

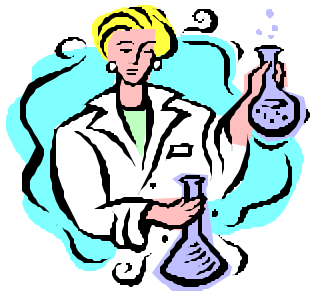
Occupational Medicine Clinical Update

*A newsletter by physicians,
for physicians, dealing
with issues related to
occupational medicine*

Occupational Health Clinics for Ontario Workers Inc, Samia-Lambton

Is working in healthcare a risk factor for breast cancer?

This issue's review was prepared by Catherine Ho, HBSc, a second year UWO medical student working at our clinic on a Summer Studentship



It's 12:00 noon at your busy family practice and you're already an hour behind. Your next patient is Wendy Smith, a 55 year-old nurse who has been recently diagnosed with Stage IIB breast cancer. She works at the local emergency department where you work the odd shift. Two other patients in your practice, also nurses, were diagnosed with breast cancer about a year ago. Before opening the door you wonder: "Does working as a nurse have something to do with breast cancer, or is this just a coincidence for a relatively common disease?"

The increasing burden of breast cancer

Breast cancer is the most frequent type of cancer in women worldwide, affecting approximately 1 in 9 during their lifetime. Incidence has been increasing in the Western world since the 1940's, and breast cancer is the second leading cause of cancer deaths in women. A fall in mortality since the 1990's due to screening programs and improvements in treatment does not address the disruption in the lives of those affected.

Table 2: Occupations suggested to be associated with an increased risk of breast cancer

Healthcare personnel : nurses, physicians, pharmacists, lab and radiology technicians,	Jewelers Laundry and dry cleaners
Agricultural workers	Librarians
Electrical workers	Pharmaceutical workers
Hairdressers and cosmetologists	Teachers

What are the risk factors?

Earlier research has revealed a number of risk factors, most of which are related to hormonal changes (especially estrogen), that influence the breast epithelium. However, the majority of breast cancer cases cannot be explained by these traditional risk factors [Brophy et al, 2002]. A recent study showed that 73% of breast cancers can be attributable to environmental factors [Lichenstein, 2000]. Table 1 summarizes known and suspected risk factors for breast cancer.

Studies of migrant populations and geographic variations in incidence of breast cancer suggest that aside from the "traditional" risk factors, environmental and lifestyle influences are primary contributors to breast cancer etiology. Among migrants from low-risk to high-risk countries (e.g. China/Japan to the United States), breast cancer rates increase and eventually become similar to those of the new country even after controlling for reproductive factors [Ziegler et al, 1993; Wu et al, 1996]. Given that women's participation in the workplace has also steadily increased in the past few decades, it is worthwhile to ask whether occupational exposures contribute to breast cancer etiology. A variety of occupations have been suspected as having associations with increased cancer risk (Table 2).

So then, back to your patient the nurse - could her job have anything to do with her disease?

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Table 1: Known and suspected risk factors for breast cancer
(data drawn from Key et al., 2001, Brekelmans 2003)

"TRADITIONAL"	"OCCUPATIONAL/ENVIRONMENTAL"
Reproductive factors (extended estradiol exposure): early menarche, nulliparity, late first live birth, late menopause, not breastfeeding	Shift work - disruption of diurnal rhythm during nightshift may reduce melatonin, resulting in increased estrogen production.
Hormone replacement therapy (HRT), Oral contraceptive therapy	Disinfectants/fixatives - e.g.: ethylene oxide, formaldehyde
Genetic factors	Ionizing radiation
Diet, alcohol consumption	Hormonally active chemicals/Endocrine disruptors - eg: PCBs, nonylphenol, bisphenol-A, butyl benzyl phthalate, pesticides, organic solvents
Obesity (post-menopausal woman)	
Benign breast disease	

Table 3: Summary of findings from studies on breast cancer and nurses

Study Design (number of studies)	Risk:		
	Increased risk (statistically significant)	Increased risk (not statistically significant)	No elevation in risk
Registry-based (7)	7	0	0
Cohort (3)	1	1	1
Case-control (6)	2	1	3

Unfortunately, there are relatively few good quality studies that assess for possible associations between working in health care and breast cancer.

The literature dealing specifically with nurses and breast cancer is divided - a not uncommon occurrence in occupational medicine research. Registry-based studies strongly support a positive relationship between nursing and breast cancer risk, while cohort and case-control studies do not (Table 3).

Of these studies, 12/16 showed increased risk, 10/16 showed a statistically significant elevation in risk. Four of the sixteen showed no elevation in risk for breast cancer in nurses.

Most registry studies are based on large numbers provided by cancer registries that are then cross-referenced with census occupational data. The strength of these studies lies in their statistical power. However, it is impossible to control for important variables such as reproductive factors, HRT use and family history. This is obviously important in breast cancer research and can lead to inaccurate risk estimates. Most cohort studies share the same limitation and are also weaker in statistical power. Case-control studies are able to control for potential confounders, but may be limited by low statistical power.

The Bottom Line

- *There is some evidence for a positive association between certain healthcare occupations and breast cancer.*
- *Given the huge disease burden of breast cancer, knowledge of occupational and environmental contributors may have important implications for cancer prevention.*
- *Not all nurses have equal work exposures. Despite the dilutional effect that has occurred from this, there appears to be an elevation of risk. Studies with better exposure data may produce more definitive results.*

There can be other important study limitations. Occupational exposures for nurses are assumed to be similar, regardless of what department or specialty they work in. This might lead to the conclusion that there are no elevations in risk in the broad category of nurses, even though a certain subgroup (e.g. pediatric nurses) has a significantly increased risk for cancer. The one study that took this into consideration did indeed reveal elevated risks, but only when the study population was separated into subgroups according to their specialty [Gunnarsdottir et al, 1997]. Furthermore, none of the studies take into account specific exposures to hazards such as ionizing radiation, estrogenic/carcinogenic chemicals or shift work. Overall, the literature suggests an association between nursing and higher breast cancer risk. However, the evidence is inconsistent and more high-quality research is needed before we can conclude any cause-effect relationships.

What may be causing an elevated risk in nurses?

Some nurses, depending on their area or work, are at risk of being exposed to multiple potential carcinogens in the workplace including: ionizing radiation, chemotherapeutics, disinfectants/fixatives, estrogenic chemicals, viruses, shift work and psychosocial stressors (Table 1).

Ionizing radiation is a well-accepted cause of breast cancer. Nurses and doctors accumulate low-level exposures while performing diagnostic testing, and doses were higher a few decades ago than they are today [Weiderpass et al, 1999]. Some pharmaceutical agents are known to act as mammary carcinogens in animal models, and some weak epidemiological evidence suggests ethylene oxide as a mammary carcinogen. Hormonally-active chemicals used in medicine have also been linked to breast cancer including: nonylphenol, bisphenol A, butyl benzyl phthalate and PCBs [DeBruin & Josephy, 2002; Aschengrau et al, 1998]. The recent Nurses' Health Study also revealed that disturbance to the diurnal sleep-wakefulness rhythm may increase breast cancer risk.

Much work remains to be done regarding other specific occupational exposures and breast cancer incidence. Clarification of any occupational causes will have significant implications for primary prevention of this all-to-common disease.



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