Many chemotherapy regimens used today require the support of a granulocyte–colony-stimulating factor for the prevention of life-threatening neutropenia. In March 2015, a delivery method was introduced for Neulasta® (pegfilgrastim) through an on-body injector (Onpro®), which may eliminate the need for patients to return for injection after chemotherapy, increase workflow, and allow more patients to be seen. The purpose of this study was to monitor the implementation of the Onpro delivery system in an outpatient facility.

**AT A GLANCE**

- The administration of pegfilgrastim via an on-body injector is a safe and effective alternative to manual injections.
- The use of on-body injectors is associated with high patient satisfaction.
- Patient use of on-body injectors has improved nursing unit workflow.

**KEYWORDS**

- pegfilgrastim; febrile neutropenia; patient satisfaction; on-body injector

**DIGITAL OBJECT IDENTIFIER**

10.1188/17.CJON.121-122

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**On-Body Injector**

An administration device for pegfilgrastim

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Febrile neutropenia is a potentially life-threatening side effect of chemotherapy, which is why it is often administered with a granulocyte–colony-stimulating factor (G-CSF). Primary prophylaxis with a G-CSF starting with the first cycle and continuing through subsequent cycles of chemotherapy is recommended in patients who have a 20% or higher risk for febrile neutropenia based on disease and treatment-related factors (Smith et al., 2015). A new delivery kit for Neulasta® (pegfilgrastim) was introduced in 2015, featuring the on-body injector (OBI) Onpro®. The device has a timed mechanism to deliver an injection 27 hours after the device is placed on a patient. This delivery method eliminates the need for patients to return to health-care facilities for injections after chemotherapy. Because pegfilgrastim and the OBI are used only in oncology practice, this is a topic of significant importance to oncology nursing. The goal of this study was to deliver pegfilgrastim via the OBI safely and effectively and to ensure that patients in an outpatient cancer center were satisfied with the delivery system. In addition, the effects of this new device on outpatient clinic workflow were evaluated, and reimbursement issues were monitored.

**Methods**

Outpatient oncology nurses received education and training related to the use and application of the pegfilgrastim OBI on patients and how to educate patients through a series of in-services taught by a nurse educator in the center and a nurse educator from Amgen, Inc. The education consisted of an oral presentation with a hands-on demonstration of how to use the training devices. Afterward, the experienced nurses partnered with others to assist with initial applications.

All patients who were eligible for a standard pegfilgrastim injection were eligible to receive the OBI delivery kit. Patients were excluded if they were cognitively impaired, to avoid the removal of the device at an inappropriate time; were receiving radiation therapy; or were scheduled for imaging studies. Patients were given the opportunity to view the product video supplied by Amgen, Inc. Education was provided by the trained oncology nurse during the patient’s treatment. In addition to a comprehensive OBI brochure, patients received a one-page information sheet adapted from the Amgen, Inc., patient guide, which summarized key points and instructions related to the recognition of potential device failure.

The OBI was applied by the oncology nurse within the last hour of the patient’s treatment. Patients were contacted by phone within 48 hours of placement to confirm dose delivery. If patients experienced device failure, leakage, or dislodgement, they were instructed to remove the device and return to the clinic for a manual injection.

**Results**

A total of 41 patients were given 104 doses of pegfilgrastim via the OBI from September 1, 2015, to January 5, 2016. After the initial four-month period,
patients were contacted to participate in a patient satisfaction survey. After approval from the institutional review board at Stony Brook University Cancer Center, data were collected and managed using REDCap electronic data capture tools (Harris et al., 2009). Thirty-eight of 41 patients responded to the survey. Patient ages ranged from 18–80 years. Six patients reporting having a problem using the OBI, whereas 32 patients reporting having no problems using the OBI. Twenty-one of the patients surveyed reported that they had not received pegfilgrastim in the past, and 20 responders reported that the device functioned properly. Thirty-eight patients rated their satisfaction on a scale of 1 (not satisfied) to 5 (extremely satisfied), of which 32 patients rated their satisfaction at a 4 or 5, and only 2 were not satisfied with the OBI. Table 1 lists issues patients reported while using the OBI.

One of the three patients who experienced febrile neutropenia required hospital admission. No patients reported pain at the injection site or felt that their activities were restricted by wearing the device. An improvement in clinic workflow was observed. One hundred four appointments were eliminated from the “short stay” nurse appointment schedule, making more appointments available to accommodate other patient needs.

<table>
<thead>
<tr>
<th>ISSUE</th>
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<tbody>
<tr>
<td>Device leaked</td>
<td>3</td>
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<tr>
<td>Febrile neutropenia</td>
<td>3</td>
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<tr>
<td>Device failed*</td>
<td>1</td>
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<tr>
<td>Device loosened</td>
<td>1</td>
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<tr>
<td>Skin irritation/redness</td>
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*Indicates that the device error indicator was activated and the dose was not delivered.

"Patients were highly satisfied with the on-body injector, which has helped improve nursing workflow."

Discussion
The education of patients and staff was a key component to the successful implementation of the OBI. Communication with other departments—such as the emergency department and radiology department, as exposure to radiation can interfere with the delivery mechanism—was also important. In addition, patients needed to be informed of security procedures in airports, as they could not be scanned while wearing the device and had to be patted down.

At the time of this writing, the OBI has been used for 11 months at Stony Brook University Cancer Center. Overall, the staff and patients have had very positive experiences. Since the conclusion of the study, the device failure rate—that is, the nondelivery of a pegfilgrastim dose for any reason—is about 3%. An observed reduction in failure rates since the initial study may be attributed to increased experience with placing the device. The most common patient-reported issue related to failure since the conclusion of the study was inadvertent dislodgement.

Conclusion
Nurses did not find it difficult to place the device, and confidence in placing the device improved with repeated applications. Patient education and placement of the device did not hinder nursing efficiency. Patients reported satisfaction with the device and with eliminating the need to return for injection. Older adult patients who do not drive appreciated not having to return to the clinic for manual injection. Younger patients found it more convenient as well, because they did not have to arrange for child care or take time off from work. By eliminating injection appointments from the schedule, more appointments were made available for other patient services, thereby improving workflow efficiency. Patient time was more efficiently used by providing education and device placement during their treatment. No reimbursement issues were identified since the implementation of Onpro. Failed devices were returned by patients and replaced through Amgen’s reimbursement program.

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References