American Academy of Neurology Code of Professional Conduct

James A. Russell, DO, MS, John C. Hutchins, JD, and Leon G. Epstein, MD,
on behalf of the AAN Ethics, Law, and Humanities Committee

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The American Academy of Neurology (AAN) developed the Code of Professional Conduct to formalize the standards of professional behavior for AAN members to help them in their pursuit of providing the highest quality of patient-centered neurologic care. The goal of this code is to establish the professional standards that AAN members must or should observe in their clinical, academic, scientific, and personal activities.

Violations of these standards may serve as the basis for disciplinary action as provided in the AAN's Bylaws¹ and Disciplinary Action Policy.² The code applies to all categories of AAN membership, to the extent the AAN member is participating in the relevant activity addressed by the code.

This code embodies traditional standards of medical ethics, dating from the time of Hippocrates and adapted to align with contemporary medical practice and ethical values. It is written in broad language to apply principles of medical ethics to the specific demands of neurologic practice.

In this code, use of the word “must” indicates that an action is ethically obligatory for AAN members; such actions are near-absolute obligations, not matters about which AAN members may use judgment or discretion. Use of the word “should” indicates an action that is ethically permissible, preferable, and strongly recommended; such actions are subject to exceptions only under special circumstances based on the AAN member's ethical judgment and discretion, exercised on behalf of the best interests of the patient.³ When the code uses the word “including” to refer to specific examples, the word should be understood to mean “including but not limited to.” The code is intended to be generally consistent with the American Board of Internal Medicine Foundation's Medical Professionalism in the New Millennium: A Physician Charter, which is endorsed by the AAN.⁴

Any reference to the law in this code is for illustrative purposes only: the statements do not describe legal obligations or the consequences of violating those obligations, both of which can vary by jurisdiction. The code is not intended to establish standards of clinical practice for use in criminal or civil proceedings. If any provision of this code conflicts with state or federal law, the relevant laws will govern in any judicial proceeding.

Where relevant, AAN members are encouraged to seek guidance from documents referenced in this code.

1.0 The Patient Relationship

1.1 The Practice of Neurology

The profession of neurology exists primarily to study, diagnose, and treat disorders of the nervous system. The trust created by an AAN member's relationship with the patient forms the foundation for neurologic care provided by the profession. The AAN member must provide the best patient care that available resources and circumstances permit to all patients. (This

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Go to [Neurology.org/N](https://www.aan.org/N) for full disclosures. Funding information and disclosures deemed relevant by the authors, if any, are provided at the end of the article.

Glossary

AAN = American Academy of Neurology.

includes providing the best patient care that available resources and circumstances permit without regard to the patient's race, color, national origin, language, religion, sex, age, disability, citizenship, marital status, creed, sexual orientation, gender expression or gender identity, or other characteristics protected by federal or relevant state law.) To help promote equity in neurologic care, AAN members should consider how their own knowledge, attitudes, behavioral patterns, biases, or beliefs may contribute (by commission or omission) to inequities and disparities in their care of patients and should take remedial action to eliminate those inequities or disparities.

When a clinician–patient relationship has been formed, AAN members have fiduciary and contractual duties to their patients. As a fiduciary, the AAN member has an ethical duty to consider the best interests of his or her patients. As a party to an implied contract, AAN members have a duty to practice competently and to respect their patients' autonomy, confidentiality, and welfare.

There are certain circumstances when an AAN member's fiduciary duty to an individual patient may be modified by other considerations. For example, a clinician may need to prioritize protecting public welfare during epidemics or natural disasters when resources are limited.⁵ In addition, the AAN member's normal fiduciary obligations may also be different throughout the independent medical examination process.⁶

An AAN member may encounter circumstances that make it difficult to fulfill his or her fiduciary aspirations to promote the well-being of each individual patient. For example, it may be impractical to take the time to advocate for every patient after receipt of third-party denials of recommended testing or treatments. The time required to advocate for individual patients may detract from the time required to address the member's remaining responsibilities. In such circumstances, AAN members should strive to advocate for each patient individually but in a manner proportionate to the benefit of the requested test or treatment and without jeopardizing the care required by other patients for whom they are responsible. AAN members are encouraged to address their concerns pertaining to inequities in care in the appropriate advocacy forums.⁷

1.2 Beginning and Ending the Relationship

The AAN member is free to decide whether to undertake medical care of a person, though the AAN member must not decline a patient based on a patient's identity, including characteristics protected by federal or state law. Once the relationship has begun, the AAN member must provide care until care is no longer necessary due to death or recovery, the patient ends the relationship, or the AAN member returns the patient to the care of another appropriate clinician. In rare circumstances, the AAN member may end the relationship if

the member has an ethically justifiable reason for doing so, as permitted by law and institutional policy, and assuring continuity of care if medically necessary.

1.3 Emergency Care

In an emergency situation, the AAN member should render appropriate care to the patient to the best of his or her abilities. In medical emergencies when an AAN member cannot obtain informed consent, consent may be presumed where there is risk of death or morbidity that a reasonable person would find unacceptable.

1.4 Informed Consent

In nonemergent situations, the AAN member must obtain the patient's consent, or when applicable, assent, prior to performing tests or providing treatment. Consent may be expressed (e.g., verbal or written) by someone with capacity (or when relevant, a lawful surrogate) capable of communicating acceptance of recommended testing or treatment. In the absence of patient capacity or communication capability, and absent a lawful surrogate decision-maker, an AAN member can utilize patient assent as manifested by the patient's willing participation relating to medically indicated testing and treatment in consideration of the patient's best interests. The AAN member should disclose information that the average person would need to know to make an appropriate medical decision, including benefits, risks, and alternatives to the proposed treatment or procedure. Consideration of cost should be discussed when appropriate. The AAN member should exercise judgment to determine the appropriate level of detail to provide the patient, considering the unique circumstance of each case and assessing whether the patient's decision-making capacity is commensurate with the complexity and significance of the decision. If the patient lacks medical decision-making capacity, the AAN member must obtain informed consent from a lawful proxy or the patient's lawful health care directive in order to proceed with tests or treatments for which informed consent is considered necessary. For patients lacking full decision-making capacity, assent from the patient should be sought whenever possible. Some state laws prohibit surrogates from making decisions for certain interventions; AAN members should be aware of any such restrictions. The AAN member is encouraged to provide guidance to patients when appropriate, based on knowledge, training, and experience.

1.5 Medical Decision-making

A patient with decision-making capacity for the issue under consideration has the right to accept or reject the AAN member's recommendation about medical treatment. The AAN member must respect decisions made by patients with decision-making capacity (or, when relevant, their lawful proxy agent) to forego recommended testing and treatment, when legally permitted. The AAN member should attempt to

understand the basis for the decision, whether it originates from either a factual misunderstanding or a difference in values. The AAN member should attempt to correct any misunderstanding and reconcile any difference in values in an attempt to serve the best interests of the patient. Notwithstanding the profession's respect for patient autonomy, it is appropriate for the AAN member to decline to honor a patient request for testing or treatment for which there is no medical indication.

Patient satisfaction metrics are influential in medical practice. AAN members should aspire to achieve optimal patient satisfaction. However, considerations of patient satisfaction should not adversely influence appropriate medical decision-making or optimal patient care.

1.6 Communication

The AAN member has a duty to communicate effectively with the patient, the patient's lawful surrogate, or other individuals authorized by the patient. The AAN member should convey relevant and easily understood information, be sensitive to the timing of each communication, and allow adequate opportunity for the patient to raise questions and discuss matters related to testing or treatment. Health literacy and ability to understand health information should be considered in communicating medical information.

1.7 Medical Risk to the AAN Member Related to Patient Care

An AAN member must not refuse to care for a patient solely because of a real or perceived medical risk to the AAN member for becoming infected with pathogens when the member is capable and has access to adequate resources. The AAN member should take appropriate precautions to minimize medical risk. AAN members can and should expect their workplace to provide adequate protective resources.

2.0 General Principles of Neurologic Care

2.1 Professional Competence

The AAN member should practice only within the scope of his or her training, experience, and competence. The AAN member should provide care that conforms to the prevailing standards of neurologic practice. The AAN member should provide care that respects diversity in the patient population and cultural factors that can affect health and health care, such as language, communication styles, beliefs, attitudes, and behaviors. To these ends, the AAN member should participate in continuing medical education.

2.2 Consultation

The AAN member should obtain consultations when indicated. The AAN member should strive to refer patients for consultation only to competent practitioners and should assure that adequate information is conveyed to the consultant.

Any differences of opinion between the AAN member and consultant or between the AAN member and the referring physician should be resolved in the best interest of the patient and with respect to the decision-making authority of the patient.

2.3 Confidentiality

The AAN member must respect patient privacy and confidentiality, including when using social media and other electronic modalities.⁸ While the AAN member must ordinarily respect a patient's confidentiality, a breach of that obligation may be justified to protect individuals or the public or to disclose or report information when the law requires it. If breaching confidentiality is necessary, it should be done in a way that minimizes harm to the patient and complies with applicable federal and state law. A patient's medical condition must not be discussed publicly in any forum without the patient's consent.

2.4 Patient Records

The AAN member should prepare records that prioritize quality over quantity. These records should include relevant and accurate history, neurologic findings, assessment, and plan for evaluation and treatment. Inaccuracy and misattribution facilitated by copying and pasting in the electronic medical record should be avoided. Patients are entitled to information within their medical records. However, AAN members should take reasonable precautions to prevent harm to their patients that could result from inadvertent, premature, or inadequately explained disclosure.

2.5 Professional Fees and Compensation

The AAN member is entitled to reasonable compensation for medical services he or she provides to or on behalf of patients. The AAN member should order and perform only those services that are medically indicated as determined by evidence or cogent medical rationale and should never allow a clinical decision to be influenced by the prospect of personal or institutional financial benefit. The AAN member should receive compensation only for services actually rendered or supervised.

The AAN member should support and advocate for equity in both compensation and opportunities for professional advancement.

AAN member ownership, or a financial interest, in a medically related business entity is permissible if the quality of the service meets accepted standards, and if the member utilizes these services in a manner consistent with accepted clinical practice standards. The AAN member must not engage in profiteering, receive a fee for making a referral ("fee-splitting"), or receive a commission from anyone for an item or service he or she has ordered for a patient ("kickback"). The agreed-upon division of practice income among members of an organized medical group is acceptable.

2.6 Patient Safety

The AAN member is encouraged to address any issue concerning a patient's condition or behavior whenever that

condition or behavior jeopardizes the patient's safety or welfare, including fall risk; driving safety; medication compliance; domestic violence; drug, alcohol, or tobacco use; and firearm safety.

2.7 Advance Directives

The AAN member is encouraged to understand the values underlying life-sustaining treatment decisions expressed by the patient or, when relevant, a lawful surrogate. The AAN member should counsel patients to identify and authorize a lawful surrogate to make medical decisions in the event that the patient becomes incapable of doing so, help the patient communicate his or her values and preferences to the surrogate, and, if requested by the patient, help the surrogate represent the patient's values and preferences without yielding to personal emotion or external interference.

2.8 Alternative Therapies

The AAN member should ascertain, to the extent possible, the relevant risks and benefits of complementary and alternative treatments and counsel the patient accordingly. This may include considering the benefits of existing treatments or those potentially available to patients in clinical trials, as well as the possibility of referral to an integrative medicine specialist.

3.0 Special Categories of Neurologic Care

3.1 The Dying Patient⁹

The AAN member should strive to relieve the physical and existential suffering of dying patients. The AAN member should ensure that the sources of patient suffering are recognized, understood, and palliated whenever possible. The AAN member should respect the expressed wishes of dying patients about life-prolonging therapy, including those expressed in documents such as validated advance directives and legally recognized medical orders pertaining to life-sustaining treatment.

The AAN member may choose, as directed by conscience, to participate or not participate in lawful physician-hastened death. Participating members should ensure that they have the requisite skills to ensure the comfortable death the patient is seeking. If the AAN member chooses not to participate, he or she should continue to care for that patient unless expressly relieved of responsibility by the patient or lawful surrogate. If the AAN member is conscientiously opposed to participating in physician-hastened death, he or she is under no obligation to assist the patient in identifying another clinician to participate.

3.2 Patients With Chronic Disorders of Cognition or Consciousness

AAN members should encourage their patients to create advance directives, as described in Section 2.8, and identify a lawful proxy agent. This is particularly important and time-sensitive for patients who are at risk for developing chronic

disorders of cognition or consciousness, prior to loss of decision-making capacity.

3.3 Brain Death¹⁰

The AAN member should determine brain death in an accurate and timely fashion, utilizing currently accepted medical standards. AAN members should be aware and respectful of the brain death laws in the jurisdiction in which they practice. AAN members who receive accommodation requests to forego brain death testing or to maintain organ-sustaining technology after a determination of brain death should seek appropriate expert guidance to clarify the legal and ethical considerations relevant to those requests in the relevant jurisdiction.

3.4 Patients Requesting Investigational Treatments

Food and Drug Administration–authorized expanded access and federally authorized right-to-try programs provide patients with potential access to investigational treatments. In consideration of the best interests of their patients, AAN members should make reasonable attempts to familiarize themselves with the potential benefits and harms of these programs, for both current and future patients, and counsel their patients accordingly. Whether the AAN member assists patients in seeking and participating in these investigational therapies is a matter of professional judgment and conscience and should not be motivated by the AAN member's self-interest.

4.0 Personal Conduct

4.1 Respect for the Patient

The AAN member must treat patients in an honest, respectful, and conscientious manner. The AAN member should strive to nurture hope and comfort, while avoiding unrealistic expectations that might erode the patient's trust. In all communications with or about the patient, the AAN member should strive to protect the patient's dignity. The AAN member must not abuse or exploit the patient psychologically, sexually, physically, or financially.

4.2 Respect for Colleagues

The AAN member must treat colleagues (including other health care professionals, coworkers, and employees) respectfully and refrain from sexual or other forms of harassment or coercion. Disagreements should be discussed in a respectful manner and resolved based on analysis of factual information, differences in clinical judgment, and the professional roles of the respective physicians, and not on personal differences.

The AAN member must make conscious efforts to foster a diverse, equitable, inclusive, and antiracist workplace. An antiracist workplace is generally described as a workplace that opposes racism, promotes racial tolerance, and strives towards racial equity, inclusion, awareness, and sensitivity.

4.3 Respect for Regulatory Agencies and the Law

The AAN member should observe applicable laws and regulatory requirements. Because agencies may have an effect on the AAN member's goal to promote patients' welfare, the AAN member should cooperate and comply with reasonable requests from insurance, compensation, reimbursement, and government agencies within the constraints of patient privacy and confidentiality. The AAN member should be aware of potential legal and ethical conflicts in medical decision-making and behavior. AAN members are advised to seek counsel when concerned about the potential legal consequences of their decisions or behavior, even if ethically justified.

4.4 Respect for Religious and Cultural Differences

The AAN member may encounter requests by patients or their surrogates that are grounded in religious beliefs or cultural practices that conflict with the ethical guidance contained within this document or with prevailing standards of medical care. The AAN member is encouraged to respect these differing values and consider the basis for them in order to reach an acceptable solution. When needed, the AAN member should seek spiritual, ethical, or legal guidance from those knowledgeable in the religious or cultural background of the patient. If an acceptable solution cannot be achieved, the AAN member may choose not to provide the care requested by a patient if doing so would violate the member's conscience, unless mandated by law.

4.5 Maintenance of the Neurologist's Personal Health

The AAN member should strive to maintain physical and emotional health. The AAN member should refrain from practices that impair their capacity to provide adequate patient care. AAN members should be considerate of any adverse effect their health status might have on the health of their patients.

5.0 Conflicts of Interest

5.1 The Patient's Interest Is Paramount

Whenever a conflict of interest arises, the AAN member must attempt to resolve it in the best interest of the patient. A patient's best interests should be interpreted in a medical context, ideally determined through a shared decision-making model in which the AAN member uses training and experience to promote the values of the patient related to medical care. If the conflict cannot be eliminated, the AAN member should withdraw from the care of the patient.

When prescribing expensive treatments, AAN members may experience perceived conflicts between their duty to individual patients and their duty to be responsible stewards of limited health care resources. In general, the best interests of an individual patient should supersede distributive justice

considerations, which should ideally be addressed at institutional or system levels (see Section 1.1 for a discussion of circumstances when an AAN member's fiduciary duty to an individual patient may be modified by other considerations).

5.2 Avoidance and Disclosure of Potential Conflicts

The AAN member must avoid practices and financial arrangements that would, because of personal gain, influence decisions in the care of patients. An AAN member must disclose to patients any financial interest the member or member's employer has that might conflict with appropriate medical care.

5.3 Prescribing Practices

The AAN member may dispense medication or other therapeutic assistance to a patient if this practice provides a convenience or an accommodation to the patient without taking financial advantage of the patient. Any medication provided in this manner must be medically appropriate and should not be used as a mechanism to entice patients or physicians to continue using a medication when more cost-effective options are available. The patient should be given a choice to accept the dispensed medication or device or to have a prescription filled outside the AAN member's office.

5.4 Health Care Institutional Conflicts

The AAN member generally should support the patient's medical interests when they are compromised by policies of a health care institution or agency. AAN members employed by health care institutions should represent the patient's medical interests and serve as advocates when the patient's welfare is potentially compromised by institutional policy, including the potential for bedside rationing created by capitated payment systems.

6.0 Relationships With Other Professionals

6.1 Cooperation With Health Care Professionals

The AAN member should cooperate and communicate with other health care professionals, including other physicians, advanced practice clinicians, nurses, and therapists, in order to provide the best care possible for patients.

6.2 Peer Review and Quality Assurance

The AAN member should participate in peer review and other quality control activities to promote the best care possible for patients.

6.3 Criticism of a Colleague

The AAN member should not unjustifiably criticize a colleague's judgment, training, knowledge, or skills. The AAN member should not knowingly ignore a colleague's incompetence or professional misconduct when doing so could

jeopardize the safety of the colleague's patients or erode public trust in the medical profession.

6.4 Legal Expert Testimony

The AAN member should only provide medical expert testimony if the AAN member meets the qualifications to testify as a medical expert and the testimony provided is consistent with the guidelines for the conduct of the medical expert, as described in the AAN's Qualifications and Guidelines for the Physician Expert Witness.¹¹ Requirements include: before testifying, carefully reviewing relevant records and facts of the case and the prevailing standards of practice; testifying only about those subjects for which the AAN member is qualified as an expert by training and experience; and providing scientifically correct and clinically accurate opinions. Compensation for testimony should be reasonable and commensurate with time and effort spent and must not be contingent upon outcome.

6.5 Health Care Organizations

The AAN member may enter into contractual agreements with managed health care organizations, prepaid practice plans, or hospitals. The AAN member should strive to retain control of medical decisions without undue interference. The patient's welfare must remain paramount. In particular, the AAN member should not allow the influence of reimbursement systems to adversely affect patient care.

6.6 The Impaired Physician

The AAN member should strive to protect the public from impaired clinicians and help identify and rehabilitate them.

7.0 Relationships With the Public

7.1 Public Representation

AAN members must not represent themselves to the public in an unprofessional, untruthful, misleading, or deceptive manner.

7.2 Duties to Community and Society

The AAN member should work toward improving the health of all members of society. This may include participating in educational programs, research, or public health activities as well as providing care to patients who are unable to pay for medical services. The AAN member should be aware of society's limited health care resources and not squander those resources by ordering unnecessary tests or treatments.

The AAN member has an important role in advancing health and human rights for all persons and should take steps to address racism and inequity in health care. These steps may include engaging in antiracism and bias training, advocating for changes in academic, governmental, and institutional policies that contribute to systematic racism, and participating in research studies addressing health care disparities in neurologic care.^{12,13}

7.3 Disclosure of Potential Conflicts

AAN members who provide services to the AAN in various capacities, including officers, directors, committee members, faculty members, clinical practice guideline or quality measure developers, authors, consultants, or other positions of official responsibility for the Academy, its publications, or education programs, must comply with the AAN's Relationships & Conflicts of Interest Policy¹⁴ and the Principles Governing Academy Relationships with External Sources of Support.¹⁵ All AAN members, even if not serving in any official AAN capacity, should disclose potential conflicts of interest when making written or oral statements concerning products or topics relevant to a company or organization from which they receive compensation or support, or in which they hold a significant equity position.

7.4 Prohibition Against Participating in Legally Authorized Executions

An AAN member must not participate in a legally authorized execution.

8.0 Research and Publication

8.1 Institutional Review

An AAN member who participates in clinical research must ascertain that the research has been approved by an institutional review board when required, or other comparable body, and must observe the requirements of the approved protocol. The AAN member who participates in clinical research in vulnerable and economically disadvantaged regions must comply with applicable informed consent and other study procedure requirements. As a research investigator, the AAN member must exercise due diligence to ascertain that the proposed research is consistent with ethical research principles and conducted according to these principles.

8.2 Disclosure of Potential Conflicts in Research

The AAN member who is paid for treating patients in a clinical research project must inform the patient of any compensation the AAN member receives for the patient's participation. The compensation for patient treatment should be reasonable in amount. The AAN member should not bill the patient or the insurer for services already compensated by the study sponsor.

8.3 Reporting Research Results

AAN members must publish and communicate research results truthfully, completely, and without distortion.

8.4 Misrepresentation of Authorship

If an undisclosed author (ghostwriter) helps an AAN member write a scholarly work in whole or part, the AAN member must disclose this fact when submitting the work for publication. If the undisclosed author wrote the entire work, the AAN member must not claim authorship of the work. Scholarly work includes work that claims research findings or offers recommendations concerning diagnosis, treatment, or prevention of medical conditions.

Acknowledgment

The AAN consulted the following codes of professional ethics and professional conduct when developing this code of conduct: American College of Physicians' Ethics Manual; American Medical Association's Code of Medical Ethics and Current Opinions of the AMA Council on Ethical and Judicial Affairs; American Academy of Orthopaedic Surgeons' Principles of Medical Ethics for the Orthopaedic Surgeon and the Code of Ethics for Orthopaedic Surgeons; American Association of Neurological Surgeons' Code of Ethics; Code of Ethics of the American Academy of Ophthalmology; and American Psychiatric Association's Principles of Medical Ethics with Annotations Especially Applicable to Psychiatry.

The following individuals participated in the development of this revised code of professional conduct as members of the AAN Ethics, Law, and Humanities Committee: Mathew Kirschen, MD, PhD (Philadelphia, PA), Ethics, Law, and Humanities Committee Vice Chair; Katharina M. Busl, MD, MS, FAAN (Gainesville, FL), committee member; Winston Chiong, MD (San Francisco, CA), committee member; Robin Conwit, MD, FAAN (Bethesda, MD), committee member; Salvador Cruz-Flores, MD, FAAN (El Paso, TX), committee member; Julie A. Kurek, MD (Augusta, GA), committee member; Ariane K. Lewis, MD (New York, NY), committee member; Michael Rubin, MD, FAAN (Dallas, TX), committee member; Barney J. Stern, MD, FAAN (Baltimore, MD), committee member; Benjamin D. Tolchin, MD, FAAN (New Haven, CT), committee member; Amy Tsou, MD (Philadelphia, PA), committee member; Charles C. Flippen II, MD, FAAN (Los Angeles, CA), committee member; Dan Larriviere, MD, JD, FAAN (Falls Church, VA), committee member; Ericka Greene, MD, FAAN (Houston, TX), committee member; Lynne Taylor, MD, FAAN (Seattle, WA), committee member; William D. Graf, MD, FAAN (Farmington, CT), committee member; Sok Lee, MD (Philadelphia, PA), committee member; Richard J. Bonnie, LLB (Charlottesville, VA), committee member; and Sarah Bird Nelson, JD (Minneapolis, MN), staff liaison to the Ethics, Law, and Humanities Committee. All of those listed had active involvement in multiple committee meetings in which document content was deliberated and were actively involved in editing multiple iterations of the document. Approval history: Approved by Practice Committee and AAN Board of Directors February 1993. Section 7.4 was added in 2008, when the AANPA Board of Directors also endorsed E-2.06 (Capital Punishment) in the AMA Code of Ethics; amendments approved by the Ethics, Law and Humanities Committee on January 12, 2008; the AANPA Executive Committee on February 21, 2008; and the AANPA Board of Directors on March 7, 2008 (AANPA Policy 2008-06). Section 8.5 was approved by the Ethics, Law and Humanities Committee in October 2009 and by the AANPA Executive Committee on December 17, 2009 (AANPA Policy 2009-14). Updates and revisions were made to the code by the Ethics, Law and Humanities Committee and approved by the AAN Board of Directors on March 18, 2021.

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Appendix Authors

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James A. Russell, DO, MS	Retired	Drafting/revision of the manuscript for content, including medical writing for content
John C. Hutchins, JD	American Academy of Neurology	Drafting/revision of the manuscript for content, including medical writing for content
Leon G. Epstein, MD	Northwestern University Feinberg School of Medicine, Chicago, IL	Drafting/revision of the manuscript for content, including medical writing for content

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Disputes & Debates: Editors' Choice

Steven Galetta, MD, FAAN, Editor
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James E. Siegler III, MD, Deputy Editor

Editors' Note: Long-term Dietary Flavonoid Intake and Subjective Cognitive Decline in US Men and Women

Using registry data from the prospective Nurse's Health Study and the Health Professional's Follow-up Study, Dr. Yeh et al. evaluated cognitive outcomes after dietary flavonoid consumption. As naturally occurring antioxidants with the potential for reducing oxidative stress in the nervous system, flavonoids may be nutrients that can reduce the cognitive decline that has been tied to oxidative stress. Given the large sample size of more than 75,000 patients with follow-up exceeding 20 years, Yeh et al. used Poisson regression to evaluate the relationship between total flavonoid use (and flavonoid subtypes) with subjective, patient-reported, cognitive decline (SCD). The multivariable model accounted for other dietary components and relevant medical and social history. Compared with the lowest quintile of total flavonoid intake, subjects reporting the highest quintile of flavonoid intake were at 19% lower odds of SCD after adjustment for covariates—with flavones (found in oranges, peppers, celery) being the most strongly tied to better cognitive outcomes. In response to the research article, Dr. Abe cautions readers regarding excess intake of flavonoids, citing literature that may have implicated higher flavonoid intake with cerebrovascular disease, cancer, and even depression. On more careful review of these studies, however, it seems higher flavonoid intake is actually protective against these conditions.

James E. Siegler, MD, and Steven Galetta, MD
Neurology® 2021;97:1094. doi:10.1212/WNL.00000000000012958

Reader Response: Long-term Dietary Flavonoid Intake and Subjective Cognitive Decline in US Men and Women

Kazuo Abe (Hyogo, Japan)
Neurology® 2021;97:1094–1095. doi:10.1212/WNL.00000000000012959

I was interested in the article by Yeh et al.¹ A lot of studies have been published concerning the associations between diet and subjective cognitive decline (SCD). This study is based on a follow-up assessment spanning more than 20 years, which is strongly persuasive. The authors conclude that many flavonoid-rich foods are significantly associated with lower odds of SCD. Their conclusion seems reasonable—however, previous studies suggest that higher flavonoid intake increases risk for cerebrovascular diseases or cancers.^{2,3} Other research reports that higher dietary flavonoid intake can be associated with decreased overall body composition in younger women.⁴ In older populations, dietary flavonoid intake may also increase the risk of depression.⁵

Considering these merits and demerits of dietary flavonoid intake, appropriate intake should be suggested.

1. Yeh TS, Yuan C, Ascherio A, Rosner B, Willett W, Blacker D. Long-term dietary flavonoid intake and subjective cognitive decline in US men and women. *Neurology*. 2021;97(10):e1041-e1056.
2. Wang X, Ouyang YY, Liu J, Zhao G. Flavonoid intake and risk of CVD: a systematic review and meta-analysis of prospective cohort studies. *Br J Nutr*. 2014;111(1):1-11.

Author disclosures are available upon request (journal@neurology.org).

3. Chang H, Lei L, Zhou Y, Ye F, Zhao G. Dietary flavonoids and the risk of colorectal cancer: an updated meta-analysis of epidemiological studies. *Nutrients*. 2018;10(7):950.
4. Gao Q, Dong JY, Cui R, et al. Consumption of flavonoid-rich fruits, flavonoids from fruits and stroke risk: a prospective cohort study. *Br J Nutr*. 2021;124(9):952-959.
5. Chang SC, Cassidy A, Willett WC, Rimm EB, O'Reilly EJ, Okereke OI. Dietary flavonoid intake and risk of incident depression in midlife and older women. *Am J Clin Nutr*. 2016;104(3):704-714.

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Author Response: Long-term Dietary Flavonoid Intake and Subjective Cognitive Decline in US Men and Women

Tian-Shin Yeh (Boston), Changzheng Yuan (Hangzhou, China), Alberto Ascherio (Boston), Bernard A. Rosner (Boston), Walter C. Willett (Boston), and Deborah Blacker (Boston)
Neurology® 2021;97:1095. doi:10.1212/WNL.0000000000012963

We thank Dr. Abe for the response to our article.¹ However, we noticed that the studies mentioned in the comment actually showed that higher intake of flavonoids was associated with lower risk of cardiovascular disease,² cancers,³ stroke,⁴ and depression.⁵

In addition, we are not recommending a specific intake of flavonoids, but rather suggesting daily intake of flavonoid-rich foods.

1. Yeh TS, Yuan C, Ascherio A, Rosner B, Willett W, Blacker D. Long-term dietary flavonoid intake and subjective cognitive decline in US men and women. *Neurology*. 2021;97(10):e1041-e1056.
2. Wang X, Ouyang YY, Liu J, Zhao G. Flavonoid intake and risk of CVD: a systematic review and meta-analysis of prospective cohort studies. *Br J Nutr*. 2014;111(1):1-11.
3. Chang H, Lei L, Zhou Y, Ye F, Zhao G. Dietary flavonoids and the risk of colorectal cancer: an updated meta-analysis of epidemiological studies. *Nutrients*. 2018;10(7):950.
4. Gao Q, Dong JY, Cui R, et al. Consumption of flavonoid-rich fruits, flavonoids from fruits and stroke risk: a prospective cohort study. *Br J Nutr*. 2021:1-8.
5. Chang SC, Cassidy A, Willett WC, Rimm EB, O'Reilly EJ, Okereke OI. Dietary flavonoid intake and risk of incident depression in midlife and older women. *Am J Clin Nutr*. 2016;104(3):704-714.

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Disputes & Debates: Rapid Online Correspondence

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 - You can include a maximum of 5 authors (including yourself)
-

Author disclosures are available upon request (journal@neurology.org).

[¹¹C]PK11195-PET Brain Imaging of the Mitochondrial Translocator Protein in Mitochondrial Disease

Neurology® 2021;97:1096. doi:10.1212/WNL.00000000000012559

In the article “[¹¹C]PK11195-PET Brain Imaging of the Mitochondrial Translocator Protein in Mitochondrial Disease” by van den Ameele et al.,¹ panels E, H, K, and N of Figure 4 should be labeled “Patient < controls.” A corrected version of Figure 4 is available at links.lww.com/WNL/B478. The editorial staff regret the error.

Reference

- 1 van den Ameele J, Hong YT, Manavaki R, et al. [¹¹C]PK11195-PET brain imaging of the mitochondrial translocator protein in mitochondrial disease. *Neurology*. 2021;96(22):e2761-e2773.

American Academy of Neurology Code of Professional Conduct

Neurology® 2021;97:1096. doi:10.1212/WNL.00000000000012889

In the Special Article “American Academy of Neurology Code of Professional Conduct” by Russell et al.,¹ the following paragraph should have been included after the first paragraph in the Acknowledgment section:

The authors thank the authors of the original code of professional conduct: James L. Bernat, MD, and H. Richard Beresford, MD, JD, in collaboration with the other then-current members of the AAN Ethics and Humanities Subcommittee. Drs. Bernat and Beresford’s original document, much of which is preserved in this revised code, continues to be a highly valued, dynamic, and seminal work for neurology.

The authors regret the omission.

Reference

1. Russell JA, Hutchins JC, Epstein LG. American Academy of Neurology code of professional conduct. *Neurology*. 2021;97(10): 489-495.

Long-term Dietary Flavonoid Intake and Subjective Cognitive Decline in US Men and Women

Neurology® 2021;97:1096. doi:10.1212/WNL.00000000000012933

In the Research Article “Long-term Dietary Flavonoid Intake and Subjective Cognitive Decline in US Men and Women” by Yeh et al.,¹ there were errors in the labels of Figure 4. The y-axis for both the Nurses’ Health Study (NHS) and Health Professionals Follow-Up Study graphs should have been labeled “OR (95% CI),” and the middle sections should have been labeled “Average intake.” For the NHS graph, the x-axis should read “1984–2006” under Average intake and “1984–1990” under Mutually adjusted intake. See the corrected figure below. The publisher regrets the errors.

Reference

1. Yeh TS, Yuan C, Ascherio A, Rosner BA, Willett WC, Blacker D. Long-term dietary flavonoid intake and subjective cognitive decline in US men and women. *Neurology*. 2021;97(10):e1041-e1056.

Continued

Figure 4 Temporal Relationships Between Flavone Intake and ORa of 3-Unit Increments in SCD

Multivariate model: Nurses' Health Study (NHS): adjusted for age, total energy intake, Census tract income, education (registered nursing degrees, bachelor degree, master or doctorate degree), husband's education (high school or lower education, college, graduate school), race (White, Black, other), smoking history (never, ≤ 4 pack-years, 5–24 pack-years, > 24 pack-years), depression, physical activity level (metabolic equivalent-hours per week, quintiles), body mass index, family history of dementia, vitamin C, vitamin D, and vitamin E supplementation use (yes/no), intakes of alcohol, postmenopausal status and hormone replacement therapy use, missing indicator for subjective cognitive decline (SCD) measurement at 2012 or 2014, number of dietary assessments during 1984 to 2006, multivitamin use (yes/no), parity (nulliparous, 1–2, > 2), and intakes of total carotenoids, vitamin C, vitamin D, vitamin E, and long-chain omega-3 fatty acid. Health Professionals Follow-Up Study (HPFS): adjusted for age, total energy intake, smoking history (never, ≤ 24 pack-years, 25–44 pack-years, ≥ 45 pack-years), cancer (yes/no), depression, physical activity level (metabolic equivalent-hours per week, quintiles), body mass index, multivitamin use (yes/no), intake of alcohol, family history of dementia, profession (dentist, pharmacist, optometrist, osteopath, podiatrist, veterinarian), percentage of energy intake from dietary total protein (quintiles), missing indicator for SCD measurement at 2008 or 2012, number of dietary assessments during 1986–2002, and intakes of total carotenoids, vitamin C, vitamin D, vitamin E, and long-chain omega-3 fatty acid. OR = odds ratio. ^aComparing 90th to 10th percentile of flavone intake.