

**SUBMISSION PAPER FOR CONSIDERATION ON THE PROPOSED CHANGES TO THE  
OCCUPATIONAL HEALTH AND SAFETY (OH &S) REGULATIONS, PART 7 RADIATION**

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### **Personal Interest and Background History**

Thank you for the opportunity to allow me to voice my concerns over proposed changes to WCB regulations, specifically Part 7 Radiation. My adventures with the Worker's Compensation Board and the radiation regulations began 5 years ago. I was diagnosed with papillary thyroid cancer in late 1998. In Jan. 1999 I had major surgery, a total thyroidectomy. I was the second of what would turn out to be a total of three Operating Room Nurses at my facility who were diagnosed with this form of cancer in less than a year of each other. Three out of 58 nursing staff had developed a rare form of the same cancer. If I could put this into perspective for you, during that same time period the occurrence of all thyroid cancers for women in the province of BC was, 6.5 in 100,000. In addition to the thyroid cancers, several of our staff have also developed thyroid disease. Because of our filing claims with WCB, a request was made to the BC Cancer Agency to do a cancer cluster study. Dr. Nhu Le of the BC Cancer Agency stated in his report: " the findings indicate an excess risk of papillary thyroid cancer among OR nurses at the hospital at least over the relatively short time period in question. The excess is statistically significant; that is, chance alone cannot adequately explain the increased risk." He went on to determine that we had an estimated rate of at least 40 times greater than the general population. A recent Canadian study (Risk Analysis of Cancer Incidence and Occupational Radiation Exposure Based on the National Dose Registry of Canada) also found an increased rate of thyroid cancer in medical workers. In Australia a recent survey (1997) has reported a potential thyroid carcinoma rate in Orthopaedic Surgeons of 1 in 200 , well above that expected in comparable Australian population of 1 to 3 per 100,000 per annum. I've spoken with Dr. P. Dewey, who co-authored a document entitled: Radiation Safety for Orthopaedic Surgeons. Dr. Dewey, Mr. Stame George, Dr. James McGrath, and Dr. Helen Beh dedicated their booklet as follows: This booklet is dedicated to those orthopaedic surgeons who have suffered from pathology likely to have been caused by radiation exposure in the hope that the information being provided may reduce the incidence of such pathology in the future. Professor Stephen Leeder, Dean Faculty of Medicine, The University of Sydney wrote the forward. He captures the essence of radiation protection which I would like to share,... "There are no Brownie points for macho behaviour with regard to x-rays-none at all. It behoves all of us to ensure that exposure is minimized (there is no evidence for an utterly safe lower dose) and that the human benefit is maximized..."

One of the things that happens when you are diagnosed with cancer is you begin to ask questions. The first question I found myself asking was, what caused my cancer? I began to read everything I could about thyroid cancer. What repeatedly came up in the literature is that radiation exposure is a known risk factor of papillary

thyroid cancer. Late effects of radiation exposure can also cause many other forms of cancers, including leukemia, bone cancer, lung cancer, and breast cancer. Working in the Operating Room we are exposed on a daily basis to ionizing radiation. Ionizing radiation is: any radiation capable of displacing electrons from atoms or molecules, thereby producing ions. Ionizing radiation can seriously injure humans. Health Canada, Atomic Energy Control Board: Assessment and Management of Cancer Risks from Radiological and Chemical Hazards, pg. 15 states, "When ionizing radiation passes through matter, including tissue, it deposits some of its energy in the traversed material as a result of electrical interactions. The resulting ionization of body tissue causes chemical changes in the irradiated cells that can potentially lead to biological damage....pg. 16, The effect of primary concern associated with low doses of ionizing radiation are an increased incidence of cancer in exposed persons, and potential genetic disorders in their offspring. The probability of occurrence of late effects is assumed to be proportional to dose, and it is generally assumed that there is no threshold below which they do not occur...Late effects arise as a result of damage to the DNA. Usually, cellular damage is repaired through a natural process; however, if it is not adequately repaired, it may result in a viable but modified cell. The reproduction of a modified somatic cell may result, after a prolonged and variable latency period, in the appearance of a cancer. The risk of cancer is the principal concern in radiation protection. Specific cancers observed in exposed populations include leukemia and cancers of the thyroid, lung, breast, and bone.

Over the last five years I have attended many meetings and had phone conversations with representatives from WCB, my Occupational Health Department, my Radiation Safety Officer, the Radiation Protection Branch of BC, Health Canada, the National Dose Registry, The Radiation Safety Institute of Canada, The Canadian Radiation Protection Association, NIOSH, OSHA, etc. It was during one of those discussions I learned about WCB regulations, Part 7. When I first read Part 7 I was amazed. I had worked in the OR for close to 20 years at two major hospitals within our province, and had never received any education on radiation safety. I was unaware of what I needed to do to protect myself. I did not know the cardinal principles of radiation protection of: time, distance and shielding. I began to teach myself. I learned that the dose to an individual is directly related to the duration of exposure; if time is doubled, exposure is doubled. I learned that as the distance between the source of the radiation and a person increases, the radiation exposure decreases; double the distance, quarter the exposure. Unfortunately, I also learned that for years I had unknowingly exposed myself without proper personal protective equipment or monitoring to one of the worst forms of radiation.

It took two years, and many phone calls before I finally persuaded someone from WCB to come to my workplace. Eventually, the result was that Inspection Orders were written based on the Part 7 regulations (# 2001119270014). We were in violation of Sections: 5.53 (4), 7.34, 7.36, 7.37, 7.40 (1), 7.41 (1), 7.42 (1). These orders were followed up with several non compliance orders. Without prejudice, I would like to say that to this date I still consider some of those initial inspection orders are still outstanding. It is important to understand that my facility is not unique in its lack of following the regulations. Nurses at other hospitals have shared that they see similiar things at their facilities. That is why we need strong enforceable regulations that everyone can understand and easily access. At the same time, as a result of our situation, the WCB recognized a need for their own staff to be further educated and they organized a training course to be given by the Radiation Safety Institute of Canada. I was asked to participate. The thing that stood out to me the most during my conversations with a lot of people within the radiation industry is that there appears to be a general lack of knowledge and understanding of the extent of radiation exposure that occurs in operating rooms and with nurses in general.

#### **Reality of Workplace Exposure to Ionizing Radiation**

Working as nurses in an acute care trauma referral center we are exposed to ionizing radiation on a daily basis. Sometimes for full shifts at a time, six days in a row. Depending on your assignment you may be required to stand directly next to the patient/C-Arm fluoroscopy for extended periods of time. The potential for exposure to radiation is greater during fluoroscopy than during conventional radiographic studies due to increased radiation scatter and increased exposure times. The areas at greatest risk of radiation exposure for personnel within a 6 foot range of the radiation source are the head, neck, and hands. That makes us as OR nurses who routinely stand next to the patients, more vulnerable to exposure. Historically, few ORs had access to thyroid shields. Fewer still have access to lead protection for eyes, hands or face shields for reduction of radiation exposure to eyes/brain/hands. Over the past several years more and more procedures are done in the Operating Room using fluoroscopy; thus our exposure times has increased. Add to that if you work in a teaching facility the procedures and exposures will be lengthened because of the learning curve of students/residents/new procedures which often increases fluoroscopy times.

#### **Concerns with Proposed Changes**

One of the first things I did when I learned of the proposed changes was to find out what the impact of moving large amounts of the regulations into guidelines. What I learned from WCB is that a regulation is legally

enforceable, a guideline is not. According to the WCBs website: The OHS Regulation contains legal requirements that must be met by all workplaces under the inspectional jurisdiction of the Workers' Compensation Board... The purpose of the OHS Regulation is to promote occupational health and safety and to protect workers and other persons present at workplaces from work-related risks to their health, safety and well-being." I was told that a guideline provides information but an employer is not legally bound to follow a guideline. WCBs own web page states, "Guidelines are intended to assist with providing ways of complying with the legislation, not to provide exclusive interpretations. The mandate of WCB, in concert with workers and employers, is to: promote the prevention of workplace injury, illness, and disease. I understand that orders can only be written on the regulations or the Act; orders cannot be written on guidelines. Therefore by gutting the regulations you are taking away the ability of a WCB Occupational Hygienist to come in to a workplace and write enforceable orders to protect workers. I strongly object to moving any regulation to a guideline. I will proceed with specific concerns regarding the proposed changes.

**7.39 changing to 7.19 (2) Changing wording from: *Once to if a worker declares her pregnancy to the employer...*** I am worried of the change in wording in this sentence. My concern centers on whether an employee has been given the education and direction to know that she needs to inform her employer of her pregnancy because her pregnancy changes her exposure limit. Also further to this regulation. I would question having the exposure level of 4mSv. for provincial health care workers. Health Canada, 20A X-ray equipment in Medical Diagnosis Part A, sets the limit for occupationally exposed women, once pregnancy has been declared, the foetus should be protected from X-ray exposure by applying a dose limit of 2 mSv to the surface of the women's abdomen for the remainder of the pregnancy, pg. 51. I believe that the lower level quoted in Health Canada for medical workers is more appropriate rather than the higher level quoted for nuclear workers. We are nurses who in the course of our work day are exposed to radiation. We are not nuclear workers who have chosen a career based on the nuclear industry.

**7.22 Monitoring exposure:** This section needs to be reworded because if your not monitored how do you know your exposure levels? After filing our claims, one of the things the WCB wanted to know is how much radiation we had been exposed to? Without personal dosimetry there is no way to accurately determine answer this question. WCB hired the Radiation Protection Branch to author a document entitled, "A Thyroid Concern Risk Assessment in Relation to Occupational Exposure to Ionizing Radiation for Three OR Nurses in RCH-A Report for WCB."

What is stated in this document is, "Estimation of risk from radiation exposure can be applied to exposed

populations, but strictly, cannot be applied to individuals." Health Canada states, "By using a dosimetry service, individuals establish their **personal dose history** records that show the details of any radiation exposures they may have received over the course of their career." Why do we need to have access to ongoing dosimetry data? Because it will help to establish our personal dose history. A staff nurse begins to work daily with radiation. Her exposure levels have definitely increased, time and frequency—yet if she does not have access to monitoring at that point in her career how will she know she has not exceeded the action level? How do you prove your exposure levels when you are not monitored? In truth there is no way to determine accurately your levels of exposure unless you have access to a personal dosimeter and have been educated in how to use it, and how to store it correctly. Mr. R. Bradley, President of the Canadian Radiation Protection Association shared with me that if a badge is worn on the side of the worker's body closest to the source of radiation the reading will be accurate; if the badge is on the opposite side of the body, it may be shielded from the radiation and could under read the exposure. Education on proper use and storage of dosimeters must be mandatory.

It is interesting that at our facility surgeons who do not routinely wear their dosimetry badges and who perform surgery approximately one day a week continue to be supplied with dosimetry badges and nurses who work with radiation on a daily basis are denied access to dosimetry badges. It is also interesting that even after WCB Inspection Orders detailing that our physician groups were not wearing dosimeters that no one is willing to remove their dosimetry badge results from the National Dose Registry. The data recorded from badges that hang on the walls outside the OR rooms continues to be recorded as personal dosimetry readings. This information is then sent on to the National Dose Registry. Eventually, this inaccurate information would also become a part of the "Report on Occupational Radiation Exposures in Canada." This is the same document WCB recommends in their Guidelines that the employer use to determine if an action level is exceeded or may be exceeded. We are one facility but I do not believe we are unique in what we observe. So I would have to question how accurate the information is that we are being asked to base not only our ability to access personal dosimeters on, but also the information used to limit our access to personal protective equipment.

**Deleting section 7.37 and 7.40 to do with Education and training.**

I strongly believe that this section should remain as worded and must not be moved. I've had first hand experience with the lack of education and training made available to nursing and medical staff. Education is a key component to radiation safety and needs to remain under the regulations of Part 7. Will a Safety code carry the same

enforceability as a regulation? If I and my co-workers had been given proper and timely education on radiation safety, the hazards involved and the proper personal protective equipment we may not face the occupationally induced diseases we are experiencing now. At that point in my career when I was diagnosed, I had worked very closely with ionizing radiation for approximately 20 years. I had never received education on radiation safety. Most of those years I did not have access to thyroid protection. Most of those years I had no monitoring of my radiation exposure. I've now learned radiation exposure is cumulative and permanent; the damage is done.

**7.35 to 7.23 moving entire sections from regulations on 'Operation of equipment' to guidelines and deleting reference to Lasers.** Why not leave the references with the regulations? Why remove the details of which Safety Codes are referenced? Why has any reference to Lasers been entirely removed from the statement? Also, the wording of, "the specific standards in existing section 7.35 are *anticipated* to be maintained in a practice guideline." Anticipated indicates to me that at this time there are no definite plans to maintain this information in a guideline?

**Deleting 7.41 (2) Personal dosimetry data must be submitted to the National Dose Registry of Health Canada, and if requested, a copy must be submitted to the board.** If you delete this entire statement which than who retains the dosimetry data? Who will follow up with the employee regarding exposure limits/levels?

**7.42 to 7.24 (c) if there is an indication of an unusually high exposure of a worker to ionizing radiation...** I would like to point out that the majority of OR nurses do not have access to personal dosimetry and currently have no way of knowing if they have incurred an unusually high exposure level. Because of the way the regulations are written, the employer is the one who determines if badges are necessary, given exposure levels. But if your not given access to a dosimeter how do you know if you have reached or exceeded an action level? I would like to also point out that fluoroscopic equipment is constantly moved in and out of the OR rooms—therefore the equipment is more prone to damage. Now you will not require radiation surveys?

**7.43 to 7.25 Records⇒ moving to a guideline, will record keeping be enforceable?**

**7.36 Deleting this entire section on personal protective equipment. UNACCEPTABLE! EMPLOYEES EXPOSED TO RADIATION MUST HAVE ACCESS TO ALL PERSONAL PROTECTIVE EQUIPMENT.**

We do not know what our exposure levels are. We neither have access to dosimetry monitoring nor will you require surveys. Time and time again I have been told that the employer determines what PPE based on your exposure levels? What crystal ball is the employer to use to determine what PPE is required? Please look to making PPE part of the regulation and not a recommendation. Also, Table 1: Personal protective equipment listed in the standards referenced in section 7.23 of the OHS Regulation, does not list thyroid shields, yet this is basic

PPE when working with radiation. I have learned by using proper protective equipment that you can greatly reduce your exposure levels and your risk of injury. According to an article that appeared in 1992, in the British Journal of Radiology, 65, 799-802 entitled, "An investigation into the effect of protective devices on the dose to radiosensitive organs in the head and neck" by N. W. Marshall, K. Faulkner, and P. Clarke: The abstract states: A series of experiments were performed to determine the dose reduction afforded to radiosensitive organs in the head and neck by various protective devices. It was found that the reduction in dose to the lens of the eye ranged between 0% and 97%, whilst the dose to the thyroid and oesophagus was reduced by between 76% and 97%, and was dependent on the protective device and tube potential employed. A reduction in brain dose of up to 81% was also measured, for the lead-acrylic face mask. We need to have access to all PPE that can help minimize our risk of injury.

#### **Summary of Recommendations:**

Education, monitoring and protection are the keys to protecting the workers of the province. Please reinforce the need for radiation safety education for every worker who will be exposed to radiation. Enforce a strong regulation that will promote radiation safety awareness that will help to minimize future injury to workers. Do not put regulations into unenforceable guidelines. You need to improve the regulations, not decrease their effectiveness.

Consider implementing mandatory training, to teach physicians how to use ionizing radiation generating equipment correctly to minimize the effects of scattering of the beam and how to decrease the time of exposure. Education to teach all staff constant and correct use of radiation protective equipment must be mandatory and take place before an employer is exposed to radiation. Educate employers that by providing the maximum personal protective equipment rather than the minimum personal protective equipment to their staff may well ultimately be cost beneficial to their organizations.

Proper monitoring of personal exposure to radiation must be mandatory for those who have the potential to be exposed. Radiation exposure is personal, cumulative and permanent. You cannot retroactively figure out a persons radiation exposure. The issuing of personal dosimetry must include proper education on the usage and storage of the equipment. The collection of proper data will be extremely beneficial in future studies and discussions on cumulative low dose radiation exposure and occupational health risks. The trend in occupational cancer studies appears to be that there are increased rates of certain cancers over that of the general populations. But issuing dosimeters alone is not enough. Without proper education and an awareness of the significance of the data being

collected, the data is worthless. As one WCB representative so aptly stated, without the proper wearing of dosimeters it is 'garbage in, garbage out.'

### **Conclusions**

I would like to ask the Board to keep the regulations for radiation intact to protect the health care workers of this province. I would go even further in that I urge you to strengthen the regulations. When reviewing the changes to Part 7 you need to remember the basic scientific principles of radiation exposure. The levels of exposure that are currently allowed do not indicate a level of exposure which carries no risk to workers, rather they indicate a level of radiation exposure of 'acceptable risk'. Any amount of radiation has the potential to cause cancers. What helps us to reduce that risk will be strong regulations.

The International Commission on Radiological Protection (ICRP), first introduced the goal of ALARA for all radiation workers. ALARA is an acronym for "As Low As Reasonably Achievable". All exposures should be kept As Low As Reasonably Achievable. Time, distance and shielding effect radiation exposure-the more protection the less exposure. Most importantly, recognize that the effect of primary concern associated with low doses of ionizing radiation are an increased incidence of cancer in exposed persons, and potential genetic disorders in their offspring.

Make decisions wisely. The regulations need to be enhanced, and just as important those regulations need to be enforceable to help protect the workers of our province. Please help prevent further work place injuries. My reality is that for the rest of my life, I will be undergoing annual check ups that will look for a reoccurrence of my cancer. I will never be 'clean' as thyroid cancer can potentially reoccur if any residual cancer cells are stimulated. I will be on thyroid medication for the rest of my life. When you contemplate the proposed changes to the Radiation regulations please ask yourselves these two questions:

- 1) What is scientific reasoning behind the proposed changes?
- 2) By making these changes are you advocating for a safe work place for the workers of our province?

Thank you for the opportunity to allow my concerns to be heard.

Susan Martel.