

# Management of Vascular Endothelial Growth Factor and Multikinase Inhibitor Side Effects

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The availability of vascular endothelial growth factor and multikinase inhibitors (MKIs) has enhanced treatment strategies for patients with advanced kidney cancer. Side effects associated with the agents include dermatologic toxicities, gastrointestinal toxicities, and hematologic and metabolic abnormalities that may interfere with treatment adherence. Nurses play a key role in managing side effects associated with emerging therapies. This article presents a case study to illustrate side-effect management strategies for patients receiving MKIs for the treatment of advanced renal cell carcinoma.

**T**his article will review the potential side effects associated with therapies used to treat metastatic renal cancer that target vascular endothelial growth factor (VEGF) and mammalian target of rapamycin (mTOR). Effective management of treatment-associated side effects will improve the potential for patients to benefit from systemic treatment while maximizing quality of life.

VEGF and platelet-derived growth factor (PDGF) are important angiogenesis regulators. Their expression is significantly increased in patients with renal cell carcinoma (RCC), leading to hyperstimulation of the angiogenesis pathway (Garcia & Rini, 2007). Multikinase inhibitors (MKIs), such as sunitinib and sorafenib, prevent angiogenesis signal transduction by competitively binding catalytic domains of VEGF and PDGF tyrosine kinases (Vakkalanka & Rini, 2008). Similarly, the antiangiogenic monoclonal antibody bevacizumab binds VEGF ligands and prevents them from connecting to receptors and attenuating activation of the angiogenesis pathway (Ferrara, 2004; Garcia & Rini) (see Figures 1 and 2). Sorafenib and sunitinib have been approved by the U.S. Food and Drug Administration (FDA) for the treatment of advanced RCC. However, bevacizumab is not approved for this indication but has demonstrated efficacy in the treatment of renal cancer (Bukowski et al., 2007; Escudier et al., 2007; Rini, Halabi, et al., 2008).

## Side Effects

Side effects of VEGF and MKIs may interfere with a patient's ability to complete a treatment regimen. The most common side effects associated with sunitinib are fatigue, diarrhea, and nausea (see Table 1). For patients receiving sunitinib, side

### At a Glance

- ◆ Vascular endothelial growth factor and platelet-derived growth factor are important angiogenesis regulators.
- ◆ Targeted therapies against the angiogenesis pathway often are associated with side effects that may interfere with a patient's ability to complete a treatment regimen.
- ◆ Patient education with an emphasis on timely reporting of symptoms and ongoing assessment of interventions are essential in managing the side effects of vascular endothelial growth factor and multikinase inhibitors.

effects and laboratory panels should be assessed at the end of each four-week course of therapy to ensure that the patient is able to tolerate the adverse events (see Table 2). For patients with metastatic renal cancer, the most common side effects of bevacizumab include hypertension, proteinuria, hemorrhage, and acute renal failure.

Nurses play a critical role in evaluating and managing the side effects, which can have a direct impact on patient outcomes. Management strategies that maximize tolerability and adherence

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