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Chemotherapy-Handling Practices of Outpatient and Office-Based Oncology Nurses

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Purpose/Objectives: To determine the current patterns of use of personal protective equipment among oncology nurses while handling antineoplastic chemotherapeutic agents in outpatient and office-based settings.

Design: Descriptive-correlational, mailed survey.

Setting: National survey of oncology nurses.

Sample: 500 randomly selected members of the Oncology Nursing Society who identified their work settings as office, clinic, or outpatient private practice; 263 responded for an overall response rate of 53%.

Methods: Mailed, self-report survey based on the current Occupational Safety and Health Administration's (OSHA's) guidelines for the handling of hazardous drugs.

Main Research Variable: Chemotherapy-handling practices.

Findings: More than 94% of participants reported usually wearing gloves during chemotherapy handling; 55% reported using laboratory coats as protective garments. Usual use of face and respiratory protection was less than 6%. Chemotherapy was reported to be prepared in laminar air flow hoods in 99% of work settings. Only 46% of sites reportedly provided any type of medical monitoring.

Conclusion: Use and availability of personal protective equipment when handling chemotherapy have increased, but medical monitoring of exposed employees still is neither widely practiced nor consistent with OSHA guidelines.

Implications for Nursing: Safety concerns and potential adverse health effects associated with the occupational handling of chemotherapeutic agents have been reported. Historically, nurses' adherence to chemotherapy-handling guidelines has been poor. Results suggest that adherence is increasing; however, research is lacking regarding nurses' level of knowledge of and specific barriers to safe handling of chemotherapy.

Key Points . . .

- Healthcare professionals involved with handling antineoplastic drugs may be exposed inadvertently to these agents, placing them at potential risk for acute and long-term adverse effects.
- The availability and use of protective equipment during chemotherapy handling have increased in outpatient settings. However, concerns may exist regarding management of spills.
- Little medical monitoring of adverse effects is occurring in the outpatient setting.

The use of antineoplastic chemotherapeutic agents for the treatment of cancer and other non-neoplastic diseases has expanded widely since the 1960s. In addition, trends in healthcare economics have caused a change in the delivery of chemotherapy from predominately a hospital-based service to outpatient and physician-based services. As a result, concerns have grown regarding the safety and potential adverse health effects associated with the occupational handling of chemotherapeutic agents. These concerns are based on the mode of action of many of these drugs, which significantly alter the functioning of cellular and DNA structures of cells (Chabner & Longo, 1996).

Generally, the occupational activities that pose the greatest risk of exposure are the preparation and administration of antineoplastic agents, cleaning of chemotherapy spills, and handling of patient excreta. During the course of patient treatment, healthcare professionals may be exposed inadvertently to these agents, placing them at risk for potential acute and long-term adverse effects. Valanis, Vollmer, Labuhn, and Glass (1993) reported a positive association between the degree of cytotoxic drug skin contact or exposure and the presence of acute symptoms reported by nursing staff. Healthcare workers exposed to these agents may be at risk for adverse side effects including nausea and vomiting, chronic cough, increased incidence of infection, myelosuppression, dizziness, headache, and eye irritation (Valanis, Hertzberg, & Shortridge, 1987). Other potential long-term adverse reactions

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documented in the literature related to occupational exposure to antineoplastics include chromosomal aberrations and adverse reproductive outcomes (Harris, Connor, Stevens, & Thesis, 1992; Hemminki, Kyyronen, & Lindbohm, 1985; Valanis et al., 1997).

In 1986, the Occupational Safety and Health Administration (OSHA) published guidelines to minimize healthcare workers' potential exposure to hazardous cytotoxic agents. The guidelines described three elements that are essential to ensure proper workplace practices.

- The use of personal protective equipment during the preparation, administration, and disposal process
- The provision of a biologic safety cabinet for the preparation of hazardous agents
- The training of all staff involved with any aspect of the handling of hazardous drugs regarding proper handling of the agents

In 1995, OSHA expanded these basic guidelines to reflect the latest scientific knowledge and broadened the guidelines to include other potentially hazardous drugs. The guidelines have been published as a chapter in the *OSHA Technical Manual* (OSHA, 1995), which serves as a central reference for compliance with OSHA safety and health technical procedures and information. The update included

- Criteria for classifying drugs as hazardous.
- A summary of the evidence supporting the management of hazardous drugs as an occupational hazard.
- A description of the equipment and worker educational recommendations.
- A description of recommended medical surveillance.
- A list of some common hazardous drugs currently in use.

The limited research regarding compliance with OSHA guidelines has focused predominately on hospital inpatient and hospital-based outpatient centers. In a study conducted in 1986, 90% of healthcare facilities identified that antineoplastic drug-handling policies were in place (Valanis, Driscoll, & McNeil, 1990). However, the policies of the institutions were less comprehensive than the OSHA guidelines. In a subsequent study, staff compliance with institutional handling policies was limited. This study also reported that staff knowledge of institutional policies was poor. Those who perceived that the use of protective equipment was mandatory used it significantly more often (Valanis, McNeil, & Driscoll, 1991). In addition to staff knowledge, professional affiliation, preparation activities, and work setting may affect handling behavior. Valanis, Vollmer, Labuhn, Glass, and Corelle (1992) noted that pharmacists used protective equipment more often than nurses, and hospital staff was better protected than staff employed in outpatient settings. In general, the use of protective garments in all the study categories did not meet OSHA guidelines.

In 1986, Stajicj, Barnett, Turner, and Henderson surveyed 61 nurses employed in oncology offices, the only study that has focused on handling practices of oncologic office nurses. The results indicated that 55% of the nurses received training regarding handling of chemotherapy. Nurses wore gloves during drug reconstitution 49% of the time, but only 15% ($p < 0.05$) used gloves during administration practices. Additionally, only 9% of the nurses reported that hoods were available for reconstitution, none of which was the type recommended by OSHA.

A notable gap exists in the understanding of the chemotherapy-handling practices in outpatient and office-based practices. With the changing healthcare economic environment, most chemotherapy now is administered in outpatient settings (Doyle & Sinha, 1998). Little research has focused on adherence to OSHA guidelines in these settings. This article provides information related to the degree of adherence to the guidelines and insight into the availability of personal protective equipment in these settings.

Purpose

Because of the change in the site of chemotherapy delivery from hospitals to outpatient settings and the lack of research related to compliance with OSHA's 1995 revised guidelines, this study was conducted to determine the current patterns of use of personal protective equipment among oncology nurses during the handling of antineoplastic chemotherapeutic agents in outpatient and office-based settings.

The specific aims of this study were to

- Describe the frequency of compliance with the OSHA guidelines for the handling of hazardous agents.
- Correlate reported handling practices with size of work site, geographic area, and nursing experience.
- Identify the use of special training programs for nurses handling antineoplastic agents.
- Determine the presence of institutional policies and procedures related to the handling of antineoplastic chemotherapy.

Methods

A descriptive-correlational survey design was used.

Sample and Setting

The study sample was selected randomly from members of the Oncology Nursing Society (ONS) who identified their work settings as office, clinic, or private practice with a primary specialty in chemotherapy. The researchers used a computerized database random selection program. The desired sample size of 237 was based on a power analysis to find a difference in practice patterns of 20% or greater with a level of significance of $p < 0.05$ and a power of 0.80, (Cohen, 1988). Because the researchers estimated a response rate of 50%, they approached 500 nurses.

Instrument

The 20-item **Chemotherapy Handling Questionnaire** was used to obtain data regarding demographic information, frequency of chemotherapy administration, frequency of utilization of personal protective equipment, site of chemotherapy preparation, availability of personal protective equipment, availability of a class II biologic laminar flow hood, medical surveillance practices, perceived effectiveness of precautions, and perceived effects of chemotherapy on health, based on the current recommendations delineated in Chapter 2 of the *OSHA Technical Manual* (OSHA, 1995). Frequency of personal protective equipment use was recorded on a 3-point Likert scale: 1 (usually), 2 (occasionally), and 3 (rarely).

In a series of pilot tests of the instrument, content and construct validity were examined by an expert panel of three advanced practice nurses and one pharmacist. The members were selected as reviewers because of their clinical expertise in handling chemotherapy and developing standards related to chemotherapy handling. Each member of the panel was provided

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with a copy of the instrument; a copy of Section IV, Chapter 2 of the *OSHA Technical Manual* (OSHA, 1995), "Controlling Occupational Exposure to Hazardous Drugs"; and a validation tool. The panel reached 100% agreement that the items adequately reflected the OSHA guidelines. All panelists believed that the instrument was easy to read and complete. Slight changes were made to the questionnaire at the suggestion of the experts.

The stability of the instrument was established using a test-retest procedure. The instrument was administered to 12 participants on two occasions, two to three weeks apart. Ten participants completed both questionnaires. Cohen's kappa statistics were calculated to measure the significance of agreement between the results from the first and second administration. The kappa for all items of the tool was greater than 0.8, with 90% agreement.

To validate the accuracy and reliability of participant responses (i.e., construct validity and reliability), 10 nurses who worked in a variety of outpatient centers, including a large community teaching hospital, academic cancer center, health maintenance organization (HMO), and private physician practice, completed the Chemotherapy Handling Questionnaire. These clinical sites were selected based on the type and size of the facilities. After the nurses completed the questionnaire, the researcher visited each clinical site to observe actual practices. During the site visits, nurses were observed preparing chemotherapy, administering it via infusion and IV push, and disposing of materials. All facilities had either latex or chemotherapy-designated gloves available in their treatment areas. Gowns, goggles, and masks were not readily available in the treatment areas of any of the settings. Within each practice setting, the frequency of gown, goggle, and mask use reported by the 10 nurses in the questionnaire correlated with the researcher's observations. The only inconsistency occurred in the responses of two nurses with regard to glove use. The nurses reported occasional (25%–49% of the time) use of gloves, but the researcher rated glove use as rarely (less than 25% of the time). Based on this observational experience, the researchers concluded that the nurses' responses on the questionnaire were an accurate and reliable reflection of actual practice.

Procedure

The researchers mailed the Chemotherapy Handling Questionnaire to the study sample using mailing labels obtained from ONS. To increase study participation, the researchers included prepaid, self-addressed envelopes and offered a raffle of two annual ONS memberships as an incentive.

Data Analysis

Practice demographic characteristics were summarized using descriptive statistics. Differences in selected practices by practice size, geographic area, nursing experience, and other variables were analyzed using the chi-square statistic for categorical data and analysis of variance for continuous variables.

Results

Characteristics of Participants

The survey sample consisted of 500 ONS members, 263 (53%) of whom responded to the survey. Of the 263 respondents, 13 no longer were working in the outpatient or office

Table 1. Sample Demographics

Characteristic	Respondents $\bar{x}$	Respondents Range	Respondents SD
Nursing experience (years)	19.0*	0.90–48	9.50
Oncology experience (years)	12.3*	0.75–31	6.10
Chemotherapy experience (years)	10.9	0.75–28	6.32

Characteristic	% of Respondents (n = 263)	% of Non-Respondents (n = 237)	% of ONS Members (n = 28,158)
Nursing experience (years)		NA	
1–3	3		5*
4–10	18		21
11–20	34		30
21 or more	45		33
Oncology experience (years)		NA	
1–3	8		16*
4–10	35		31
11–20	47		34
21 or more	10		12
Chemotherapy experience (years)		NA	NA
1–3	14		
4–10	36		
11–20	44		
21 or more	6		
Education		NA	
Diploma	24*		15
Associate degree	30		24
Bachelor's degree	39		37
Master's degree or higher	7		17
Certification		NA	
OCN®	78*		48
AOCN®	2		4
Other	2		NA
Region**			NA
Northeast	25	13	
Mid-Atlantic	9	18	
Southeast	16	10	
Midwest	29	32	
Southwest	6	16	
West	16	15	
Type of employment institution		NA	NA
Academic teaching center	10		
Community teaching hospital	13		
Community nonteaching hospital	16		
Public or government hospital	5		
Health maintenance organization	2		
Private physician practice	51		
Other	2		
Employment status*		NA	
Full-time	64		78
Part-time (< 21 hours per week)	25		17
Part-time (> 20 hours per week)	10		NA
Other	2		NA

(Continued on next page)

* $p < 0.05$ compared with ONS membership

** $p < 0.05$ compared with nonresponses

NA—not available; ONS—Oncology Nursing Society

Note. Because of missing data, not all percentages total 100.

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Table 1. Sample Demographics *(Continued)*

Characteristic	% of Respondents (n = 263)	% of Non-Respondents (n = 237)	% of ONS Members (n = 28,158)
Chemotherapy recipients treated at work site per day		NA	NA
5–10	19		
11–25	37		
26–50	27		
51 or more	16		
Patients treated by nurse per day		NA	NA
Less than 1	4		
1–3	7		
4–6	23		
7–9	41		
10 or more	23		

NA—not available; ONS—Oncology Nursing Society

Note. Because of missing data, not all percentages total 100.

setting. Table 1 summarizes respondent characteristics in comparison with the total ONS membership and with those who were sent a questionnaire but did not respond. The respondents had a mean nursing experience of 19 years, and their mean oncology experience was 12.3 years. Compared with the ONS membership, the study sample was significantly more experienced in nursing ($p < 0.025$) and oncology ($p < 0.001$). More respondents reported having a diploma (24%) or associate degree (30%) as the highest level of education compared with the ONS membership ($p < 0.001$). Also, 80% of the participants were certified as either an OCN® or AOCN®, in contrast with 52% of the ONS membership ($p < 0.001$). Nurses from the northeastern and southeastern regions of the United States had a higher response rate compared with other geographic areas ($p < 0.001$). Significantly more nurse respondents worked part-time: 35% versus 17% of the ONS membership ($p < 0.001$). About half of respondents practiced in community-based settings (physician offices and HMOs). Participants most frequently (37%) reported that their practices treated between 11–25 patients per day. The number of patients each nurse treated per day was most frequently reported (41%) to be seven to nine patients per day. Nursing workload was significantly higher in community-based practices (65%) as compared to hospital-based practices (36%) ($p = 0$).

Compliance With Guidelines

Availability of personal protective equipment: Gloves were available in 100% of settings for all handling procedures. Chemotherapy-designated gloves were the most common type used in both preparation (83%) and administration (60%). In 93% of settings, protective garments were available for cleaning spills. Chemotherapy-designated gowns were most frequently (67%) cited as being available for preparation activities. Laboratory coats were reported to be available most frequently during administration (38%). Goggle and mask availability was reported most frequently for the management of spills (see Table 2).

Variations in the availability of personal protective equipment were noted among work sites. Hospital-based nurses used polyvinyl chloride (PVC) gloves more frequently for chemotherapy preparation than did nurses in community practices ($p = 0.04$). Chemotherapy-designated gloves were used significantly more often in the western regions ($p = 0.005$). Chemotherapy-designated gowns were available significantly more frequently in the midwestern and western as compared with the eastern and southeastern regions ($p = 0.01$). Nurses from the northeast ($p = 0.002$) and those with a bachelor's or higher degree ($p = 0.05$) were significantly more likely to report wearing laboratory coats rather than chemotherapy-designated gowns.

No significant differences were found in availability of personal protective equipment by employment status (full-time versus part-time), nursing experience, or certification. Participants from the southwestern and western regions reported that gowns were available significantly more frequently than did nurses from other regions ($p = 0.03$).

Frequency of use of personal protective equipment: Among nurses who prepared chemotherapy, the frequency of personal protective equipment use was similar in all work settings and did not differ by the characteristics of the nurses (experience, education, certification, nursing workload). As outlined in Table 3, 99% reported "usually" (more than 50% of the time) wearing gloves and 53% reported "usually" wearing gowns. Goggle and mask use rarely was reported in any setting.

During administration of chemotherapy, the frequency of personal protective equipment use also was similar across work settings. The majority of participants (94%) reported "usually" wearing gloves. The use of gowns, goggles, and masks was reported much less frequently. Noncertified nurses reported using gowns significantly more frequently than certified nurses ($p = 0.01$). Respondents in the southwestern and western regions reported using gowns significantly more frequently than those in other regions of the country ($p = 0.02$). Nurses with less oncology experience were significantly more likely to report frequent use of gowns ($p = 0.03$).

More than 90% of respondents reported wearing gloves for handling excreta and disposing of chemotherapy. Noncertified nurses were more likely to use gowns ($p < 0.01$) and goggles ($p = 0.05$) while handling excreta as compared to certified nurses. Likewise, noncertified nurses wore gowns more frequently than certified nurses during disposal of chemotherapy ($p = 0.05$).

Chemotherapy preparation practices: Pharmacists were responsible for preparing chemotherapy in 49% of all work settings, and nurses in another 49% (see Table 4). In 9% of institutions, ancillary technicians such as pharmacy technicians were identified either alone or in association with licensed practitioners for preparation. Hospital-based practices (80%) employed pharmacists significantly more frequently than community-based practices (22%) ($p < 0.01$). In community-based settings, nurses were responsible for preparation 74% of the time. Nurses were more likely to be responsible for the preparation of chemotherapy in work settings that treated fewer than 25 patients per day ($p = 0.001$). Additionally, nurses were more likely to be responsible for preparing agents in practices where the nurse treated fewer than six patients per day ($p = 0.02$). No significant differences were found in who prepared chemotherapy by region, employment status, or nurses' experience, education, or certification status.

Chemotherapy was reported to be prepared in a laminar air flow hood in 100% of the sample, but 15% of the respondents reported turning the hood off. This practice occurred significantly more often in community-based practices ($p < 0.01$), in

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Table 2. Occupational Safety and Health Administration's Recommended Equipment Availability

Equipment	Preparation[a] (%)	Administration (%)	Handling Excreta[b] (%)	Disposal (%)	Cleaning Spills (%)
Gloves	100	100	100	100	100
Polyvinyl chloride	8	16			
Latex	18	41			
Chemotherapy	83	60			
Other	5	10			
Gowns or protective garments	85	80	75	76	93
Laboratory coats	38	55			
Cloth or isolation garments	5	1			
Chemotherapy-designated gowns	67	44			
Goggles	54	56	54	53	79
Masks	55	60	59	58	83

N = 250 (Not all respondents answered all questions.)

[a] Respondents who prepare chemotherapy: n = 121

[b] Respondents who reported handling excreta: n = 238

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institutions where agents were prepared in either a medication room or specially designated areas ($p < 0.001$), and where nurses were responsible for preparation ($p < 0.001$). Also, 52% of respondents indicated that tubing was primed under the hood. Pharmacists were more likely to prime tubing under the hood ($p = 0.01$).

Management of spills: The participants reported that spill kits were available in 98% of work settings. However, only 82% reported using a spill kit during the cleaning of a spill. The availability of a spill kit was positively correlated with certification ($p = 0.01$). Spill kits were used more frequently in the midwestern region ($p = 0.05$) and in hospital-based practices ($p = 0.03$).

Table 3. Frequency of Personal Protective Equipment Use Reported by Nurses

Variable	Usually (%)	Occasionally (%)	Rarely (%)
Preparation[a]			
Gloves	99	1	–
Gowns	53	13	34
Goggles	6	2	92
Masks	3	7	91
Administration			
Gloves	94	4	2
Gowns	31	15	54
Goggles	3	5	92
Masks	1	5	94
Handling Excreta			
Gloves	96	3	1
Gowns	23	19	58
Goggles	2	7	91
Masks	3	8	89
Disposal			
Gloves	94	4	1
Gowns	26	12	60
Goggles	2	4	94
Masks	1	4	95

[a] Percentage represents responses among nurses who prepare chemotherapy.

Medical monitoring: Only 46% of the respondents reported that their employers provided health evaluations. Of those who received health evaluations, 50% reported having a pre-employment physical examination as the only monitoring method. Only 6% reported that the health history included reproductive and cancer evaluation. Hospital-based practices (67%) were significantly more likely to provide health evaluations ($p < 0.01$) as compared to community-based practices (33%). Participants from the mid-Atlantic and southeastern regions reported medical monitoring significantly more frequently ($p = 0.02$) than nurses in other regions.

Education and Training of Nurses Handling Chemotherapy

Attendance at an educational program focusing on chemotherapy administration and handling was reported by 87% of the participants. Of those who attended a program, 61% reported that it was an accredited, formal continuing education program. Only 8% reported on-the-job training as their method of chemotherapy education. Region, employment status, and nursing variables were not significantly associated with whether an educational program was formal or on the job.

Policies and Procedures

The respondents reported that policies and procedures related to chemotherapy handling were available in 85% of work sites. Those working in hospital-based practices reported having policies and procedures available significantly more frequently than those in community-based practices ($p < 0.01$).

Discussion

The goal of this survey was to identify current chemotherapy-handling practices and demographic factors associated with personal protective equipment use among nurses in outpatient and office-based settings. The participants in this study were older and more experienced compared with the general ONS population. This finding may be explained, in part, by the fact that previous oncology or chemotherapy experience usually is

Table 4. Chemotherapy Preparation Work Practices

Variable	%
Person responsible for chemotherapy preparation	
Physician	–
Nurse	49
Pharmacist	49
Other (i.e., technicians)	9
Drug preparation area	
Pharmacy	46
Specially designated room (not medication room)	32
Medication room	15
Other (e.g., utility room, treatment area)	6
Chemotherapy prepared in laminar air flow hood	100
Laminar air flow hood on at all times	68
Tubings primed in laminar air flow hood	50

N = 250 (Not all respondents answered all questions.)

required for employment in outpatient and office practices; therefore, nurses in those settings may be older. Because the study population was derived from ONS members, these nurses also may have been more aware of appropriate handling practices as compared to non-ONS members. Thus, the results of this study may not be generalizable to non-ONS nurses. In addition, the researchers had no reason to assume that those who responded handled chemotherapy differently, but a response bias cannot be ruled out.

The findings of this survey suggest that the availability and frequency of use of personal protective equipment are increasing as compared to previous chemotherapy-handling studies (Mahon et al., 1994; Nieweg et al., 1994; Valanis & Shortridge, 1987). The majority of participants have integrated glove use into their practice. In early studies, glove use was reported to be 42% during administration and 77% during preparation of chemotherapy (Valanis & Shortridge). Mahon et al. reported that gloves were worn for preparation and administration about 90% of the time. This study also reported that chemotherapy-designated glove use ranged from 44%–52% during preparation and administration. The respondents in the current study overwhelmingly reported using this type of glove, especially during preparation activities. The use of PVC gloves was much higher in this study than in previous reports. Mahon et al. reported that only 3%–4% used PVC gloves. This change in practice may be related to the cost of gloves and concerns regarding latex allergies secondary to repeated latex exposure. This practice may be of concern because PVC gloves provide the least protection during handling (Connor, Laidlaw, Theiss, Anderson, & Matney, 1984; Laidlaw, Connor, Theiss, Anderson, & Matney, 1984). Additionally, glove contamination during handling procedures has been reported to be commonplace (Sessink, Boer, Scheefhals, Anzion, & Bos, 1992). The current study noted an increase in the use of PVC gloves versus previous studies. Additionally, chemotherapy-contaminated gloves may lead to leaching of the drug through the glove, thus causing skin contamination.

Based on this survey, the frequency of protective garment or gown use during preparation activities has increased dramatically since 1985, when frequency rates of 22% and 38% for office practices and outpatient areas, respectively, were reported (Valanis & Shortridge, 1987). Reported chemotherapy-designated gown use during chemotherapy preparation has increased markedly from previous studies (Mahon et al., 1994). Reported use of laboratory coats increased considerably in the current survey. This trend in practice is of concern because cloth garments do not provide protection from chemotherapy. Gown manufactures currently are marketing protective garments constructed of low-permeability material with cuffed sleeves that resemble laboratory coats.

The use of face protection such as goggles and masks continues to be limited. As reported in previous studies, the use of eye protection was only 30% when mixing and 20% while administering (Mahon et al., 1994). In the current study, respondents reported limited availability of eye protection and said they rarely used eye protection during handling activities. OSHA recommends that face and eye protection be used when splashing, spraying, or aerosolization are possible. Goggles with side protection are cited as appropriate protection. Eyeglasses provide inadequate protection. Biologic safety cabinets are equipped with glass shields that may provide protection during preparation. During administration, however, the potential of skin contact or aerosol exposure still exists, especially when connecting syringes, tubings, and infusions. In addition, the National Institute for Occupational Safety and Health (NIOSH) recommends the use of a respirator with a high-efficiency filter (preferably a powered, air-purified respirator) when aerosolization is possible[a] (Bollinger & Schutz, 1987). In the current survey, respondents reported using masks as a protective device. Surgical masks are not recommended by NIOSH because they provide inadequate protection from aerosolized drugs.

In 1987, Valanis and Shortridge reported that the availability of vertical flow hoods ranged from 22%–48%, but the use of laminar air flow hoods seems to have become standard in both community- and hospital-based practices since then. However, a sizeable percentage of the respondents to the current survey reported turning the hood blowers off. This action, often done to avoid noise and heat, may cause air and surface contamination, thus increasing the risk of exposure. OSHA recommends that exhaust fans or blowers remain on at all times, except during maintenance.

In this survey, spill kits were available routinely in both hospital- and community-based practices. However, about 20% of respondents reported not using the kits. Additionally, those working in community practices were less likely to use the kits when spills occurred despite the fact that the personal protective equipment recommendations for small spills (less than 5 ml) or large spills (greater than 5 ml) include gowns, double latex gloves, splash goggles, and NIOSH-approved respirators if aerosolization may occur. Explanations for failure to use the kits may include inaccessibility in the treatment area during spills, the perception that cleaning spills using kits may be too time-consuming, or the perception that spills do not warrant the use of kits.

In the revised 1995 guidelines, OSHA recommended "a systematic program of medical surveillance intended to prevent occupational injury and disease." According to the guidelines, medical evaluations should be conducted before job placement, periodically during employment, after acute expo-

[a] At the time of publication, NIOSH had convened a panel to review the guide for industrial respiratory protection.

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sures, and at the time of job termination or transfer (exit examination). These findings indicate that the majority of work settings do not provide medical evaluations or only monitor during the pre-employment period. Furthermore, the major purpose of this recommendation, identification of early reversible adverse effects, is not being met because monitoring is not occurring during potentially high-exposure periods.

Conclusions

Since the 1979, the use of personal protective equipment when administering chemotherapy has increased, but medical monitoring of exposed employees is neither widely practiced nor consistent with OSHA guidelines. A number of areas for future nursing research may evolve from this survey's findings. Currently, research is lacking regarding specific barriers to safe handling of chemotherapy. Information regarding nurses' level of awareness and knowledge of the components of the OSHA guidelines is lacking. Few articles concerning safe chemotherapy-handling procedures were published in nursing journals in the 1990s. Whether nurses, physicians, and administrators are aware of the updated guidelines is unclear. Many of the practices cited in the guidelines are recommended, not mandated. Further studies should be conducted on the influence of nurses' knowledge, perception of the effectiveness of precautions, perceived risks of handling chemotherapy, and health beliefs on adoption of safe handling behaviors. Researchers also should identify how organizational culture influences chemotherapy-handling practices. Information regarding the updated guidelines needs to be disseminated both at the practice and administration levels.

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- MEDLINEplus: Cancer Chemotherapy
  www.nlm.nih.gov/medlineplus/cancerchemotherapy.html
- CancerIndex: The Chemotherapy and Pharmacology Page
  www.cancerindex.org/clinks4c.htm

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