

# EDITOR'S MESSAGE

## Cell phones, radiation, and population health

Much has changed in the 45 years since the world's first mobile phone call was made from a busy downtown New York sidewalk on a brick-sized device.<sup>1</sup> Gone are the days of bulky, costly devices limited to the wealthy as cell phone ownership has become ubiquitous; Canada alone had nearly 31 million wireless subscribers in 2016.<sup>2</sup> Advances in technology have revolutionized the mobile phone industry allowing expansion into social media, education, and entertainment. A recent poll found that 26% of Canadians under the age of 34 spend 3 hours or more on their phones per day.<sup>3</sup> Mobile device use among the pediatric population, including the very young, has also risen. United States data suggest that between 2011 and 2013, mobile media use by children aged 2-4 years old had increased from 39% to 80%.<sup>4,5</sup>

The social and health related impact of mobile phone use on users has been the topic of much research since its rapid uptake in the early 1990's. As a result, questions have been raised regarding the potential cancer risk associated with mobile phone use.<sup>6</sup> The radiation mobile phones emit is non-ionizing (radiofrequency) meaning it is low energy that is too weak to break atomic bonds, unlike ionizing radiation (x-rays, radon), which is a known carcinogen.<sup>7-9</sup> The amount of radiofrequency (RF) radiation emitted from mobile phones is carefully regulated by Industry Canada, ensuring manufacturers adhere to exposure guidelines prior to entering the Canadian market.<sup>10</sup> RF exposure is assessed using a measurement known as specific absorption rate (SAR), which quantifies the rate of RF radiation absorption into a defined human mass (W/kg).<sup>11</sup> During testing, the SAR is measured with the mobile phone transmitting at maximum output power "when the device is used near the head" and "when the device is used near or in contact with the body."<sup>11</sup>

In 2011, the World Health Organization (WHO) classified the RF electromagnetic fields associated with wireless phone use as 'possibly carcinogenic to humans' – "a category used when a causal association is considered credible, but when chance, bias or confounding cannot be ruled out with reasonable confidence."<sup>12</sup> Interestingly, as a point of reference, the WHO also places Aloe vera extract and talc body powder in this same risk category.<sup>13</sup> This recommendation was based on a series of studies commissioned by the WHO using international pooled analysis from 13 participating countries. The findings suggested there was no increased risk of glioma or meningioma with mobile phone use longer than 10 years, although there was a possible increased risk of glioma in participants who reported the highest 10% of cumulative hours of cell phone use.<sup>14</sup> Due to methodologic limitations, they

concluded that this could not be inferred as a causal relationship.<sup>15</sup>

In past years, studies have predominantly focused on using animal models to assess the relationship of RF radiation with cancer risk, yet results across studies are inconsistent.<sup>16,17</sup> The U.S. National Toxicology Program recently released findings suggestive of increased risk of multiple cancers in lab rats exposed to RF radiation. However, investigators noted that radiation levels exceeded the standard upper limit placed on mobile phones, with a duration of exposure surpassing nine hours per day, 7 days per week, for two years.<sup>17</sup> Further analysis of this study data is pending. The release of the WHO advisory in 2011 prompted Health Canada (HC) to publish a statement outlining the differences between ionizing radiation and RF radiation while highlighting the rigorous regulatory requirements placed on cell phone manufacturers.<sup>18</sup> HC also developed guidelines on safe exposure to RF radiation emphasizing practical measures to reduce mobile phone exposure by;<sup>19</sup>

- 1) Limiting the length of cell phone calls
- 2) Using hands free devices
- 3) Replacing cell phone calls with text messages

Other agencies such as the California Department of Public Health have recently taken a more conservative approach by recommending users "use a speakerphone or a headset instead" of holding a phone to their head. They've also recommended against carrying a mobile phone directly on your person or using the phone when it is sending out high levels of RF energy (e.g., one or two bars are available, travelling in a fast-moving vehicle, or streaming audio or video).<sup>20</sup>

The American Academy of Pediatrics also has taken a conservative approach regarding the use of mobile phones despite acknowledging the limitations of the current evidence. These recommendations are based on differences in pediatric anatomy (head size, skull thickness, etc.) compared to adults and the fact that current radiation standards are based on adult data.<sup>21</sup> Their advice is to limit mobile phone exposure to children and teens by following a list of safety tips for families. This list includes suggestions such as holding mobile phones one inch or more from your head during a conversation, avoiding carrying your phone against your body, not using your phone when it has a weak signal, and avoiding making calls while in elevators, trains, buses, or cars.<sup>21</sup>

As physicians and future medical professionals, we are called to focus on the immediate health needs of our patients while advocating for preventative and population based practices that ensure the future

health of our communities. Despite the many questions and lack of evidence regarding the carcinogenicity of mobile phone use we must maintain vigilant as a profession to continue to provide accurate information to the concerned public. Considering the paucity of high quality evidence regarding mobile phone use and cancer, numerous population and animal based studies are currently underway to hopefully provide closure to this longstanding debate.

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## References

1. "Mobile phone's 40th anniversary: from 'bricks' to clicks." (2013 Apr 03) < <https://www.theguardian.com/technology/2013/apr/03/mobile-phone-40th-anniversary>> (2018 Apr 28)
2. The CRTC. "Canadians appetite for data and high speed connections continues to grow" Communications Monitoring Report 2017. <<https://crtc.gc.ca/eng/publications/reports/PolicyMonitoring/2017/cmr2017>> (2018 Apr 28)
3. Bozinoff, Lorne. "Forum Research." <<http://poll.forumresearch.com/data/8e9fd4d8-bba3-4e6f-92cc-4dc81b31699cSmart-phone%20usage%20and%20addiction>> (2018 Apr 28)
4. Common Sense Media. "Zero to Eight: Children's Media Use in America" 2013: A Common Sense Research Study. <[www.common SenseMedia.org/research/zero-to-eight-childrens-media-use-in-america-2013](http://www.common SenseMedia.org/research/zero-to-eight-childrens-media-use-in-america-2013)>(2018 Apr 28).
5. Roy R, Paradis G. "Smartphone Use in the Daily Interactions Between Parents and Young Children." Philadelphia: Society for Research in Child Development. <[www.csustan.edu/sites/default/files/groups/Child%20Development/srcd\\_poster\\_2015\\_smartphones](http://www.csustan.edu/sites/default/files/groups/Child%20Development/srcd_poster_2015_smartphones)> (2018 Apr 28).
6. Moulder JE, Erdreich LS, Malyapa RS, Merritt J, Pickard WF, Vijayalaxmi. Cell phones and cancer: what is the evidence for a connection? *Radiat Res.* 1999;151(5):513-531.
7. World Health Organization. "Introduction – Waves and Particles" Ionizing Radiation. < [http://www.who.int/ionizing\\_radiation/about/what\\_is\\_ir/en/](http://www.who.int/ionizing_radiation/about/what_is_ir/en/)> (2018 Apr 28)
8. World Health Organization. "Radiation, Non-Ionizing" < [http://www.who.int/topics/radiation\\_non\\_ionizing/en/](http://www.who.int/topics/radiation_non_ionizing/en/)> (2018 Apr 28)
9. World Health Organization. "Ionizing Radiation Part 1: X- and Gamma-radiation and Neutrons." IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. <<https://monographs.iarc.fr/ENG/Monographs/vol75/mono75>> (2018 Apr 28)
10. Government of Canada. "Wireless Communication in Health – An overview." Radiocommunications. (2012 Aug 31) < <https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf09583.html>> (2018 May 06)
11. Government of Canada. "Specific Absorption Rate." Certification and Engineering Bureau. (2016 Nov 29) < [https://www.ic.gc.ca/eic/site/ceb-bhst.nsf/eng/h\\_tt00084.html](https://www.ic.gc.ca/eic/site/ceb-bhst.nsf/eng/h_tt00084.html)> (2018 May 06)
12. International Agency for Research on Cancer. "IARC Classifies Radiofrequency Electromagnetic Fields as Possibly Carcinogenic to Humans." (2011 May 31) <[http://www.iarc.fr/en/media-centre/pr/2011/pdfs/pr208\\_E\\_](http://www.iarc.fr/en/media-centre/pr/2011/pdfs/pr208_E_)> (2018 Apr 28)
13. International Agency for Research on Cancer. "Agents Classified by the IARC Monographs." <<https://monographs.iarc.fr/ENG/Classification/ClassificationsAlphaOrder>> (2018 Apr 28)
14. World Health Organization. "Electromagnetic fields and public health: mobile phones" (2014 Oct 08) < <http://www.who.int/en/news-room/fact-sheets/detail/electromagnetic-fields-and-public-health-mobile-phones>> (2018 Apr 28)
15. INTERPHONE Study Group. Brain tumour risk in relation to mobile telephone use: results of the INTERPHONE international case-control study. *Int J Epidemiol.* 2010;39(3):675-694.
16. Falcioni L, Bua L, Tibaldi E, Lauriola M, De Angelis L, Gnudi F et al. Report of final results regarding brain and heart tumors in Sprague-Dawley rats exposed from prenatal life until natural death to mobile phone radiofrequency field representative of a 1.8 GHz GSM base station environmental emission. *Environ Res.* 2018.
17. Wyde M, Cesta M, Blystone C, Elmore S, Foster P, Hooth M et al. Report of Partial findings from the National Toxicology Program Carcinogenesis Studies of Cell Phone Radiofrequency Radiation in Hsd: Sprague Dawley SD rats (Whole Body Exposure). *BioRxiv* 2018.
18. Health Canada. "Health Canada Offers Practical Advice on Safe Cell Phone Use." (2011 Oct 04) < <http://www.healthycanadians.gc.ca/recall-alert-rappel-avis/hc-sc/2011/13548a-eng.php>> (2018 Apr 28)
19. Government of Canada. "Reduce your risk." Safety of cell phones and cell phone towers. (2015 Mar 15) < <https://www.canada.ca/en/health-canada/services/consumer-radiation/safety-cell-phones-cell-phone-towers.html>> (2018 Apr 28)
20. Division of Environmental and Occupational Disease Control – California Department of Public Health. "How to reduce exposure to radiofrequency energy from cell phones." < <https://www.cdph.ca.gov/Programs/CCDC/DEOD/CEHIB/CDPH%20Document%20Library/Cell-Phone-Guidance.pdf>> (2018 Apr 28)
21. American Academy of Pediatrics. "Cell phone radiation and children's health: what parents need to know." (2016 Jun 13) < <https://www.healthychildren.org/English/safety-prevention/all-around/Pages/Cell-Phone-Radiation-Childrens-Health.aspx>> (2018 Apr 28)