Cardiometabolic ECHO Case Presentation Template

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E-mail completed Case form to Dr. Nicole Ehrhardt (nehrhard@uw.edu)
BEFORE SENDING CASES, PLEASE ENSURE ALL PHI IDENTIFIERS (Names, MRNs, Dates of Birth, Addresses, Phone Numbers, etc.) ARE REDACTED FROM ALL DOCUMENTS TO COMPLY WITH HIPAA PRIVACY LAWS.

Case Presentation Date: __11/16/2022_____ New Case_x__ Follow-up___

Presented By: __Binisha Shrestha_____

Patient has insurance? ___ No _**x**_ **Yes** Insurance Type: _**Molina AH**_____

Patient age: **49**

Please describe the main concern:

Patient has uncontrolled diabetes with hyperglycemia that has been challenging to control due to contraindications to metformin, GLP-1, SGLT2. Pt also has socioeconomic barrier that interferes with easy access to low carb nutritious foods. Question here is:

1. How do I convince patient that there is no correlation between her brain fog with use of metformin.
2. Can I take a risk and add GLP-1 despite possible hx of thyroid cancer?
3. What are some of the tasty low carb, affordable and easy to prepare options for patient so she stays motivated to change her nutritional choices?
4. Should I plan on checking c-peptide and GAD after average glucose gets lower than 200?
5. What are some options for physical activity for patient who have chronic pain with no access to gym.

PATIENT MEDICAL HX

Current Relevant Diagnosis/Problem List:

1. Uncontrolled diabetes with hyperglycemia
2. History of thyroid nodule. Cancer? unsure
3. Hyperlipidemia. Hypertension
4. Osteoporosis without pathological fracture
5. Sleep apnea – does not use CPAP machine
6. PTSD, Major depression, GAD, Homelessness, chronic myofascial pain
7. Migraine

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Current Medication(s) (including dose frequency):

Medication	Dose	Frequency
Lantus solostar	45 units	bedtime
Humalog Kwikpen	10 units	TID start on 10/22/2022
Januvia	100 mg	Daily
Pioglitazone	30 mg	Daily
Atorvastatin	40 mg	bedtime
Duloxetine	60 mg	Daily
Gabapentin	300 mg	TID
Gakcanezumabo-gnlm (Emgality)	120 mg/ml	
Dicyclomine	10 mg	
Losartan	25 mg	daily

Allergies/Prior Intolerances:

PCN, Codeine, Cyclobenaprine, Empaglifozin, metformin, Lisinopril

Family Medical HX:

Father- HTN, Heart disease
Mother- none
Maternal Grandmother- diabetes
Maternal Grandfather- hypertension
Paternal Grandmother- Hypertension, hyperlipidemia
Paternal Grandfather- Hypertension, hyperlipidemia

Family HX of Heart Disease? No ___ Yes __x_

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Patient is divorced, lives by herself.
Has a son that lives around and has good relationship with her.
Patient's only other relative is her mother that also lives close by.

PATIENT SOCIAL HX

Occupation: __Studying to be a mental health counselor_ **Education Level:** __Some college_____

Marital Status: Single ___ Married ___ **Divorced __x_** Widowed ___

Tobacco Use: Yes ___ **No __x_**

Prior EtOH: __None_____

PATIENT EXAM DATA

Vital Signs:

Height	Weight	BMI	BP	Heart Rate
5'5"	200 lb	33.33	102/70	82

Current Labs (Include date, if known):

	LAB VALUE:	DATE:
Glucose	387	10/7/2022
HbA1c	>14	10/7/2022
Creatinine	0.53	10/7/2022
Chol (+ date)	266	10/7/2022
LDL	154	10/7/2022
HDL	45	10/7/2022
Triglycerides	333	10/7/2022

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Urine Micro:

Alb: ___30_____ **LFT:** ____AST/ALT 21/21_____

Other Labs/Lab Notes:

Vitamin B 12 >2000 was taking too many supplements
Folate >24
TSH 0.79
Vitamin D 19

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AGP Report

October 8, 2022 - October 21, 2022 (14 Days)

LibreView

GLUCOSE STATISTICS AND TARGETS

October 8, 2022 - October 21, 2022	14 Days
% Time CGM is Active	62%

Ranges And Targets For	Type 1 or Type 2 Diabetes
Glucose Ranges	**Targets** % of Readings (Time/Day)
Target Range 70-180 mg/dL	Greater than 70% (16h 48min)
Below 70 mg/dL	Less than 4% (58min)
Below 54 mg/dL	Less than 1% (14min)
Above 180 mg/dL	Less than 25% (6h)
Above 250 mg/dL	Less than 5% (1h 12min)

Each 5% increase in time in range (70-180 mg/dL) is clinically beneficial.

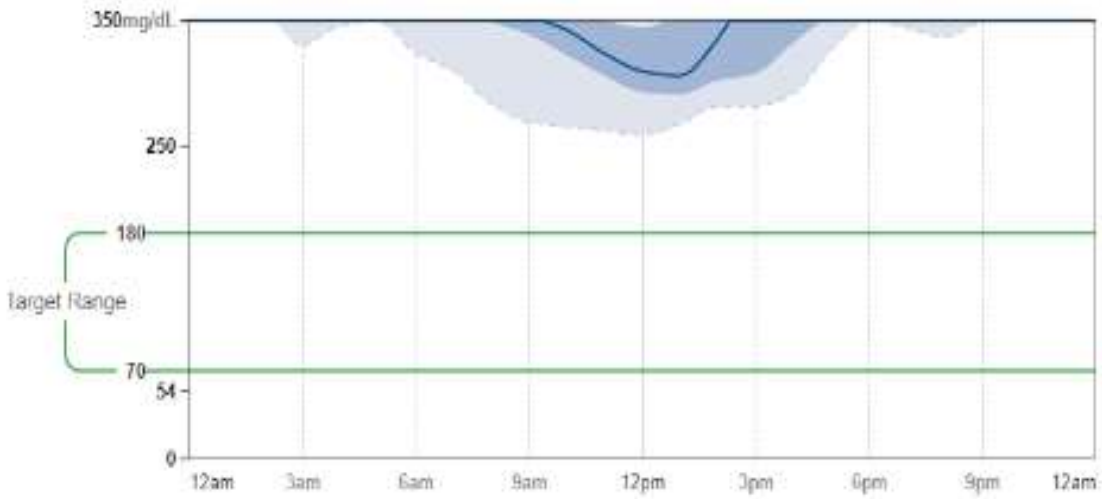
Average Glucose	367 mg/dL
Glucose Management Indicator (GMI)	12.1%
Glucose Variability	11.1%

Defined as percent coefficient of variation (%CV)

TIME IN RANGES

AMBULATORY GLUCOSE PROFILE (AGP)

AGP is a summary of glucose values from the report period, with median (50%) and other percentiles shown as if occurring in a single day.



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1 mo ago (10/7/22)	5 mo ago (5/21/22)	8 mo ago (3/2/22)	1 yr ago (10/2/21)	1 yr ago (6/21/21)	1 yr ago (3/10/21)	2 yr ago (10/19/20)
>14.0 !	8.3 !	7.4 !	8.3 !	8.7 !	8.1 !	8.4 !

PERTINENT EXAM FINDINGS

Diabetes Standards of Care:

Date of last foot exam: 10/7/2022
Date of last retinal exam: 3/2021 – No retinopathy
Depression screening: PHQ 9 21/ GAD 18
Date of last dental visit: 6/2022

Has patient had Diabetes Self-Management Education? Yes __x_ No ___ Unknown ___

Has patient been referred for Medical Nutrition Therapy? Yes __x_ No ___ Unknown ___

Social Services Pathways: *Mark an "X" where applicable*

x	**Domestic Violence**	x	**Housing**
x	**Disability**		**Literacy Assistance**
	Immigrant Status		**Medicine/Pharmacy Access**
x	**Employment**		**Transportation**
x	**Food Security**		**Other:** *(please identify)*

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Identified Barriers to Patient Compliance/Treatment Success:

- In April 2022 pt was evicted from her apartment due to delinquent payment. Since then patient has been in and out of her mother's home and living in her car.
- Prior to her eviction, pt was cautious of her carb intake and was able to maintain her A1c down to 7.4 at one point.
- Her mom has physically assaulted patient couple of times during her stay there.
- Patient's mom fell and has a hip fracture now so patient is back living wither mom to help her out.
- About a month prior to patient being homeless she had stopped taking metformin. Pt was going through persistent episodes of vertigo and headaches and also had short term memory loss/brain fogginess which she attributed to metformin. Brain fog has improved per patient after stopping metformin.
- Pt is being followed about a neurologist for above concern.
- Vitamin B 12 was check and found to be >2000.
- Patient was then started on Jardiance which she tool for about 2 months but stopped due to persistent care of vaginitis. Vaginal candida checked and isolated at least 3 times in the clinic. Even after repeated treatment pt continued to have vaginal itching and irritation (even when vaginal candida was not isolated).
- Then patient refused to take Jardiance.
- Patient was then started on Januvia. Followed shortly after by Lantus when her A1c started climbing up to 8.3 and her post prandial BG were in mid 200s.
- Around this time patient lost her housing and started to eat mostly processed foods. See nutrition for details.
- We discussed trialing GLP-1 but patient reports in 1980's when her thyroid nodule were removed they were cancerous. This was done in North Carolina. Patient doesn't remember the name of the clinic or the exact date of procedure. At this time, patient does not have any concerns of difficulty swallowing, or symptoms of thyroid disorder.
- We have two weeks' worth of CGM data from a sample Free style libre we gave to patient.
- Order for free style libre was declined by insurance and is going through PA process right now.
- As of now patient, refuses to go back on metformin and Jardiance, is struggling to change her nutrition, and does not exercise much due to chronic pain.
- Patient sees SeaMar nutritionist at least once every month. She has a great baseline knowledge of diabetes and low carb diet but has gotten complacent due to all the socioeconomic barrier she is facing.
- Current eating habits:
  "Some days I barely eat, other days I'm eating all the time" "I don't want to use frozen vegetables, they're covered in processed stuff and preservatives". Also reports emotional eating when around her mom.
- Patient is working with a housing liason and a BH therapist at this time.
- Does not qualify for food stamps- gets some benefits for L&I claim.

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Mealtime	Location of meal	Portion size	Snacks between meals
Breakfast	Bowl of shredded wheat cereal or frosted flakes with 2% milk		Diet soda, sometimes regular soda
Lunch	2 hot pockets, a lot of PB &J, mac n cheese,		Bag of light crispy chips
Dinner	Panda express: chow mein, honey glazed shrimp, beef and broccoli, chicken teriyaki, water		
Bedtime			

PLEASE NOTE that Project ECHO® educational case discussions are designed to facilitate educational discussion on best practices among health care professionals regarding a given medical condition and do not constitute a formal medical consult or provision of medical services to a specific patient. The requesting healthcare professional is responsible for the medical management and care of any individual patient that they treat. Discussions with Project ECHO experts do not create or otherwise establish a clinician-patient relationship between any UW Medicine health care professional and any patient whose case is being presented in a Project ECHO setting.

ISSUE BRIEF

Key Ingredients for Successful Trauma-Informed Care Implementation

April 2016 | By Christopher Menschner and Alexandra Maul, Center for Health Care Strategies

IN BRIEF

Because of the potentially long-lasting negative impact of trauma on physical and mental health, ways to address patients' history of trauma are drawing the attention of health care policymakers and providers across the country. Patients who have experienced trauma can benefit from emerging best practices in trauma-informed care. These practices involve both organizational and clinical changes that have the potential to improve patient engagement, health outcomes, and provider and staff wellness, and decrease unnecessary utilization. This brief draws on interviews with national experts on trauma-informed care to create a framework for organizational and clinical changes that can be practically implemented across the health care sector to address trauma. It also highlights payment, policy, and educational opportunities to acknowledge trauma's impact. The brief is a product of *Advancing Trauma-Informed Care*, a multi-site demonstration project supported by the Robert Wood Johnson Foundation and led by the Center for Health Care Strategies.

Exposure to abuse, neglect, discrimination, violence, and other adverse experiences increase a person's lifelong potential for serious health problems and engaging in health-risk behaviors, as documented by the landmark Adverse Childhood Experiences (ACE) study.[1,2,3] Because of the ACE study, and other subsequent research, health care policymakers and providers increasingly recognize that exposure to traumatic events, especially as children, heighten patients' health risks long afterward.

As health care providers grow aware of trauma's impact, they are realizing the value of trauma-informed approaches to care. Trauma-informed care acknowledges the need to understand a patient's life experiences in order to deliver effective care and has the potential to improve patient engagement, treatment adherence, health outcomes, and provider and staff wellness. A set of organizational competencies and core clinical guidelines is emerging to inform effective treatment for patients* with trauma histories (Exhibit 1), but more needs to be done to develop an integrated, comprehensive approach that ranges from screening patients for trauma to measuring quality outcomes. Questions remain for the field regarding how to conceptualize trauma and how to develop payment strategies to support this approach.

This issue brief draws insights from experts across the country to outline the key ingredients necessary for establishing a trauma-informed approach to care at the organizational and clinical levels (*see Exhibit 1*). It explores opportunities for improving care, reducing health care costs for individuals with histories of trauma, and incorporating trauma-informed principles throughout the health care setting.

* *For simplicity, the term "patient" is used throughout this brief to refer to individuals receiving services in clinical settings. The authors recognize that the terms "client" and "consumer" are often used in behavioral health and social services settings.*

Exhibit 1. Key Ingredients for Creating a Trauma-Informed Approach to Care

Organizational	Clinical
▪ Leading and communicating about the transformation process ▪ Engaging patients in organizational planning ▪ Training clinical as well as non-clinical staff members ▪ Creating a safe environment ▪ Preventing secondary traumatic stress in staff ▪ Hiring a trauma-informed workforce	▪ Involving patients in the treatment process ▪ Screening for trauma ▪ Training staff in trauma-specific treatment approaches ▪ Engaging referral sources and partnering organizations

Background

Experiencing trauma, especially during childhood, significantly increases the risk of serious health problems — including chronic lung, heart, and liver disease as well as depression, sexually transmitted diseases, tobacco, alcohol, and illicit drug abuse[1, 2, 3]— throughout life. Childhood trauma is also linked to increases in social service costs.[5] Implementing trauma-informed approaches to care may help health care providers engage their patients more effectively, thereby offering the potential to improve outcomes and reduce avoidable costs for both health care and social services. Trauma-informed approaches to care shift the focus from "What's wrong with you?" to "What happened to you?" by:

- Realizing the widespread impact of trauma and understanding potential paths for recovery;
- Recognizing the signs and symptoms of trauma in individual clients, families, and staff;
- Integrating knowledge about trauma into policies, procedures, and practices; and
- Seeking to actively resist re-traumatization (i.e., avoid creating an environment that inadvertently reminds patients of their traumatic experiences and causes them to experience emotional and biological stress).[6, 7]

No Universal Definition of Trauma

Experts tend to create their own definition of trauma based on their clinical experiences. However, the most commonly referenced definition is from the Substance Abuse and Mental Health Services Administration (SAMHSA):[4]

> *"Individual trauma results from an event, series of events, or set of circumstances that is experienced by an individual as physically or emotionally harmful or life threatening and that has lasting adverse effects on the individual's functioning and mental, physical, social, emotional, or spiritual well-being."*

Examples of trauma include, but are not limited to:

- Experiencing or observing physical, sexual, and emotional abuse;
- Childhood neglect;
- Having a family member with a mental health or substance use disorder;
- Experiencing or witnessing violence in the community or while serving in the military; and
- Poverty and systemic discrimination.

To develop this report, CHCS conducted interviews with nationally recognized experts in the field, including primary care physicians, behavioral health clinicians, academic researchers, program administrators, and trauma-informed care trainers, as well as with state and federal policymakers. Information from the interviews is organized within a framework outlining key steps and skill sets essential to trauma-informed care. The paper also summarizes opportunities for further exploration to advance the field of trauma-informed care.

Implementing a Comprehensive Trauma-Informed Approach

Trauma-informed care must involve both organizational *and* clinical practices that recognize the complex impact trauma has on both patients and providers. Well-intentioned health care providers often train their clinical staff in trauma-specific treatment approaches, but neglect to implement broad changes across their organizations to address trauma. Widespread changes to organizational policy and culture need to be implemented for a health care setting to become truly trauma-informed. Organizational practices that recognize the impact of trauma reorient the culture of a health care setting to address the potential for trauma in patients and staff, while trauma-informed clinical practices address the impact of trauma on individual patients. Changing both organizational *and* clinical practices to reflect the following core principles of a trauma-informed approach to care is necessary to transform a health care setting:

> *"Trying to implement trauma-specific clinical practices without first implementing trauma-informed organizational culture change is like throwing seeds on dry land."*
>
> Sandra Bloom, MD,
> Creator of the Sanctuary Model

- ***Patient empowerment***: Using individuals' strengths to empower them in the development of their treatment;
- ***Choice***: Informing patients regarding treatment options so they can choose the options they prefer;
- ***Collaboration***: Maximizing collaboration among health care staff, patients, and their families in organizational and treatment planning;
- ***Safety***: Developing health care settings and activities that ensure patients' physical and emotional safety; and
- ***Trustworthiness***: Creating clear expectations with patients about what proposed treatments entail, who will provide services, and how care will be provided.[8]

These attributes form the core principles of a trauma-informed organization and may require modifying mission statements, changing human resource policies, amending bylaws, allocating resources, and updating clinical manuals. The following sections describe key strategies for adopting these principles at the organization-wide and clinical levels.

Organizational Practices

Changing organizational practices to fit trauma-informed principles will transform the culture of a health care setting. Experts recommend that organizational reform precede the adoption of trauma-informed clinical practices. Key ingredients of an organizational trauma-informed approach include:

Key Ingredients of Trauma-Informed Organizational Practices

1. Leading and communicating about the transformation process
2. Engaging patients in organizational planning
3. Training clinical as well as non-clinical staff members
4. Creating a safe environment
5. Preventing secondary traumatic stress in staff

Leading and Communicating about the Transformation Process

Becoming a trauma-informed organization requires the steady support of senior leaders. Crafting a plan that empowers the workforce to be part of the transformation process can help generate buy-in throughout the organization. Leadership will need to establish strategies for rolling out the changes, particularly with regard to clearly communicating the rationale and benefits to both staff and patients. It is important for both groups to understand why there will be changes in how the organization functions. Because trauma-informed approaches to care are evolving,

communication strategies are just beginning to emerge, and each organization will need to take its size and structure into account when developing ways to discuss trauma-informed care.

A successful transformation will likely require significant investments — to continuously train staff, hire consultants, and make physical modifications to the facility — and senior leaders are typically responsible for identifying the resources needed to do so, often through outside funding. At the same time, leadership must also consider how designating time for staff training, rather than billable clinical activities, could influence the financial health of the organization.

Engaging Patients in Organizational Planning

When a health care organization commits to becoming trauma-informed, a stakeholder committee, including individuals who have experienced trauma, should be organized to oversee the process. These individuals can provide valuable first-hand perspectives to inform organizational changes by serving alongside staff, patient advisory boards, and boards of trustees. Health care organizations should consider compensating patients and community members for their time as they would with other highly valued consultants.

Training Clinical as well as Non-Clinical Staff

Providing trauma training is critical for not only clinical, but also for non-clinical employees. Providers should be well-versed in how to create a trusting, non-threatening environment while interacting with patients and staff. Likewise, non-clinical staff, who often interact with patients before and more frequently than clinical staff, play an important role in trauma-informed settings. Personnel such as front-desk workers, security guards, and drivers have often overlooked roles in patient engagement and in setting the tone of the environment. For example, greeting people in a welcoming manner when they first walk into the building may help foster feelings of safety and acceptance, initiate positive relationships, and increase the likelihood that they will engage in treatment and return for future appointments.

The San Francisco Department of Public Health's Training Model for a Trauma-Informed Workforce

The San Francisco Department of Public Health (SFDPH) is using an innovative approach to respond to the impact of trauma. Its *Trauma-Informed Systems Initiative* aims to develop and sustain organizational and workforce change by training its entire workforce. Using the principles of implementation science,[9] SFDPH is seeking to create an organizational structure that supports its commitment to becoming trauma-informed. It will designate specific staff to lead trauma-informed training, spark collaboration across systems, and engage in continual evaluation.

Creating a Safe Environment

Feeling physically, socially, or emotionally unsafe may cause extreme anxiety in a person who has experienced trauma, potentially causing re-traumatization. Therefore, creating a safe environment is fundamental to successfully engaging patients in their care. Examples of creating a safe environment include:

Physical Environment

- Keeping parking lots, common areas, bathrooms, entrances, and exits well lit;
- Ensuring that people are not allowed to smoke, loiter, or congregate outside entrances and exits;
- Monitoring who is coming in and out of the building;
- Positioning security personnel inside and outside of the building;
- Keeping noise levels in waiting rooms low;
- Using welcoming language on all signage; and
- Making sure patients have clear access to the door in exam rooms and can easily exit if desired.

Social-Emotional Environment

- Welcoming patients and ensuring that they feel respected and supported;
- Ensuring staff maintain healthy interpersonal boundaries and can manage conflict appropriately;
- Keeping consistent schedules and procedures;
- Offering sufficient notice and preparation when changes are necessary;
- Maintaining communication that is consistent, open, respectful, and compassionate; and
- Being aware of how an individual's culture affects how they perceive trauma, safety, and privacy.

> *"A non-trauma-informed system punishes and blames your adult actions and asks, 'what's wrong with you?' A trauma-informed provider will hold you accountable for your adult actions, but give you space and time to process 'what happened to you?' without adding guilt and more trauma."*
>
> Patient at Stephen and Sandra Sheller 11th Street Family Health Services of Drexel University, Philadelphia, PA

Preventing Secondary Traumatic Stress in Staff

Working with patients who have experienced trauma puts both clinical and non-clinical staff at risk of secondary traumatic stress. Defined as the "emotional duress that results when an individual hears about the firsthand trauma experiences of another,"[10] secondary traumatic stress can lead to chronic fatigue, disturbing thoughts, poor concentration, emotional detachment and exhaustion, avoidance, absenteeism, and physical illness. Clinicians and other front-line staff experiencing these symptoms may struggle to provide high-quality care to patients and may experience burnout, leading to staff turnover — which can create a negative feedback loop that intensifies similar feelings in remaining employees.

Many in the "helping professions" may have their own personal trauma histories, which may be exacerbated by working with others who have experienced trauma. Non-clinical staff may also have trauma histories, which can especially be true when the care facility is located in a community that experiences high rates of adversity and trauma (e.g., poverty, violence, discrimination) because non-clinical staff often live in the neighborhood.

Preventing secondary traumatic stress can increase staff morale, allow staff to function optimally, and reduce the expense of frequently hiring and training new employees. Strategies to prevent secondary traumatic stress in staff include:

- Providing trainings that raise awareness of secondary traumatic stress;
- Offering opportunities for staff to explore their own trauma histories;
- Supporting reflective supervision, in which a service provider and supervisor meet regularly to address feelings regarding patient interactions;
- Encouraging and incentivizing physical activity, yoga, and meditation; and
- Allowing "mental health days" for staff.

Hiring a Trauma-Informed Workforce

Hiring staff suited for trauma-informed work — based on factors including previous experience with relevant patient populations, training, and personality — is essential for employing a trauma-informed approach. Although medical, nursing, social work, and public health school curricula generally do not incorporate training in trauma-informed principles, organizations can begin by hiring staff with personality characteristics well suited for trauma-informed work. Hiring managers can use behavioral interviewing,[11] a technique that relies on candidates' past behavior as a predictor

of future behavior, to screen for empathy, non-judgment, and collaboration. This method can identify viable candidates who may not have had formalized training in trauma-informed care.

Clinical Practices

While the concept of a comprehensive trauma-informed approach is still taking shape, there are a number of evidence-based clinical practices for working with individuals who have experienced trauma. Key ingredients of a trauma-informed clinical approach include:

Key Ingredients of Trauma-Informed Clinical Practices

1. Involving patients in the treatment process
2. Screening for trauma
3. Training staff in trauma-specific treatment approaches
4. Engaging referral sources and partnering organizations

Involving Patients in the Treatment Process

Patients need a voice in their own treatment planning and an active role in the decision-making process. In traditional care, clinicians often dictate the course of action without much opportunity for patient feedback or dialogue. In a trauma-informed approach, patients are actively engaged in their care and their feedback drives the direction of the care plan.

One promising engagement strategy uses peer support workers — individuals with lived trauma experiences who receive special training — to be part of the care team.[12] Based on their similar experiences and shared understanding, patients may develop trust with their peer support worker and be more willing to engage in treatment. Peer engagement is a powerful tool to help overcome the isolation common among individuals who have experienced trauma.

Screening for Trauma

Although trauma screening is recognized as the most fundamental aspect of a clinical trauma-informed approach, experts often differ on *when* and *how* to screen patients for trauma. Upfront and universal screening involves screening every patient for trauma history as early as possible. Proponents of this approach assert that it allows providers a better understanding of a patient's potential trauma history, helps target interventions, provides aggregate data, and quantifies the risk of chronic disease later in life. Universal screening can also reduce the risk of racial/ethnic bias by screening all patients. Furthermore, a patient can be asked to share a cumulative ACE or other trauma screening score after completing a questionnaire rather than identifying specific traumatic experiences, which allows patients to decide how much detail to provide.

The Center for Youth Wellness Begins with Patient Screening

The Center for Youth Wellness in San Francisco, CA, begins its integrated pediatric and behavioral health services by screening children for ACEs and assessing their overall health status. For children with high ACE scores and other health conditions, the organization provides care management and prevention strategies. Prevention activities are focused on these patients' elevated risk for physical and behavioral health problems.

Opponents of upfront screening feel that patients should have the opportunity to build trust in providers before being asked about their trauma history. Those who favor later screening for trauma contend that upfront screening removes the patient's choice of sharing sensitive information, can re-traumatize a patient, and may hinder progress made if there are not appropriate interventions or referrals in place.

Despite differing viewpoints, consensus is building in the field around several aspects of screening:

- **Treatment setting should guide screening practices.** Upfront, universal screening may be more effective in primary care settings and later screening may be more appropriate in behavioral health settings.
- **Screening should benefit the patient.** Providers who screen for trauma must ensure that, once any health risks are reported, they can offer appropriate care options and referral resources.
- **Re-screening should be avoided.** Frequently re-screening patients may increase the potential for re-traumatization because it requires patients to revisit their traumatic experiences. Minimizing screening frequency and sharing results across treatment settings with appropriate privacy protections may help reduce re-screening.
- **Ample training should precede screening.** All health care professionals should be proficient in trauma screening and conducting appropriate follow-up discussions with patients that are sensitive to their cultural and ethnic characteristics (e.g., language, cultural concepts of traumatic events).

Training Staff in Trauma-Specific Treatment Approaches

While the concept of a comprehensive trauma-informed approach is relatively new, a number of evidence-based trauma-specific treatment approaches are available. Exhibit 2 (*see next page*), while not exhaustive, offers select examples of treatment options for both adults and children and describes major characteristics, target populations, and outcomes to date. Additional treatment options include, but are not limited to, motivational interviewing, mindfulness training, and formal peer support programs.

Engaging Referral Sources and Partnering Organizations

Individuals who have experienced trauma often have complex medical, behavioral health, and social service needs and, therefore, receive care from an array of providers. If providers screen for or inquire about trauma, they need to be able to offer appropriate care responses, often including referrals, ideally to other "practitioners" of trauma-informed care. It is essential that providers within a given community or system of care work together to develop a trauma-informed referral network. Opportunities for providers to engage with potential referral sources might include: inviting them to participate in internal training; hosting community-wide trauma-informed care training efforts; or encouraging patients serving on advisory boards to lobby organizations in a given provider network or community to become trauma-informed.

> *"It is very difficult for most providers and clinics to help patients heal from lifelong trauma and prevent re-victimization on their own. Forming partnerships with community-based organizations is essential."*
>
> Edward Machtinger, MD, Director of the Women's HIV Program at the University of California, San Francisco

Exhibit 2: Examples of Trauma Treatment Approaches: Characteristics and Evidence

Treatment Model	Description	Target Population(s)	Outcomes
Adult-Focused Models[13]			
Prolonged Exposure Therapy (PE Therapy)	▪ Focuses on: (1) posttraumatic stress disorder (PTSD) education; (2) breathing techniques to reduce the physiological experience of stress; (3) exposure practice with real-world situations; and (4) talking through the trauma. ▪ Eight to 15 60-90-minute sessions that occur 1-2 times a week.	Adults who have experienced trauma or who have been diagnosed with PTSD.	▪ Has been shown to be one of the most effective PTSD treatments for veterans. ▪ Meta-analysis showed that the average PE patient had better outcomes than 86 percent of counterparts in the control group.
Eye Movement Desensitization and Reprocessing (EMDR)	▪ Focuses on: (1) spontaneous associations of traumatic images, thoughts, emotions, and sensations; and (2) dual stimulation using bilateral eye movements, tones, or taps. ▪ Information processing therapy to reduce trauma-related stress and strengthen adaptive beliefs.	Adults who have experienced trauma or who have been diagnosed with PTSD.	▪ Meta-analyses show similar outcomes to other exposure therapy techniques. ▪ Endorsed by World Health Organization and Department of Veterans' Affairs.
Seeking Safety	▪ Focuses on: (1) prioritizing safety; (2) integrating trauma and substance use; (3) rebuilding a sense of hope for the future; (4) building cognitive, behavioral, interpersonal, and case management skill sets; and (5) refining clinicians' attention to processes. ▪ Present-focused treatment to help individuals attain a sense of safety.	Adults who have experienced trauma, or who have been diagnosed with PTSD or substance use issues; groups and individuals in a variety of settings, including residential and outpatient.	▪ Listed as "supported by research evidence" for adults by the California Evidence-Based Clearinghouse and "strong research support for adults" by the Society of Addiction Psychology of the American Psychological Association.
Child-Focused Models			
Child-Parent Psychotherapy	▪ Focuses on: (1) the way trauma has affected the caregiver-child relationship; and (2) the child's development.[14,15] ▪ A primary goal is to bolster the caregiver-child relationship to restore and support the child's mental health.[16]	Youth, ages 0-6, who have experienced a wide range of trauma, and parents with chronic trauma.[17]	▪ Listed as "supported by research evidence" by the California Evidence-Based Clearinghouse.[18]
Attachment, Self-Regulation, and Competency (ARC)	▪ Focuses on: (1) attachment; (2) self-regulation; (3) competency; and (4) trauma experience integration; developed around an overarching goal of supporting the child, family, and system's ability to engage in the present moment.[19,20] ▪ Grounded in attachment theory and early childhood development; addresses how a child's entire system of care can become trauma-informed.[21]	Youth, ages 2-21, and families who have experienced chronic traumatic stress, multiple traumas, and/or ongoing exposure to adverse life experiences.[22]	▪ Research suggests that ARC leads to a reduction in a child's posttraumatic stress symptoms and general mental health symptoms, as well as increased adaptive and social skills.[23]
Trauma-Focused Cognitive Behavioral Therapy (TF-CBT)	▪ Focuses on: (1) addressing distorted beliefs and attributions related to abuse or trauma; (2) providing a supportive environment for children to talk about traumatic experiences; and (3) helping parents who are not abusive to cope with their own distress and develop skills to support their children.[24] ▪ Designed to reduce negative emotions and behaviors related to child sexual abuse, domestic violence, and trauma.[25]	Youth, ages 3-21, and parents or caregivers who have experienced abuse or trauma.[26]	▪ Highlighted by several groups of experts and federal agencies as a model program or promising treatment practice, including the National Child Traumatic Stress Network, the California Evidence-based Clearinghouse, and SAMHSA.[27]

Key Opportunities for Advancement

As discussed above, implementing a trauma-informed approach requires organizational policy change at the provider level. Furthermore, program and payment reforms at the payer and health system levels, as well as at the state and federal level, can also help support the adoption of trauma-informed care approaches. Examples are touched on below.

Standardizing Language Used for Trauma-Informed Approaches

There is no universally accepted definition of trauma, and there is disagreement about the need for one. Some experts encourage open-ended definitions, positing that the idea of trauma is too broad to be defined and fearing the potential exclusion of patients who need trauma-informed services, but whose experiences do not fit within the definition. Others view the lack of standardized terminology as a barrier to developing trauma-informed cross-sector collaboration and advancing the field. Key policymakers and stakeholders, such as SAMHSA and the National Child Traumatic Stress Network, have created their own definitions.[28,29]

Nonetheless, the language used in the field — in medical and behavioral health settings — influences both providers' practices and patients' experiences. When explaining trauma-informed approaches to patients, it is important to describe trauma in terms that reduce stigma and accommodate low health literacy. Patients may also be more likely to trust providers and follow the treatment plan if providers explain how patients' traumatic experiences contribute to their overall health instead of focusing solely on the experience of trauma itself.

Payment Considerations

Traditional payment systems present major barriers to implementing a trauma-informed approach. Presently, providers lack billing codes to charge for trauma-informed services and face limitations on billing for multiple types of treatment and prevention. Some payers prohibit reimbursement for same-day and two-generation services, strategies that could allow children and parents to be served together. Fee-for-service reimbursement practices also often limit primary care visits to 10-15 minutes, which makes it difficult to administer screening tools, discuss the patient's history of trauma, and offer appropriate follow-up care or referrals.

Moreover, the fragmented care caused by separate physical and behavioral health service systems creates additional barriers. Integrated behavioral health and primary care services, which provide coordinated care and a whole-person approach, increase the opportunity for successful trauma-informed treatment. Rethinking reimbursement strategies, lengthening the amount of time providers spend with patients, and reducing siloed funding streams are critical for more coordinated care.

Fortunately, some delivery system and payment reforms are beginning to address these barriers. Payers are increasingly integrating physical and behavioral health services financing, which should streamline integration at the practice level. Likewise, current efforts to promote accountable care entities hope to address misaligned incentives in the fee-for-service payment model. By moving toward incentives that reward value over volume, accountable care organizations and other similar models should improve providers' financial incentives for investing in trauma-informed care.

Building the Evidence Base

Identifying appropriate metrics, best practices, and scalable solutions for trauma-informed approaches will require more evaluation of patient outcomes and implementation costs. However, in the absence of dedicated funding, collecting patient, cost, and system-related outcomes may present an ongoing challenge. The field also needs to create

tools to measure the adoption of trauma-informed approaches and progress over time within organizations and across the health care system.

Because the field of trauma-informed care is new, there is a lack of consensus about what can be achieved or how to measure it. Health care providers and policymakers need more guidance on how to collect data and track outcomes specific to trauma-informed care. The potential for broader adoption of trauma-informed approaches will increase as there is more evidence of the positive impact of trauma-informed care on patient outcomes, staff wellness, and overall costs.

Building Awareness and Competency

Trauma is a public health issue and calls for public education campaigns akin to those used in anti-smoking efforts, vaccination promotion, and seat belt use. Changing the health care culture hinges on increasing the recognition of the lifelong impact of trauma on people's physical health, behavioral health, and social outcomes. Health care organizations may benefit from clear education and marketing materials for patients and providers, social media campaigns, and public service announcements to build awareness and reduce stigma about receiving trauma-informed services.

This transformation requires a paradigm shift for health care workers that recognizes the significance of trauma and the importance of trauma-informed care. Cross-disciplinary training in trauma-informed approaches should ideally start early in a provider's education. Trauma training in medical, public health, nursing, social work, and residency/fellowship programs should be considered as a standard practice. Continuing education credits around trauma-informed training and services would also build awareness among current health care workers.

Upstream efforts are also critically important for advancing the field, especially in light of the multigenerational nature of trauma. Prevention initiatives — such as improving care for new mothers and young children; supporting families through home visit programs; promoting universal strategies to nurture safe, stable, and caring parental relationships; and creating violence prevention programs — should be further supported and implemented broadly.

A Recipe for Trauma-Informed Care

The health care community increasingly recognizes trauma and its associated avalanche of long-term negative consequences as a serious public health crisis. Research shows that early adversity has lasting effects on a child's brain. It increases the risk of developing adaptive yet ultimately unhealthy coping behaviors that can lead to serious health problems throughout life.[30,31,32] By adopting trauma-informed approaches to care, health care systems and providers can help mitigate those risks, improve health outcomes for children and adults who have experienced trauma, and reduce costs inside and outside the health care system.

Through the early work of leaders in trauma-informed care, organizational and clinical processes are emerging to guide better care for patients and further the field. Organizations wishing to implement a trauma-informed approach must provide steady leadership and clear communications strategies to support the transition to trauma-informed care; engage patients in planning; train and support *all* staff; create safe physical environments; prevent secondary traumatic stress in staff; and hire trauma-informed workforces. There are a number of clinical practices that are critical to advancing a trauma-informed approach, including screening for trauma; training staff in trauma-specific treatment approaches; and engaging both patients and appropriate partner organizations within the treatment process.

While there is a surge of interest in using trauma-informed care to address the physical health, behavioral health, and social impacts of trauma, there is a lack of understanding about the most effective way to standardize the approach to meet patients' needs. There is also disagreement about the need for a standard definition of trauma and trauma-

informed care terminology. On a payment and policy level, reimbursement structures must support provider incentives to implement a trauma-informed approach. Furthermore, investments in research and evaluation are necessary to achieve consensus around standardized measures related to trauma and to support the establishment of effective approaches.

Building foundational awareness of trauma-informed approaches should begin early in a provider's education and be reinforced through continuing education. Reinforcing upstream prevention efforts, such as providing high quality care for new mothers and young children and strengthening parenting capacity, is also critical to advancing the field. Collectively, policymakers, providers, and payers have a compelling opportunity to confront the short- and long-term impacts of trauma, and pursue the opportunity that trauma-informed care presents to improve health outcomes and decrease costs.

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Nutrition and physical activity: An Obesity Medicine Association (OMA) Clinical Practice Statement 2022

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ABSTRACT

Background: This Obesity Medicine Association (OMA) Clinical Practice Statement (CPS) on Nutrition and Physical Activity provides clinicians an overview of nutrition and physical activity principles applicable to the care of patients with increased body fat, especially those with adverse fat mass and adiposopathic metabolic consequences.

Methods: The scientific information and clinical guidance is based upon referenced evidence and derived from the clinical perspectives of the authors.

Results: This OMA CPS on Nutrition and Physical Activity provides basic clinical information regarding carbohydrates, proteins, fats (including trans fats, saturated fats, polyunsaturated fats, and monounsaturated fats), general principles of healthful nutrition, nutritional factors associated with improved health outcomes, and food labels. Included are the clinical implications of isocaloric substitution of refined carbohydrates with saturated fats and vice-versa, as well as definitions of low-calorie, very low-calorie, carbohydrate-restricted, and fat-restricted dietary intakes. Specific dietary plans discussed include carbohydrate-restricted diets, fat-restricted diets, very low-calorie diets, the Mediterranean diet, Therapeutic Lifestyle diet, Dietary Approaches to Stop Hypertension (DASH), ketogenic (modified Atkins) diet, Ornish diet, Paleo diet, vegetarian or vegan diet (whole food/plant-based), intermittent fasting/time restricted feeding, and commercial diet programs. This clinical practice statement also examines the health benefits of physical activity and provides practical pre-exercise medical evaluation guidance as well as suggestions regarding types and recommended amounts of dynamic (aerobic) training, resistance (anaerobic) training, leisure time physical activity, and non-exercise activity thermogenesis (NEAT). Additional guidance is provided regarding muscle physiology, exercise prescription, metabolic equivalent tasks (METS), and methods to track physical activity progress.

Conclusion: This Obesity Medicine Association Clinical Practice Statement on Nutrition and Physical Activity provides clinicians an overview of nutrition and physical activity. Implementation of appropriate nutrition and physical activity in patients with pre-obesity and/or obesity may improve the health of patients, especially those with adverse fat mass and adiposopathic metabolic consequences.

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1. Introduction

The purpose of the Obesity Medicine Association (OMA) Clinical Practice Statement (CPS) on Nutrition and Physical Activity is to provide clinicians an overview of nutrition and physical activity principles applicable to the care of patients with increased body fat, especially those with adverse fat mass and adiposopathic metabolic consequences. The OMA is an organization of providers in the field of obesity medicine dedicated to the comprehensive care of patients with obesity. OMA members are physicians, nurse practitioners, physician assistants, and other allied healthcare providers who engage in a comprehensive, patient-centered, evidence-based approach towards managing obesity. This approach is comprised of the four pillars of nutrition, physical activity, behavior, and medication. "Obesity Pillars" is the journal of the Obesity Medicine Association.

2. Nutrition

Medical nutrition therapy is an essential pillar regarding treatment of patients with obesity. Table 1 outlines 10 takeaway messages regarding nutrition and obesity. Table 2 provides general principles of healthful nutrition. Fig. 1 describes nutrition factors associated with improved health outcomes. The principles outlined pertain to general nutrition and may not apply to the individual patient.

2.1. Macronutrients

2.1.1. Carbohydrates

Carbohydrates are a type of macronutrient composed of carbon, hydrogen, and oxygen atoms, often with a hydrogen-oxygen atom ratio of 2:1. Types of carbohydrates commonly found in foods and drinks include sugars, starches, and fiber. Carbohydrates serve as a source of energy (4 kcal/gram) as well as components of cellular structures [9]. Simple sugars include monosaccharides and disaccharides. Examples of monosaccharides include hexose sugars such as glucose (blood sugar), fructose (fruit sugar), and galactose (combines with glucose to form lactose). Examples of disaccharides include maltose (two linked glucose molecules found in grains), sucrose (glucose linked to fructose found in table sugar), and lactose (glucose linked to galactose found in dairy products). Examples of polysaccharides (chain of simple sugars) include glycogen (i.e., branched polysaccharide of glucose found in animals), starch (i.e., branched and chain polysaccharide of glucose found in plants), chitin (i.e., structural carbohydrates for exoskeleton of arthropods and cell walls of fungi), and plant cell wall structural elements such as cellulose, hemicellulose, and pectin. Animals (e.g., humans) have cell membranes and not cell walls. The principal components of animal cell membranes are lipids (e.g., phospholipids and cholesterol), proteins, and carbohydrates. Carbohydrates in cell membranes are mostly attached to proteins (glycoproteins) or lipids (glycolipids).

The digestion of carbohydrates begins in the mouth (e.g., chewing and saliva with amylase). Carbohydrate digestion continues in the intestine via body enzymes (e.g., pancreatic amylase and intestinal maltase and lactase) and bacteria where polysaccharides (i.e., starches from plant foods and glycogen from animal foods) are converted to monosaccharides (i.e., simple sugars), which are then absorbed across intestinal cell membranes. Fructose may be absorbed by facilitated diffusion via intestinal glucose transporter 5 (GLUT-5); glucose and galactose are actively transported by intestinal sodium glucose cotransporter-1 (SGLT-1) [10]. Glucose can be broken down into carbon dioxide and water,

Table 1
Ten Takeaway Messages: Obesity and Nutrition. This table summarizes ten illustrative healthful dietary intakes as they apply to medical nutrition therapy for obesity [1].

Ten Takeaway Messages: Obesity and Nutrition
1. Health outcomes are most improved with medical nutrition therapy when the dietary interventions are evidence-based, quantitative, qualitative, and conducive to patient adherence.
2. A low-calorie diet is ~1200–1800 kcal/day; a very low-calorie diet is generally <800 kcal/day.
3. Fat-restricted diets are often defined as 10–30% of total calories from fat.
4. Low-carbohydrate diets are generally defined as 50–150 g of carbohydrates per day; very low-carbohydrate diets contain <50 g of carbohydrates per day.
5. The intake of both ultra-processed (refined) carbohydrates and saturated fats increases the risk of cardiovascular disease. The isocaloric substitution of ultra-processed carbohydrates with saturated fats does not improve cardiovascular disease risk; the isocaloric substitution of saturated fats with ultra-processed carbohydrates does not improve cardiovascular disease risk.
6. The Ketogenic Diet is a carbohydrate-restricted intervention that typically discourages unhealthful ultra-processed and refined foods, foods high in glycemic index/load, and foods rich in trans fatty acids. Ketosis may reduce hunger.
7. The Mediterranean Diet is not a defined diet, but rather a generalized meal pattern that encourages olive oil, vegetables, fruits, legumes, whole grains, nuts, seeds, seafood, fermented dairy products, poultry, eggs, and red wine; it discourages high amounts of red meats, meat products, and ultra-processed carbohydrates.
8. The DASH Diet is a dietary pattern that encourages vegetables, fruits, whole grains, fat-free or low-fat dairy products, fish, poultry, lean meats, nuts, seeds, legumes, fiber, foods containing calcium, potassium, and magnesium; it discourages sodium >2300 mg per day, total fat >27% of total daily calories, cholesterol >150 mg per day for a 2100 Calorie eating plan, red and ultra-processed meats, sugar-sweetened beverages, and foods with added sugars.
9. The vegetarian diet encourages vegetables, fruits, whole grains, legumes, seeds, and nuts and discourages meats. A vegan diet encourages vegetables, fruits, whole grains, legumes, seeds, and nuts, and discourages all animal products.
10. Fasting (alternative day, intermittent, or time-restricted feeding) may contribute to overall caloric restriction and weight reduction.

Table 2
General Principles of Healthful Nutrition. Listed are general nutritional recommendations [4].

General Principles of Healthful Nutrition	
Limit:	Encourage:
o Limit ultra-processed foods of minimal nutritional value such as "sweets," "junk foods," cakes, cookies, candy, pies, chips, sugar-sweetened beverages, and ultra-processed meats such as bacon, sausage, hot dogs, and pastrami.	o Encourage consumption of minimally processed proteins and fats such as monounsaturated and polyunsaturated fats such as marine oily fish rich in omega-3 fatty acids, as well as fats from naturally fatty foods such as nuts and seeds, avocados, and olives.
o Limit saturated fats.*	o Encourage vegetables, leafy greens, fruits, berries, nuts, seeds, legumes, and whole grains [1,2].
o Limit sodium intake.	o Encourage complex carbohydrates over simple sugars and low glycemic index/load foods over high glycemic index/load foods.
o Limit foods high in cholesterol in patients at high risk for cardiovascular disease and known intestinal hyper absorbers of cholesterol, such as some patients with obesity who undergo weight loss.**	o Encourage high-fiber foods over low-fiber foods.
o Limit alcohol and high-calorie alcoholic drinks.	o Encourage no-sugar-added dairy products (while being mindful of caloric content).
o Avoid energy-dense foods and beverages.	o Encourage minimally processed and whole foods over ultra-processed, packaged foods.
o Avoid trans fats.	
o Among sweeteners, sucrose and saccharin may increase body weight compared to aspartame, rebaudioside A, and sucralose [3].	

* Some clinical data suggest variance in the potential unhealthful nature of some saturated fats, depending on the clinical scenario. (See discussion below).
** Patients with obesity who lose weight and become leaner may increase their intestinal absorption of cholesterol, which may help explain why some patients on a ketogenic diet may have marked increases in cholesterol blood levels. (See discussion below) [5].

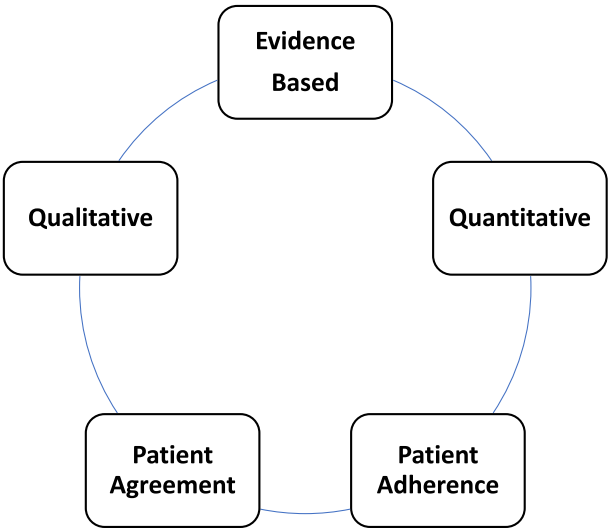

Fig. 1. Nutrition Factors Associated with Improved Health Outcomes. Regarding medical nutrition therapy for obesity, the most effective approaches are evidence-based, consider both qualitative and qualitative aspects of dietary intake, and promote patient agreement and adherence. While possibly counterintuitive, randomized clinical trials do not necessarily support improved weight reduction when diets are based upon patient food preferences. In fact, meta-analyses suggest that patient choices in weight reduction strategies have no significant effect on duration or attrition, with greater weight reduction often occurring in the control groups. However, the effectiveness of any therapeutic intervention is likely enhanced when patients are engaged and agree to treatment plans [6–8].

which is a glycolytic process that generates biochemical energy in the form of adenosine triphosphate or ATP via cellular respiration (i.e., glycolysis, citric acid cycle, electron transport, oxidative phosphorylation). Conversely, excessive carbohydrates can be converted to and stored as fat via a process called lipogenesis, which is stimulated by insulin.

The satiation from carbohydrates in foods (e.g., fruits) is substantially dependent upon the presence of fiber. Fiber-free juice can be consumed 11 times faster than intact apples, with apples more satiating than puree, and puree more satiating than fruit juice. Especially in susceptible individuals (e.g., those with insulin resistance), fruit juice consumption may result in higher insulin levels compared to whole fruit consumption [11]. In addition, more calories per unit volume are found in apple juice than in intact apples. An intact apple and a glass of apple juice may occupy the same volume in the stomach, but the fiber-containing apple may contain fewer calories, depending on the concentration of the apple juice.

Carbohydrates are generally not considered an essential macronutrient. The liver, kidney, and possibly small intestine can synthesize glucose (i.e., gluconeogenesis). However, genetic defects of glucose metabolism and/or storage (e.g., glycogen storage disease) may cause carbohydrates to be conditionally essential. While calorie deficiency can lead to marasmus (insufficient calories), in patients without impairment in carbohydrate metabolism or storage, no known carbohydrate deficiency exists [12].

2.1.2. Fats

Fats, or lipids, are a diverse group of compounds used to store energy (i.e., 9 kcal/gram of fat) [9], that provide body insulation through body fat, and that facilitate or contribute to immune response (i.e., omega-3 fatty acids), cell membrane structure (phospholipids), brain tissue composition (cerebrosides contain the fatty acid sphingosine attached to galactose or glucose), synthesis of bile acid, cholesterol, absorption of fat-soluble vitamins (A, D, E, and K), and synthesis of steroid hormones. Cholesterol is sterol derived from animal fats, not carbohydrates.

Omega-3 alpha linolenic acid (ALA) and omega-6 linoleic acid (LA) are two fatty acids that cannot be made by the body. These are termed "essential" fatty acids and must be consumed in the diet. Omega-3 fatty acids, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), and gamma linolenic acid (an omega-6 fatty acid) are sometimes considered "conditionally essential," meaning they can be endogenously derived on the condition of a lack of intake of essential fatty acids. Given humans are only able to produce small amounts of EPA and DHA, oral intake of EPA and DHA is often recommended from cold water marine fish. The USDA Dietary Reference Intake (DRI) for fat is at least 30 g/day.

Replacing saturated fats with polyunsaturated or monounsaturated fats may reduce cardiovascular disease risk. Replacing saturated fats with ultra-processed (refined) carbohydrates and sugar is not associated with reduced cardiovascular disease risk, as shown in Fig. 3 [13].

Insulin promotes fatty acid and triglyceride synthesis and storage (lipogenesis) and inhibits fat breakdown (lipolysis). Foods that cause a rise in blood glucose, such as sugars, starches, or, to a smaller degree, amino acids, will stimulate the secretion of insulin from the pancreas. A nutritional therapy plan that limits the prandial rise in insulin levels may decrease ectopic fat deposition (e.g., visceral fat, intrahepatic fat, and intrapericardial fat), and improve components of the metabolic syndrome independent of weight reduction.

2.1.2.1. *Trans fats.*

Trans fats are created through a process of artificially hydrogenating polyunsaturated fats (vegetable oils) into more saturated fats, allowing for higher melting temperatures, which is more desirable for processed foods, cooking, and frying. Partially hydrogenated vegetable oils were developed because they tasted better in foods and were less expensive than saturated fats derived from animals (lard). Some early shortenings (i.e., fats used in cooking) made from partially hydrogenated vegetable oil (cottonseed and soybean oil) originally contained 50% trans fats and were marketed as being a more healthful alternative to animal fat, because they were derived from "vegetables." Although many contain partially hydrogenated palm and soybean oils, common shortenings now contain minimal trans fats, soybean oil, and fully hydrogenated palm oil (i.e., 3 g saturated fats, 6 g polyunsaturated fats, 2.5 monounsaturated fats) [14].

Trans fats may increase low-density lipoprotein cholesterol, reduce high-density lipoprotein cholesterol, and increase the risk of cardiovascular disease (i.e., myocardial infarction and stroke), type 2 diabetes mellitus, and certain cancers [15] (Figs. 2 and 3). While the FDA banned partially hydrogenated oil in 2018, trans fats are sometimes reportedly still found in some cakes, pies, cookies (especially with frosting), biscuits, microwavable breakfasts, stick margarine, crackers, microwave popcorn, cream-filled candies, doughnuts, fried fast foods, and frozen pizza.

Conjugated linoleic acid (CLA) is a naturally occurring trans/cis fat derived from ruminants (i.e., fermentation of plant-based foods via microbes in the stomach prior to digestion). Naturally occurring CLA in foods is generally not thought detrimental to health; conjugated trans linkages are not included as trans fats for nutritional regulations and food labeling [16].

2.1.2.2. *Saturated fats.*

Saturated fats are composed of carbon chain fatty acids with no double bonds. They are solid or semisolid at room temperature. Many natural foods containing saturated fats also contain polyunsaturated and monounsaturated fat. Coconut and palm oils have a high percent of saturated fats (both medium and large chain) and are commonly found in snack foods. Long chain saturated fatty acids (>12 carbons) are found in meats, dairy products, tropical oils (i.e., coconut and palm oil), and hydrogenated vegetable oils (i.e., shortening). Medium chain saturated fatty acids (8–12 carbons) are found in coconut and palm oil. Stearic acid (C18:0) represents about 25% of saturated fats in the U.S. adult diet and has minimal effects upon low density lipoprotein (LDL) cholesterol. Conversely, palmitic acid (C16:0) represents about 50% of saturated fats in the U.S. adult diet and increases LDL cholesterol

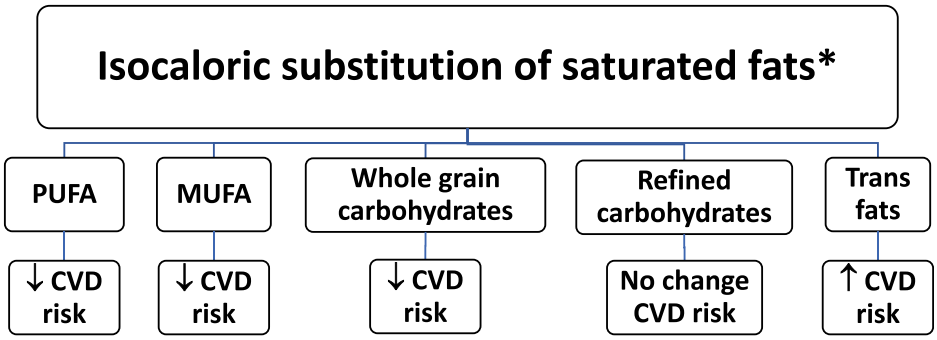

Fig. 2. Macronutrient Effects on CVD Risk. The health effects of isocaloric substitutions depends on the macronutrient [13,26–29].
Abbreviations: PUFA: Polyunsaturated Fatty Acids; MUFA: Monounsaturated Fatty Acids: CVD: Cardiovascular disease
* This figure is focused on isocaloric substitutions and does not necessarily reflect health effects of substitutions that result in changes in weight.

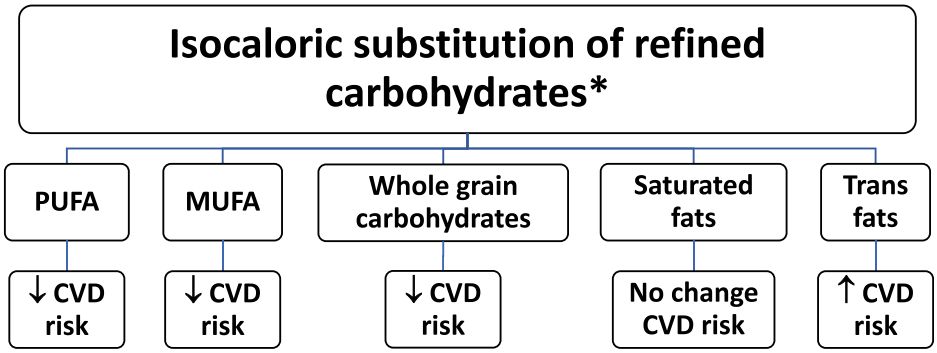

Fig. 3. Macronutrient Effects on CVD Risk. The health effects of isocaloric substitutions depends on the macronutrient [13,26–29].
Abbreviations: PUFA: Polyunsaturated Fatty Acids; MUFA: Monounsaturated Fatty Acids: CVD: Cardiovascular disease
* This figure is focused on isocaloric substitutions and does not necessarily reflect health effects of substitutions that result in changes in weight.

[13,17].

Saturated fat consumption may impair vascular endothelial function; polyunsaturated fats such as omega-3 fatty acids may improve endothelial function [18,19]. Conversely, saturated fats are less likely than unsaturated fats (e.g., with cooking) to become oxidized or become rancid [17]. Reports are inconsistent regarding the relationship of saturated fat-containing dairy products and cardiovascular disease. Dairy food intake is included in "diets" that are generally considered to be healthful (e.g., Mediterranean Diet). Some reports suggest that fermented dairy products (e.g., cheeses and yogurt) may be more healthful than other high fat dairy products (e.g., butter) [20,21].

Most studies suggesting saturated fats are unhealthful (i.e., especially regarding increased cardiovascular disease risk) evaluated isocaloric substitution for other nutrients. Most studies have not prospectively evaluated the health effects of different types of saturated fats during clinically meaningful weight reduction, and not when accompanied by improvement in adiposopathic obesity-related metabolic diseases [13] (Figs. 2 and 3). Many patients with pre-obesity/obesity who undergo weight reduction via carbohydrate restricted diets may experience improvement in fat mass disease symptoms and/or improvement or remission in diabetes mellitus, hypertension, dyslipidemia (i.e., triglycerides), and thuds reduced CVD risk factors [13]. Having said this, some patients with genetic dyslipidemias may have moderate to marked increases in low-density lipoprotein cholesterol with carbohydrate restriction, which, if excessive or uncontrolled, should prompt replacement of saturated fats with poly or monounsaturated fats and restriction of dietary cholesterol [22] (see discussion below).

2.1.2.3. Polyunsaturated fats. Polyunsaturated fats contain carbon chain fatty acids with multiple double bonds. They are typically liquid at room temperature (e.g., vegetable and fish oils). Nuts (e.g., walnuts, almonds, macadamia nuts, hazelnuts, pecans) contain both polyunsaturated and monounsaturated fats and are thought to reduce the risk of cardiovascular disease (Figs. 2 and 3). Omega-3 fatty acids are polyunsaturated fats, such as those found in oceanic cold-water fish and are often considered cardioprotective. In patients at risk for atherosclerotic cardiovascular disease and elevated triglyceride levels, prescription dose omega-3 fatty acids (4 g per day of eicosapentaenoic acid) can reduce triglyceride levels and reduce the risk of cardiovascular disease [23].

Cooking oils beyond their individual smoking points or repeated use of the same cooking oils may increase oxidation, generate unhealthful free radicals, and have some minor potential to create trans isomers; more likely with unrefined, unbleached, undeodorized, raw, pure, virgin polyunsaturated fats [24,25].

2.1.2.4. Monounsaturated fats. Monounsaturated fats contain carbon chain fatty acids with one double bond. They are typically liquid at room temperature (e.g., olive and canola oils). Isocaloric substitution of monounsaturated fats for saturated fats may reduce cardiovascular disease risk factors and cardiovascular disease risk (Figs. 2 and 3).

Smoking points can vary widely depending on the oil. While some polyunsaturated fats have among the lowest smoking points (e.g., unrefined safflower and sunflower oils are approximately 200–300° F), some sources of monounsaturated oils have among the higher smoking points (e.g., pomace and extra light olive oil and avocado oil ~ 500° F). Stoves and ovens can be as hot as 500° F. Baking and stir-frying with canola oil does not significantly increase the generation of trans fats [25].

2.1.3. Protein

Protein contains amino acids and serves as the major structural building block of the human body: bone, muscle, skin, brain, and nucleic acids. Proteins can also serve as a source of energy (4 kcal/gram) [9].

Essential amino acids are those that cannot be made by the human body and must be consumed in the diet. These 9 essential amino acids include histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, and valine. Some amino acids can be used as an energy source (i.e., converted to glucose or ketones when needed), and can be used as a substrate to make carbohydrates in a process called gluconeogenesis. Two conditions that are associated with severe protein deficiency include Kwashiorkor and Marasmus.

Kwashiorkor occurs with sufficient calories, but with protein deficiency of such severity as to cause muscle wasting (often with normal or increased body fat), hypoalbuminemia, and movement of potassium and other intracellular ions to the extracellular space. The subsequent osmotic water movement to the extracellular space is clinically manifest by edema. Marasmus is a term typically used to describe malnutrition in infants due to inadequate energy intake of all forms of nutrients.

The biologic value of a protein is the proportion absorbed from a food and incorporated into proteins of the body. For example, an egg has a protein biologic value of 100 (top efficiency). However, a single egg may only have a protein Daily Value of ~12%, with the Daily Value being the percent of a nutrient recommended per day, based upon a 2000 Calorie a day diet. If a food protein lacks one of the nine essential amino acids, then it is given a biologic value of zero. Gelatin (and collagen) lack tryptophan; hence, gelatin and collagen are often given low biologic values (i.e., sometimes as low as 0). The USDA Dietary Reference Intake (DRI) for protein is 0.8–2.0 g/kg/day depending upon age, sex, and physical activity.

2.1.4. Alcohol

Pure alcohol contains ~7 kcal/gram. Limiting alcoholic drinks is often an important principle of medical nutrition therapy. Beyond their alcohol content, many alcoholic drinks are energy dense (e.g., two margaritas may be well over 1000 Calories) and should be avoided in patients being treated for pre-obesity or obesity.

2.2. Food labels

The Dietary Reference Intake (DRI) is a set of reference ranges published by the US Institute of Medicine, and includes Recommended Dietary Allowance (RDA), Adequate Intake (AI), Tolerable Upper Intake Level (UL), and Estimated Average Requirement (EAR).

The RDA/AI for trans fatty acids (0%) and saturated fats (<10%) are generally recommended to be as low as possible while consuming a nutritionally adequate diet. Added sugar should be less than 10% of consumed calories. Perhaps most applicable to patients is that the DRI establishes the recommended percent dietary allowance (RDA), which is noted in food labels, and lists the recommended percent intake of a nutrient sufficient to meet the requirements of 98% of healthy individuals. These dietary guidelines are intended to be informational and not specifically intended to be a clinical guideline for treating chronic disease, including obesity [30].

Food labels list the amount of total fat (saturated and trans fat), cholesterol, sodium, total carbohydrates, sugar, fiber, vitamin D, calcium, iron, and potassium in the food, as well as the percent Daily Values (DV) in food based upon a 2,000 Calorie diet. Perhaps most relevant to energy intake and weight management is that food labels also list servings per container, serving size, and Calories. A calorie is the amount of heat energy required to raise the temperature of 1 g of water 1 °C. A Calorie (capital "C") is the same as a kilocalorie (kcal), which is the heat energy required to raise the temperature of 1 kg of water by 1 °C. One kcal is equal to 4.184 kJ. Kilocalories are used in food labels, usually expressed as Calories. When referring to food or physical exercise, it is common that the term "calorie" actually refers to kilocalorie (kcal) [31].

When available, reading and understanding food labels at grocery stores and restaurants can be an empowering form of education that can affect food choice, form the basis of accountability, and effect positive change. For example, a single serving of a certain popular ice cream can be ~350 Calories, but the entire 2 cup/1 pint container contains ~900 Calories or more.

2.3. Caloric intake

Hunger is the physiologic craving or need for food (e.g., increased by ghrelin, neuropeptide Y, asprosin and/or decreased by leptin and many other hormones). Appetite is the desire to eat food, which may be physiologic due to hunger or may be independent of hunger via responses to psychosocial environments and/or cued responses to senses such as touch, sight, hearing, smell, and taste. Satiation is the feeling of fullness within a meal. Satiety is the feeling of fullness between meals. Cravings, or desire to eat food, can be measured by validated scales, often utilizing visual analog scales. Other measures include the Intuitive Eating Scale-2, Dutch Eating Behavior Questionnaire, Power of Food scale, and the Eating Inventory (Three-Factor Eating Questionnaire or Stunkard-Messick Eating Questionnaire).

Multiple factors influence satiety and satiation and thus affect daily *ad libitum* calorie intake. Such factors include the amount/volume of food (i.e., quantitative), type of food (i.e., qualitative carbohydrates, fats, and proteins), food form and texture, food palatability, and dietary fiber intake. These factors have potential clinical application, such as when recommending fiber, complex carbohydrates and proteins to enhance satiation [32]. Other factors that may influence food intake includes food availability, environmental triggers, sensory specific satiety, sleep deprivation and circadian rhythm alignment/malalignment, physical activity, mental stress, ketosis, and body composition (i.e., muscle and fat mass) [33–36].

Sleep deprivation may increase hunger (i.e., especially for energy dense foods), decrease physical activity, increase partitioning of body energy to body fat, (i.e., particularly abdominal or visceral fat), reduce insulin sensitivity, and preferentially promote fat mass accumulation relative to lean mass accumulation [37]. In addition, sleep deprivation can promote metabolic derangements that lead to worsening hepatic steatosis, development of non-alcoholic fatty liver disease (NAFLD) that progresses to non-alcoholic steatohepatitis (NASH), and worsening metabolic syndrome [38–40].

2.3.1. Caloric organ delivery and storage

Caloric partitioning is the distribution of consumed energy to specific tissues. Carbohydrates are preferentially utilized in muscle for immediate energy needs. During positive caloric balance, carbohydrates are stored in the liver and muscles as glycogen. If not utilized for energy needs, then carbohydrates may ultimately be converted to fat, mainly in adipose tissue. Fats are utilized in muscles (i.e., fatty acids) at lower levels of physical activity, and predominantly stored in adipose tissue during periods of positive caloric balance. Proteins may be preferentially delivered, utilized, and stored in muscle tissue [36].

A greater proportion of consumed energy will partition to muscle during resistance training, and a greater proportion of energy will partition to fat without resistance training. During negative caloric balance, the derivation of energy from muscle tissue is likely to be less during concomitant resistance training, with some mitigation of muscle wasting and the possibility of increase muscle mass during weight reduction when accompanied by high levels of resistance training [32].

2.4. Choice of nutrition plan

The most appropriate nutritional therapy for management of obesity is one that is safe, effective, and one that the patient is most likely to adhere. In patients with obesity, a goal is to encourage food intake that results in a negative caloric balance to achieve and maintain a healthy body weight with consideration of the following:

- Eating behaviors and meal patterns
- Cultural background, traditions, and food availability

- Time constraints and financial limitations
- Nutritional knowledge and cooking skills
- Medical conditions potentially affected by the nutrition plan
- Medical conditions impacting the optimal nutrition plan

Medical nutrition therapy approaches for weight reduction in patients with pre-obesity or obesity typically focus on the caloric manipulation of the three macronutrients: carbohydrates, fats, or proteins. Very low-calorie diets contain less than 800 kcal/day and require close medical supervision for safety reasons. Low calorie diets range from 1200 to 1800 kcal/day (1200–1500 for women and 1500–1800 for men) [41]. Restricting dietary saturated fat leads to a greater reduction in total and LDL cholesterol, whereas restricting dietary carbohydrates leads to a greater reduction in serum triglycerides and an increase in HDL-cholesterol levels [42]. Reduction of carbohydrates can lead to a greater reduction in serum glucose and hemoglobin A1C. Fig. 4 describes dietary energy consumption intended to cause negative caloric balance and reduction of fat mass. Different dietary approaches are reviewed below.

3. Hypocaloric medical nutrition therapies

3.1. Carbohydrate-restricted hypocaloric diet

A low-carbohydrate diet is often defined as 50–150 g of carbohydrates per day. A very low-carbohydrate diet is often defined as < 50 g of carbohydrates per day. A carbohydrate restricted diet may produce modestly greater weight reduction compared to fat-restricted dietary intake, at least for the first 6 months. After 6 months, the net weight reduction may be similar to other calorie-restricted nutritional interventions [45]. Carbohydrate-restricted hypocaloric diets may reduce fasting glucose, insulin, and triglyceride levels, and modestly increase high-density lipoprotein cholesterol and low-density lipoprotein cholesterol levels, as well as modestly reduce blood pressure. Some of these metabolic effects may occur with or without weight reduction.

A low-carbohydrate ketogenic diet (LCKD) may improve diabetes mellitus complications (i.e., nephropathy). In patients with epilepsy, a very low-carbohydrate ketogenic diet (VLCKD) may reduce seizures. Finally, LCKD may help increase energy expenditure during maintenance of weight reduction [46,47].

A carbohydrate-restricted diet is sometimes associated with malaise during early implementation and may produce carbohydrate cravings within the first few days of implementation, which may be mitigated by adding low-glycemic-index carbohydrate foods. A carbohydrate-restricted diet may induce gout flares in patients with history of gout, especially during initial implementation, and may also present challenges in patients where dietary protein restriction may be recommended (i.e., severe kidney disease). Due to the possibility of hypoglycemia and hypotension in patients treated for diabetes mellitus and hypertension respectively, blood sugar and blood pressure should be monitored for potential adjustment in applicable metabolic drug treatments. As with any new aggressive medical nutrition therapy, clinicians should consider

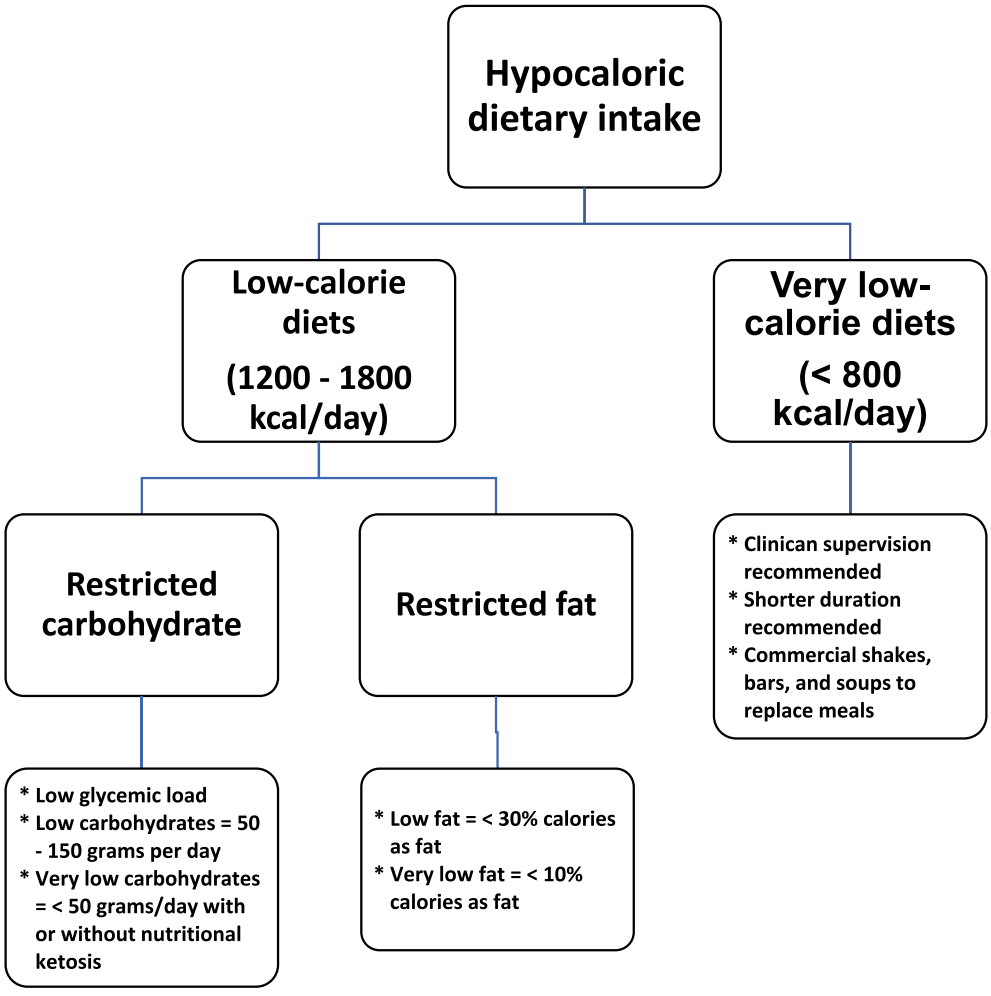

Fig. 4. Dietary Energy Consumption Intended to Cause Negative Caloric Balance and Reduction of Fat Mass. This figure summarizes the types and definitions of different hypocaloric diets [41–44].

whether patients (i.e., especially those having well-controlled blood pressure and blood sugar) might proactively require dose reduction or discontinuation of some antihypertensive drugs or hypoglycemic agents, particularly insulin or sulfonylureas [48].

3.2. Fat-restricted hypocaloric diet

A fat-restricted diet is often defined as 10–30% of total calories from fat. After six months, fat-restrictive, low-calorie nutritional interventions generally produce similar weight reductions as a "low-carb diet." If accompanied by weight reduction, a fat-restricted diet may reduce fasting glucose and insulin levels and modestly reduce blood pressure. It may also modestly decrease low-density and high-density lipoprotein cholesterol levels [49,50].

Hunger control may present challenges with a fat-restricted hypocaloric diet, which may be mitigated with anti-obesity pharmacotherapy. If fat restriction results in a substantial increase in carbohydrate consumption, and if weight reduction is not achieved, then an increase in dietary carbohydrate intake may contribute to hyperglycemia, hyperinsulinemia, hypertriglyceridemia, and reduced levels of high-density lipoprotein cholesterol.

3.3. Very Low-Calorie Diet (VLCD)

Very low-calorie diets (VLCDs) are defined as diets containing less than 800 kcal/day and are typically implemented utilizing specifically formulated meal-replacement products under the supervision of a trained clinician. VLCDs may also be achievable without meal replacements by a trained clinician. A VLCD produces more rapid weight reduction than low-calorie fat-restricted or carbohydrate-restricted diets due to lower energy intake [51]. VLCDs may reduce fasting glucose, insulin, triglyceride, low-density lipoprotein cholesterol levels, may reduce blood pressure, and may modestly increase high-density lipoprotein cholesterol levels [51,52]. Common adverse effects of VLCD include fatigue, nausea, constipation, diarrhea, hair loss, brittle nails, cold intolerance, dysmenorrhea, and some increased risk for gallstones, kidney stones, and gout flares. Due to the possibility of hypoglycemia and hypotension in patients treated for diabetes mellitus and hypertension, respectively, blood sugar and blood pressure should be monitored for potential adjustment in applicable metabolic drug treatments. In many cases, anti-diabetes mellitus and antihypertensive drugs might best be reduced in dose or discontinued before start of a VLCD, if this is determined to be in the best safety interest of the patient.

Finally, if insufficient mineral intake occurs with a VLCD, then this may predispose patients to palpitations, cardiac dysrhythmias, and muscle cramps. Weight regain *will* occur if patients are not taught how to maintain healthful eating when transitioning to non-meal-replacement eating patterns or to a higher-calorie diet [51,53].

4. Dietary patterns

4.1. Ketogenic diet (Keto or Modified Atkins Diet)

The Ketogenic Diet is illustrative of a carbohydrate-restricted nutritional intervention that promotes utilization of fat for energy and generates ketosis, which may reduce hunger.

- **Encouraged** [33,54,55]**:**
  - The induction phase allows no more than 20 g of carbohydrates per day from non-starchy vegetables and leafy greens, encourages adequate protein, and includes a higher proportion of dietary fat to reduce insulin levels and generate a state of nutritional ketosis.
  - The ongoing weight reduction phase allows a wider variety of vegetables, seeds and nuts, and low-glycemic fruits (i.e., strawberries and blueberries).
  - The pre-maintenance phase, after the goal weight is achieved, allows increased carbohydrate intake to be slowly increased if weight gain does not occur.
  - In the maintenance phase, 60–90 g of carbohydrates per day is allowed if weight and health benefits are maintained, which may include legumes, whole grains, and fruits.
  - All phases encourage a balance of saturated, monounsaturated, and polyunsaturated fatty acids.
- **Discouraged** [33,54,55]**:**
  - Avoid ultra-processed and refined foods, foods with a high glycemic index/glycemic load, foods rich in *trans* fatty acids.
  - In all but the maintenance phase, limit cereals, breads, grains, dairy products (except cheese), starchy vegetables, and most fruits.
- **Advantages:**
  - May contribute to clinically meaningful weight reduction in patients with pre-obesity or obesity [56].
  - May reduce hunger [33].
  - Lower carbohydrate food intake will typically result in lower postprandial glucose and insulin levels [57].
  - If associated with weight reduction, a ketogenic diet may improve glucose metabolism with improved insulin sensitivity, reduced fasting glucose, and reduced fasting insulin levels [58].
  - May lower diastolic blood pressure [54].
  - May reduce triglyceride and increase high density lipoprotein cholesterol levels [54].
  - Ketonemia may help treat seizures [59].
  - Effects upon physical exercise performance are inconsistent [60].
  - Possible patient-specific adjunct to multifactorial therapy for certain kinds of cancers [61].
- **Disadvantages:**
  - May increase low density lipoprotein (LDL) cholesterol levels, sometimes substantially so in patients with genetic hypercholesterolemia [54] or who increase intestinal cholesterol absorption with weight reduction (see discussion below).
  - May not improve insulin sensitivity in patients not experiencing weight reduction [58].
  - May cause transient fatigue and mild decrease in mental cognition upon the start of a ketogenic diet [56].
  - Effects upon physical exercise performance are inconsistent [60].

4.1.1. Management of the rare patient with moderate/marked increases in LDL cholesterol and/or LDL particle number with ketogenic diet [62]

If clinically meaningful weight reduction is achieved, then the increase in low density lipoprotein cholesterol and/or LDL particle number with ketogenic diet is generally modest [62]. However, the ketogenic diet is sometimes associated with individual, rare cases of moderate to marked increases in LDL cholesterol levels [63]. If this occurs, then a reasonable first step is confirmation and evaluation. Any unexpected or unexplained clinically meaningful change in lipid levels should initially be addressed with repeat lipid testing. If the change in lipid measures is confirmed, then this should prompt evaluation for new onset or worsening of secondary causes of hypercholesterolemia (e.g., diabetes mellitus, hypothyroidism, nephrotic syndrome, liver disease) and recent changes in medications that may worsen cholesterol levels (e.g., some beta-blockers, corticosteroids, amiodarone, cyclosporin, anabolic steroids, protease inhibitors, some diuretics). If it is determined that the weight loss via the ketogenic diet is likely the cause for elevations in low-density lipoprotein cholesterol levels, then this may be because the weight reduction has facilitated an increase in intestinal cholesterol absorption [5]. In severe cases, the clinician might consider evaluation for diet-sensitive genetic dyslipidemias (e.g., sitosterolemia).

If a patient treated with a ketogenic diet is confirmed to have developed moderate/marked increases in LDL cholesterol and/or LDL particle number with ketogenic diet, then management may include:

- Replace dietary saturated fats with polyunsaturated or mono-unsaturated fats.
- Reduce dietary cholesterol.
- Consider a trial of ezetimibe (i.e., if the patient is suspected to be a hyper-absorber of intestinal cholesterol).
- Consider cholesterol-lowering drug treatment (e.g., statin).
- Consider a trial period off the ketogenic diet to determine if elevated lipid levels resolve.

4.1.2. Sitosterolemia is an illustrative example of a diet-sensitive genetic condition that can result in high cholesterol levels [64]

Beta-sitosterolemia (phytosterolemia) is a rare autosomal recessive disorder that may phenotypically resemble heterozygous familial hypercholesterolemia. Beta-sitosterolemia is due to bi-allele mutations in one or both genes encoding for intestinal sterol co-transporters [i.e., adenosine triphosphate binding cassette transporters (ABC) G5 and/or G8]. Loss of function of ABC G5 and G8 impairs the efflux of absorbed consumed plant sterols and animal cholesterol from intestinal and hepatic cells into the intestinal and biliary lumen.

Clinical findings related to beta-sitosterolemia include tendon xanthomas and increased cardiovascular disease risk out of proportion to the patient's lipid profile. Some patients may also have low platelet counts. The degree of elevation in cholesterol levels can vary, with some patients exhibiting marked hypercholesterolemia, despite no immediate family history of hypercholesterolemia. The diagnosis should be suspected in patients with wide fluctuations of cholesterol levels during nutritional changes.

Diagnosis can be made clinically, or biochemically by measuring plant sterol levels (sitosterol, campesterol, and possibly stigmasterol), or documenting bi-allelic loss-of-function mutations in ABC G5 and/or G8. Patients with beta-sitosterolemia may respond poorly to statins but may respond well to reduced dietary plant sterol and cholesterol consumption as well as treatment with bile acid sequestrants. Beta-sitosterolemia responds to cholesterol/sterol absorption inhibitors such as ezetimibe, which is the only drug approved to treat beta-sitosterolemia (i.e., ezetimibe lowers LDL cholesterol and LDL particle number) [65–67].

4.2. Mediterranean Diet

The Mediterranean Diet is not a defined "diet," but rather a generalized term describing several meal pattern variants. The Mediterranean Diet has among the most consistent and robust scientific support in reducing atherosclerotic cardiovascular disease risk [68–71].

- **Encouraged** [72]**:**
  - Olive oil as main source of fat
  - Vegetables, fruit, legumes, whole grains, nuts, and seeds
  - Intake of red wine.
  - Moderate consumption of seafood, fermented dairy products (e.g., cheese and yogurt), poultry, and eggs
- **Discouraged** [72]**:**
  - Limit consumption of high amounts of red meat, meat products, and ultra-processed carbohydrates
  - Saturated fats are often discouraged with the Mediterranean Diet; olive oil is a staple of most definitions of the Mediterranean Diet. However, some Mediterranean cuisine may include lard and butter for cooking, and olive oil for dressing salads and vegetables
- **Advantages:**
  - May reduce the risk of cardiovascular disease
  - The diet is high in olive oil and certain nuts. Therefore, it is high in mono-unsaturated fatty acids (MUFAs) and polyunsaturated fatty acids (PUFAs), which are predominantly omega-3 rather than omega-6 fatty acids.
  - Although the Mediterranean Diet has higher fat content than other common diets (40% of total calories), it is low in saturated fats (less than 10% of calories)
  - Phenol-rich extra virgin olive oil has been shown to exert hepatoprotective effects through the induction of cellular antioxidant response and inhibition of inflammatory pathways (e.g., visceral adipocyte inflammatory cytokine expression) and steatosis. This can also contribute to anti-cancer effects [73].
  - This diet is high in fiber (average 25–35 g a day), fruits, and vegetables that are rich in dietary active compounds like phytochemicals, antioxidant compounds, vitamins, phenolics, and flavonoids. Dietary fiber helps reduce hunger and serum peak glucose levels.
  - It may improve insulin resistance and lipid profiles.
  - It is safe to implement in children and adults.
- **Disadvantages:**
  - Weight loss may be less than a very low-carbohydrate diet [74].
  - Food choices may be more expensive than less healthful foods.

4.3. DASH diet

The "Dietary Approaches to Stop Hypertension" (DASH) is a diet pattern promoted by the U.S. National Heart Lung and Blood Institute, primarily to treat high blood pressure [75,76].

- **Encouraged** [75]:
  - Vegetables, fruits, and whole grains
  - Fat-free or low-fat dairy products
  - Fish, poultry, and lean meats
  - Nuts, seeds, and legumes
  - Fiber and the minerals calcium, potassium, and magnesium
- **Discouraged** [75]**:**
  - Limit sodium: 1,500 - 2,300 mg per day
  - Limit total fat: ~27% of total daily calories.
  - Limit saturated fat: <6% of total daily calories
  - Limit cholesterol: ≤150 mg per day for a 2,100-Calorie eating plan
  - Avoid red and processed meats
  - Avoid sugar-sweetened beverages
  - Avoid foods with added sugars
- **Advantages:**
  - May reduce cardiovascular disease risk
  - May improve blood pressure and dyslipidemia
- **Disadvantages:**
  - May be challenging to maintain
  - Largely eliminates convenience foods
  - May not be ideal for weight loss

4.4. Vegetarian diet

A vegetarian nutritional intervention includes a meal plan consisting of foods that come mostly from plants. Plant-based nutritional intake is generally associated with weight reduction, reduced risk of heart disease (including heart failure), and beneficial effects on metabolic diseases, some cancers, and possibly all-cause mortality [77–85]. However, these potential benefits may be negated when more healthful plant-based whole foods (i.e., with natural fiber and nutrients) are replaced by ultra-processed foods, fried foods, and refined carbohydrates [86]. Vegetarian diets may also result in deficiencies of micronutrients and minerals such as vitamin B12 and iron, which may require clinical monitoring and nutrient replacement when appropriate [87]. Patients who begin a vegetarian diet may benefit from dietitian counseling regarding healthful macro and micronutrient consumption.

Table 4 shows common variants of the vegetarian diet.

- **Encouraged:**
  - Vegetables
  - Fruits
  - Whole grains
  - Legumes
  - Seeds

Table 4
Vegetarian Diet Variants. Common variants of the vegetarian diet, including veganism, lacto-vegetarianism, lacto-ovo vegetarianism, pescatarianism, and flexitarianism [77,78].

VEGETARIAN DIET VARIANTS	
Vegan ("total vegetarian")	Only plant-based foods (e.g., fruits, vegetables, legumes, grains, seeds, and nuts) with no animal proteins or animal by-products, such as eggs, milk, or honey
Lacto-vegetarian	Plant foods plus some or all dairy products (e.g., cheese)
Lacto-ovo vegetarian (or ovo-lactovegetarian)	Plant foods, dairy products, and eggs
Semi- or Partial Vegetarian	Plant foods and may include chicken or fish, dairy products, and eggs, but not red meat
Pescatarian	Plant foods and seafood
Flexitarian	Mostly plant-based foods (minimally processed), with occasional fish, meat, and animal products in moderation

  - o Nuts
  - o Some varieties may include eggs, milk, seafood, and occasional chicken.
- **Discouraged:**
  - o Animal protein from fowl, fish/seafood, beef, pork, and lamb
- **Advantages:**
  - o Plant-based diets may reduce the risk of cardiovascular disease.
  - o Diets high in fruits, vegetables, and fiber are high in antioxidants, polyphenols, and anti-inflammatory phytochemicals and may reduce oxidative stress.
  - o The high-fiber and low-calorie content of plants promotes weight loss and maintenance.
- **Disadvantages:**
  - o Health benefits of a vegetarian diet may not be realized upon consumption of unhealthful, energy dense, ultra-processed, plant-based foods that are high in glycemic index, low in fiber, low in micronutrients, and high in calories and trans fats.
  - o Some vegetarian diets contain high levels of beans, which, without proper preparation, can be high in phytic acid and can cause vitamin deficiencies and poor absorption of iron, zinc, and calcium [88].

4.5. *Therapeutic Lifestyle Change Diet (TLC)*

The TLC Diet is a low-fat meal plan variant that was recommended by the National Cholesterol Education Program, Adult Treatment Panel [89–91]. It was historically the "diet" most utilized in the conduct of lipid clinical trials and is still utilized today in many lipid clinical trials.

- **Encouraged:**
  - o Total fat: 25–35% of daily calories
  - o Polyunsaturated fat: Up to 10% of total daily calories
  - o Monounsaturated fat: Up to 20% of total daily calories
  - o Carbohydrate: 50% to 60% of total calories
  - o Soluble fiber: At least 5–10 g a day, preferably 10–25 g a day
  - o 2 g per day of plant stanols or sterols through foods or dietary supplements
- **Discouraged:**
  - o Limit saturated fat: $< 7\%$ of total calories
  - o Limit cholesterol: < 200 mg a day
  - o Avoid foods with *trans* fatty acids.
- **Advantages:**
  - o Encourages healthful lifestyle habits
  - o May improve lipid levels
- **Disadvantages:**
  - o Requires close tracking of macronutrients that may be difficult for some patients
  - o May have limited weight loss effects

4.6. *Ornish diet*

The Ornish Diet is illustrative of a fat-restricted nutritional intervention [92–94].

- **Encouraged:**
  - o Foods are best eaten in their natural form
  - o Vegetables, fruits, whole grains, and legumes
  - o One serving of a soy product each day
  - o Limited amounts of green tea
  - o Fish oil 3–4 g each day
  - o Small meals eaten frequently throughout the day.
- **Discouraged:**
  - o Limit dietary fat: $< 10\%$ of total daily calories
  - o Limit dietary cholesterol: ≤ 10 mg per day
  - o Limit sugar, sodium, and alcohol
  - o Avoid animal products (red meat, poultry, and fish) and caffeine (except green tea)
  - o Avoid foods with *trans* fatty acids, including vegetable shortening, stick margarines, and commercially prepared foods, such as frostings; cake, cookie, and biscuit mixes; crackers and microwave popcorn; and deep-fried foods
  - o Avoid refined carbohydrates and oils
- **Advantages:**
  - o May reduce the risk of cardiovascular disease
- **Disadvantages:**
  - o The Ornish diet is a very restricted diet that may be hard to maintain long term.
  - o May have limited weight loss effects

4.7. *Paleolithic diet*

The Paleolithic nutritional intervention is based upon a dietary pattern presumed to exist during the Paleolithic period (i.e., lasting 3.4 million years and ending 6000–2000 BCE). It differs from some other diets in that it excludes grains, dairy, and ultra-processed foods [95–97].

- **Encouraged:**
  - o Fresh vegetables, fruits, and root vegetables
  - o Grass-fed lean red meats
  - o Fish/seafood
  - o Eggs
  - o Nuts and seeds
  - o Naturally produced oils (olive, walnut, flaxseed, macadamia, avocado, and coconut)
- **Discouraged:**
  - o Cereal grains
  - o Legumes, including peanuts
  - o Dairy products
  - o Potatoes
  - o Ultra-processed foods
  - o Refined sugar, refined vegetable oils, and salt
- **Advantages:**
  - o Removal of preservatives, fillers, and non-natural additives in food
  - o Anti-inflammatory
  - o Improved satiety with the type of foods in the diet
  - o May promote weight loss and improvement in insulin sensitivity and blood pressure in some individuals
- **Disadvantages:**
  - o May be more expensive than less healthful food choices
  - o Difficult for vegetarians
  - o May not promote clinically meaningful weight loss in many patients

4.8. Fasting (e.g., alternative day, intermittent, time-restrictive feeding)

Fasting is a lack of eating/feeding that may limit overall caloric intake, used therapeutically with the intent to avoid inducing malnutrition [98,99]. Periodic fasting (PF) is defined as limiting food for greater than two consecutive days followed by one week of normal feeding. Intermittent fasting (IF) limits food intake on certain days. IF has three main protocols. In the 5:2 protocol, food is limited for two days, and normal feeding resumes for the other five days of the week. The 2:1 protocol has one day of limited feeding followed by two days of normal meals. The 1:1 protocol alternates between limited and full feeding in equal durations. Another subset of IF is time restricted feeding (TRF), where food is limited to a fixed period during the day [100].

- **Potential advantages:**
  - o Reducing "decision fatigue" regarding food selection [101].
  - o Quickly reversible
  - o May better fit in day-to-day patient scheduling (including religious fasts such as Ramadan) [101–103].
  - o May reduce caloric intake with variable effects on lean body mass, resting metabolic rate, and total energy expenditure, often dependent upon concomitant physical activity [98,99,101,104].
  - o May reduce body weight and improve metabolic parameters (e.g., improve insulin sensitivity, blood pressure, lipids, and inflammatory markers) [98,99,101,104–107].
- **Potential disadvantages:**
  - o Does not necessarily emphasize healthful meal quality [108].
  - o May not be appropriate for patients with eating disorders (e.g., bulimia or binge-eating disorder) [109].
  - o Increases the risk of hypoglycemia among patients with diabetes mellitus who do not appropriately adjust their hypoglycemic antidiabetes drug treatments (e.g., insulin, sulfonylurea) [108].
  - o Unclear if sustainable on a lifetime basis for a lifelong disease (i.e., obesity) [99].
  - o Most long-term evidence of efficacy, health benefits and safety are derived from animal studies [104].
  - o Prolonged fasting (weeks or more) may promote gout, urate nephrolithiasis, postural hypotension, and cardiac dysrhythmias [102].

5. Physical activity

Physical activity can be defined as skeletal muscle movements requiring energy expenditure [110,111]. Physical exercise is physical activity that is "planned, structured, repetitive, and aims to improve or maintain one or more components of physical fitness" [110]. Physical activity also includes skeletal muscle use for leisure enjoyment (i.e., gardening), ambulation and transportation, and work-related activities - often termed NEAT (non-exercise activity thermogenesis). Physical inactivity increases the risk of cardiovascular disease (CVD) [111]. Table 5 describes 10 takeaway messages regarding obesity and physical activity.

Table 5
Top 10 Takeaway Messages: Obesity and Physical Activity. This table lists ten important takeaway messages from the OMA regarding obesity and physical activity.

Top 10 Takeaway Messages: Obesity and Physical Activity
Routine physical activity may improve body composition.
Routine physical activity may improve adiposopathic endocrine and immune body processes.
Physical activity may improve metabolic, musculoskeletal, cardiovascular, pulmonary, mental, sexual, and cognitive health.
Dynamic training may promote weight reduction and may help prevent weight gain or regain.
Resistance training may improve body composition, prevent muscle loss during weight reduction, and increase resting energy expenditure.
In addition to physical exercise, increased energy expenditure can be achieved via increased leisure time physical activity and non-exercise activity thermogenesis (NEAT).
A common physical exercise prescription (FITTE) includes frequency, intensity, time spent, type of activity, and enjoyment.
Metabolic equivalent tasks (METS) are used to assess the intensity of physical exercise, with one MET equal to the amount of energy expended for 1 min while lying down at rest [equal to 3.5 mL of oxygen consumption per kilogram of bodyweight per minute (3.5 mL/kg/min) in a middle-aged male with a normal BMI]. Oxygen consumption per kilogram body weight per minute decreases with increased adiposity and decreased muscle mass [115].
Standing is equal to 2 METS; walking 4 miles per hour is equal to 4 METS; running 10 miles per hour is equal to 16 METS.
Tracking physical activity can be done via a variety of activity logs as well as by taking body composition measurements using a reliable technique.

5.1. Dynamic (Aerobic) training

Moderate physical activity is better than minimal physical activity [112]. At least 150 minutes (2.5 hours) per week of moderate physical activity or at least 75 minutes (1.25 hours) per week of vigorous intensity aerobic exercise has the most health benefits, promotes modest weight reduction, and may help prevent weight gain or regain [113]. Some patients may further benefit from at least 300 minutes (5 hours) per week of moderate physical activity or at least 150 minutes (2.5 hours) per week of vigorous intensity aerobic exercise; this will promote more robust weight reduction and better prevent weight regain after weight reduction [113].

5.2. Resistance (Anaerobic) strength training [112,114]

Resistance training involves the strengthening of major muscle groups two or more times per week. The emphasis is on increasing total muscle mass, which is most efficiently achieved by training large muscle groups which may increase the percentage of lean body mass. Resistance training utilizes appropriate weight-lifting techniques using a variety of free weights, machines, and resistance bands, which may reduce boredom and provide greater flexibility regarding scheduling and location. In resistance training, development of "core" muscles is important for posture and balance stabilization; this includes muscles located at the midsection of the body (i.e., abdomen, back, hips).

During negative caloric balance, resistance training can help mitigate muscle loss and limit reduced resting metabolic rate. Short-term sore muscles may be expected. Sore joints suggest poor technique, with a possible need for medical evaluation and physical activity modification. In resistance training, it is often best to prioritize muscle mass metrics (e.g., muscle tape measurements) versus the amount of weight lifted.

6. Physical activity and thermogenesis

6.1. Exercise Activity Thermogenesis (EAT)

EAT is planned, structured, and repetitive physical activity conducted with the objective of improving health (e.g., sports and gym activities). Similar to the fuel of gasoline for motor vehicles, available energy in muscle (i.e., the "fuel" of adenosine triphosphate or ATP) is used to facilitate motion (mechanical work), with some energy released as heat (thermogenesis). The efficiency in converting ATP to muscle mechanical work is around 30%; dynamic exercise efficiency can be increased with training and weight reduction [116]. Muscle work efficiency may decrease with resistance training [117], resulting in more energy expended as heat.

Whether at steady-state or during physical activity, body temperature is tightly regulated by the autonomic nervous system. At steady state in muscle, adipose tissue, and other body tissues, generation of body heat is largely regulated by the function of mitochondria uncoupling proteins, with increasing mitochondrial inefficiency resulting in more body energy generating heat than energy stored, and with most of the body's stored

energy being stored in triglyceride-containing adipose tissue. During physical activity, an increase in body temperature triggers the central nervous system (e.g., hypothalamus) to cool the body via increased dilation of skin smooth muscle blood vessels, increased heart rate, and increased sweat production, all of which help facilitate heat loss during physical exercise [116].

6.2. Non-Exercise Activity Thermogenesis (NEAT)

NEAT is defined as energy expenditure not typically considered physical exercise (e.g., maintaining posture, standing, stair climbing, fidgeting, cleaning, singing, and other activities of daily living). Walking can be considered EAT or NEAT. NEAT often represents the widest variance in total energy expenditure among individuals and can range between 150 and 500 kcal/day, which is often more than bouts of physical exercise. Along with genetic/epigenetic, biological (i.e., increased proportion of brown adipogenesis), and environmental factors, NEAT is an example of a behavioral factor that can help explain perception that some individuals are "naturally lean" and/or maintain a healthier body weight compared to others, even with the same caloric intake and same routine "exercise" activity [118–120].

7. Steps

One of the most common forms of physical activity is steps. Increasing the number of steps taken per day can be achieved by altering daily activity, or by scheduled walking/running. Compared to being seated for hours (such as in the workplace), it is better to walk at least 10 minutes per hour, which might be better achieved by implementing behavior modifications such as preferentially taking stairs instead of elevators and parking further from a destination. The number of steps per day can be monitored via a pedometer or other tracking device. The average number of steps for U.S. adults is < 5,000 steps per day. In terms of number of steps taken, < 5,000 steps per day is considered sedentary, 5,000–7,500 steps per day is low active, 7,500–10,000 steps per day is somewhat active, and ~10,000 steps or more per day is active [121].

Although variable due to multiple factors, in general, one Calorie (kcal) is "burned" for every 20 steps (i.e., 4000 steps/20 = 200 Calories). 10,000 steps per day x 7 days per week x one Calorie per 20 steps = 3500 Calories burned per week. The adage of "3500 Calories per pound of fat" is a frequently referenced energy content approximation for a pound of fat. However, this calculation was developed to determine the amount of energy in one pound of fat measured via calorimetry. The amount of physical activity required to "burn 3500 Calories" depends on body weight, body efficiencies that depend on body weight, and body weight changes. During negative caloric balance and weight loss, dynamic adaptations in body energetics occur (i.e., changes in resting metabolic rate, skeletal muscle efficiencies) with greater energy expenditure and/or further reduction in energy intake required to achieve the same rate of weight reduction [122,123]. Fig. 5 describes the Obesity Medicine Physical Activity Goals, which are consistent with physical activity goals by other organizations, such as the Physical Activity Guidelines for Americans.

8. Benefits of physical activity

8.1. Benefits of physical activity not exclusive to obesity

Physical activity has been shown to provide the following benefits not exclusive to obesity [125–132]:

- Improve metabolic health
- Improve musculoskeletal health
- Improve cardiovascular health
- Improve pulmonary health
- Improve neurological health
- Improve mental health (e.g., improve mood, promote happiness & sense of well-being, reduce stress)
- Improve sexual health
- Improve cognitive heath
- Reduce risk of cancer, and improve response to cancer treatments

8.2. Beneficial effects of physical activity to patients with obesity

Physical activity offers additional benefits to patients with obesity, including the following [126,127,133]:

- **Treatment of fat mass disease:** Physical activity-related weight reduction, or physical activity prevention of body fat regain after weight loss, may help improve pathogenic biomechanical complications of obesity, such as sleep apnea and osteoarthritis.
- **Treatment of adiposopathy or sick fat disease:** In addition to helping to promote weight reduction and especially chronic management of obesity, increased physical activity may potentially improve body composition, improve adiposopathic physiologic disturbances, possibly improve adipocyte function ("train" fat cells), improve insulin sensitivity, increase mitochondrial biogenesis, and increase browning ("beiging") of fat cells.

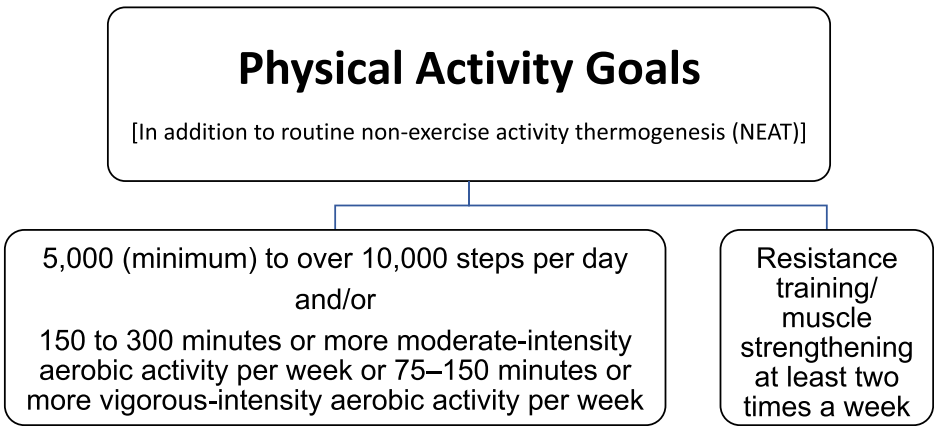

Fig. 5. Obesity Medicine Association Physical Activity Goals. OMA physical activity goals include steps per day, specified exercise intensities and durations, and recommended resistance training sessions per week [118,121,124]. The OMA physical activity goals specifically include steps as a way to achieve daily, dynamic physical activity goals, with even greater aerobic activity providing additional health benefits.

9. Physical activity and evaluation of the patient with obesity

9.1. Essential and targeted medical evaluation to ensure safety before beginning new physical exercise program

The following evaluations are considerations before beginning a new exercise program [134]:

- Assess current physical activity level
- Assess readiness
- Agree upon patient expectations and goals (with optional written "contract")
- Assess potential need for medical testing/evaluation (i.e., cardiac stress testing, pulmonary function tests, musculoskeletal assessment, etc.)
- Assess mobility, fitness, and potential equipment needs or modifications
- Potential adjustment of medications
  - o Before start of physical activity plan (e.g., diabetes and blood pressure medications)
  - o During implementation of physical activity plan
- Optimal default backup plan

9.2. Mobility

An assessment of patient mobility will help determine the most appropriate individual exercise program. The following are recommended based on levels of mobility [135,136]:

- **Unable to walk:** Seated exercise program, arm exercises (i.e., arm cycling), swimming/aquatic exercises (e.g., shallow or deep-water exercises), resistance/gravity-mediated physical activity (e.g., seated leg raises, band exercises, dumbbells). Consider physical therapy evaluation:
  - o Rehabilitation and physical therapy guided activity program
  - o Set physical activity goals.
- Assess the situation for special equipment needs.
- **Limited mobility:** Walking, swimming/aquatic exercises (e.g., shallow or deep-water exercises), resistance/gravity-mediated physical activity (e.g., seated leg raises, band exercises, dumbbells), and balance exercises (e.g., walking in a straight line, standing on one foot, standing/sitting up and down, targeting "core" muscles) are recommended. Assess the situation for special equipment needs.
- **No substantial limitations to mobility**: The exercise/physical activity prescription plan will be driven by the patient and guided by the clinician. Assess the situation for special equipment needs.

10. Additional physical activity recommendations and tracking

10.1. Leisure time physical activity

The following activities are encouraged to promote leisure time physical activity [137,138]:

- Engage in competitive sport activities involving substantial physical activity, best if on a routine basis.
- Engage in non-competitive sports such as running, hiking, cycling, cross-fit training, etc.
- Outdoor warm-weather physical activity in sunlight may facilitate negative caloric balance. and have other health benefits, with a caveat being the need to avoid excessive sun exposure.
- Engage in physical activity sport alternatives, such as dancing.

10.2. Transportation-related and occupational Non-Exercise Activity Thermogenesis (NEAT)

Several behavior modifications related to transportation and occupation can increase NEAT, including the following recommended activities [137,138]:

- Walk short distances instead of taking automated transportation.
- Take stairs instead of elevators.
- Carry overnight travel bags instead of using rollers (i.e., akin to a farmer's walk exercise).
- Utilize an active work environment (i.e., standing desks, walking desks).
- Avoid prolonged inactivity.
- Take breaks from inactivity.
- Walk, stand, and complete incidental movements throughout the day.

10.3. Exercise Prescription (FITTE)

The FITTE exercise prescription can help promote and measure physical activity and is defined as follows [134]:

- ***F***requency
- ***I***ntensity
- ***T***ime spent
- ***T***ype
- ***E***njoyment level

10.4. Exercise Prescription (FITT-VP)

A variation on FITTE, FITT-VP, is defined as follows [139,140]:

- ***F***requency
- ***I***ntensity
- ***T***ime or duration
- ***T***ype or mode
- ***V***olume or total energy expenditure of the exercise
- ***P***rogression of the exercise

10.5. Metabolic Equivalent Tasks (METS)

METS are used to assess the intensity of physical exercise (kcal = METS x weight x time) [141,142]:

- Equal to the amount of energy expended in 1 min while lying down at rest
- Equal to ~3.5 mL of oxygen consumption per kilogram of bodyweight per minute (3.5 ml/kg/min), with oxygen consumption decreased with increased age and increased adiposity
- Standing = 2 METS
- Walking 4 miles per hour = 4 METS
- Running 10 miles per hour = 16 METS

10.6. Tracking progress

A variety of methods and devices can be used to track physical activity-related progress, which can be helpful in motivation and goal setting [143–148]:

- Daily activity logs (written or electronic)
- Pedometer/accelerometer logs
- Dynamic training metrics (i.e., miles run, laps swam, etc.)

- Resistance training metrics (i.e., muscle-circumference measurements, reps, sets, etc.)
- Percent body fat measurements

11. Conclusions

This OMA Clinical Practice Statement on Nutrition and Physical Activity discusses basic principles regarding nutrition and physical activity. It is hoped that an understanding of essential nutrition and physical activity principles may help clinicians better manage patients with obesity.

Transparency [149]

This manuscript was largely derived and edited from the 2021 Obesity Medicine Association (OMA) Obesity Algorithm. Beginning in 2013, OMA created and maintained an online Adult "Obesity Algorithm" (i.e., educational slides and eBook) that underwent yearly updates by OMA authors and was reviewed and approved annually by the OMA Board of Trustees. This was followed by a similar Pediatric "Obesity Algorithm," with updates ~ every two years by OMA authors. Authors of prior years' version of the Obesity Algorithm are included in Supplement #1.

Group composition

Over the years, the authors of the OMA Obesity Algorithm have represented a diverse range of clinicians, allied health professionals, clinical researchers, and academicians. (Supplement #1) The authors reflect a multidisciplinary and balanced group of experts in obesity science, patient evaluation, and clinical treatment.

Author contributions

HEB transcribed the first draft from the 2021 OMA Adult Obesity Algorithm. LA, SMC, LR, ABI, KB, AG, SK, DC MS, and HEB then reviewed, edited, and approved the document for peer review by the OMA Board of Trustees.

Managing disclosures and dualities of interest

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Evidence

The content of the OMA Obesity Algorithm and this manuscript is supported by citations, which are listed in the References section.

Ethics review

This OMA Clinical Practice Statement manuscript was peer-reviewed and approved by the OMA Board of Trustee members prior to publication. Edits were made in response to reviewer comments and the final revised manuscript was approved by all the authors prior to publication. This submission did not involve human test subjects or volunteers.

Conclusions and recommendations

This Clinical Practice Statement is intended to be an educational tool that incorporates the current medical science and the clinical experiences of obesity specialists. The intent is to better facilitate and improve the clinical care and management of patients with pre-obesity and obesity. This Clinical Practice Statement should not be interpreted as "rules" and/or directives regarding the medical care of an individual patient. The decision regarding the optimal care of the patient with pre-obesity and obesity is best reliant upon a patient-centered approach, managed by the clinician tasked with directing an individual treatment plan that is in the best interest of the individual patient.

Updating

It is anticipated that sections of this Clinical Practice Statement may require future updates. The timing of such an update will depend on decisions made by *Obesity Pillars* Editorial team, with input from the OMA members and OMA Board of Trustees.

Disclaimer and limitations

Both the OMA Obesity Algorithms and this Clinical Practice Statement were developed to assist health care professionals in providing care for patients with pre-obesity and obesity based upon the best available evidence. In areas regarding inconclusive or insufficient scientific evidence, the authors used their professional judgment. This Clinical Practice Statement is intended to represent the state of obesity medicine at the time of publication. Thus, this Clinical Practice Statement is not a substitute for maintaining awareness of emerging new science. Finally, decisions by practitioners to apply the principles in this Clinical Practice Statement are best made by considering local resources, individual patient circumstances, patient agreement, and knowledge of federal, state, and local laws and guidance.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.obpill.2021.100005.

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Medical News & Perspectives

Trauma-Informed Care May Ease Patient Fear, Clinician Burnout

Bridget M. Kuehn, MSJ

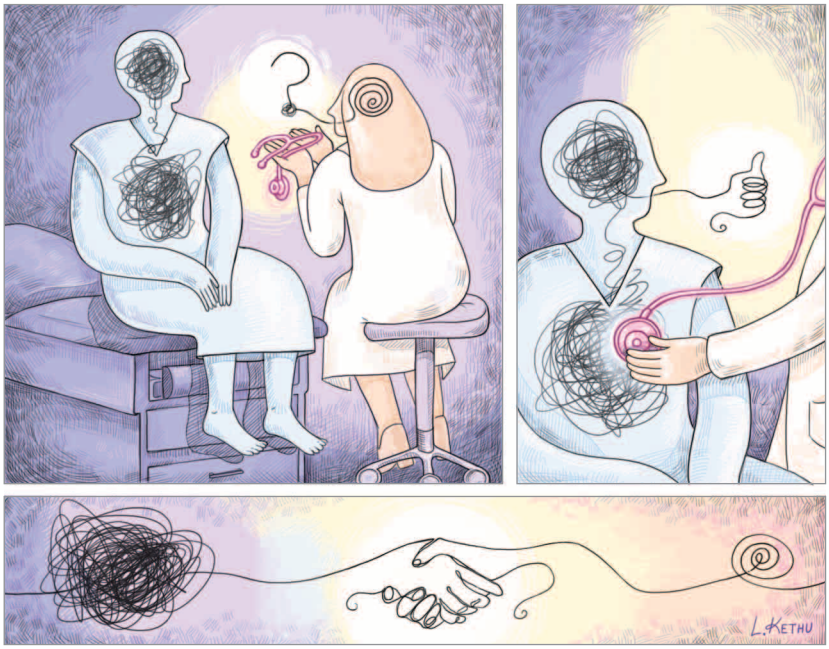
For many sexual assault survivors whom Anita Ravi, MD, MPH, sees as a New York City–based family physician, the prospect of even basic medical care can be frightening. Some have put off Papanicolaou tests and mammograms for years or even decades.

To help them, Ravi has adopted a trauma-informed approach that works to restore patients' trust and give them a greater sense of control over their visit. This may include asking permission before touching and suggesting alternatives to certain procedures that make them uncomfortable. For example, she may offer patients who require a throat or vaginal swab the option of doing it themselves.

"It's essential to give people the opportunity to know all the steps that are going to happen and say, 'If that doesn't work for you, we can try this other way,'" said Ravi.

Trauma-informed care is already widely used in behavioral health, with guidance available from the US Substance Abuse and Mental Health Services Administration (SAMHSA). But it's also increasingly being applied in other settings including primary care, obstetrics and gynecology, and emergency departments.

In addition to addressing patient care, the approach recognizes that some clinical interactions can reevoke physicians' own past traumas or transmit secondary trauma, said Andrea Garroway, PhD, a senior instructor in the departments of psychiatry and medicine at the University of Rochester School of Medicine and Dentistry in New York.



These interactions can hurt physicians and patients alike. "A [clinician's] ability to bring a trauma-informed approach to care is dependent on their own well-being," Garroway said. "They can bring the most empathy, understanding, and compassion to these conversations if they've taken care of themselves emotionally."

Universal Precautions

Any event or series of events—whether experienced or witnessed—that profoundly affects a person's social, physical, psychological, and physiological well-being can traumatize them, according to Linda Henderson-Smith, PhD, who directs trauma-informed services for children at the National Council for Behavioral Health. These events are prevalent: 70% of US adults have had at least 1 traumatic

What Is Trauma-Informed Care?

- Being aware that many patients have a history of trauma
- Recognizing trauma symptoms and patients' resilience
- Responding to agitated patients in a nonjudgmental, supportive way
- Ensuring physical and emotional safety for staff and patients
- Being trustworthy and transparent with patients, family members, and staff
- Promoting recovery and healing for those who have experienced trauma
- Making decisions in partnership with patients and avoiding a power imbalance in interactions
- Empowering patients and giving them choice and control over the care they receive
- Promoting self-care among staff and clinicians

Adapted from the National Council for Behavioral Health

experience in their lifetime, and past trauma is an almost universal experience for patients with substance abuse and mental health disorders, according to SAMHSA.

For people with a history of trauma, clinical settings like a noisy, chaotic emergency department or a small, enclosed examination room may trigger trauma-related symptoms.

"When you're treating that patient [who] is a victim of a gunshot wound at the bedside, you might not just be treating their injuries from today," said Kyle R. Fischer, MD, MPH, a clinical assistant professor at the University of Maryland School of Medicine and lead author of a guide to trauma-informed care in the emergency department. "They also might be having a flare-up of their posttraumatic stress disorder [from previous trauma] at that exact moment."

Recognizing trauma symptoms and taking an empathetic approach can help clinicians navigate such complex patient interactions and deescalate a situation when a patient becomes agitated, Fischer said.

Scott M. Surico, BSN, RN, an emergency services education coordinator at Hoag Hospital in Newport Beach, California, agreed. In 2018, Hoag nurses, technicians, and security staff trained in trauma-informed care as part of an Institute for Healthcare Improvement pilot that included 8 US emergency departments. The education enabled them to reduce the use of patient restraints.

"The biggest change was that nurses came back and said, 'When I just acknowledge they are upset and I understand that upset, it takes about 40% of their agitation right off the top,'" Surico said. As a result, nurses reported being able to better care for patients experiencing a behavioral health crisis.

Because many trauma sources, such as a history of child abuse or sexual assault, may not be apparent to a clinician, some have chosen to implement trauma-informed care as a sort of universal precaution.

Zufall Health, a federally qualified health and dental center serving low-income and underserved communities in New Jersey, adopted this policy across its clinics starting in October 2018. The center was 1 of 7 US primary care organizations to pilot a trauma-informed program created by the National Council for Behavioral Health with funding from Kaiser Permanente.

Staffers at Zufall first assessed whether the clinic's environment was comfortable and welcoming to all patients. (Was the color scheme muted and soothing? Were posters on the wall inclusive? How might patients perceive the security guards?) They then trained all new and existing employees on better ways to interact with patients who may show signs of trauma. For example, they now emphasize a nonjudgmental approach with disruptive patients.

"Of course, you have to stay safe, but you have to think, 'What happened to this person that they are reacting in this way?'" said Rina Ramirez, MD, Zufall's chief medical officer.

Asking about patients' preferences is another important component that clinicians can integrate into routine care. The practice shows patients respect and may also help to avoid inadvertently retraumatizing them, said Lauren Sobel, DO, a fourth-year medical resident at Boston University Medical Center.

A survey by Sobel and her colleagues found that women with a history of sexual assault have specific preferences for their obstetric care. They may find the word "rape" retraumatizing when it's used to describe their past experiences, for example. They may want control over who's in the room during delivery, how exposed their bodies are, and to whom their history is disclosed. Asking all women about such preferences can ensure that those who choose not to disclose a previous assault still receive trauma-informed care, Sobel explained.

Taking these steps can also increase patients' satisfaction with their care, said Garroway, who developed a trauma-informed curriculum for medical residents in the VA Connecticut Healthcare System. In her experience, patients appreciate physicians who understand their story and the adversity they have overcome and who recognize their strength and resilience.

Clinicians said the feedback they've gotten from patients so far has been positive. Increasingly, Ravi's patients ask her for referrals to trauma-informed clinicians in other specialties. Ramirez said she and her team were recently brought to tears by the words in a patient's letter: "I feel safe in your space, I feel safe in your clinic."

Collateral Benefits

Both the National Council for Behavioral Health and the Institute for Healthcare Improvement plan to publish results from their pilot programs this year. Preliminary data and anecdotes suggest the initiatives may improve clinician safety and morale.

"We are starting to see a change in our culture," Surico said. "Patients get the help they need, and nurses and doctors feel more fulfilled in treating these patients."

He noted that Hoag's emergency department has seen incidents of patient violence against staff decline from an average of 12 to 18 per month to about 5 since implementing trauma-informed care training. The results and staff reviews so impressed administrators that they implemented a 2-hour trauma-informed care training throughout the hospital and in a second emergency department within the same health system.

"It spreads like a medicine through the blood system when people start seeing it in action," Surico said. Although it's too soon to know if the initiative will affect staff burnout and turnover, he said he suspects that it will.

Ravi cofounded the Purple Health Foundation, which helps women and girls who have experienced gender-based violence. She said that learning about trauma-informed care helped her recognize and manage her own secondary trauma, which can occur when clinicians hear or witness disturbing details about their patients' experiences.

Initially, working with sexual assault survivors left Ravi feeling happy that they had connected with health care. But days later she'd break down crying in line at a coffee shop remembering the details they had shared. "I didn't understand what was happening to me while it was happening," she said. But now she's built a supportive team, including colleagues and a mental health professional to whom she can turn.

> For people with a history of trauma, clinical settings like a noisy, chaotic emergency department or a small, enclosed examination room may trigger trauma-related symptoms.

Fischer said his understanding of trauma-informed care inspired him to better support his medical students, residents, and fellow staff when they experience a difficult situation or patient death. These deaths can profoundly affect medical students, he said, making it important to offer them support and opportunities to debrief.

He has also learned to ask for support himself. Recently, when a patient who was enrolled in his department's violence intervention program was shot and killed, he felt on edge during his next shift. He told the resident he was working with how he felt. Sharing his emotions gave him the feeling that he was ready to move on.

Henderson-Smith said that although the prevailing culture of medicine may encourage physicians to "just take it," promoting self-care for clinicians is an important component of trauma-informed care.

There are countless ways to do so, big and small. A clinical psychologist at the VA Connecticut Health System taught medical residents a brief meditation they could do while washing their hands, for instance. Employees at Zufall's clinics are invited to participate in a guided deep-breathing exercise broadcast over speakers twice a day. And Ramirez and her colleagues have implemented half-day retreats twice a year to give Zufall staff a chance to talk, share ideas, and work on more supportive interactions with each other.

"We're taking care of ourselves to take care of everybody else," she said. ■

Note: Source references are available through embedded hyperlinks in the article text online.

Correction: This article was corrected online February 7, 2020, to amend an institutional affiliation and describe the mission of a foundation.

QUICK UPTAKES

Concussions Linked With Erectile Dysfunction in Football Player Study

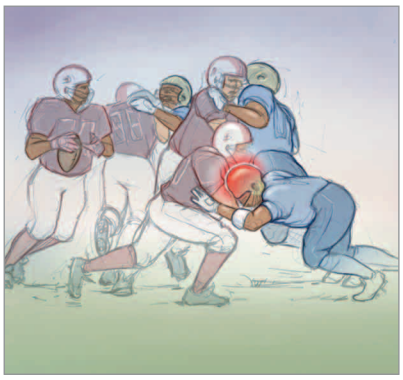
Jennifer Abbasi

The Super Bowl generates gut-busting menus, fierce rivalries, and possibly some unexpected health consequences for the game's players. A recent *JAMA Neurology* study found that the more concussion symptoms former National Football League (NFL) players had during their careers, the more likely they were to have been prescribed medication for low testosterone levels or erectile dysfunction (ED) later in life. Knowing that head injuries may cause sexual dysfunction could help more men and their physicians overcome the stigma of ED and talk about treatment.

Audio

What's New

The research fills a knowledge gap. One large study found an association between ED and single traumatic brain injuries in the general Taiwanese population. So far, only small studies have linked elite athletes' head injuries with hormone insufficiencies and sexual dysfunction. With 3409 participants, this is the first large study to make the connection in athletes and to show a dose-response relationship: as self-reported concussion symptoms increased so did the odds of having indicators of ED and low testosterone levels. The study was also large enough to assess a variety of confounding factors.



The Design

The research is part of the Football Players' Health Study, a Harvard University project to understand US-style football's health risks and benefits. For the ED study, participants on average were about 53 years old and had played around 7 seasons. Former offensive linemen made up the largest group of respondents, almost 22%.

Researchers tallied concussion symptom scores by adding up the number of head injury–related symptoms that retired players reported on questionnaires, like loss of consciousness, seizures, or memory problems. The researchers grouped the players into quartiles based on their scores and then examined whether the groupings were associated with the athletes' self-reported low testosterone and ED medication recommendations or prescriptions.

They also adjusted for the players' demographic characteristics, current health factors, and football-related exposures (like the position they played, their body mass index at the time, and their self-reported performance-enhancing drug use).

What We've Learned

- Nearly 23% of participants reported that a physician had recommended or prescribed ED medication—indicators of having the condition—and half of those participants were currently taking it.
- More than 18% of participants said they had been recommended or prescribed low