

## **Nurses' exposures to antineoplastic drugs in Canada and risk assessment of lifetime cancer incidence**

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### **Objectives:**

Oncology as well as non-oncology nurses are at risk for exposure to antineoplastic drugs some of which are known to be carcinogenic. Exposures may occur while transporting, preparing, administering and disposing the drugs but also indirectly when caring for treated patients by handling excreta, washing or removing linen (1). Despite the safety guidelines regarding handling and disposing of these drugs, issues of work environment contamination and biologic evidence for personal occupational exposure are still described in the literature (2). Occupational exposure limits for these drugs have not been set anywhere. Our objectives were to estimate the number of patients treated with potentially carcinogenic antineoplastic drugs and to evaluate the magnitude of possible occupational exposures to these drugs among nurses in Canada. Furthermore, we aimed to review publications which measured cyclophosphamide in the urine of nurses in order to quantify the average cumulative lifetime uptake of this drug and extrapolate the personal lifetime risks for developing certain types of cancer.

### **Methods:**

Within the framework of an occupational study of chemical exposures among acute care nurses in BC, a comprehensive review of exposures to antineoplastic drugs was performed. In order to estimate the potential number of nurses involved with handling antineoplastic drugs, Canadian incidence rates of cancer types associated with potentially carcinogenic antineoplastic drug therapies were gathered to evaluate the amounts of antineoplastic drugs prescribed annually in Canada. Data on urinary levels of cyclophosphamide among health care workers, a widely used anticancer drug that is known to be carcinogenic, was collected through literature review to estimate its uptake among nurses. Based on bladder cancer incidence rates from a Swedish study on patients diagnosed with Wegener's Granulomatosis, an autoimmune condition, and followed up after treatment with cyclophosphamide (3), bladder cancer risk estimates resulting from lifetime exposures were evaluated. Additional task specific risk estimates were made for assessing the risks among nurses involved with indirect exposure to cyclophosphamide.

### **Results:**

Annually about 177,000 Canadians are diagnosed with cancer (4). About 20% of them are treated with antineoplastic drugs that are potentially carcinogenic including cyclophosphamide among others. Some patients with severe autoimmune conditions that are also treated with these drugs should be added to these numbers. According to estimates from CAREX about 17,000 Canadians are exposed to antineoplastic drugs at their workplaces of whom the vast majority (almost 15,000) are nurses (5). Based on literature review on urine Cyclophosphamide monitoring among Nurses and Pharmacists that handle these drugs we have estimated a cumulative lifetime uptake of 10-19mg cyclophosphamide (2). Our calculated lifetime bladder cancer risk is 42-83 per million. Further specific cancer estimates will be presented.

### **Conclusions:**

Despite nurses' awareness of the risks, exposure to antineoplastic drugs is still prevalent (6). It is forecasted that the potential magnitude of health care personnel exposure to antineoplastic drugs will grow with the increasing number of patients newly diagnosed with cancer as the Canadian population grows and ages.

Therefore, new strategies for mitigating exposures among health care personnel and especially nurses must be implemented.