

PRELIMINARY

Clinical Practice Guidelines in the Diagnosis and Management of Electromagnetic Field Hypersensitivity (EHS)

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Introduction

Environmental health is the study of effects upon human beings of external physical/ electromagnetic, chemical and biological factors in air, water, soil, food and other environmental media which impact on the general population as well as genetic aberrations and psychosocial stressors.¹ Environmental health is an evidence- and public- health-based discipline. The physical environment is a determinant of health and is interrelated with socioeconomic, social-justice and equity issues. The impact of the environment is an especially important part of our public health domain.²

In 2014, a systematic review of 63 studies³ revealed that despite heterogeneity, the criteria predominantly used to identify idiopathic environmental intolerance attributed to electromagnetic fields (IEI-EMF) individuals were:

1. Self-report of being (hyper)sensitive to electromagnetic fields (EMF)
2. Attribution of non-specific physical symptoms (NSPS) to at least one EMF source
3. Absence of medical or psychiatric/psychological disorder capable of accounting for these symptoms
4. Symptoms should occur soon (up to 24 hours) after the individual perceives an exposure source or exposed area

Electromagnetic Field Hypersensitivity (EHS) is a spectrum disorder in which there is an awareness and/or adverse response to electromagnetic fields.⁴ Environmental Sensitivities are recognized as a disability under the Canadian Human Rights Commission (Federal).⁵

Demographics

EHS can occur in all age groups, genders (women are more genetically predisposed⁶), races and income levels. Since 2005, the physicians at the Environmental Health Clinic at Women's College Hospital have assessed an increasing number of patients who, due to co-morbid conditions coupled with chronic

¹ NEHA. Definitions of Environmental Health. <https://www.neha.org/about-neha/definitions-environmental-health>.

² Electromagnetic hypersensitivity: fact or fiction? Genuis SJ, Lipp CT. *Sci Total Environ*. 2012; 414:103-12.

³ Idiopathic environmental intolerance attributed to electromagnetic fields (IEI-EMF): A systematic review of identifying criteria. Baliatsas C, Van Kamp I, Lebre E, et al. *BMC Public Health*. 2012; 12(1).

⁴ Electrosensitivity and electromagnetic hypersensitivity. Leitgeb N, Schrottner J. *Bioelectromagnetics*. 2003; 24(6):387-94.

⁵ Canadian Human Rights Commission. Environmental sensitivity and scent-free policies. <https://www.chrc-ccdp.gc.ca/eng/content/policy-environmental-sensitivities>. 2019.

⁶ Belpomme, D.; Irigaray, P. Electrohypersensitivity as a Newly Identified and Characterized Neurologic Pathological Disorder: How to Diagnose, Treat, and Prevent It. *Int. J. Mol. Sci.* 2020, 21, 1915.

exposures to electromagnetic fields. Patients present to the clinic after become unwell with a pattern of functional impairments, some becoming disabled, losing their jobs or becoming homeless. Prolonged and/or excessive exposures to these factors cause functional impairments in individuals, and a huge burden of suffering.⁷

Etiology and Pathophysiology

The pathophysiology is poorly characterized. The degree of functional impairment caused by EMF exposure is dependent upon genetic polymorphisms⁸ that predispose the individual to a poor detoxification profile and therefore an increased total body burden (Figure 1). A poor detoxification profile can also lead to co-morbid illnesses such as Multiple Chemical Sensitivities (MCS), nervous, cardiac and immune system dysfunction which renders a person vulnerable to EMF exposures. Most commonly, patients have had prolonged chronic exposures to radiofrequency radiation, microwaves, electrical and/or magnetic fields from either wired or wireless technology. Patients can react to electric fields (measured in volts per meter), magnetic fields (measured in milligauss or nano Tesla), dirty electricity (high frequency voltage transients, which are deviations from a pure 50-60Hz sine wave), radiofrequency radiation, microwave radiation, ground currents and electrosmog.

The severity of the impact appears to depend upon the nature, dose, and timing of exposures, as well as a person's allostatic load, which is the maximum tolerated dose for combined environmental stressors.⁹ Patients can be identified as having environmental sensitivities, electrical sensitivities or as being "EMF sensitive" or "EMF susceptible" rather than "hyper" in order to decrease stigmatization potential.

Radiofrequency radiation can cause the following adverse biological effects:^{10 11}

- Cerebral **hypoperfusion/ hypoxia-related neuroinflammation**
- Histamine release causing oxidative stress in biological systems¹²
- Peroxidation, DNA damage, changes to antioxidant enzymes
- Voltage gated calcium channel dysregulation effecting the cardiac and nervous system
- Peroxynitrite formation which causes chronic inflammation, damage to mitochondrial function and structure and reduction of ATP
- Reduced glutathione and CoQ10
- TRPV1 receptor activation^{13 14}

Radiofrequency radiation and microwaves can cause thermal (heat related) or non-thermal effects. Under the non-thermal category, adverse physiological effects have been identified including DNA damage, immune system suppression, increased blood-brain barrier permeability, increased blood viscosity with rouleaux formation.

⁷ Johansson O. Electrohypersensitivity: a functional impairment due to an inaccessible environment. *Reviews on environmental health*. 2015 Dec 1;30(4):311-21.

⁸ De Luca C, Thai JC, Raskovic D, Cesareo E, Caccamo D, Trukhanov A, Korkina L. Metabolic and genetic screening of electromagnetic hypersensitive subjects as a feasible tool for diagnostics and intervention. *Mediators Inflamm*. 2014;2014:924184

⁹ Selye H. (1946). The general adaptation syndrome and the diseases of adaptation. *The Journal of clinical endocrinology and metabolism*, 6, 117–230. <https://doi.org/10.1210/jcem-6-2-117>

¹⁰ Martin Pall; De Luca/ Herbert and Sage

¹¹ Belpomme, Dominique, Philippe Irigaray. "Electrohypersensitivity as a Newly Identified and Characterized Neurologic Pathological Disorder: How to Diagnose, Treat, and Prevent It" *Int. J. Mol. Sci.* 2020; 21,1915.

¹² Yakymenko I. Oxidative mechanisms of biological activity of low-intensity radiofrequency radiation. *Electromagn Bio Med*. 2016;35(2):186-202

¹³ Ertlav K, Uslusoy F, Ataizi S, Nazıroğlu M. Long term exposure to cell phone frequencies (900 and 1800 MHz) induces apoptosis, mitochondrial oxidative stress and TRPV1 channel activation in the hippocampus and dorsal root ganglion of rats. *Metab Brain Dis*. 2018 Jun;33(3):753-763

¹⁴ Ghazizadeh V, Nazıroğlu M. Electromagnetic radiation (Wi-Fi) and epilepsy induce calcium entry and apoptosis through activation of TRPV1 channel in hippocampus and dorsal root ganglion of rats. *Metab Brain Dis*. 2014 Sep;29(3):787-99.

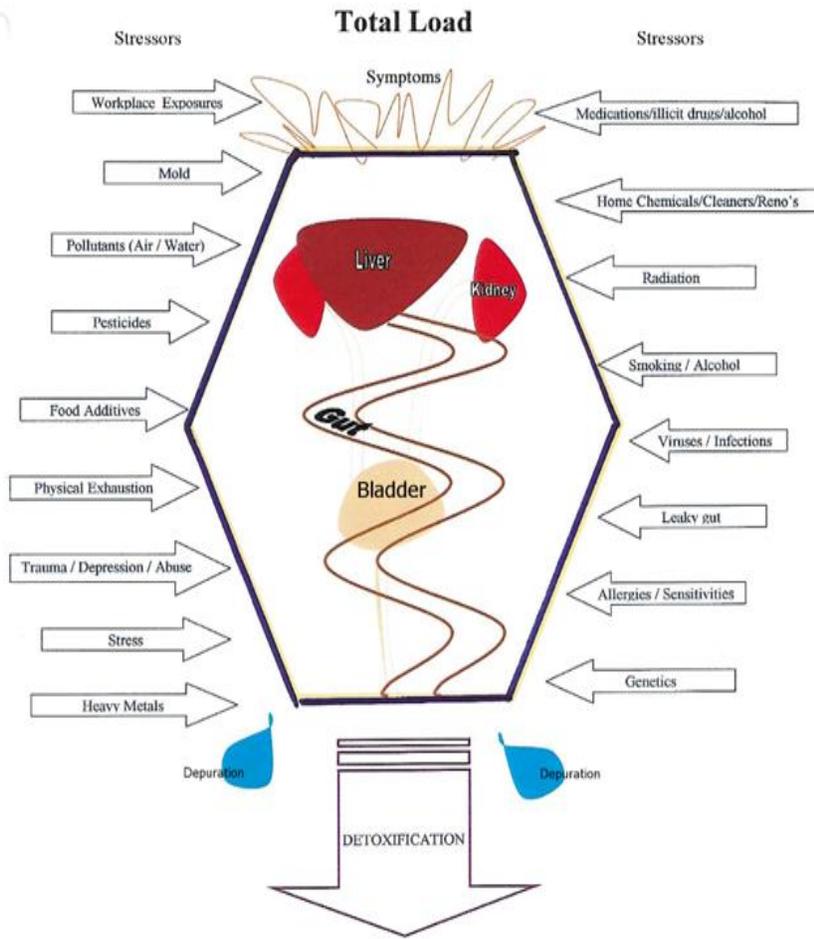


Figure 1: Total Toxic Load (Bray and Marshall, 2005)

History

The clinician is advised to:

1. Conduct a complete exposure history using the CH2OPD2 mnemonic^{15 16} to determine total toxic load in the form of EMF/ RFR exposure, toxic metal exposure sources (diet, water, prosthetics, implants, gadolinium), mould, and other potentially toxic chemical exposures.

¹⁵ Marshall et al, 2002

¹⁶ Bray, 2020

<https://static1.squarespace.com/static/593f8894e3df288fc64b6cf0/t/598bbabdf14aa18c52a6dccc/1502329836033/Environmental+Health+Clinic+Pre-Visit+Questionnaire.pdf>

CH2OPD2 mnemonic

- Community
- Home
- Hobby
- Occupation
- Personal habits
- Diet
- Drugs

2. Determine specific community, work, school and home exposures to EMFs: proximity of cell phone towers, routers, DECT cordless phones, any other wireless technology. Most importantly, determine if the sleeping area is affected.^{17 18}

A helpful mnemonic to determine the parameters of exposure is (F.I.N.D.)¹⁹

- **F- frequency (Hertz)**
- **I- intensity (Power in $\mu\text{W}/\text{m}^2$)**
- **N- nearness**
- **D- duration**

3. Have a high index of suspicion for immune deficiencies (which can, for example, lead to candida infection), gut dysbiosis and possible mast cell activation disorder (MCAS).

Symptoms Commonly Occurring Singly or in Combination:

- Irritability, lack of appetite, memory problems, vertigo; visual, skin and vascular problems²⁰
- Tinnitus, sleep disorders (disrupted stage 4 sleep with alpha wave intrusions and reduced REM²¹) mood changes (anxiety, depression, irritability, panic attacks)²²
- Headache, weakness, pressure in the head, racing or fluttering heart²³
- Dermatological: itch, pain, edema, erythema secondary to elevated transthyretin concentrations²⁴
- Neurasthenic and vegetative symptoms: fatigue, tiredness, cognitive problems, concentration difficulties, dizziness, nausea, heart palpitations (tachycardia, PACs and PVCs), and digestive disturbances²⁵

Etiology of Common Clinical Presentations

Category I

Patients can present with a toxic metal body burden, most commonly mercury, due to the overconsumption of aquatic, contaminated seafood. Methylmercury (half-life of 27 years in the brain) is neurotoxic causing axonal demyelination and inflammation. Zinc/nickel/mercury dental amalgams also release elemental mercury vapour which enters the brain through the olfactory bulb, and then is converted to methylmercury. Patients can present with cardiac and neurological manifestations. Those with metallic

¹⁷ Maes B. Standard of building biology testing methods. Inst. Building Biol.+ Sustainability IBN, Rosenheim, Germany, Tech. Rep. SBM-2008. 2008.

¹⁸ Maes B. Building Biology Evaluation Guidelines. Inst. Building Biol.+ Sustainability IBN, Rosenheim, Germany. SBM-2015. 2015.

¹⁹ Havas, M. (2014). Electromog and Electrosensitivity: What Doctors Need to Know to Help their Patients Heal. Anti-Aging Therapeutics Volume XV.

²⁰ Gomez-Perretta et al. Subjective symptoms related to GSM radiation from mobile phone base stations, BMJ, 2014

²¹ EUROPAEM Guideline 2015 for the prevention, diagnosis and treatment of EMF-related health problems and illnesses. Belyaev I. Dean A. Eger H. Hubmann G. Jandrisovits R. et al. Rev Environ Health. 2015; 30(4):337-371.

²² Bhat, Kumar and Gupta. Effects of mobile phone and mobile phone tower radiations on human health. 2013

²³ Park and Knudson. Medically Unexplained Physical Symptoms. Statistics Canada 2007

²⁴ Johannsson O, Disturbances 2009

²⁵ WHO, Electromagnetic Fields and Public Health, December 2005

hardware implants such Harrington rods, braces, wire meshes, pins and screws can potentially be affected. Those with excessive gadolinium from multiple contrast studies are also at risk. Other toxic metals include nickel (jewelry, cookware), lead (old water pipes), cadmium (smokers), aluminum(soy products, contaminated water, medications) and arsenic (rice, fish, almonds, well water), all of which increase total load. First Nations populations are at high risk given exposure to contaminated fish with methylmercury. Patients present with headaches (lancinating and heaviness), brain fog, fatigue and anxiety when exposed to EMFs.

Category II

Patients fall into this category if they suffer from infectious diseases such as Lyme disease, co-infections of Lyme, and other infections which affect the nervous system. These patients have central or peripheral nervous system vulnerability, neuroborreliosis, cerebral vasculitis, polyneuropathy, chronic encephalomyelitis and cranial neuropathy (all late manifestations of Lyme). They present with tremor, dysarthria, ataxia, extreme fatigue, headache, cognitive dysfunction, presyncope and mood disturbances. It is important to reduce body burden through detoxification in order to decrease inflammation. Oxygen therapy is useful in order to help with hypoxia from compromised cerebral blood flow to the bi-frontal cortices and temporal lobes, but provides only short, temporary relief. This may help to confirm the diagnosis, however. fMRI, SPECT, and PET scans can help further reveal pathology. Treatment of Lyme with antibiotics can potentially decrease EHS symptoms.²⁶

Category III

This category of patients suffer from lesions of the brain (including tumours such as pituitary adenomas), demyelination, microangiopathic changes, diffuse ischemia, inflammation (from neurotoxic pesticides) and neurodegenerative diseases (multiple sclerosis and ALS for example).²⁷ Nonspecific white matter findings due to simple aging and dementia should also be considered. They present with headaches, brain fog, fatigue, restlessness and low mood, tinnitus(+/-) and potentiation of their already pre-existing signs and symptoms related to their disease. The mechanism of action is associated with the impact of EMFs on voltage gated calcium channel (VGCC) integrity, causing increases in intracellular calcium and thus increase of oxidative stress from ONOO- formation.²⁸

Category IV

These patient suffer from heart rhythm disturbances: either exacerbations of existing conditions or new onset caused by radio and microwaves.²⁹ There are periods of poor blood circulation at the capillary level due to rouleaux formation and there is a disturbance of heart conduction because of effects on VGCC. Tachycardic spells, especially at night, can occur. People also experience premature ventricular contractions, premature atrial contractions, atrial flutter and fibrillation. Those with Wolff Parkinson White syndrome are especially at risk for sudden cardiac death due to EMF exposures.³⁰ Conduction problems also affect the autonomic nervous system, causing increased sympathetic tone. A Holter monitor will show rhythm disturbances near cellphone towers and in areas with high Wi-Fi usage. These symptoms are very alarming to the patient and causes severe, prolonged anxiety. Sleep time can be also particularly difficult causing frequent awakenings due to hyper-vigilance with tachycardic spells or PAC/PVCs.

²⁶ Belpomme, Dominique, Philippe Irigaray. "Electrohypersensitivity as a Newly Identified and Characterized Neurologic Pathological Disorder: How to Diagnose, Treat, and Prevent It" *Int. J. Mol. Sci.* 2020; 21,1915.

²⁷ De Luca C, Thai JC, Raskovic D, et al. Metabolic and genetic screening of electromagnetic hypersensitive subjects as a feasible tool for diagnostics and intervention. *Mediators Inflamm.* 2014;2014:924184. doi:10.1155/2014/924184

²⁸ Pall, Martin L. "Wi-Fi Is an Important Threat to Human Health." *Environmental Research* 164 (July 1, 2018): 405–16. <https://doi.org/10.1016/j.envres.2018.01.035>

²⁹ Havas M. Radiation from wireless technology affects the blood, the heart, and the autonomic nervous system. *Reviews on Environmental Health.* 2013 Nov 1;28(2-3):75-84.

³⁰ Reversed reciprocating paroxysmal tachycardia controlled by guanethidine in a case of Wolff-Parkinson-White syndrome. Harris WE. Semler HJ. Griswold HE. *American heart journal* 67.6 (1964): 812-816.

Category V

These patients include students and teachers. University, college, high school, and grade school students are all being exposed to high levels of radiation. They frequently work under fluorescent lights. They get eye strain, and sometimes develop rashes related to exposure of this radiation. The epidemic of anxiety, depression, and suicide at universities and colleges is in part being fuelled by the increased level of agitation and anxiety caused by radio and microwave radiation on mood. Students have extremely high levels of nighttime exposure to RFR or electric fields/ dirty electricity. Before prescribing methylphenidate or amphetamines, reducing EMFs in the workspace is critical.

Category VI

A minority of patients, approximately 1%, exhibit a nocebo response in which inert substances or mere suggestions of substances actually bring about negative effects, i.e. feelings of malaise and anxiety. This is understandable, given the ubiquitous nature of electrical devices in our everyday lives which is unnatural. These patients tend to feel better using wearable jewellery, stickers on cellphones, and special rocks (shungite).

Category VII

There are many clinical similarities and overlapping comorbid conditions between EHS and multiple chemical sensitivities (MCS) that are reflected in similar genetic polymorphism profiles. Inflammation resulting from impaired detoxification biochemical processes create illness and functional impairment.³¹

³²

Physical Examination

Do a complete physical looking for dental amalgam load, metal appliances in the mouth, rashes on the face and/or hands, signs of inflammation and edema, arrhythmias, autoimmunity. Abdomen may be tender due to peristaltic abnormalities and bacterial dysbiosis. Usually a physical exam will reveal neurological, dermatological and/or cardiac signs in the way of arrhythmia and/or poor circulation. Tremor of the tongue and hands may be indicative of mercury overload.

There is no gold standard for EHS diagnosis except for elimination of the source and reintroduction/ provocation to confirm if the signs and symptoms are reproduced.

Laboratory and Diagnostic Tests

Studies have shown that approximately 30% of patients with EHS have no abnormal laboratory biomarkers,³³ but genetic polymorphisms are likely prevalent and need further investigation. Some blood tests are expensive and not sensitive or specific but can help guide management if deficiencies or other disease states exist that must be corrected.³⁴ The following laboratory tests will help shed light on the total toxic load and detoxification profile, and it is the **combination** that allows for the best management of the patient:

- Essential mineral and toxic metal panel (RBC)
- GGT
- Bilirubin
- ALP
- Chromogranin A

³¹ De Luca C, Thai JC, Raskovic D, et al. Metabolic and genetic screening of electromagnetic hypersensitive subjects as a feasible tool for diagnostics and intervention. *Mediators Inflamm.* 2014;2014:924184. doi:10.1155/2014/924184

³² Belpomme, Dominique, Christine Campagnac, and Philippe Irigaray. "Reliable disease biomarkers characterizing and identifying electrohypersensitivity and multiple chemical sensitivity as two etiopathogenic aspects of a unique pathological disorder." *Reviews on environmental health* 30.4 (2015): 251-271.

³³ Belpomme D, Irigaray P. Electrohypersensitivity as a Newly Identified and Characterized Neurologic Pathological Disorder: How to Diagnose, Treat, and Prevent It. *International Journal of Molecular Sciences.* 2020 Jan;21(6):1915.

³⁴ Europaem 2015/ Oberfeld, 2016/ Belpomme, 2015

- Tryptase.³⁵
- Vitamin D2-D3
- **IgE**, IgG, IgM, IgA
- Inflammatory markers (ESR, hsCRP, CRP, interleukins)
- Histamine
- Autoimmune markers (including thyroid antibodies)
- Presence of infectious diseases – screen for Lyme and co-infections (ELISA and Western blot)
- Mitochondriopathy (intracellular ATP)
- Oxidative stress lipid peroxidation markers
- Anti-myelin-O antibodies
- Nitrotyrosin (NTT) - Nitric oxide production increasing BBB permeability
- Melatonin (hydroxy-melatonin sulfate – 6-OHMS)
- SPEP – effects on bone marrow
- Salivary cortisol
- Alpha-amylase
- Transthyretin
- Blood sugar levels after provocation

Biomarker	Normal range
High-sensitivity C reactive protein (hs-CRP)	≤ 3 mg/L
Vitamin D2-D3	≥ 30 ng/mL
Histamine	≤ 10 nmol/L
IgE	≤ 100 UI/mL
Protein S100B	≤ 0.105 µg/L
Nitrotyrosine (NTT)	≥ 0.6 µg/L and ≤ 0.9 µg/mL
Heat shock protein 70 (HSP70)	≤ 5 ng/mL
Heat shock protein 27 (HSP27)	≤ 5 ng/mL
Anti-O-myelin autoantibodies	Negative
Hydroxy-melatonin sulfate (6-OHMS)	≥ 5 ng/L and ≤ 40 ng/L
6-OHMS/creatinine	≥ 0.8 and ≤ 8

Figure 2: (Belpomme et al., 2015)

To further aid in diagnosis:³⁶

- Genetic testing to determine SNPs related to detoxification³⁷
- Weighted MRI showing hypoperfusion in limbic system and thalamus
- Ultrasonic cerebral tomosphygmography (UCTS) and Transcranial Doppler US (TDU)³⁸ showing temporal lobe hypoperfusion due to decreased flow in the middle cerebral artery

³⁵ Belpomme, et al, 2015

³⁶ Havas, 2010

³⁷ The DNA Company. <https://www.thednacompany.com/>

³⁸ Belpomme, Dominique, Philippe Irigaray. "Electrohypersensitivity as a Newly Identified and Characterized Neurologic Pathological Disorder: How to Diagnose, Treat, and Prevent It" *Int. J. Mol. Sci.* 2020; 21,1915.

- BP and heart rhythm monitoring for 24 hours (night-time changes) for heart rate variability and heart rate abnormalities³⁹
- Sleep study showing abnormalities due to wireless technology in the sleep labs. Alpha wave intrusions and reduced REM sleep are the most likely finding.⁴⁰

Co-Morbid Conditions

1. Toxic metal overload – mercury
2. Infectious diseases causing neural inflammation – e.g. Lyme disease
3. Toxic Mold Syndrome
4. Cardiac conduction abnormalities – PVC, PAC, atrial fibrillation
5. Neurodegenerative diseases
6. Multiple chemical Sensitivities (MCS)

Management

Allopathic

All co-morbid conditions need to be investigated further and treated. Referrals to specialists may be required to address medical issues that may have been overlooked.

Pharmacological

Sleep restoration is paramount, and pharmaceuticals can be used if natural remedies are not effective. Antihistamines with sedative effects are the drug of choice. For heart palpitations and arrhythmias, especially those occurring at night, bisoprolol 1.25-2.5mg QHS helps. For sudden tachycardic spells, waves of anxiety, and sympathetic overdrive, propranolol 2.5-5mg po QID PRN is also helpful. Acetylsalicylic acid 81mg daily prevents coagulation secondary to high intensity effects due to the close proximity of routers, DECT base stations and other potent emitters and combinations thereof. A calcium channel blocker, such as diltiazem 15-30mg daily PRN, could help reduce symptoms. Gentle chelation therapy may be required if toxic metal load is too high⁴¹.

Remediation

Health-care providers need to encourage patients to seek help from building biologists. These technicians can assess the degree of EMF exposure a person is receiving in their home and make sensible recommendations. The impacts of cell phone towers, smart meters and hydro wires on living spaces can be determined, as well as anything internally generating EMFs. Voltage, power density and magnetic fields, as well as dirty electricity can be measured. Proximity to wind turbines which, due to poor enforcement of safety standards, emit ground currents that increase symptoms of EHS, can be identified.

Advise patients to use only corded phones without any electronic features. DECT cordless phones emit RFR and need to be removed altogether.

Metallic paint on interior or exterior walls can be used to reflect radiation coming in from neighbours, cell towers or other emitting devices. Any other type of shielding using metallic reflective surfaces can help attenuate the signals.

Advise patients to turn off all wireless devices in the home and replace with ethernet cables or hardwire everything were possible. Smartmeter removal or shielding installed by a technician is recommended.

³⁹ Havas M. Radiation from wireless technology affects the blood, the heart, and the autonomic nervous system. Reviews on Environmental Health. 2013 Nov 1;28(2-3):75-84.

⁴⁰ Andrianome S, Hugueville L, de Seze R, Hanot-Roy M, Blazy K, Gamez C, Selmaoui B. Disturbed sleep in individuals with idiopathic environmental intolerance attributed to electromagnetic fields (IEI-EMF): Melatonin assessment as a biological marker. Bioelectromagnetics. 2016 Apr;37(3):175-82.

⁴¹ Sears ME. Chelation: harnessing and enhancing heavy metal detoxification—a review. The Scientific World Journal. 2013 Jan 1;2013.

Integrative

A diet rich in antioxidants and low in pro-inflammatory foods is strongly recommended. Eat organic if possible. Omega-3 (balanced DHA:EPA 1:1) 1500mg daily will help with inflammation and neural health. Vitamin D3 is also neuroprotective and should be taken at a dose of at least 4000IU per day.

Electrolytic imbalances for whatever reason (i.e. low K⁺, Na⁺, Cl⁻, etc.) need to be corrected with oral rehydration solutions. To manage *adrenal* fatigue, adaptogen herbs and mindfulness based stress reduction (MBSR) can be useful. Homeopathic treatments are useful for those with chemical sensitivities.

Enhance Natural Detoxification to Reduce Body Burden

- Natural detoxification strategies include: sauna therapies (depuration), MBSR, balanced diet, supplements, exercise.
- To decrease body burden of oxidative stress (peroxynitrite ONOO⁻) or methylmercury take antioxidants: vitamins E and C, glutathione, alpha-lipoic acid, N-acetyl-cystine, B vitamin complex, zinc, resveratrol, CoQ10, selenium, turmeric. A high fibre diet (especially in the form of bran) will assist with elimination of methylmercury.
- Correct any dental work with toxic or immunoreactive materials such as mercury, lead oxide, gold or titanium and replace with zirconium dioxide, porcelain or composite.
- Mercury amalgams (mercury (50%), silver (~22–32%), tin (~14%), copper (~8%)) need to be removed using proper protocol.^{42 43}

Fasting is not recommended due to the possibility of already existing poor nutritional status thus inadequate supplies of vitamins, minerals and other antioxidant substrates in their body.⁴⁴ Food sensitivities/intolerances must be addressed.

Lifestyle

Tell patients to hold the cell phone away from their heads when in use and keep it in airplane mode when not in use. The Bluetooth, data and Wi-Fi functions should be off if they are not being used. Extended videogaming and high electronic equipment use can exacerbate symptoms and must be curtailed. Laptop use in wireless mode needs to be switched to ethernet cable connectivity to decrease exposure.

Clothing (including the lining of hats) made of cotton fabric with copper or silver weave provides relief during travel at airports, in hotels, etc., when shielding the torso and head. This can reduce palpitations and headaches. Blankets/sheets with similar construction can be used to block out in-coming radiation into habitable spaces during travel or at work.

A Faraday cage (canopy) can be used at night to reduce radiation on the body which can seriously interfere with sleep quality. For sleep, herbal remedies and supplements are helpful. Magnesium bisglycinate 100mg po QHS, increasing by 100mg weekly to bowel tolerance, can help with palpitations and shock sensations.

Grounding practices are important to balance out the electron shifts. This should not be done under hydro wires, where magnetic fields are extraordinarily strong. There will be a depletion of electrons. The aim is to replenish lost electrons. Therefore, placing one's bare feet on a special grounding mat, walking barefoot on grass and sand or in lake shallows, pools or a bath tub can help. Grounding can be important to balance out the electrons and replenish the electrons that have been depleted from the body.

Airpods and other wireless earpieces should not be used due to the proximity and intensity of the radiation to the brain.

⁴² De Luca, 2014

⁴³ Institute for Functional Medicine. Textbook of Functional Medicine. 2010.

⁴⁴ Institute for Functional Medicine. Textbook of Functional Medicine. 2010.

Remove all harmful substances used in personal care products, cleaning and other household products, as well as unnecessary medications.

Psychological

Finally, patients need a lot of psychosocial support in dealing with and removing stress triggers. Mindfulness Based Stress Reduction, and CBT can be useful to decrease sympathetic nervous system overdrive.

Connecting with support groups such C4ST, EPIC, WEEP and Electrosensitive Society, all of which are Canadian based, can decrease social isolation.

Advocacy for Public Health Protection

- Accommodation at work, school or any learning institution should be supported thereby respecting a person's right to work and live in a space that is free of any potentially harmful EMF exposure impacting on their biopsychosocialspiritual well-being.
- Students should be given letters/notes informing teachers of the need to be at a maximal distance from routers and that laptops need ethernet access.
- People must be able to exercise their rights to refuse harm from EMFs which may be impacting them, their children and loved ones or their fetus/embryo, if that be the situation. Each person, should know exactly how much and what sort of radiation is impacting on their bodies.^{45 46}
- Recommendations presented in the HESA report to the House of Commons – Radiofrequency Electromagnetic Radiation and the Health of Canadians, 2010 and 2015 – can be used for guidance in community events.
- Ontario wide, mandatory physician surveys, of how many patients they see in their roster who complain of possible EMF-related signs and symptoms, should be implemented.
- Validated screening tools need to be developed through further research studies.
- Physician education through CME is critical.

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⁴⁵ Right to Know, CCOHS <https://www.ccohs.ca/oshanswers/legisl/responsi.html>

⁴⁶ Government of Canada. Guide for Assessing Persons with Disabilities - How to determine and implement assessment accommodations - Environmental Sensitivities. <https://www.canada.ca/en/public-service-commission/services/public-service-hiring-guides/guide-assessing-persons-disabilities/guide-assessing-persons-disabilities/guide-assessing-persons-disabilities-determine-implement-assessment-accommodations-environmental-sensitivities.html>. 2007.

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