Making the Case for Taking X-Rays

By Daniel Lyons, D.C., DPhCS
Green Bay, WI
(From the March 2018 issue of The "G"Note)

While finishing this article—or more accurately, the article I was writing—I read a brand-new article that slightly altered my direction. The article I read and one that I recommend you all read is *Best Practices, Radiogenic Cancer Risks from Chiropractic X-rays are Zero: 10 Reasons to Take Routine Radiographs in Clinical Practice* by Paul Oakley and Deed Harrison. It is very well referenced and spot-on.

There has been a lot of grumbling about the ACA's latest attempt to gain relevancy and force themselves into our offices. In case you are wondering what I am talking about, I refer to their *Choosing Wisely* campaign, of which I am obviously *NOT* a fan. This is a political move whereby they have chosen to align themselves with the American Board of Internal Medicine (ABIM) Foundation who launched their *Choosing Wisely* campaign in 2012.

This is not the first time our x-ray rights have been attacked. More than 20 years ago there was an attempt to take away full spine radiography that many of you may have helped defeat. In Wisconsin, Clarence Gonstead's own nephew, Kurt Gonstead wrote an excellent missive that Dr. Phyllis Markham thought was the deciding factor which tipped the scales in our favor.

There are three things we will discuss here; (1) the argument against films, (2) the argument for them and (3) the potential added bonus of taking them. The argument against them should not be new to anyone: the danger of radiation exposure. The argument for films is not new either: It includes being an essential part of diagnosis (their words not mine), biomechanical information, identification of anomalies, screening for contraindications, following the degenerative process, patient understanding, convenience, legal considerations, public perception and helps to secure our future. The bonus I mentioned is the very real potential health benefit of being x rayed; Hormesis.

The single most important point to understand in the argument against taking x-rays is that the Linear Non-Threshold Model (LNTM) is unproven. Let me say that another way. Everything you have ever been told about the negative and dangerous effects of x-ray on our patients was speculation. Or as the ancient Romans would have said, "Verba, non Facta"…. Words, not Deeds.

"How did this happen?" you ask. The simple answer is fear. Scientists used a liner model while trying to determine safety standards in the 1920's and 30's. Mind you, testing known dangerous substances on humans has always held a moral dilemma. On one hand it is necessary in order to know what is, and what is not dangerous. On the other, we can't just go around harming people in the name of "science" or "health" can we? This is seen through the years, beginning with the Hippocratic Oath, "thou shalt do no harm", then the food and drug act in 1938, the Nuremberg Code in 1947, and the establishment of the International Code of Medical Ethics in 1949 where it was decided that "A physician shall always bear in mind the obligation of preserving human life".

“The health of the patient shall be the physician's first consideration.” In 1964 the Helsinki Declaration was signed by U.S. (revised in 1975, 1983, 1989) which stated in part that;

—Clinical research should be based on animal and laboratory experiments.

—Clinical research should be conducted and supervised only by qualified medical workers.

—Clinical research should be preceded by a careful assessment of risks and benefits to the patient.

—Human beings should be fully informed and must freely consent to the research.

—Responsibility for the human subject must always rest with a medically qualified person, and never with the subject.

—Results of experiments that do not comply with ethical guidelines should not be accepted for publication.

These laws, rules and guidelines are continually being updated and discussed. Bearing this in mind, it becomes easy to see how the LNTM has been accepted for over 70 years. Add to that the inherent institutional dangers (Hurt Pride) of admitting that you had staunchly upheld an incorrect idea for nearly a century and now you understand the uphill battle we face. *BUT*, we are ChiropracTORs and we love being the underdog so let’s dig a little deeper.

There are two reasons people do not want x-rays taken in our offices. They do not want to spend the money and/or they are afraid of the radiation. Earlier, I alluded that there has never been a study performed or published proving, or even suggesting, that LNTM is anything more than a consensus decision based upon the indisputable fact that higher doses of radiation are dangerous if not deadly. What if there was no risk in the low doses that patients receive in our offices? What if there was a physiological benefit to them?

The LNTM or LDR (Low Dose Response) models have many critics and the number is growing. The argument in favor of these models is this: All ionizing radiation is (1) harmful (2) irreversible (3) cumulative and (4) linear. * Calabrese 2015. This was decided by a genetics panel in 1955. The problems with this model are (1) we do not know. All the original studies were on fruit flies and the extrapolation was based on the LNTM theory and math, no actual tests on people measuring genetic damage. (2) this was a presumption and not measured. Some of the hormesis studies would show irreversible damage if the data collection was cut off before the damage had been healed. (3) cumulative again, we do not know if this is cumulative or not due to the nature of the studies needed to know. (4) Linear—this is a theory, a model that the powers that be are unwilling to look at. It has also been documented by Calabrese that the genetics panel skewed the data by excluding data from researchers whose data increased the degree empirical disagreement and omitting to mention that there were three other scientists, who were asked to participate, but declined because, “*too much uncertainty precluded the possibility of making any reliable estimates*”. Other authors have shown that proponents of the “*mathematically convenient linear extrapolation from high to low dose effects*” of radiation readily admit that poor signal to noise ratios at low doses obscure LNT, or more specifically, of no threshold that distinguishes effects at

high and low doses and doses rates, with inhibition of damage repair/removal above and promotion of same below. (*Dose-Response*. July-Sept 2017:1-4)

The list of studies documenting the fault of the LNTM paradigm or phenomena that seem to disprove it are quite lengthy, but here are some highlights:

Areas in Brazil, Egypt, Iran, and India have up to 20 times more radiation than the US average of 2 mGy/y. Brazilians flock to beaches which have high radiation levels, 0.03 mGy/h, from black monazite sand. (Cullan and Franca, 1977).

1) The incidences of solid cancers decreased in 21,500 exposed workers at Mayak, a Russian plutonium production complex. 2) The total cancer deaths in 8,600 cleanup workers at Chernobyl (who received an average of 5 cGy) was 12% lower than that of the general Russian population. 3) The leukemia death rate in 96,000 nuclear workers (in three countries) exposed to over 40 cSv was only half that predicted. 4) No increased cancer was found in 222,400 radiologists and radiation technicians who received more than 20 cGy in 20 years. 5) There was no increased cancer rate in 46,740 flight crews (mostly European) who received over 1.5 mGy/y. 6) Repeated diagnostic exposures of patients who have received less than 10 cGy radiation results in no perceptible leukemia, the most radiosensitive of all cancers. 7) There was no increased cancer in adjoining tissues which received less than 5 cGy radiation in 160,000 women exposed to high doses of radiation to the cervix. 8) No excess thyroid cancer was found in two million children who were irradiated by the Chernobyl explosion. 9) Twin pregnancies receive twice the number of diagnostic radiobiologic examinations as do single pregnancies; some studies show considerably reduced cancer incidence in twins. Recent reports on the effect of low doses of ionizing radiation and its dose–effect relationship Aurengo et al., 2005

Possibly the most surprising finding was this: When ionizing radiation is lowered below ambient levels, a wide variety of animals either do not survive, or become weak and perform poorly (Luckey, 1991, 1999a, Ruda and Kuzin, 1991.

The argument(s) for films that I gave earlier came from a very surprising source—The late Ray Sherman, who had served as clinic director at CMCC from 1976-1979 and was a Fellow of the *American Chiropractic College of Radiography*. In case you were wondering, that is the ACAs Radiology branch. Though published in 1986 in the *Journal of the Canadian Chiropractic Association* it is still as valid as it was back then. Here are the highlights.

1. Essential component of clinical diagnosis; *"the garden variety x-ray examination conducted by the chiropractor, the dentist or the radiologist remains one of the most useful tools in each group's diagnostic realm."*

2. Biomechanical information; Identification of the chiropractic subluxation by roentgen inquiry began at least 75 years ago. No palpator can elicit the degree of information gleaned from flexion/extension views or from lateral bending studies. Even the traditional static study enjoys primacy in the routine and is integral to determination of leg length.

3. Identify anomalies; How many times have you seen an x-ray report from a radiologist which was essentially negative in its findings, only to review the films and discover that a lumbosacral

transitional vertebrae with dissimilar facet facings was ignored by the radiologist? A reluctant conclusion drawn by this 25-year chiropractic veteran is unfortunate but true: that one must physically view the films. In certain instances, this may even mean re-x-raying the patient.

4. Contraindications screen; There are recognized contraindications to active adjustment of a human spine and pelvis. Without access to the benefits of roentgenology every chiropractor would be compromised on a daily basis

5. Follow degenerative processes; It is oft times necessary to evaluate the condition of a patient on a continuing basis. The hyper-flexion, hyper-extension "whiplash" injury may cause the cervical spine to undergo a series of changes extending over a period of years. The scoliosis of a teenage girl will have to be evaluated at certain intervals. The grade 3 spondylolisthesis of an overweight young man will have to be checked for possible slippage.

6. Patient understanding and reassurance; A major strength of chiropractic is the sound relationship we enjoy with our patients. One of the aspects that is so important in maintaining patient bonding is our approach to explaining health problems. X-ray films are paramount in illustrating to an individual just what is or is not involved in their particular condition.

7. Patient convenience; Pain clinics, MDs and PTs enjoy many advantages compared to us. One that they do not enjoy is the ability to perform their own x-ray examination and provide a patient in pain with prompt active therapy without the need for referral and delay.

8. Jurisdictional and/or legal consideration; Back when the author penned this article, Medicare still required an x-ray.

9. Future status of the profession; Again, Rosenberg is quoted: *"...the right to use x-ray is both clinically necessary and important to the future status of the chiropractic profession. It is a right that has been won and protected at great cost..."* Undoubtedly, to forsake x-ray would lessen our standing in the community and remove from chiropractic an analytical modality which will be seen to be of inestimable value to the professions' posterity. Rosenberg, L. K., *Chiropractic in Ontario*. JCCA, December 1984; 28(4): 357-359.

X-ray is so important because it is our window into the concrete world. Chiropractic deals with the abstract (universal and innate intelligence, intellectual adaptation and the mental impulse) and the concrete (the body). Much of the information we glean from x-ray is literally black or white. There is a spur or there isn't. The disc is thin, or it isn't. There is a loss of curve or there isn't. You get the idea. Some of those findings are important enough that the *National Library of Medicine* stores the following radiographic information under the direction of the NIH; In the C-Spine: Anterior osteophytes, disc space narrowing, and subluxation (emphasis mine) and in the Lumbar spine: Anterior osteophytes, disc space narrowing, and spondylolisthesis. "These features were selected from a larger list of candidate features that were identified as "highly interesting" to researchers, but not susceptible of repeatable inter-/intra-observer interpretation. Image informatics at a national research center. L. Rodney Long, et al *Computerized Medical Imaging and Graphics* 29 (2005) 171-193.

The bonus: Hormesis. Over 3,000 scientific research papers show that low dose irradiation is stimulatory and/or beneficial in a wide variety of microbes, plants, invertebrates, and vertebrates.

The idea of hormesis makes the discussion even more interesting. Simply put, the idea of hormesis is "that which does not kill you makes you stronger". Merriam-Webster Medical Dictionary defines it as "a theoretical phenomenon of dose-response relationships in which something (as a heavy metal or ionizing radiation) that produces harmful biological effects at moderate to high doses may produce beneficial effects at low doses.

Others argue that tiny doses of radiation are not harmful. Some scientists even claim that low doses, by stimulating DNA repair, make you healthier—an effect known as hormesis.—Dennis Normile, *Science*, 20 May 2011.

There have been over 3,000 research paper published documenting the stimulatory or beneficial effects of low dose irradiation on many different plant, microbes, invertebrates and vertebrates. Luckey, 1980a, 1991, Muckerheide, 2001

Dr. K. Sakamoto and several other published their work demonstrating that low dose irradiation of the torso was the most effective treatment for malignant lymphoma as early as 1996. Sakamoto K., Myojin J. Fundamental and clinical studies on tumor control by total body irradiation. Am Nucl Soc Trans. 1996;75:404-5. Sakamoto K., Myonin M., Hosor Y., Ogawa Y., Nemoto K., Takai Y., Kakuto Y., Yamada S., Watabe N. Fundamental and clinical studies on cancer control with total or upper half body irradiation. J Jpn Soc Ther Radiol Oncol. 1997;9:161–175.

When we hear the word Radon, we automatically think of danger but Dr. Cohen showed that lung cancer deaths decreased with increased radon concentration in homes and that 8 pCi/l is about the optimum level for radon in homes. Radon concentration was the only one of 54 epidemiologic parameters which showed good correlation between increased radon concentration and decreased lung cancer death rates. Test of the linear-no threshold theory of radiation carcinogenesis for inhaled radon decay products. Cohen BL Health Phys. 1995 Feb; 68(2):157-74.

Other studies have confirmed this. Bogoljubov W.M. *Clinical aspects of radon therapy in the U.S.S.R.* J Phys Med Balneol Med Klimatol. 1988;17:59–70. Becker K. A *Loss of innocence? Rad Protect Dosimetry*. 1995;59:234–235. *Health Effects of High Radon Environments in Central Europe: Another Test for the LNT Hypothesis?* Becker K Nonlinearity Biol Toxicol Med. 2003 Jan; 1(1):3-35. Deetjen P. *Biological and therapeutical properties of radon*. In: Katase A., Shimo M., editors. *Radon and Thoron in the Human Environment. Singapore: World Scientific*; 1998. pp. 515–522.

In 2005, the French Academy of Sciences released a 600 page report detailing their finding on low dose radiation exposure. Here are their highlights. 1) The incidence of solid cancers decreased in 21,500 exposed workers at Mayak, a Russian plutonium production complex. 2) The total cancer deaths in 8,600 cleanup workers at Chernobyl (who received an average of 5 cGy) was 12% lower than that of the general Russian population. 3) The leukemia death rate in 96,000 nuclear workers (in three countries) exposed to over 40 cSv was only half that predicted. 4) No increased cancer was found in 222,400 radiologists and radiation technicians who received more than 20 cGy in 20 years.

5) There was no increased cancer rate in 46,740 flight crews (mostly European) who received over 1.5 mGy/y. 6) Repeated diagnostic exposures of patients who have received less than 10 cGy radiation results in no perceptible leukemia, the most radiosensitive of all cancers. 7) There was no increased cancer in adjoining tissues which received less than 5 cGy radiation in 160,000 women exposed to high doses of radiation to the cervix. 8) No excess thyroid cancer was found in two million children who were irradiated by the Chernobyl explosion. 9) Twin pregnancies receive twice the number of diagnostic radiobiologic examinations as do single pregnancies; some studies show considerably reduced cancer incidence in twins. T.D. Luckey Radiation Hormesis: *The Good, the Bad, and the Ugly Dose response*. 2006; 4(3): 169–190.

They ultimately came to the following conclusion: *"this report doubts the validity of using LNT in the evaluation of the carcinogenic risk of low doses (< 100 mSv) and even more for very low doses (< 10 mSv)."* Aurengo et al., 2005 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2477686/#B1).

So, how much radiation are we talking about? First let's talk terms. We typically talk in term of Rem or Rads, but we should not. No one else in the radiology world uses them. They use the terms Gray (Gy) and Sievert (Sv). A Gray is a measure of absorbed dose, and a Sievert is a dose equivalent. Both are defined as a Joule of energy per Kilogram of recipient mass. 1 Gy = 1 Sv.

So how much radiation do our patients actually receive? Not much. Radiologyinfo.org gives the figure of 1.5 mSv for a spinal study. It does not specify if this is complete so it could be as much as 3 mSv. By the way, 1.5 mSv is the average American's 6-month background radiation dose.

I do not believe that this debate will end anytime soon. There are too many factors and too much history and emotion involved. What I do hope will change is the unwillingness to look at things openly and objectively in order to move the conversation forward. Our profession needs standards. As Gonstead Chiropractors, we have standards of practice. Patients can move from one office to another without the culture shock of everything being different. We must adopt and adhere to these standards and the public must know this for the profession to move forward and achieve true relevancy in the healthcare system. They must be educated to these standards, not because they read it in the paper, but by experiencing it in our offices. I believe that it is the analysis part of the visit that is the most problematic for the profession. The simple inclusion of x-ray (which you have just read a very small, not nearly inclusive list of the benefits of them) is a simple and easy first step.