational activity; 3) complete the posttest by recording the best answer to each question in the answer key on the evaluation form; 4) complete the evaluation form; and 5) mail or fax the evaluation form with answer key to Institute for Medical Education & Research.

A statement of credit will be issued only upon receipt of a completed activity evaluation form and a completed posttest with a score of 70% or better. Your statement of credit will be immediately available to download and print.

Media

Newsletter

Disclosure of Unlabeled Use

This educational activity may contain discussion of published and investigational uses of agents that are not indicated by the FDA. IMER does not recommend the use of any agent outside of the labeled indications. The opinions expressed in the educational activity are those of the faculty and do not necessarily represent the views of IMER. Please refer to the official prescribing information for each product for discussion of approved indications, contraindications, and warnings.

Disclaimer

Participants have an implied responsibility to use the newly acquired information to enhance patient outcomes and their own professional development. The information presented in this activity is not meant to serve as a guideline for patient management. Any procedures, medications, or other courses of diagnosis or treatment discussed or suggested in this activity should not be used by clinicians without evaluation of their patient's conditions and possible contraindications on dangers in use, review of any applicable manufacturer's product information, and comparison with recommendations of other authorities.

Safeguards Against Commercial Bias

IMER affirms that the content and format of its CE activities and related materials promote improvements and quality in healthcare and do not promote a specific proprietary business interest of a commercial entity. To this end, IMER employs several strategies to ensure the absence of commercial bias, including but not limited to review of all planned content for CE activities sponsored by IMER to ensure adherence to the American Nurses Credentialing Center's criteria and operational requirements and the Accreditation Council for Continuing Medical Education's content validation statements and resolution of any actual or perceived conflict of interest that exist. We employ three metrics as we review materials:

1. Fair balance
   a. Recommendations or emphasis must fairly represent and be based on a reasonable and valid interpretation of the information available on the subject matter
   b. No single product or service is overrepresented when other equal competing products or services are available for inclusion
2. Scientific objectivity of studies mentioned in the materials or used as the basis for content
3. Appropriateness of patient care recommendations made to learners

Institute for Medical Education & Research, Inc.
12000 Biscayne Blvd.
Suite 300
North Miami, Florida 33181

Address Service Requested

IMER supports

GO GREEN cme

Printed on recycled paper

Individualized Colorectal Cancer Treatment in 2009: The Role of the Oncology Nurse in the Delivery of Quality Care

Posttest for Individualized Colorectal Cancer Treatment in 2009: The Role of the Oncology Nurse in the Delivery of Quality Care

(Please record the correct answer for each question in the answer key.)

There are no fees for participating and receiving 1.2 nursing contact hours for this activity. During the period November 13, 2009 through November 12, 2010, participants must complete the posttest (below) by recording the best answer to each question in the answer key. Once you have finished your test and completed the subsequent evaluation form, please send your responses to us. Your test will be reviewed and if you receive a passing grade of 70% or higher your certificate of completion will be mailed to you within 3 weeks.

1. According to the American Joint Committee on Cancer staging guidelines for colorectal cancer (CRC), the usual treatment for stage I chemotherapy is:
   a. Surgery only
   b. Surgery first with or without chemotherapy
   c. Chemotherapy first with or without follow-up surgery
   d. None of the above

2. *KRAS* mutations can be found in 30% to 50% of all CRC tumors and are excellent indicators of which patients will benefit from the addition of cetuximab.
   a. True
   b. False

3. The National Comprehensive Cancer Network recommends *KRAS* gene testing should be included in the workup of all patients diagnosed with stage IV disease.
   a. True
   b. False

4. Which of the following statements is true regarding the management of cetuximab-induced infusion reactions?
   a. Reduce dose by 25% and continue infusion
   b. Permanently discontinue drug for mild and severe infusion reactions
   c. Immediately stop infusion and follow institutional protocol for management of infusion reaction
   d. None of the above

5. Which of the following are treatments that should be used in the management of moderate epidermal growth factor receptor-associated dermatologic toxicities?
   a. Topical hydrocortisone (1% or 2.5% cream) and clindamycin (1% gel only)
   b. Hydrocortisone (1% or 2.5% cream), clindamycin gel, pimecrolimus plus doxycycline (100 mg bid), or minocycline (100 mg bid)
   c. Hydrocortisone (1% or 2.5% cream), clindamycin gel, pimecrolimus plus doxycycline (100 mg bid), or minocycline (100 mg bid) plus methylprednisolone dose pack
   d. None of the above

6. Management of chemotherapy-induced diarrhea does not include:
   a. Loperamide
   b. Octreotide
   c. Opioids
   d. Increased fluid intake

7. A patient with adenocarcinoma is being treated with fluorouracil, leucovorin, oxaliplatin (FOLFOX), and bevacizumab is noted to have a rise in blood pressure to 152/100 mm Hg after 4 cycles. What do you do with the patient's treatment?
   a. Hold therapy and repeat blood pressure in 1 week
   b. Hold bevacizumab only
   c. Hold bevacizumab and start an antihypertensive medication
   d. Treat the patient while starting an antihypertensive medication

8. Which of the following antiemetic prophylaxes should be recommended to prevent high-risk chemotherapy-induced nausea and vomiting?
   a. A 5-HT3 antagonist (eg, palonosetron) only
   b. NK-1 RA (eg, aprepitant) plus dexamethasone
   c. A 5-HT3 antagonist, NK-1 RA plus dexamethasone
   d. None of the above

9. Which of the following is recommended for the management of stomatitis/mucositis?
   a. Chlorhexidine mouth wash
   b. Bland rinses (eg, salt and soda in water)
   c. Sucralfate
   d. Alcohol-based mouthwashes

Evaluation Form – Colorectal Cancer: Nursing Roundtable Discussions

IMER respects and appreciates your opinions. To assist us in evaluating the effectiveness of this activity and to make recommendations for future educational offerings, please take a few minutes to complete this evaluation form. You must complete this evaluation form to receive acknowledgement of participation for this activity.

5 = Outstanding	4 = Good	3 = Satisfactory	2 = Fair	1 = Poor

Extent to Which Program Activities Met the Identified Purpose

- To educate nurses on the latest treatment and nursing management strategies for patients with colorectal cancer (CRC). 5 4 3 2 1

Extent to Which Program Activities Met the Identified Objectives

Upon completion of this activity, participants should be able to:

- Outline pathology and staging criteria for CRC 5 4 3 2 1
- Describe the latest research on the application of molecular biomarkers/genomics in clinical decision-making 5 4 3 2 1
- Outline evidence-based recommended treatment guidelines for adjuvant therapy for patients with high-risk stage II disease 5 4 3 2 1
- Evaluate emerging data on the use of neoadjuvant and adjuvant therapy for patients with liver- or lung-limited metastases 5 4 3 2 1
- Analyze nursing practice research relating to the administration of therapy as well as assessment and management of treatment-related toxicities of commonly used metastatic CRC regimens 5 4 3 2 1
- Incorporate performance/functional status assessment into the nursing care plan 5 4 3 2 1
- Plan patient education regarding participation in clinical trials 5 4 3 2 1

Overall Effectiveness of the Activity

- Was timely and will influence how I practice 5 4 3 2 1
- Will assist me in improving patient care 5 4 3 2 1
- Fulfilled my educational needs 5 4 3 2 1
- Avoided commercial bias or influence 5 4 3 2 1

Approximately what percentage of the program content was new to you?

☐ 0–20% ☐ 21–40% ☐ 41–60% ☐ 61–80% ☐ 81–100%

Impact of the Activity

Do you feel that the activity:

- Reinforced your current practice/treatment habits ☐ Yes ☐ No
- Will improve your practice/patient outcomes ☐ Yes ☐ No
- Enhanced your current knowledge base ☐ Yes ☐ No
- Will cause you to make changes in your practice? ☐ Yes ☐ No

If yes, please describe any change(s) you plan to make in your practice as a result of this activity: _____

How committed are you to making these changes?
(very committed) 5 4 3 2 1 (not committed)

Additional comments about this activity: _____

Future Activities

Do you feel future activities on this subject matter are necessary and/or important to your practice? ☐ Yes ☐ No

Please list any other topics that would be of interest to you for future educational activities: _____

Was there anything not covered that would have better helped meet the learning objectives? _____

What prompted you to participate in this educational activity? _____

What are your perceived barriers to implementing the information presented in this activity? _____

Is there a gap between the information provided in this activity and your practice habits? _____
☐ Yes ☐ No

If yes, please describe: _____

Would you recommend this activity to a colleague? ☐ Yes ☐ No

If you wish to receive acknowledgement of participation for this activity, please fill out your contact information.
Mail or fax this test and evaluation form to receive your certification of completion.

Institute for Medical Education & Research
12000 Biscayne Boulevard, Suite 300 | North Miami, FL 33181 | Fax (305) 892-1039

Request for Credit

Name _____

Degree _____

Specialty _____

Organization _____

Street Address _____ Box/Suite _____

City _____ State _____ ZIP Code Work Phone

Number _____

Work Fax Number _____

E-mail _____

Signature _____ Date _____

This newsletter can be viewed on our Web site, www.IMERonline.com. On the homepage, click on the CE/CME tab, select On-Demand Education, and select **Individualized Colorectal Cancer Treatment in 2009: The Role of the Oncology Nurse in the Delivery of Quality Care**

Posttest Answer Key **451**

1	2	3	4	5	6	7	8

☐ **Please send me FREE IMER CE programs and invitations to IMER's FREE CE symposia.**

I'm also interested in these other types of cancers:

☐ **lung** ☐ **breast** ☐ **lymphoma** ☐ **leukemia**
☐ **colorectal** ☐ **prostate** ☐ **ovarian** ☐ **head & neck**
☐ **other**

(please describe) _____

While we strive not to send duplicates, we hope that you will share yours with a friend if you receive more than one copy.

The following items do not need to be completed to receive acknowledgement of participation for this activity.

Follow-up

Years in practice:
- ☐ < 2 years
- ☐ 2–5 years
- ☐ 6–10 years
- ☐ >10 years

Educational background (highest degree):
- ☐ Associate/Diploma
- ☐ BSN
- ☐ MSN
- ☐ PhD
- ☐ Other _____

Primary functional area:
- ☐ Patient care
- ☐ Education
- ☐ Administration
- ☐ Research
- ☐ Other _____

Primary specialty:
- ☐ Chemotherapy/biotherapy
- ☐ GI oncology
- ☐ Pediatric oncology
- ☐ Thoracic oncology
- ☐ Prevention/detection
- ☐ Other _____
- ☐ Breast oncology
- ☐ Hematology/BMT
- ☐ Radiation oncology
- ☐ Patient education
- ☐ Palliative care

Primary position:
- ☐ Academic educator
- ☐ Clinical trials nurse
- ☐ Clinical nurse specialist
- ☐ Director/asst. director/VP
- ☐ Nurse manager/coordinator
- ☐ Nurse practitioner

Do you prefer educational CE seminars or mail CE programs?
- ☐ Seminars
- ☐ Mail

I most prefer CE programs that are:
- ☐ On a Web site that I can visit
- ☐ Audio CDs
- ☐ Print materials
- ☐ Teleconferences
- ☐ CD-ROMs (audio plus slideshow)

I least prefer CE programs that are:
- ☐ On a Web site that I can visit
- ☐ Audio CDs
- ☐ Print materials
- ☐ Teleconferences
- ☐ CD-ROMs (audio plus slideshow)

As part of our ongoing quality-improvement effort, we conduct post-activity follow-up surveys to assess the impact of our educational interventions on professional practice. Please indicate your willingness to participate in such a survey:
- ☐ Yes, I would be interested in participating in a follow-up survey
- ☐ No, I'm not interested in participating in a follow-up survey

Privacy Policy

When you participate in an educational activity provided by the Institute for Medical Education & Research ("IMER" or "we"), we ask you for your name, degree, affiliation, street address, telephone number, fax number, and e-mail address (the "Information"). We use that Information in the following ways:
We use the Information to grade your posttest and to send you a certificate of completion of the educational activity. If we use a third-party company to grade your posttest and issue certificates of completion, we will give the Information to that company for that purpose only.
For each educational activity that you take, you must complete an evaluation questionnaire. That questionnaire asks if you are willing to participate in a follow-up survey. If you answer yes, we will use your name and contact information to send you the survey.
We may use the Information to invite you to participate in other educational activities that IMER or its affiliates may offer.
On occasion, the commercial supporter of an educational activity will ask us for a list of the people who participated in that activity, so that it may document the first level of outcomes-based evaluation in the educational activity (i.e., who attended, which medical specialties/practices were represented, how this compares to the target audience, and whether the activity needs to be repeated because significant numbers of the target audience did not attend). In that event, we will provide the supporter with your name, title and affiliation, but we will request in writing that the supporter not contact you directly for any purpose.
If our company is acquired or merged into another company, we may make the Information available to the new owner/entity to use in the ways described above, to enable it to continue our business.
Any changes to our privacy policy will be posted here immediately.