

THE HANDLING OF ANTICANCER DRUGS IN RIYADH AND THE EASTERN PROVINCE

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There is increasing evidence that exposure to cytotoxic drugs in the workplace carries a definite hazard to the health of workers. The International Agency for Research on Cancer of the World Health Organization¹ has identified at least five anticancer drugs with sufficient evidence of carcinogenicity. Urine mutagenicity in pharmacists² and damaged chromosomes³ as well as fetal loss in nurses after exposure to antineoplastic drugs during the first trimester of pregnancy⁴ were reported. Exposure of workers to cytotoxic drugs may occur mainly by inhalation of airborne particles or direct skin contact.⁵ In response to the potential hazards to health care personnel, a number of organizations such as the National Institutes of Health (NIH),⁶ American Society of Hospital Pharmacists (ASHP),⁷ Clinical Oncological Society of Australia⁸ and Occupational Safety and Health Administration (OSHA)⁹ have developed guidelines for the safe handling of parenteral antineoplastic drugs during both preparation and administration. These guidelines are summarized in Table 1.

Until recently, only King Faisal Specialist Hospital and Research Centre in Riyadh treated cancer patients with cytotoxic agents, but now almost all the referral hospitals in Saudi Arabia provide this service. It was our concern that some hospitals have neither a policy nor the necessary equipment and training for handling such hazardous drugs. This study, therefore, was aimed at investigating the conditions and proficiency of handling cytotoxic drugs in Saudi Arabia.

Method

Twelve referral hospitals known to offer cancer chemotherapy service in the Eastern Province and Riyadh City were investigated. They included four hospitals in the Ministry of Health (MOH) (Riyadh Central Hospital, Riyadh Maternity and Children's Hospital, Dammam Central Hospital and Qatif Central Hospital), two for the

TABLE 1. Summary of guidelines for safe handling of cytotoxic drugs, published by various international organizations.*

1. Cytotoxic drugs should be reconstituted and administered by trained personnel.
2. Reconstitution should be carried out in designated closed areas.
3. Reconstitution should be done in a class II laminar-flow biological cabinet (vertical laminar-flow).
4. Protective outer garments such as closed-front gowns, gloves, surgical face masks and eye spectacles should be used during preparation and administration.
5. A special pad for breaking open ampoules, and removing air from syringes should be used.
6. Pregnant staff should not handle cytotoxic drugs.
7. Contaminated syringes, vials, bottles, gloves, absorbent materials and disposable gowns should be placed in a plastic bag and incinerated.
8. Cleaning up of spillage during preparation should be carried out by the same person involved in preparation.
9. In case of direct skin contact with antineoplastic drugs, the affected area should be thoroughly washed with water and soap. A first-aid protocol for treating cases of direct contact should be established.
10. Access to all areas where cytotoxic drugs are stored should be limited to specified authorized staff.
11. Patients' excreta and blood should be handled with care, especially during the first 48 hours after infusion.

*References 5-9.

Armed Forces, one for the National Guard, one for the Ministry of Interior, two teaching hospitals, King Faisal Specialist Hospital and Research Centre and Aramco Hospital. A random visit was made to each site by one of the authors without prior knowledge of any of the professional workers involved. The study was conducted through a detailed questionnaire to pharmacists, nurses and physicians and all questions were answered at the time of the visit. The questionnaire was aimed at investigating the adherence to internationally recommended guidelines summarized in Table 1. The unannounced visit was made to ensure accurate and complete response.

Results

Only seven (58%) of the 12 hospitals investigated had a written policy for handling such hazardous chemicals (Table 2). Staff nurses were involved in preparation of cytotoxic drugs in three (25%) hospitals, while domestic staff were involved in cleaning up spillage in five (42%)

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Accepted for publication 7 September 1996. Received 27 March 1996.

hospitals. Administration of these drugs was mainly carried out by nursing staff.

The site of preparation was considered unsuitable in five hospitals (42%), due to either lack of essential equipment such as vertical laminar flow cabinet (33%) or use of the site for preparing other drugs (42%) or both (Table 2). The area of preparation was not closed off and aseptic conditions were not maintained in three hospitals. In one hospital, even a wash basin was not available at the site of preparation.

Gloves were used during preparation in all of these hospitals, while eye spectacles and surgical face masks were used in six (50%) hospitals, and gowns or aprons were used in 9 (75%). Special trays or absorbent sheets for preparation were used in 75%, while a special pad to break open ampoules was used in 50% of investigated hospitals. A vertical laminar flow cabinet was used in 67%, and Luer lock syringe fittings in 75%. Only in one hospital was air expelled from syringes into a special pad.

Disposable boxes were used to keep sharps, needles and ampoules of cytotoxic drugs in nine hospitals (75%). Special bags or double plastic bags were used for other disposable materials in nine hospitals (75%) before being sent for incineration, which was the method used to eliminate the residuals of cytotoxic drugs in 10 hospitals (83%). A chemical kit, or disposable absorbent material to clean up spillage, was available in eight hospitals (67%).

TABLE 2. Current practices relating to cytotoxic drug administration.

Criteria	No. of hospitals	Percentage (%)
Hospitals investigated	12	100
Hospitals with dispense >40 antineoplastic injections a week	8	67
Hospitals with written policy for handling cytotoxic drugs	7	58*
Personnel involved in preparation		
Pharmacist	9	75
Technical pharmacist	8	67
Nurse	3	25
Personnel involved in administration		
Nurse	12	100
Physician	2	17
Personnel involved in cleaning up spillage during preparation		
Same person concerned with preparation	7	57
Domestic staff	5	42
Preparation		
Designated closed area	9	75
Location in the pharmacy	7	58**
Aseptic conditions maintained	9	75
Vertical laminar flow cabinet (available)	8	67
Wash basin (available)	11	92
Uses for other purposes	5	42

*Two hospitals follow OSHA guidelines for handling dangerous chemicals;

**some hospitals had additional designated preparation rooms in ward or Outpatient Department.

Discussion

Our survey shows that all the investigated referral hospitals are dispensing parenteral cytotoxic drugs and that a high proportion of them were dispensing more than 40 injections/week. Furthermore, different professionals were involved in preparation, administration and cleaning up of cytotoxic drugs (Table 2). This would lead to a greater risk of exposure to these extremely hazardous drugs if safety policies are not implemented. It has been recommended⁵⁻⁹ that a comprehensive written policy describing all the procedures of safe handling during the various stages of preparation, administration, cleaning up of spillage and disposal of contaminated material is kept by each hospital dispensing cytotoxic drugs. Personnel should be aware of its existence and trained to implement it. This represents an essential step toward improving and maintaining high safety standards.¹⁰ Our results showed that only 58% of investigated hospitals had a written policy for handling antineoplastic drugs.

Despite the fact that occupational risk could be minimized by strict adherence to safety measures and the use of protective equipment such as vertical laminar flow cabinet (biological safety cabinet) and full apparel, which consists of gloves, apron or gown, eye spectacles and surgical face mask or respirator,⁷⁻¹² our findings suggest that most protective measures during preparation were not stringently enforced in some hospitals. While most items of protective clothing were ignored in some hospitals, gloves were the only consistently used method for self-protection. This finding is consistent with that reported by Wiseman and Wachs.¹²

Systemic absorption of antineoplastic agents in hospital workers results mainly from the inhalation of airborne drugs.⁵ Preparation of cytotoxic drugs in a vertical laminar flow cabinet significantly reduces the risk of inhalation of drug particles and has been strongly recommended for this purpose.^{5,7,8,13} The cabinet should be continuously turned on and should be decontaminated once a week.¹³ A vertical laminar flow cabinet was used during preparation in only 67% of investigated hospitals, while the remaining four hospitals were not equipped with this important cabinet. Unfortunately, use of a surgical mask or even horizontal laminar flow cabinet does not provide sufficient protection.²

The awareness of all staff involved in cytotoxic drug handling of the hazards posed by such chemicals is also important in raising standards of safety.¹³ It is the pharmacist's responsibility to instruct nurses, physicians, and domestic staff on safe handling of hazardous drugs.¹³ Furthermore, the pharmacist should educate patients on safety aspects when handling cytotoxic drugs in home chemotherapy.¹⁴

In conclusion, our study revealed serious inadequacies in equipment and expertise in handling cytotoxic agents in some of the investigated hospitals. These range from absence of written policies to lack of essential facilities and proper training and practice. Although some effort has been made to promote the standard of safety handling of cytotoxic drugs,^{15,16} the authors are of the opinion that a center for training personnel in the proper handling of cytotoxic agents should be created in each region of the country. Major hospitals with appropriate facilities and proper administration of handling policy may serve as such centers. The Saudi Council for Health Specialties and the Saudi Pharmaceutical Society should be the organizing bodies for such training programs. Different methods of instruction, such as organizing workshops and group discussions¹³ or implementing self-learning exercises,¹⁷ may be used. In addition, the safety committee in each hospital should ensure appropriate implementation of safety policies for handling cytotoxic drugs. Meanwhile, employees' apprehension about handling cytotoxic drugs could be reduced by keeping them informed about hospital plans, listening to their concerns, and involving them in developing procedures for safe handling of these agents.¹⁸

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