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6
7 UNITED STATES DISTRICT COURT
8 EASTERN DISTRICT OF CALIFORNIA
9

10 UNITED STATES OF AMERICA,

11 Plaintiff,

12 v.

13 BRIAN PICKARD,

14 Defendant.

Case No. 2:11-CR-00449-KJM-16

DIRECT EXAMINATION OF
GREGORY T. CARTER, M.D.

15
16 I, Gregory T. Carter, M.D., declare:

17 I am a physician licensed to practice medicine in the State of Washington since 1994, and
18 from 1987 until 1995 in the State of California. I earned a Bachelor's of Science in Animal
19 Physiology in 1981, and a Master of Science in Physiology in 1982, at the University of
20 California, Davis. I earned a Doctor of Medicine from Loyola from the University Chicago
21 Stritch School of Medicine in 1986. I returned to the University of California, Davis, in 1986 to
22 perform my Internship and Residency, where after I received several fellowships, including as a
23 Neuromuscular Disease post-doctoral research fellow at the National Institute on Disability and
24 Rehabilitation Research (1990-1991), a MayDay Pain Fellow, University of Washington, School
25 of Medicine Multi disciplinary Pain Center (1994-1995), and a Hartford Foundation Fellow in
26 Geriatric Medicine in the University of Washington, School of Medicine Department of Internal
27 Medicine (1999).

28 I am a certified by the National Board of Medical Examiners (1987), American Board of

1 Physical Medicine and Rehabilitation (1991), American Board of Electrodiagnostic Medicine
2 (1992), American Board of Psychiatry and Neurology with a subspecialty in Neuromuscular
3 Medicine (2006), and the American Board of Physical Medicine and Rehabilitation with a
4 subspecialty certification in Neuromuscular Medicine (2008).

5 I co-founded the Muscular Dystrophy Association/Amyotrophic lateral sclerosis (ALS)
6 Center at the University of Washington and the Muscular Dystrophy Association (MDA)
7 Regional Neuromuscular Disease Center at Providence St. Peter Hospital in Olympia,
8 Washington.

9 In 2012, I earned the Distinguished Researcher Award from the American Association of
10 Neuromuscular and Electrodiagnostic Medicine. Other honors I have received include, but are
11 not limited to, the Excellence in Research Writing Award from the Association of Academic
12 Physiatric (1998), the Best Research Paper Published by a Physiatrist Award from the American
13 Academy of Physical Medicine and Rehabilitation/Education and Research Foundation (1994). I
14 have been voted one of the Best Doctors in America, on www.bestdoctors.com, every year since
15 2001, and received the Excellence in Clinical Care Award, Muscular Dystrophy Association
16 (2002).

17 I am a member of the American Academy of Physical Medicine and Rehabilitation,
18 American Association of Neuromuscular and Electrodiagnostic Medicine, the Association of
19 Academic Physiatrists, and the Washington State Medical Association.

20 I am currently employed as the Medical Director of St. Luke's Rehabilitation Institute in
21 Spokane, Washington. I also hold a position at the Providence Sacred Heart Hospital in
22 Spokane, and I perform research in conjunction with Seattle Children's Hospital in Seattle,
23 Washington, and with the University of California, Davis Medical Center in Sacramento,
24 California. Additionally, I worked for the University of Washington Hospitals, Harborview
25 Medical Center from 1994 until 2010. Past clinical positions I have held include, but are not
26 limited to, the Chief of Medical Staff, Providence Centralia Hospital (2005-2007), the Medical
27 Director, Providence Hospice Services, Lewis County, Washington (2007-2013), and the
28 Founding Medical Director, Muscular Dystrophy Association Regional Neuromuscular Center,

1 Providence Medical Group, Olympia, WA (1995-2013).

2 Further information, including public and private funding research grants I received,
3 additional research and academic duties, and a bibliography of the significant publications that I
4 authored or co-authored, including peer-reviewed scientific publications (over 185 separate
5 publications), chapters of several medical books (14 book chapters), eight published
6 books/monographs, and numerous other publications, are listed in my Curriculum Vitae, attached
7 hereto.

8 **Report: Statement of Grounds**

9 1. In 2011, I co-authored a report regarding the therapeutic value of the plant, genus
10 Cannabis, with Mitchell Earlywine, Ph.d., and Jason T. McGill J.D., at the behest of Washington
11 State Governor Chris Gregoire, who, along with Rhode Island State Governor Lincoln Chafee,
12 submitted the document to the Drug Enforcement Administration as an Exhibit and Statement of
13 Grounds in support of a Petition for Rescheduling of marijuana. The 99-page report, entitled
14 “Exhibit B: Statement of Grounds” (hereafter referred as “The Report”), was purposed to present
15 the most thorough review of the available scientific research on cannabis available, and to
16 analyze the claimed harmful effects of cannabis put forth by various government agencies in
17 order to rationalize its continued inclusion in Schedule I. A comprehensive presentation of the
18 vast body of current scientific research was presented supporting the conclusion made by myself
19 and colleagues: cannabis does not have a high potential for abuse; the substance is currently
20 accepted for medical use in treatment, and there exists clear evidence of accepted safety for use
21 under medical supervision, all contraindicative of the factors set forth in *21 U.S.C. § 812 (b)(1)*
22 which defines the properties of a Schedule I controlled substance.

23 2. While I will not repeat what is contained therein, I highlight the most important
24 sections of the Report below. The Report is attached hereto as Exhibit A, and is incorporated by
25 reference as though fully set forth herein.

26 I. Pharmacology of Cannabis 21 U.S.C. § 811(c)(2)¹

27 _____
28 ¹ As the Report was intended to be filed with the DEA as an administrative petition, it focused on
the eight factors set forth in *21 U.S.C. § 811(c)(1)-(8)*. However, due to subject matter flow, the

1 3. Although not set by statute, the DEA assesses that a drug has a currently accepted
2 medical use by looking to five elements: (A) the drug's chemistry is known and reproducible, (B)
3 adequate safety studies exist on the drug, (C) there are adequate and well-controlled studies
4 proving efficacy, (D) the drug is accepted by qualified experts, and (E) the scientific evidence is
5 widely available. (Exhibit A, p. 6.) The Report addresses each of these elements in depth,
6 concluding the classification of marijuana as a Schedule I controlled substance is untenable and
7 even absurd. I provide the following in support of this opinion:

8 (A) The drug's chemistry is remarkably well known and highly reproducible compared
9 even to other *legal* drugs. The plant contains over 400 chemicals, over 60 of which are
10 considered cannabinoids.² Cannabinoids are biologically active compounds found only in the
11 plant cannabis. There are two known cannabinoid receptors in the human body, CB1 and CB2.³
12 CB1 is expressed primarily in the brain, whereas CB2 is expressed primarily in the periphery. *Id.*

13 (B) Adequate safety studies exist. A breakthrough in the study and scientific

14 _____
15 organization of the Report addresses the 8 factors under 21 U.S.C. § 811(c)(1)-(8) out of order and, in
16 order to maintain consistency with the Report, my brief recitation summarizes such factors in the same
17 order.

18 ² 1. Adams, I.B., and Martin, B.R. Cannabis: Pharmacology and toxicology in animals and
19 humans. *Addiction* 91(11):1585-1614, 1996.

20 2. Aggarwal SK, Kyashna-Tocha M, Carter GT. Dosing Medical Marijuana: Rational Guidelines
21 on Trial in Washington State. *MedGenMed* 2007; 9(3):52.

22 3. Agurell, S.; Halldin, M.; Lindgren, J.E.; Ohlsson, A.; Widman, M.; Gillespie, H.; and
23 Hollister, L. Pharmacokinetics and metabolism of delta 1 tetrahydrocannabinol and other cannabinoids
24 with emphasis on man. *Pharmacol Rev* 38(1):21-43, 1986.

25 4. Carter GT, Weydt P. Cannabis: old medicine with new promise for neurological disorders.
26 *Curr Opin Investig Drugs* 3(3):437-440, 2002.

27 5. Schwilke EW, Schwoppe DM, Karschner EL, Lowe RH, Darwin WD, Kelly DL, Goodwin RS,
28 Gorelick DA, Huestis MA. Delta9-tetrahydrocannabinol (THC), 11-hydroxy-THC, and
11-nor-9-carboxy-THC plasma pharmacokinetics during and after continuous high-dose oral THC. *Clin
Chem* 2009;55(12):2180-9.

6. Schwoppe DM, Scheidweiler KB, Huestis MA. Direct quantification of cannabinoids and
cannabinoid glucuronides in whole blood by liquid chromatography-tandem mass spectrometry. *Anal
Bioanal Chem* 2011;401(4):1273-83.

³ 1. Kapeller DC1, Bräse S. (2011). Versatile solid-phase synthesis of chromenes resembling
classical cannabinoids. *ACS Comb Sci*. 2011 Sep 12;13(5):554-61. doi: 10.1021/co200107s. Epub 2011
Aug 25.

2. Klein TW; Lane B; Newton CA; Friedman H. The cannabinoid system and cytokine network.
Proc Soc Exp Biol Med 225(1):1-8, 2000.

3. Pope HG, Gruber AJ, Hudson JI, Huestis MA, Yurgelun-Todd D. Neuropsychological
performance in long-term cannabis users. *Arch Gen Psychiatry* 58(10):909-15, 2001.

1 understanding of cannabis as medicine came in the 1990s when scientists discovered the
2 endogenous endocannabinoid system in humans, thus enhancing our knowledge in regard to
3 cannabis' unique safety profile and its mechanism of action. At the time the Report was
4 prepared, there were dozens of completed and published controlled clinical trials using cannabis
5 in the United States which evidenced its safety, routes of administration, and its effect when
6 compared to a placebo, standard drugs, and Dronabinol, a synthetic form of
7 Tetrahydrocannabinol (THC), the main isomer found in the cannabis plant. Three years since the
8 Report was completed, even more controlled clinical trials using cannabis have been published,
9 as the medical and scientific communities show no slowing in investigating the therapeutic uses
10 of cannabis. It must be noted here that, despite innumerable clinical trials observing, surveying,
11 and even administering cannabis use in human subjects, there has never been a lethal dose of
12 marijuana reported in humans.⁴

13 (C) Adequate and well-controlled studies proving efficacy exist based on four
14 comprehensive reviews of modern human clinical studies with cannabis and cannabinoids in the
15 United States and elsewhere showing that, even by strict evidence-based medicine (EBM)
16 criteria, cannabis does relieve nausea and vomiting. In addition, the research demonstrates that
17 cannabis presents significant therapeutic potential as an antimetic, appetite stimulant, analgesic,
18 and also shows significant benefit in the treatment of multiple sclerosis, spinal cord injuries,
19 Tourette's syndrome, epilepsy, and glaucoma.⁵ These findings are consistent with a recent paper
20

21 ⁴ Carter GT, Weydt P, Kyashna-Tocha M, Abrams DI. Medical marijuana: rational guidelines for
22 dosing. IDrugs 2004; 7(5):464-470

23 ⁵ Igor Grant, M.D., et. al. (2012)/ Medical Marijuana: Clearing Away the Smoke. The Open
24 Neurology Journal, 2012, 6.

25 Arno Hazekam et al. (2010). Review on clinical studies with cannabis and cannabinoids
26 2005-2009. Institute Biology Leiden, Leiden University, The Netherlands nova-Institut, Chemiepark
27 Knapsack, Industriestraße, D-50354 Hürth, Germany. Cannabinoids 2010;5(special issue):1-21.

28 Rocha FCM, Oliveira LMQR, Da Silveira DX: Therapeutic use of Cannabis sativa on
chemotherapy-induced nausea and vomiting among cancer patients: Systematic review and meta-
analysis. Eur J Cancer Care 2008; 17: 431-44.

Ben Amar M: Cannabinoids in medicine: A review of their therapeutic potential. J
Ethnopharmacol. 2006; 105: 1-25.

Musty RE, Rossi R: Effects of smoked cannabis and oral 9- tetrahydrocannabinol on nausea and
emesis after cancer chemotherapy: A review of state clinical trials. J Cannabis Ther. 2001; 1: 29-56.

1 published earlier this month by the National Institute on Drug Abuse [NIDA], in which this
2 organization acknowledges the potential medical benefits of marijuana.⁶

3 (D) Cannabis is accepted by qualified experts as meeting the current standards for what
4 constitutes medicine. In 2009, the American Medical Association [AMA] adopted a report
5 entitled “Use of Cannabis for Medicinal Purposes,” which affirmed that marijuana did indeed
6 have a therapeutic benefit. In 2013, the AMA, modified its position regarding the legalization of
7 marijuana; where the organization had previously supported the continued criminalization of the
8 sale *and* possession of marijuana, their policy statement now has deleted the possession of
9 marijuana in this context. Importantly, the AMA continues to assert marijuana’s therapeutic
10 efficacy, and urges that additional cannabis research “should be encouraged.”⁷

11 (E) The scientific evidence is widely available, as there exists a large body of
12 randomized, double-blinded, placebo-controlled clinical trials documenting the efficacy of
13 cannabis treatment for many more medical conditions than is typically required of a standard
14 medication to obtain FDA approval. In fact, presently inputting the word “marijuana” into a
15 keyword search on the National Library of Medicine website,
16 (<http://www.ncbi.nlm.nih.gov/pubmed>), the government repository for peer-reviewed scientific
17 research), will produce more peer reviewed scientific studies relating to marijuana (20,125) than
18 to Acetaminophen (17,485), Dextromethorphan (DXM) (2,288), and Ibuprofen (10,571). Only
19 Acetylsalicylic acid was referenced more often than marijuana (56,259). (*See also*, Exhibit A, p.
20 15.)

21
22 II. Other Current Scientific Knowledge 21 U.S.C. § 811(c)(3)

23 4. In combination with the pharmacology section, *supra*, the vast majority of modern
24

25 ⁶ Nora D. Volkow, M.D., Ruben D. Baler, Ph.D., Wilson M. Compton, M.D., and Susan R.B.
26 Weiss, Ph.D. (2014), Adverse Health Effects of Marijuana Use. N Engl J Med 2014; 370:2219-2227 June
27 5, 2014 DOI: 10.1056/NEJMra1402309. This conclusion was based in part on a governmental report
issued by the Institute of Medicine, entitled Marijuana and Medicine.

28 ⁷ AMA preliminary report of actions located online at
<http://www.ama-assn.org/assets/meeting/2013i/i13-refcommk-annotated.pdf>.

1 research indicates that cannabis has significant therapeutic efficacy. Nearly all of the published
2 controlled clinical trials in the United States using cannabis have shown statistically significant
3 and measurable benefits in subjects receiving the treatment. (Exhibit A, p. 18.)

4 III. Cannabis is not a Precursor 21 U.S.C. § 811(c)(8)

5 5. Cannabis is a controlled substance that, if metabolized, will not become another
6 controlled substance. (Exhibit A, p. 19.)

7 IV. Actual and Potential for Abuse 21 U.S.C. § 811(c)(1)

8 6. Confusion arises regarding the abuse potential of cannabis, as there exists diverse
9 meanings for the word “addiction,” although such a term does not necessarily involve drugs.
10 While some medical texts’ definition of addiction emphasizes preoccupation with the substance,
11 compulsive use, and frequent relapses, there are at least two models of addiction: the moral and
12 the disease. (Exhibit A, p. 19-20.) The moral model identifies the initial source of the disorder as
13 being inside the individual and characterizes their problem as one of will power. The disease
14 model, on the other hand, considers addiction as a medical disorder best treated by medical
15 therapy. *Id.* Both such definitions, however, exclude important economic, societal and
16 psychological contributors, and recent data suggests that such contributors, rather than biological
17 process, may play a greater role in addiction than previously thought.⁸ It is important to note that
18 the word “addiction,” has taken on many different meanings in our society, and is therefore no
19 longer well defined for scientific purposes.

20 7. Under any interpretation, however, cannabis use, abuse, misuse, or dependence is
21 within reasonable levels when compared with other drugs, as researchers and mental health
22 professionals consistently rate cannabis at the lowest of the addiction spectrum, far below other
23

24
25 ⁸ 1. Miller, N. S., Gold, M. S. & Smith, D. E. (1997). Manual of therapeutics for addictions. New
26 York: Wiley.
27 2. Peele, S. (1998). The meaning of addiction. San Francisco: Josey Bass Publishers.
28 3. Szasz, T. S. (1961). The myth of mental illness. New York: Hoeber-Harper.
4. Foucault, M. (1973). Madness and civilization: A history of insanity in the age of reason. New
York: Random House.
5. Goldberg, R. (1997). Drugs across the spectrum. Englewood, Colorado: Morton.

1 drugs, including nicotine, alcohol, and caffeine.⁹

2 V. Psychic or Physiological Dependence Liability 21 U.S.C. § 811(c)(7)

3 8. According to the seven factors for physiological dependence set forth in the
4 Diagnostic and Statistical Manual (DSM) developed by the American Psychiatric Association
5 (APA), cannabis does have some dependence liability, though it is significantly less than other
6 drugs, both licit and illicit.¹⁰ Even the Institute of Medicine, a federal governmental agency,
7 minimizes such dependence, reporting: “[i]n summary, although few marijuana users develop
8 dependence, some do. But they appear to be less likely to do so than users of other drugs
9 (including alcohol and nicotine), and marijuana dependence appears to be less severe than
10 dependence on other drugs.”¹¹

11 VI. History and Current Pattern of Abuse 21 U.S.C. § 811(c)(4)

12 9. Some estimates provide that over 40% of our nation’s population have used marijuana
13 (rates being particularly high in the 1970s and among certain age groups.)¹² Despite the
14 prevalence of the use of cannabis, negative consequences remain rare. Rates of cannabis
15 dependence or abuse are also remarkably lower when compared to a host of other drugs, and this
16 factor could be further alleviated where legitimate sources of cannabis are available to medical
17 users, negating the medical use of cannabis from the abuse analysis.¹³

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19 ⁹ Gore, R. L. & Earleywine, M. (2007). Marijuana’s perceived addictiveness: A survey of
20 clinicians and researchers. In M. Earleywine, (Ed.) Pot politics: The cost of prohibition. New York:
Oxford University Press.

21 ¹⁰ American Psychiatric Association: Diagnostic and Statistical Manual of Mental Disorders,
22 Fifth Edition. Arlington, VA, American Psychiatric Association, 2013.

23 ¹¹ Janet Joy et al. (1999) Marijuana and Medicine: Assessing the Science Base. Institute of
24 Medicine. National Academy Press, Washington D.C., p. 98.

25 ¹² Aggarwal SK, Carter GT, Sullivan MD, Morrill R, ZumBrunnen C, Mayer JD. Medicinal use
of cannabis in the United States: historical perspectives, current trends, and future directions. J Opioid
Manag 2009; 5(3):153-168.

26 ¹³ 1. Earleywine M, Barnwell SS. Decreased respiratory symptoms in cannabis users who
vaporize. Harm Reduct J 2007; 4:11.

27 2. Gore, R. L. & Earleywine, M. (2007). Marijuana’s perceived addictiveness: A survey of
clinicians and researchers. In M. Earleywine, (Ed.) Pot politics: The cost of prohibition. New York:
Oxford University Press.

28 3. Chung T, Martin CS, Winters KC, Cornelius JR, Langenbucher JW. Limitations in the

1 VII. Scope, Duration, and Significance of Abuse 21 U.S.C. § 811(c)(5)

2 10. Abuse is widely considered a less severe diagnosis than dependence, as abuse
3 contemplates significant impairment and or distress directly related to the drug. As related to
4 cannabis, it is clear that while the substance is not benign, the prevalence of any associated
5 problems is far less than other legal medicines.¹⁴

6 VIII. Public Health Risk 21 U.S.C. § 811(c)(1)

7 11. Cannabis plays a reduced role in producing social problems such as amotivation,
8 reckless -driving, and aggression or hostility. Evidence for cannabis induced amotivation is
9 lacking and no meaningful or consistent impact on productivity is shown after long-term
10 exposure to cannabis in the laboratory.¹⁵ As to reckless driving, people with THC but not alcohol
11 in their blood do not have a higher rate of culpability than do THC-free drivers. Laboratory
12 experiments that administer THC and placebo revealed an increased weaving within the lane,
13 although such drivers attempted to compensate by slowing their speed, increasing their following
14

15 assessment of DSM-IV cannabis tolerance as an indicator of dependence in adolescents. *Experimental*
16 *and Clinical Psychopharmacology*. 2004;12:136–146.

17 4. Compton WM, Grant BF, Colliver JD, Glantz MD, Stinson FS. Prevalence of Marijuana Use
18 Disorders in the United States: 1991–1992 and 2001–2002. *Journal of the American Medical*
19 *Association*. 2004;291:2114–2121.

20 ¹⁴ 1. Grant, B. F. & Pickering, R. (1998). The relationship between cannabis use and DSM-IV
21 cannabis abuse and dependence: Results from the national longitudinal alcohol epidemiological survey.
22 *Journal of Substance Abuse*, 10, 255-264.

23 2. National Institute on Drug Abuse (NIDA). (1991). NIDA capsules: Summary of findings
24 from the 1990 Household Survey on Drug Abuse. Rockville, MD: U.S. Department of Health and Human
25 Services.

26 ¹⁵ 1. Cohen, J. (1986). *Statistical power analysis for the behavioral sciences*. Hillsdale, NJ:
27 Lawrence Erlbaum.

28 2. Cohen, M. J. & Rickles, W. H., Jr. (1974). Performance on a verbal learning task by subjects
of heavy past marijuana usage. *Psychopharmacologia*, 37, 323-330.

3. Foltin, R. W., Fischman, M. W., Brady, J. V., Bernstein, D. J., Capriotti, R. M., Nellis, M. J.
& Kelly, T. H. (1990). Motivational effects of smoked marijuana: Behavioral contingencies and
low-probability activities. *Journal of the Experimental Analysis of Behavior*, 53, 5-19.

4. Foltin, R. W., Fischman, M. W., Brady, J. V., Kelly, T. H., Bernstein, D. J. & Nellis, M. J.
(1989). Motivational effects of smoked marijuana: Behavioral contingencies and high- probability
recreational activities. *Pharmacology, Biochemistry and Behavior*, 34, 871-877.

5. Slikker, W., Paule, M. G., Ali, S. F., Scallett, A. C. & Bailey, J. R. (1992). Behavioral,
neurochemical, and neurohistological effects of chronic marijuana smoke exposure in the nonhuman
primate. In L. Murphy & A. Bartke (Eds.), *Marijuana/cannabinoids: neurobiology and neurophysiology*
(pp. 387-423). Boca Raton: CRC.

1 distance, and rarely attempted to pass other cars. A recent meta-analysis in the journal Accident
2 Analysis and Prevention concluded that the involvement of cannabis-positive drivers in fatal
3 traffic accidents or in accidents resulting in injury was not statistically significant at the 5 percent
4 level.¹⁶ Finally, causation between cannabis and aggression or criminality cannot be found.

5 12. In sum, as we concluded in the Report, the continued inclusion of marijuana in
6 Schedule I is untenable and unconscionable, as very ill people have a difficult time obtaining
7 cannabis or defending their possession of it in the courts, despite the irrefutable evidence that it
8 helps alleviate the painful symptoms associated with many serious illnesses. (Exhibit A, pp. 42-
9 43.)

10 **Speciality: Amyotrophic Lateral Sclerosis (ALS)**

11 13. Amyotrophic Lateral Sclerosis (ALS), commonly referred to as “Lou Gehrig's
12 Disease,” is a progressive neurodegenerative disease that affects nerve cells in the brain and the
13 spinal cord. An ALS patient’s motor neurons, electrically excitable cells that processes and
14 transmits information through electrical and chemical signals from the brain to the spinal cord
15 and then out to the muscles, degenerate and die, resulting in muscle weakness, twitching or
16 cramping of the muscles, impairment of the limbs, and eventually in death in an average of three
17 to five years.

18 14. As a primary focus of my medical practice has been the treatment of those suffering
19 from ALS, I have been involved in the exploration of if and how cannabis can be used to help
20 this patient population.

21 15. The significant scientific discovery of the endogenous cannabinoid system referenced
22 in paragraph 3(B), *supra*, advanced the potential for the application of cannabis therapeutics to
23 ALS patients. Researchers discovered an endogenous molecular signaling system within the
24 human body which is activated by cannabinoids. This system includes specific receptors and
25 ligands that are intricately involved in normal human physiology, specifically in the control of
26

27 ¹⁶ Elvik, Rune. (2013). Risk of Road Accident Associated with the Use of Drugs: A Systematic
28 Review and Meta-Analysis of Evidence From Epidemiological Studies. Accident Analysis and
Prevention. 60 (2013) 254-267.

1 movement, pain, appetite, memory, immunity, and inflammation, among others. The detection of
2 widespread cannabinoid receptors in the brain and peripheral tissues suggests that the
3 endocannabinoid system represents a previously unrecognized, ubiquitous network in the
4 nervous system. Dense cannabinoid receptor concentrations have been found in the cerebellum,
5 basal ganglia, and hippocampus, which accounts for the effects of marijuana on motor tone,
6 coordination, and mood state. Further, the low concentrations found in the brainstem, account
7 for the remarkably low toxicity of marijuana.

8 16. This interaction between the exogenous cannabinoids and endogenous cannabinoids
9 system supports the conclusion that marijuana has a tremendous potential in treating
10 neurodegenerative disorders and neuromuscular disease such as ALS.

11 17. Well over a decade ago, I was one of the first research investigators to report the
12 effectiveness of using marijuana to treat ALS.¹⁷ I hypothesized that the interaction between
13 cannabis and the endocannabinoid system might prove effective in managing many symptoms of
14 the disease, such as analgesia (inability to feel pain), muscle relaxation, bronchodilation
15 (expansion of the bronchial air passages), saliva reduction, appetite stimulation, and sleep
16 induction. Additionally, marijuana had been shown to have strong antioxidative and
17 neuroprotective effects, which may prolong neuronal cell survival and thus prolong the patient's
18 life.

19 18. Several years later in 2004, I and my colleagues performed a survey of ALS patients
20 who had used cannabis, and determined that cannabis was indeed moderately effective at
21 reducing symptoms of appetite loss, depression, pain, spasticity, and drooling.¹⁸ The symptoms
22 of depression were abated for two to three hours, a significant time period. Later preclinical data
23 in the G93A-SOD1 ALS mouse, demonstrated prolonged neuronal cell survival, delayed onset,

24
25 ¹⁷ Carter GT1, Rosen BS. (2001). Marijuana in the management of amyotrophic lateral sclerosis.
26 *Am J Hosp Palliat Care*. 2001 Jul-Aug;18(4):264-70, "[i]n areas where it is legal to do so, marijuana
should be considered in the pharmacological management of ALS."

27 ¹⁸ Amtmann D1, Weydt P, Johnson KL, Jensen MP, Carter GT. (2004). Survey of cannabis use in
28 patients with amyotrophic lateral sclerosis. *Am J Hosp Palliat Care*. 2004 Mar-Apr;21(2):95-104, "the
results indicate that cannabis may be moderately effective at reducing symptoms of appetite loss,
depression, pain, spasticity, and drooling."

1 and slower progression of the disease were indeed shown.¹⁹ Thus, it is more than reasonable at
2 this point to believe that cannabis may significantly slow the progression of ALS, potentially
3 extending life expectancy and substantially reducing the overall burden of the disease.

4 19. Due to these very encouraging and possibly life-extending preclinical research
5 results, I sought to lawfully purchase cannabis from the National Institute on Drug Abuse
6 (NIDA) for use in a clinical trial on my ALS patients. Having been given no response, I re-
7 applied, and again have received no response. Given the short life expectancy of my patients,
8 and the potential for treating them with a life extending medication, NIDA's disregard is
9 particularly troubling. In effect, because marijuana is classified as a Schedule I controlled
10 substance many of my patients are being deprived of a medication which may extend their lives,
11 and importantly has been proven to enhance the quality of their lives.

12 20. In sum, it is my considered opinion that including marijuana and THC in Schedule I
13 of the Controlled Substances Act is contrary to all rationality. Not only is such a categorization
14 utterly lacking in scientific support, as I have witnessed the federal restrictions retard the
15 continued study of a potentially beneficial medication, this position is inhumane.

16 I declare under penalty of perjury that the foregoing is true and correct, except for those
17 matters stated on information and belief, and as to those matters I believe them to be true. This
18 declaration signed on the 19th day of June, 2014, in Spokane, Washington.

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20 /s/ Greg Carter, M.D.
GREG CARTER, M.D.

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¹⁹ Carter GT1, Abood ME, Aggarwal SK, Weiss MD. (2010). Cannabis and amyotrophic lateral sclerosis: hypothetical and practical applications, and a call for clinical trials. Am J Hosp Palliat Care. 2010 Aug;27(5):347-56. doi: 10.1177/1049909110369531. Epub 2010 May 3.

CURRICULUM VITAE

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EDUCATION:

Undergraduate 1981 Bachelor of Science (BS), Honors and Departmental Citation
Animal Physiology, University of California, Davis (UC Davis)

Graduate 1982 Master of Science (MS), Physiology, UC Davis;
B A Horwitz, PhD, advisor

1986 Doctor of Medicine (MD) Loyola University Chicago
Stritch School of Medicine

POST DOCTORAL TRAINING

Internship: 1986-87 Internal Medicine UC Davis Medical Center (UCDMC)

Residency: 1987-90 Physical Medicine and Rehabilitation (PM&R), UCDMC

Fellowships: 1990-91 National Institute on Disability and Rehabilitation Research
Neuromuscular Disease post-doctoral research fellow; W M Fowler, Jr,
MD, advisor

1994-95 MayDay Pain Fellow, University of Washington, School of
Medicine (UW SOM), Multidisciplinary Pain Center, John D Loeser, MD,
advisor

1999 Hartford Foundation Fellow in Geriatric Medicine, UW SOM,
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BOARD CERTIFICATION

1987 Diplomat, National Board of Medical Examiners Certificate #320604

1991 Diplomat, American Board of PM&R, Certificate #3481

1992 Diplomat, American Board of Electrodiagnostic Medicine, Certificate #1562

2006-16 Diplomat, American Board of Psychiatry and Neurology, subspecialty in
Neuromuscular Medicine Certificate #3

2008-18 Diplomat, American Board of PM&R, subspecialty certification in
Neuromuscular Medicine, Certificate #3

HONORS (academic):

- 1980 UC Davis President's Undergraduate Academic Fellowship (first award)
- 1981 UC Davis President's Undergraduate Academic Fellowship (second award)
(award won independently two years consecutively)
- 1981 Graduation *with Honors* and the Departmental Citation for *Outstanding Undergraduate Accomplishment in Animal Physiology*, UC Davis
- 1982 San Joaquin County Medical Society Scholarship
- 1994 Best Research Paper Published by a Physiatrist Award from the American Academy of Physical Medicine and Rehabilitation/Education and Research Foundation.
- 1995 National Catholic Education Association Distinguished Graduate Award
- 1998 Excellence in Research Writing Award, Association of Academic Physiatrists
- 2012 Distinguished Researcher Award, American Association of Neuromuscular and Electrodiagnostic Medicine

HONORS (clinical):

- 2001-current Best Doctors in America; elected every year since 2001;
web site: www.bestdoctors.com
- 2002 Excellence in Clinical Care Award, Muscular Dystrophy Association

PROFESSIONAL ORGANIZATIONS:

- Fellow, American Academy of Physical Medicine and Rehabilitation
- Fellow, American Association of Neuromuscular and Electrodiagnostic Medicine
- Diplomat, Association of Academic Physiatrists
- Delegate, Washington State Medical Association

HOSPITAL POSITIONS HELD:

Current

- 2013-current St. Luke's Rehabilitation Institute: active
- 2013-current Providence Sacred Heart Hospital, Spokane, WA
- 1994-2013 Providence Hospital, Centralia, WA: active
- 1994-2013 Providence Saint Peter Hospital, Olympia, WA: active
- 1994-current Seattle Children's Hospital, Seattle, WA: research

1990-current University of California, Davis Medical Center, Sacramento, CA: courtesy

Prior

1994-2010 University of Washington Hospitals (UWMC, Harborview Medical Center)

Clinical Duties-present

2013 Medical Director, St Lukes Rehabilitation Institute, Spokane, WA

2007-current Member, Industrial Insurance Medical Advisory Committee, Washington State Department of Labor and Industries

2007-current Member, Agency Medical Director's Group Advisory Committee on Opioid Dosing Guidelines for Washington State

Clinical Duties-past

1995-2013 Founding Medical Director, Muscular Dystrophy Association Regional Neuromuscular Center, Providence Medical Group, Olympia, WA

2007-2013 Medical Director, Providence Hospice Services, Lewis County, WA

2005-2007 Chief of Medical Staff, Providence Centralia Hospital

2003-2005 Medical Consultant for Quality Assurance, Physical Medicine and Rehabilitation, Washington State Department of Labor and Industries

1991-94 Medical Director, Muscular Dystrophy Association (MDA) Clinics, Department of PM&R, UCDCMC

2001-2005 Medical Consultant for Quality Assurance, Electrodiagnostic Medicine, Washington State Department of Labor and Industries

2002-10 Founder/Co-Director, MDA-Amyotrophic Lateral Sclerosis Center, UW Medical Center

ACADEMIC FACULTY APPOINTMENTS:

1990-current UC Davis, SOM, Department of PM&R

2010-current UW SOM MEDEX Northwest Division;

1994-2010 UW SOM Department of Rehabilitation Medicine

LICENSES TO PRACTICE:

Current

1994-present; State of Washington license: MD00031534 [expires 02/03/15]

Federal Drug Enforcement Agency license: BC1116006 [expires 08/31/14]

National Provider Identification (NPI) number: 1073531695

Universal Provider Identification Number (UPIN): E56212

WA state Medicaid Provider: 7058589

WA state L & I Provider: 028551

Expired

1987-1995; State of California license: G060691

EDITORIAL RESPONSIBILITIES

1999-present Editorial Board, *The American Journal of Hospice and Palliative Care*

2004-present Editorial Board, *The Journal of Clinical Neuromuscular Disease*

2005-2008 Editorial Board, *Muscle & Nerve*

2009-present Senior Associate Editor, *Muscle & Nerve*

2008-present Associate Editor, DeLisa JA, Gans BM, Walsh NE (eds): *Physical Medicine and Rehabilitation: Principles and Practice*, 5th edition. Philadelphia, Lippincott, Williams, & Wilkins 2008

2011-present Editor, *PM&R Clinics of North America*, Philadelphia, W.B. Saunders Co; division of Elsevier Publishing

2013- Editorial Board, *American Journal of Physical Medicine and Rehabilitation*

RESEARCH FUNDING

1990-91 National Institute on Disability and Rehabilitation Research Training Grant #G0087C2005.

1990-96 Co-Director 1990-93; principle investigator 1990-96; National Institute on Disability and Rehabilitation Research Training Center Grant #H133B30026: Longitudinal Assessment of Physical and Neuropsychological Performance in Slowly Progressive Neuromuscular Disease;; funding 10/01/90 - 10/01/1996.

1997-2010 Charcot Marie Tooth Research Fund, Providence Healthcare Foundation

1998-2003 Principal Investigator, National Institute on Disability and Rehabilitation Research Training Center Grant #HB133B980008: Pain in Neuromuscular Disease: Incidence, Severity and Relationship to Physical Impairment and Disability; funding 10/01/98 - 10/01/2003.

2002-2007 Co-investigator (Mark Jensen, PhD, principal investigator), National Institutes of Health Program Project Grant 2P01HD33988-06A1; Relationship Between Pain and Disability in Neuromuscular Disease.

2003-2004 Principal Investigator, Endo Pharmaceuticals, Protocol EN3220-010: Lidoderm Patch Clinical Trial for Musculoskeletal Pain.

- 2003-2008 Principal Investigator, National Institute on Disability and Rehabilitation Research Training Center Grant # H133B03118: Promotion of Health and Wellness through Community Recreation and Exercise: Impact of Impairment, Pain, Self-efficacy, and Environmental Barriers in Neuromuscular Disease.
- 2003-2005 Principal Investigator, Genzyme sponsored trial for alpha-glucosidase replacement in children and adults with Acid Maltase Deficiency (Pompe's disease).
- 2008-09 Co-Investigator, PTC Therapeutics, Inc. (PTC), small molecule drugs targeting post-transcriptional control mechanisms for Duchenne muscular dystrophy; with oral bioavailability.
- 2008- Principal Investigator, Amicus sponsored trial for novel alpha-glucosidase replacement in children and adults with Acid Maltase Deficiency (Pompe's disease); trial starting Jan 2009
- 2009- Investigator, National Institute on Disability and Rehabilitation Research Center Grant # H133B080024: Effects of Aging on Physical Performance, Functional Capacity and Quality of Life in Persons with Neuromuscular Disease.
- 2010-12 Principal Investigator, Neuraltus sponsored trial for novel mast cell inhibitor to reduce neuronal inflammation in adults with amyotrophic lateral sclerosis (ALS); trial ended October 2012
- 2013 Investigator, (PI Dr. Bia Carlini, University of Washington) Analysis of Provider Knowledge on Uses of Medical Marijuana in WA state (funded by Attorney General's office, WA state); funded through 2016
- 2014 American Heart Association: Smoking Cessation in in-patient rehabilitation

ADDITIONAL RESEARCH and ACADEMIC DUTIES

- 1990-93 Director of Research and Co-Director, National Institute on Disability and Rehabilitation Research Training Center Grant #H133B30026
- 1996 Program Evaluation Subcommittee/Advisory Committee, National Institute on Disability and Rehabilitation Research Training Center Grant #H133B30026.
- 1998-2010 Program Evaluation Subcommittee/Advisory Committee, National Institute on Disability and Rehabilitation Research Training Center Grant #H133B980008.
- 2002-2004: Faculty, Dannemiller Memorial Education Foundation (by invitation)
- 2002-04 Neuromuscular Disease Self Assessment Examination Subcommittee, American Academy of Physical Medicine and Rehabilitation; duties involve writing board questions
- 2002-present Clinical Services Advisory Committee, Muscular Dystrophy Association, National Office, Tucson, AZ
- 2002-present Neuromuscular Guidelines Steering Committee, Joint Committee, American Academy of Neurology and the American Academy of Physical Medicine and Rehabilitation

- 2003-07 Oral Board Examiner (Part II), by invitation, American Board of Physical Medicine and Rehabilitation
- 2004-08 American Academy of Neurology, Peripheral Neuropathy Guidelines Development Committee.
- 2005-present Founding Member, Neuromuscular Subspecialty Examination Board, American Board of Psychiatry and Neurology
- 2010- American Academy of Neurology, Muscular Dystrophy Guidelines Development Committee.
- 2012- Medical Advisory Committee, Charcot Marie Tooth Association
- 2013- Agency Medical Director advisory committee for Opioid Dosing Guidelines
- 2014- WSMA/UW Physician Leadership Program

BIBLIOGRAPHY

Peer-reviewed publications with PubMed Identifier (PMID) [National Library of Medicine]

1. Guttas JJ, **Carter GT**, Horwitz BA. Plasma membrane protection against the acute effects of inorganic lead on the respiratory rates of intact liver cells. *J Toxicol Environ Health* 1983; 12:731-737 PMID:6668620
2. Kilmer DD, **Carter GT**, Lieberman JS. Prophylaxis in control of seizures in brain injured patients. *West J Med* 1988; 49(2):266-7. PMID:18750453
3. **Carter GT**, Kilmer DD, Rosen BS. The peril of espresso machines: repetitive strain injury inducing ulnar neuropathy at the elbow. *West J Med* 1990; 153(6):664-5 PMID:2293482
4. **Carter GT**, Johnson ER, Bonekat HW, Lieberman JS. Laryngeal diversion in the treatment of intractable aspiration in motor neuron disease. *Arch Phys Med Rehabil* 1992; 73(7):680-682 PMID:1622326
5. **Carter GT**, Kilmer DD, Bonekat HW, Lieberman JS, Fowler WM. Evaluation of phrenic nerve and pulmonary function in hereditary motor and sensory neuropathy, type I. *Muscle Nerve* 1992; 15:459-462 PMID:1565114
6. **Carter GT**, Longley KJ, Entrikin RK. Electromyographic and nerve conduction studies in the *mdx* mouse. *Am J Phys Med Rehabil* 1992; 71(1):2-5 PMID:1739439
7. **Carter GT**, Longley KJ, Walsh SA, Entrikin RK. Lack of effect of amitriptyline in murine myotonia. *Am J Phys Med Rehabil* 1992; 71(5):279-282 PMID:1388974
8. **Carter GT**, Bonekat HW, Milio L. Successful pregnancies in the presence of spinal muscular atrophy: two case reports. *Arch Phys Med Rehabil* 1994; 75(2):229-231 PMID:8311683
9. **Carter GT**, Kikuchi N, Horasek S, Walsh SA. The use of fluorescent dextrans as a marker of sarcolemmal injury. *Histo Histopathol* 1994; 9(3):443-447 PMID:7526906

10. **Carter GT**, Kikuchi N, Abresch RT, Walsh SA, Horasek S, Fowler WM. Effects of exhaustive concentric and eccentric exercise on murine skeletal muscle. *Arch Phys Med Rehabil* 1994; 75(5):555-559 PMID:8185449
11. **Carter GT**, Wineinger MA, Walsh SA, Horasek SJ, Abresch RT, Fowler WM. Effect of voluntary wheel-running exercise on muscles of the *mdx* mouse. *Neuromusc Disord* 1995; 5(4):323-331 PMID:7580246
12. **Carter GT**, McDonald CM, Chan TT, Margherita AJ. Isolated femoral mononeuropathy to the vastus lateralis: EMG and MRI findings. *Muscle Nerve* 1995; 18:341-344 PMID:7870114
13. **Carter GT.**: Phrenic nerve involvement in Charcot-Marie-Tooth disease. *Muscle Nerve* 1995; 18(10):1215-1216 PMID:7659121
14. Fowler WM, Abresch RT, Aitkens SA, **Carter GT**, Johnson ER, Kilmer DD, McCrory MA. Impairment and disability profiles of neuromuscular diseases: design of the protocol. *Am J Phys Med Rehabil* 1995; 74(5):S62-69 PMID:7576423
15. McDonald CM, Abresch RT, **Carter GT**, Fowler WM, Johnson ER, Kilmer DD. Profiles of neuromuscular disease: Duchenne muscular dystrophy. *Am J Phys Med Rehabil* 1995; 74(5):S70-92 PMID:7576424
16. McDonald CM, Abresch RT, **Carter GT**, Fowler WM, Johnson ER, Kilmer DD. Profiles of neuromuscular disease: Becker muscular dystrophy. *Am J Phys Med Rehabil* 1995; 74(5):S93-103 PMID:7576425
17. Johnson ER, **Carter GT**, Kilmer DD, Abresch RT, Fowler WM, Wanlass RL. Profiles of neuromuscular disease: myotonic muscular dystrophy. *Am J Phys Med Rehabil* 1995; 74(5):S104-116 PMID:7576418
18. McDonald CM, Abresch RT, **Carter GT**, Fowler WM, Johnson ER, Kilmer DD, Wright NC. Profiles of neuromuscular disease: limb-girdle syndromes. *Am J Phys Med Rehabil* 1995; 74(5):S117-130 PMID:7576419
19. Kilmer DD, Abresch RT, Aitkens SG, **Carter GT**, Fowler WM, Johnson ER, McDonald CM. Profiles of neuromuscular disease: facioscapulohumeral dystrophy. *Am J Phys Med Rehabil* 1995; 74(5):S131-139 PMID:7576420
20. **Carter GT**, Abresch RT, Fowler WM, Johnson ER, Kilmer DD, McDonald CM, Wright NC. Profiles of neuromuscular disease: hereditary motor and sensory neuropathy, types I and II. *Am J Phys Med Rehabil* 1995; 74(5):S140-149 PMID:7576421
21. **Carter GT**, Abresch RT, Fowler WM, Johnson ER, Kilmer DD, McDonald CM. Profiles of neuromuscular disease: spinal muscular atrophy. *Am J Phys Med Rehabil* 1995; 74(5):S150-159 PMID:7576422
22. **Carter GT**, Kilmer DD, Szabo RM, McDonald CM. Focal posterior interosseus neuropathy in the presence of hereditary motor and sensory neuropathy, type I. *Muscle Nerve* 1996; 19:644-648 PMID:8618563
23. **Carter GT**, Fritz RC. Pancreatic adenocarcinoma presenting as a monomelic motor neuronopathy. *Muscle Nerve* 1997; 20:103-105 PMID:8995591

24. **Carter GT**, Abresch RT, Walsh SA, Wineinger MA. The *mdx* mouse diaphragm: exercise-induced injury. *Muscle Nerve* 1997; 20:393-394 PMID:9052828
25. **Carter GT**, Fritz RC. Electromyographic and lower extremity STIR MRI findings in lumbar radiculopathy. *Muscle Nerve* 1997; 20:1191-1193 PMID:9270680
26. **Carter GT**. Rehabilitation management of neuromuscular disease. *J Neuro Rehab* 1997; 11(2):1-12
27. **Carter GT**, Arnot CF, Silverya A, Luetkenhaus C, Parcel M, Emerick CE, McCrory MA. Body mass index does not correlate with functional outcome in acute stroke rehabilitation. *J Neurovas Dis* 1997; 2(5): 189-192
28. Lew HL, Robinson LR, **Carter GT**. Auditory P300 event-related potentials are promising predictors for outcome in non-traumatic coma. *J Neurovas Dis* 1997; 2(6): 265-267
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30. Willick SE, Margherita AJ, **Carter GT**. Isolated superior gluteal nerve injury: two case reports. *Muscle Nerve* 1998; 21:951-953 PMID:9626259
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34. **Carter GT**, Jensen MP, Galer BS, Kraft GH, Crabtree LD, Beardsley RM, Abresch RT, Bird TD. Neuropathic Pain in Charcot Marie Tooth disease. *Arch Phys Med Rehabil* 1998; 79:1560-4 PMID:9862301
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36. **Carter GT**, Robinson LR, Chang VH, Kraft GH. Electrodiagnostic evaluation of traumatic nerve injuries. *Hand Clinics* 2000; 16(1):1-12 PMID:10696572
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38. McDonald CM, **Carter GT**, Fritz RC, Anderson MW, Abresch RT, Kilmer DD. Magnetic resonance imaging of denervated muscle: comparison to electromyography. *Muscle Nerve* 2000; 23(9):1431-34 PMID: 10951448
39. **Carter GT**, McDonald CM. Preservation of function in Duchenne dystrophy with long-term pulse prednisone therapy. *Am J Phys Med Rehabil* 2000; 79(5):455-58 PMID:10994887

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41. Abresch RT, Jensen MP, **Carter GT**. Health quality of life in peripheral neuropathy. *Phys Med Rehabil Clin N Am* 2001; 12(2):461-472 PMID:11345018
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43. Steinborn J, Alison K. Chinn, **Carter GT**: The latest buzz on medicinal marijuana: a legal and medical perspective. *Am J Hosp Palliat Care* 2001; 18(5):295-6 PMID:11565181
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45. **Carter GT**, Sullivan MD. Antidepressants in pain management. *Curr Opin Investig Drugs* 2002; 3(3):454-458 PMID:12054096
46. **Carter GT**, Weydt P. Cannabis: old medicine with new promise for neurological disorders. *Curr Opin Investig Drugs* 2002; 3(3):437-440 PMID:12054093
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58. **Carter GT**, Weydt P, Kyashna-Tocha M, Abrams DI. Medical marijuana: rational guidelines for dosing. *IDrugs* 2004; 7(5):464-470 PMID:15154108
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77. Fritz RC, Domroese ME, **Carter GT.** Physiological and anatomical basis of muscle magnetic resonance imaging. *Phys Med Rehabil Clin N Am* 2005; 16(4):1033-1051. PMID:16214058
78. Aggarwal S, **Carter GT**, Steinborn J. Clearing the air: What the latest Supreme Court decision regarding medical marijuana really means. *Am J Hosp Palliat Care* 2005; 22(5):327-329. PMID:16225351
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85. **Carter GT**, Mirken B. Medical marijuana: politics trumps science at the FDA. *Medscape General Medicine* 2006; 8(2):46. PMID:16926785
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91. Baumrucker SJ, Stolick M, Morris GM, **Carter GT**, Sheldon JE. Brain death and organ transplantation. *Am J Hosp Palliat Med* 2007; 23(4):332-337 PMID:17895498
92. Aggarwal SK, Kyashna-Tocha M, **Carter GT**. Dosing Medical Marijuana: Rational Guidelines on Trial in Washington State. *MedGenMed* 2007; 9(3):52. PMID:18092058
93. Gwinn K, Corriveau RA, Mitsumoto H, Bednarz K, Brown RH Jr, Cudkowicz M, Gordon PH, Hardy J, Kasarskis EJ, Kaufmann P, Miller R, Sorenson E, Tandan R, Traynor BJ, Nash J, Sherman A, Mailman MD, Ostell J, Bruijn L, Cwik V, Rich SS, Singleton A, Refolo L, Andrews J, Zhang R, Conwit R, Keller MA; **Carter GT**; ALS Research Group. Amyotrophic lateral sclerosis: an emerging era of collaborative gene discovery. *PLoS ONE*. 2007 Dec 5;2(12):e1254 PMID: 18060051
94. Baumrucker SJ, Sheldon JE, Morris GM, Stolick M, **Carter GT**, Harrington D. Withdrawing treatment for the “wrong” reasons. *Am J Hosp Palliat Med* 2008; 24(6):509-514. PMID:18182638
95. Jensen MP, Hoffman AJ, Stoelb BL, Abresch RT, **Carter GT**, McDonald CM. Chronic pain in persons with myotonic and facioscapulohumeral muscular dystrophy. *Arch Phys Med Rehabil* 2008; 89(2):320-328 PMID:18226657
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3. **Carter GT**, Fritz RC. Should every unclear neuromuscular symptom be termed "paraneoplastic"? [commentary] *Muscle Nerve* 1997; 20:1204-1205
4. **Carter GT**. Habitat for an aging, physically impaired humanity. [editorial] *J Neurovas Dis* 1998; 3(7):5
5. **Carter GT**. Does managed care work for stroke rehabilitation? [editorial] *J Neurovas Dis* 1998; 3(5):189
6. **Carter GT**. Medical marijuana: historical and modern perspectives for rehabilitation. *ADVANCE for Directors in Rehabilitation* 2004; 13 (7):31-35.
7. **Carter GT**. Developing an evidenced-based case for polyneuropathy. *The Physiatrist* 2004; 20(8):3.
8. **Carter GT**. Shoring up strength. Exercise plays an important role for people with neuromuscular disease. *ADVANCE for Directors in Rehabilitation* 2004; 13(11):33-34.

9. Domroese ME, **Carter GT**. A powerful tool: magnetic resonance imaging can help rehabilitation clinicians evaluate muscle. *ADVANCE for Directors in Rehabilitation* 2005; 14(8):23-26
10. **Carter GT**, Hecht TW. Rehabilitation of the adult neuromuscular disease patient. In: University of Washington School of Medicine; syllabus for Rehabilitation Medicine Clerkship (medical school course 690); updated May 2005 pp:72-74.
11. **Carter GT**. Exercise and nutrition can enhance muscle performance in patients with neuromuscular disease. *ADVANCE for Directors in Rehabilitation* 2006; 15(6):29-32.
12. Han JJ, **Carter GT**. Staying strong: A multidisciplinary approach to treating patients with DMD can help them overcome muscular challenges. *ADVANCE for Directors in Rehabilitation* 2006; 15(9): 25-28.
13. Vranna JA, **Carter GT**. Do you know how to prescribe an exercise-based rehab program for older adults? *ADVANCE for Directors in Rehabilitation* 2007; 16(3):49-51.
14. Kennedy DJ, Emerick N, **Carter GT**. Maximum capacity. Strength training in elderly adults can correct common biomechanical abnormalities. *ADVANCE for Directors in Rehabilitation* 2008; 17(4): 57-58.

Published Abstracts

1. **Carter GT**, Yang CS, Abresch RT, Lieberman JS, Fowler WM. Pulmonary assessment in patients with facioscapulohumeral dystrophy [abs]. *Arch Phys Med Rehabil* 1989; 71(11):A67
2. **Carter GT**, Fowler WM, Lieberman JS. Maximum static airway pressures in patients with limb-girdle and facioscapulohumeral dystrophy [abs]. *Arch Phys Med Rehabil* 1990; 71(10):822
3. **Carter GT**, Kilmer DD, Bonekat HW, Lieberman JS, Fowler WM. Phrenic nerve involvement in Charcot-Marie-Tooth disease [abs]. *Arch Phys Med Rehabil* 1991; 72(10):827
4. **Carter GT**, Longley KJ, Entrikin RK. Muscular dystrophy in *mdx* mice: electromyography and nerve conduction [abs]. *Faseb J* 1991; 5(4):A900
5. **Carter GT**, Longley KJ, Walsh SA, Entrikin RK. Lack of effect of amitriptyline in murine myotonia [abs]. *Faseb J* 1992; 6(4):A1299
6. **Carter GT**, Kilmer DD, Bonekat HW, Breslin EH, Johnson ER. Pulmonary function in hereditary spinocerebellar ataxia [abs]. *Arch Phys Med Rehabil* 1992; 73(10):1000
7. Johnson ER, **Carter GT**, Fowler WM. Spine deformity profiles in neuromuscular disease [abs]. *Arch Phys Med Rehabil* 1992; 73(10):1001.
8. Longley KJ, Entrikin RK, **Carter GT**, Horasek SJ. Antagonism of myotonia by dexamethasone in muscular dystrophy of the chicken [abs]. *Faseb J* 1992; 6(4):A1299
9. Breslin E, Booth J, Lord B, **Carter GT**, Bonekat HW, Volz B, Mercer K, Siefkin A. Respiratory responses to unsupported arm exercise (UAE) in Charcot Marie Tooth (CMT) [abs]. American Thoracic Society *Am Rev Resp Dis* 1993; 147(4):A532

10. Abresch RT, Fowler WM, Larson DB, Horasek SJ, Walsh SA, **Carter GT**. Contractile abnormalities in dystrophin-less (*mdx*) mice [abs]. *Med Sci Sports Exer* 1993; 5(5):S15
11. Breslin EH, **Carter GT**, Mercer K, Bonekat HW, Lee K. Fatigue in patients with Charcot-Marie-Tooth [abs]. *Arch Phys Med Rehabil* 1993; 74(11):1256-57
12. Wineinger MA, **Carter GT**, Abresch RT, Walsh SA, Horasek SJ, Fowler WM. Effect of aging on the histological, biochemical and contractile properties of dystrophin-deficient (*mdx*) mice [abs]. *J Cell Biochem* 1994; S18D:525
13. **Carter GT**, Wineinger MA, Walsh SA, Horasek SJ, Abresch RT, Fowler WM. Effect of voluntary wheel-running exercise on muscles of the *mdx* mouse [abs]. *J Cell Biochem* 1994; S18D:526
14. **Carter GT**, Kilmer DD. Posterior interosseus nerve entrapment in the presence of hereditary motor and sensory neuropathy, type I [abs]. *Muscle Nerve* 1994; 17:1085
15. Kawasaki RI, **Carter GT**, McDonald CM, Kilmer DD. Electromyographic and muscle biopsy findings in limb girdle syndromes [abs]. *Arch Phys Med Rehabil* 1994; 75(9):1050
16. **Carter GT**, Fritz RC. Electromyographic and lower extremity STIR MRI findings in lumbar radiculopathy [abs]. *Muscle Nerve* 1996; 19:1215-1216
17. Abresch RT, Jensen MP, **Carter GT**. Assessment of pain and health-related quality of life in slowly progressive neuromuscular disease [abs]. *Arch Phys Med Rehabil* 2000; 81:1289
18. Han JJ, Ra JJ, Abresch RT, Robinson LR, Chamberlain JS, **Carter GT**. Electromyographic characterization of the *mdx* mouse, an animal model for Duchenne muscular dystrophy [abs]. *Am J Phys Med Rehabil* 2005; 84(3):202.
19. Hodapp JA, **Carter GT**, Kraft GH, Bird TD. Double trouble in Charcot-Marie-Tooth disease: mutation in the PMP-22 gene concomitant with another gene mutation producing a novel phenotype [abs]. *Neurology* 2005; 64(6):A80.
20. Escolar DM, Wokke J, LaForet P, Pestronk A, Jaffe K, **Carter GT**, Florence J, Skrinar, A, Mayhew JE. The use of a comprehensive battery for the assessment of muscle strength and function in late onset Pompe disease. [abs]. *Neuromusc Disord*, Volume 17 (9-10):793-794
21. **Carter GT** Jaffe K, Wokke J, LaForet P Pestronk A, Escolar DM, Mayhew JE, Florence J, Skrinar, A,. Late onset Pompe disease is associated with impaired pulmonary and muscle function and diminished health-related quality of life. [abs]. *World Muscle Society*, 2007 meetings.
22. Han JJ, Abresch RT, **Carter GT**, Kilmer DD, Skalsky A, McDonald CM. Body Composition analysis using whole body and regional dual x-ray absorptiometry (DEXA) in Duchenne muscular dystrophy. *ISPRMI* 2007; Seoul, Korea.

NATIONAL INVITED LECTURES:

- 1994 Co-Chairperson and Course Faculty, "Natural History Profiles of Neuromuscular Diseases", presented at the American Academy of Physical Medicine and Rehabilitation Annual Meeting, Los Angeles, CA

- 1996 Course Faculty, "Palliative and Rehabilitative Strategies in ALS", University of Texas, Health Sciences Center, San Antonio
- 1996 Chairperson and Course Faculty, "Update on Motor Neuron Disorders"; by invitation; American Association of Electrodiagnostic Medicine annual meeting
- 1998 Moderator and Course Faculty: "STIR MRI: Usefulness Compared to Electromyography as a Diagnostic Tool for Neuromuscular Disorders", presented at the American Academy of Physical Medicine and Rehabilitation Annual Meeting
- 2001 "Adaptations to Exercise in Animal Models of Neuromuscular Disease"; by invitation; Consensus Conference on Muscle Physiology; San Diego, CA
- 2001 "Magnetic Resonance Spectroscopy in Metabolic Myopathies"; by invitation; American Association of Electrodiagnostic Medicine, Albuquerque, NM
- 2001 Plenary Session faculty, by invitation, "Magnetic Resonance Imaging: Anatomic and Physiologic Aspects of Muscle Evaluation"; American Association of Electrodiagnostic Medicine, Albuquerque, NM
- 2002 Dannemiller Memorial Education Foundation invited faculty; Seminars on Painful Neuropathies: Diagnostic Approach, Pathophysiology, and Treatment, Seattle, WA and Dallas, TX
- 2003 Chairperson and Course Faculty, by invitation, "The Role of Exercise in Neuromuscular Diseases", presented at the American Academy of Physical Medicine and Rehabilitation Annual Meeting, Chicago, IL
- 2003 Grand Rounds, by invitation, "Adaptations to Exercise in Animal Models of Neuromuscular Disease"; Loyola University Medical Center, Department of Orthopedics and Rehabilitation; Chicago, IL
- 2004 "Chronic Pain in Persons with Neuromuscular Disease"; joint scientific meeting of the American Pain Society and the Canadian Pain Society. Vancouver, British Columbia, Canada
- 2004 Course faculty, by invitation, "Rehabilitation Management of Peripheral Neuropathy", presented at the American Academy of Neurology Annual Meeting, San Francisco, CA
- 2004 Course faculty, by invitation "Rehabilitation Management of Peripheral Neuropathy"; presented at the American Academy of Physical Medicine and Rehabilitation Annual Meeting, Phoenix, AZ
- 2005 Course faculty, by invitation "The Role of Cannabinoids in Treating Neuromuscular Disorders"; presented at the National Organization for the Reform of Marijuana Laws (NORML) Annual Meeting, San Francisco, CA
- 2005 Course faculty, "Electrophysiological Tools and Their Use in the Rehabilitation of Myopathies", by invitation; presented at the American Academy of Neurology Annual Meeting, San Francisco, CA and the American Academy of Physical Medicine and Rehabilitation Annual Meeting, Philadelphia, PA
- 2005 Course faculty, by invitation; "Methods of Assessing Muscle Function in Neuromuscular Disease"; Course C, American Association of Neuromuscular and Electrodiagnostic Medicine, Monterey, CA

- 2005 Course faculty, by invitation; "Nerve and Muscle Imaging with MRI"; Symposium F, American Association of Neuromuscular and Electrodiagnostic Medicine, Monterey, CA
- 2005 Course faculty, by invitation; "Hereditary and New Myopathies"; Course E, American Association of Neuromuscular and Electrodiagnostic Medicine, Monterey, CA
- 2005 Plenary Session faculty, by invitation; "Rehabilitation of Neuromuscular Disorders"; Plenary Session, American Association of Electrodiagnostic Medicine, Monterey, CA
- 2005 Course Faculty, "Developing an Evidenced Based Guide for Diagnosing Polyneuropathy", presented at the American Academy of Physical Medicine and Rehabilitation Annual Meeting, Philadelphia, PA
- 2005 Course faculty, by invitation; "Rehabilitation Management of Muscular Dystrophy"; Clinic Directors Meeting of the Muscular Dystrophy Association, Tucson, AZ
- 2006 Course Faculty, "Rehabilitation Management of Neuromuscular Disease", presented at the Oregon Health Sciences University Update on Neuromuscular Disease conference, Portland, OR, January
- 2006 Course Faculty, "Comprehensive Management of ALS", presented at the Madigan Army Medical Center Physical Medicine and Rehabilitation Update Course, Tacoma, WA
- 2006 Course Moderator and Faculty, "Maximizing Quality of Life in Neuromuscular Disease, Course C, American Association of Neuromuscular and Electrodiagnostic Medicine, Washington, D.C.
- 2006 Course Instructor, Workshop on "Distinguishing Lumbar Radiculopathy from Lumbosacral Plexopathy, American Association of Neuromuscular and Electrodiagnostic Medicine, Washington, D.C.
- 2007 Course Instructor, Workshop on "Lumbosacral Plexopathy", American Association of Neuromuscular and Electrodiagnostic Medicine, Phoenix, AZ.
- 2007 Course Faculty, "Advances in Neuromuscular Disease: Rehabilitation", American Association of Neuromuscular and Electrodiagnostic Medicine, Phoenix, AZ.
- 2008 Course Faculty, "Physiological Responses to Exercise Training in Neuromuscular Disease", American Association of Neuromuscular and Electrodiagnostic Medicine, Providence, RI
- 2008 Course Faculty, "Improving Quality of Life through Exercise in Neuromuscular Disease", American Association of Neuromuscular and Electrodiagnostic Medicine, Providence, RI
- 2008 Course faculty, "Physiological Adaptations to Exercise in Dystrophic Skeletal Muscle"; American Academy of Physical Medicine and Rehabilitation Annual Meeting, San Diego, CA
- 2009 Course faculty, "Neuromuscular Update: Hereditary Neuropathy"; American Association of Neuromuscular and Electrodiagnostic Medicine; Annual Meeting, San Diego, CA
- 2009 Course faculty, "Neuromuscular Update: Postoperative Foot Drop"; American Association of Neuromuscular and Electrodiagnostic Medicine; Annual Meeting, San Diego, CA
- 2009 Invited Guest Speaker, "Medical Marijuana: The Role of the Pharmacist"; National American Board of Pharmacy; Annual Meeting, Tucson, AZ

- 2010 Invited Keynote Speaker "Rehabilitation of Spinocerebellar Ataxias"; Canadian Academy of Physical Medicine and Rehabilitation 58th Annual Scientific Meeting, Ottawa, Ontario, Canada
- 2010 Course director and faculty, "Neuromuscular Update: Orthotic Management of Charcot Marie Tooth disease."; American Association of Neuromuscular and Electrodiagnostic Medicine Annual Meeting; Québec City, Québec, Canada
- 2010 Course Director and faculty, "Pain and Quality of Life in Neuromuscular Disease"; American Academy of Physical Medicine and Rehabilitation Annual Meeting, Seattle, WA
- 2010 Course Director and faculty, "Update on Research and Management of Amyotrophic Lateral Sclerosis"; American Academy of Physical Medicine and Rehabilitation Annual Meeting, Seattle, WA
- 2010 Course Director and faculty, " Electrophysiological Characterization of Animal Models of Neuromuscular Disease"; American Academy of Physical Medicine and Rehabilitation Annual Meeting, Seattle, WA
- 2010 Course Director and faculty, "Advances in the Evaluation and Management of Duchenne Muscular Dystrophy"; American Academy of Physical Medicine and Rehabilitation Annual Meeting, Seattle, WA
- 2011 Course faculty, "Aging with Muscular Dystrophy"; National Institute of Disability and Rehabilitation Research; Physical Disability and Aging: A State of the Science Conference, Washington, DC
- 2011 Course faculty, "Neuromuscular Update: Rehabilitation Management in Autoimmune Neuromuscular Disorders"; American Association of Neuromuscular and Electrodiagnostic Medicine Annual Meeting; San Francisco, CA
- 2011 Course faculty, "Neuromuscular Update: Alternative Medicines in the Management of Neuromuscular Disease"; American Association of Neuromuscular and Electrodiagnostic Medicine Annual Meeting; San Francisco, CA
- 2012 Course faculty, "Alternative Medicines in the Management of Chronic Pain"; PAINWeek National Conference, Las Vegas, NV (Sept 05)
- 2012 Course faculty, "Chronic Pain in Neuromuscular Disease"; PAINWeek National Conference, Las Vegas, NV (Sept 05)
- 2012 Course faculty, "Neuromuscular Update: Case Vignettes in Management of Neuromuscular Disease"; American Association of Neuromuscular and Electrodiagnostic Medicine Annual Meeting; Orlando, FLA (Oct 3-6)
- 2012 Invited Speaker, Medical Marijuana in Management of Chronic Pain and Neuromuscular Disease"; WA State Department of Behavioral Health Annual meeting; Yakima, WA Oct 8
- 2012 Course faculty, " The John D. Loeser 5th Annual CME for Primary Care Providers: Discussions with your chronic pain patient. "Medical Marijuana – Where does it fit in?" UW Pain Medicine Seminar, Seattle, WA Fri, Nov 2nd; 11:15 AM

- 2012 Course faculty, " Medical Marijuana – Emerging Role in the Management of Pain", American College of Physicians (ACP) annual meeting, Seattle, WA Nov 3; 11:00 – 11:45 AM
- 2012 Course faculty, Support and Action Group Facilitator Conference, Elk Grove Village, Illinois November 8- Sunday, November 11.
- 2012 Course faculty, " Practical Update in Neuromuscular Disease Update on Muscle Disease: The Role of Exercise"; American Academy of Physical Medicine and Rehabilitation Annual Meeting, Atlanta, GA; Thurs Nov 15; 11:15 AM
- 2013 Invited Speaker: "Use of Medical Marijuana for pain management"; Annual "Challenge of Pain"; UW Continuing Nursing Education. Wednesday Jan 23rd 2013, 4:00-4:30 PM
- 2013 Invited Speaker: "Use of Medical Marijuana for pain management"; American Pain Society May 2013; New Orleans, LA
- 2013 Course Director and faculty, "Medicinal Cannabis in the management of chronic pain – from Pharmacology to Bioethics" PAINWeek National Conference, Las Vegas, NV (Sept 4)
- 2013 Course Director and faculty, "A Role for Medicinal Cannabis (Marijuana) in the management of chronic pain" American Academy of Physical Medicine and Rehabilitation Annual Meeting, Washington, DC, Oct 3-6
- 2013 Faculty, "Rehabilitation Management of Multifocal Motor Neuropathy" American Academy of Physical Medicine and Rehabilitation Annual Meeting, Washington, DC, Oct 3-6
- 2013 Course Director and faculty, "Disease Modification in Peripheral neuropathy: Challenges & opportunities" American Association of Neuromuscular and Electrodagnostic Medicine, San Antonio, Texas, Oct 16-19, 2013
- 2013 Course faculty, " The John D. Loeser 6th Annual CME for Primary Care Providers: Discussions with your chronic pain patient. "The Use of Suboxone for Management of Chronic Pain" UW Pain Medicine Seminar, Seattle, WA Fri, Nov 1nd; 4:25 PM