Risk Management of Excreta in a Cancer Unit

Brigitte Leduc-Souville, MLT, Eric Bertrand, Eng, and Joël Schlatter, PharmD

Although many legal and clinical requirements are in effect for the preparation and administration of the antineoplastic drugs, limited data exist on the potential cytotoxic risk to healthcare personnel from exposure of excreta (urine, feces, expectorations, saliva, perspiration, and vomiting) from patients. A preliminary risk analysis was conducted with a multidisciplinary work group. The objectives were to identify all potential hazards and accidental events that may lead to an accident related to the excreta management and to implement a global risk reduction and quality improvement policy. The findings revealed the potential risks of excreta contamination in health service and led to recommendations for the healthcare team to optimize working conditions, ensure public protection and occupational health, and promote environmental and employee safety.

O ccupational exposure to antineoplastic agents has been proven to cause reproductive toxic effects and chromosomal aberrations (Sorsa & Anderson, 1996). In addition, some antineoplastic drugs are genotoxic and may cause cancer (Burgaz et al., 2002; Cavallot et al., 2005; Dranitsaris et al., 2005; International Agency for Research on Cancer, 1987, 1990; Selevan, Lindbohm, Hornung, & Hennminki, 1985; Stucker et al., 1990). Acute adverse health effects such as skin rashes and hair loss have been reported (Krstev, Perunicic, & Vidakovic, 2003; Valanis, Vollmer, Labuhn, & Glass, 1993). Research into the ways in which hospital personnel are exposed to these hazardous drugs has led to heightened awareness in oncology nurses and pharmacists about the potential hazards and the subsequent safe handling of the preparation and administration of highly concentrated antineoplastic drugs. However, little attention has been paid to other potential exposure events that may occur during nursing care and cleaning tasks involving treated patients. Because the dermal route represents the most significant point of entry into the body, surface contamination on the nurse’s skin plays an important role in occupational exposure (Fransman, Vermeulen, & Kromhout, 2005; Sottani, Porro, Comelli, Imbriani, & Minola, 2010). Despite adherence to currently recommended handling procedures in all clinics, widespread contamination with antineoplastic drugs was found (Acampora et al., 2005; Connor, DeBord, & Pretty, 2010). Although many legal and clinical requirements are in effect for the preparation and administration of antineoplastic drugs, limited data exist on the potential cytotoxic risk of excreta, such as urine, feces, expectorations, saliva, perspiration, and vomiting from treated patients (Cass & Musgrave, 1992; Kopp, Schierl, & Nowak, 2013).

To determine the scope of the real dangers for healthcare personnel who come in contact with excreta from patients treated with cytotoxic drugs, the authors conducted a preliminary risk analysis (PRA) to identify all potential hazards and accidental events that may lead to an accident related to excreta management, and to implement a global risk reduction and quality improvement policy.

Methods

To determine the potential risks for excreta management in the hospital, a work group was formed with representatives from the pharmacy, risk management, care, occupational medicine, waste management, laundry, and hygiene departments, as well as from the cancer unit and the laboratory.

Sample and Procedures

All patients were informed of the study’s approach and personally identifiable information was kept confidential. The study was conducted for six months, from January to June 2010, and 300 patients were monitored and treated. The potential exposed persons (healthcare personnel and family members) to excreta from treated patients were identified. All contacts with excreta were recorded and the devices used to collect the excreta and associated wastes were listed. The day-to-day routines and interactions for each patient were observed and analyzed, including restroom use, room cleaning procedures, food procedures, contact with other healthcare personnel, and laundry service. When the patient used the toilet,
TABLE 1. Severity, Criticality, and Probability Scale

<table>
<thead>
<tr>
<th>Scale</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of severity (S)</td>
<td></td>
</tr>
<tr>
<td>S1. Minor</td>
<td>No impact on performances and security, no clinical impact on personnel, and no impact on patient care</td>
</tr>
<tr>
<td>S2. Significant</td>
<td>Degradation of performances with respect to security, low impact to patient care, and moderate clinical impact to personnel</td>
</tr>
<tr>
<td>S3. Severe</td>
<td>Failure of performances of the system without impact on the security, high impact to patient care but reversible consequences, and high clinical impact to personnel but reversible consequences</td>
</tr>
<tr>
<td>S4. Critical</td>
<td>Degradation of the security or the system integrity, major impact to patients with serious but reversible consequences, and major clinical impact to personnel but reversible consequences</td>
</tr>
<tr>
<td>S5. Disastrous</td>
<td>Failure of the security or the system, patient death or permanent disability, and personnel death or permanent disability</td>
</tr>
<tr>
<td>Probability (P)</td>
<td></td>
</tr>
<tr>
<td>P1. Highly unlikely</td>
<td>Once per year or more seldom</td>
</tr>
<tr>
<td>P2. Unlikely</td>
<td>Between once per six months and once per year</td>
</tr>
<tr>
<td>P3. Possible</td>
<td>Between once per three months and once per six months</td>
</tr>
<tr>
<td>P4. Likely</td>
<td>Between once per month and once per three months</td>
</tr>
<tr>
<td>P5. Very likely</td>
<td>Once per month or more</td>
</tr>
<tr>
<td>Criticality (C)</td>
<td></td>
</tr>
<tr>
<td>C1. Acceptable</td>
<td>The risk is low; no action is required</td>
</tr>
<tr>
<td>C2. Tolerable under control</td>
<td>The risk may be acceptable, but further risk-reducing measures have to be performed</td>
</tr>
<tr>
<td>C3. Unacceptable</td>
<td>Remedial actions should be introduced to reduce the criticality, or the situation should be rejected</td>
</tr>
</tbody>
</table>

The potential contamination was noted and the cleaning management was controlled. During the study period, every toileting event was monitored and recorded. The meal and the associated elements were considered potentially contaminated by the saliva. The cleaning of the patient’s room by medical and servicing personal was observed. The laundry in contact with the patient also was considered as a potential risk. Sheets could be contaminated by absorption of excreta. The scope of the analysis covered the internal organization of the cytotoxic drugs, the patients’ treatments, and the patients’ interactions with all hospital personnel who were involved in the cancer unit.

Preliminary Risk Analysis

A PRA, a semiquantitative analysis, was conducted to identify all potential hazards and events that may lead to an accident. The identified accidental events were ranked according to their severity—defined by the work group—and the identified hazard controls and follow-up actions were identified. The PRA was carried out in two stages. First, a chart of dangerous situations was created. Then, an analysis was conducted of every scenario concerning each dangerous situation. Scenarios were assessed using parameters validated by the work group and included severity, probability, and criticality scales (see Table 1) as well as a criticality matrix (see Table 2). Each severity scale was developed in two axes of consequences: those related to patient safety and those related to the personnel’s safety. The criticality scale is composed of three levels, ranging from C1–C3, with C1 representing an acceptable risk and C3 an unacceptable risk.

Results

The chart of risks of excreta management in a cancer unit was constructed by the work group and is represented in Figure 1. The work group identified 568 hazardous situations. Among them, 238 (42%) were ranked first in priority by the criticality matrix. Management, human factors, and clinical practice represented the majority of risk scenarios analyzed, with 44% (n = 104), 22% (n = 52), and 21% (n = 50), respectively, of the 238 hazardous situations identified (see Figure 2).

Upon analysis, provider care appeared as a major risk (see Figure 3). The potential risks of excreta contact could be explained by a failure in risk management and a lack of information and education. The lack of standardized procedures increased the risk of errors in excreta manipulation. Hospital personnel who generally worked on the cancer unit without using appropriate standards of protection from excreta were considered to be potentially contaminated by antineoplastic agents. To control those deviations, a continuing education program was conducted by the risk manager of the work group to explain the potential risk management of excreta, the results of this study, and the protection procedures.

Clinical Practice and Medical Devices

The work group noted that medical devices were not well adapted to manage the excreta as the measures of protection. Therefore, the members of the work group decided to create standard operating procedures for protecting personnel from patient excreta.

Risk Management Plan

All waste potentially contaminated by excreta, such as linens or sterile devices, were placed in a specific yellow bag labeled CMR (carcinogenic mutagenic for...
reproduction) and manually tracked. That procedure allowed for collection of the waste nearest to the patient. Staff members were educated to take protective measures while delivering care. Of note, glove thickness may be more important than glove material because all materials tested have been found to be permeable to some hazardous drugs (Wallemacq et al., 2006). Latex gloves provide the best protection (American Society of Health-System Pharmacists, 2006; Connor, 1999; Wallemacq et al., 2006). Powdered gloves should be avoided because the powder adds particulate that may facilitate inhalation of hazardous drugs (Carmignani & Raymond, 1997). Double-gloving with powder-free latex surgical gloves or using thicker latex chemotherapy gloves is recommended (Carmignani & Raymond, 1997).

Disposable lint-free gowns made of low-permeability fabric are recommended for protecting the arms and chest (American Society of Health-System Pharmacists, 2006; Carmignani & Raymond, 1997). Laboratory coats and washable gowns are immediately penetrated by liquids, providing no protection from hazardous drugs, and also expose additional personnel to hazardous drugs when laundered (Patel, Urech, & Werner, 1998). Protective gowns should be worn only in the immediate area of patient care. Protective eyewear and a respiratory mask also were recommended by the work group. To ensure compliance with these procedures, the risk management department proposed specific formations to all hospital personnel and family in contact with a patient treated in the cancer unit. The work group rewrote some of the recommendations to apply to the patients’ perspective, such as urinating in a sitting position followed by immediate handwashing. In addition, a summary sheet of recommendations was systematically handed to the patient prior to discharge. For cleaning procedures following contact with excreta, the use of bleach was suggested because oxidation completely degraded and inactivated anticancer drugs such as etoposide, bleomycin, and methotrexate. In addition, oxidation followed by nucleophilic substitution resulted in the complete degradation and inactivation of cyclophosphamide and ifosfamide (Benvenuto et al., 1993). Because antineoplastic agents caused adverse effects such as diarrhea, the work
group recommended protecting the bed with a single-use draw sheet and disposable diaper. The hospital’s laboratories also were concerned about handling potentially contaminated biologic liquids (blood, urine, feces, or sputum). The work group recommended closed and secure devices for samples. In addition, skin contacts with liquid projection or inhalation with suspended particles also were included. The work group recommended the use of disposable medical devices despite the additional cost.

**Recommendations**

Body fluids from patients receiving chemotherapy may contain traces of cytotoxic drugs and their active metabolites. Precautions should be taken for as many as seven days after treatment because the majority of cytotoxic drugs will be excreted within that time (Cass & Musgrave, 1992; International Society of Oncology Pharmacy Practitioners, 2007).

All caregivers should be informed about the risk of handling contaminated excreta. Gloves, masks, and nonpermeable gowns should be worn when handling excreta from patients who have received chemotherapy. Personal protective equipment should be worn when cleaning bathrooms and toilet facilities and the equipment, when done, should be treated and disposed of as contaminated waste. Disposable items should be used for patients receiving chemotherapy as opposed to reusable products. If possible, specific toilets should be dedicated for use by patients receiving chemotherapy for inpatient care. Contaminated linen should be placed in a bag labeled “hazardous contamination” and forwarded to the laundry. Contaminated linen and clothing should be laundered before washing with other linen.

The authors’ analysis revealed the potential risk of contaminated excreta from patients in a cancer unit. The findings resulted in the development of procedures for hazardous drug-handling practices and personal protection equipment that were designed to minimize the routes of contact. The recommendations are valid for the hospital and the home to optimize healthcare providers’ working conditions and ensure public protection and employee safety. Each hospital is encouraged to develop their own standard organization procedures in this regard.

**References**


---

**Do You Have an Interesting Topic to Share?**

Safety provides readers with information on safety issues affecting patients with cancer and those caring for them. Length should be no more than 1,000–1,500 words, exclusive of tables, figures, insets, and references. If interested, contact Associate Editor Carol A. Sheridan, RN, MSN, at carol.sheridan@nbhn.net.