CLINICAL RESEARCH GAPS IN

Pediatric Obesity Pharmacotherapy

White Paper

NCCOR

Suggested Citation:

National Collaborative on Childhood Obesity Research (NCCOR). (2026). Clinical Gaps in Pediatric Obesity Pharmacotherapy [White paper]. https://www.nccor.org/projects/clinical-research-gaps-in-pediatric-obesity-pharmacotherapy/

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Executive Summary

Pediatric obesity affects more than 21 percent of children and adolescents in the United States and contributes to substantial physical, psychological, social, and economic burdens across the lifespan.[1] Recent advances in obesity treatment include the approval and growing use of glucagon-like peptide-1 (GLP-1) and other obesity medications (OMs), expanding therapeutic options for youth who may not achieve or sustain improved health outcomes with lifestyle interventions alone. However, the rapid evolution of the treatment landscape has outpaced the evidence needed to guide day-to-day decision-making in real-world health care settings.

To address this gap, NCCOR (the National Collaborative on Childhood Obesity Research) convened the "Clinical Research Gaps in Pediatric Obesity Pharmacotherapy" workshop, bringing together experts in pediatric medicine, nutrition, physical activity, mental health, public health, and lived experience. Building on past efforts, their task was to develop actionable, clinically relevant research priorities and tools that could support practitioners over the next two to three years in the initiation, maintenance, and discontinuation of OMs for youth.

Using a structured Nominal Group Technique process that included virtual and in-person convenings, participant reflections, case studies, expert review, and prioritization exercises, the workshop generated an initial list of prospective research questions. These questions spanned five priority domains: 1) GLP-1 treatment initiation, selection, duration, and discontinuation; 2) GLP-1 treatment effects and outcomes; 3) mental and behavioral health; 4) nutrition and physical activity assessment, monitoring, and counseling; and 5) health behavior and lifestyle treatment.

Over the course of a year, 27 national experts in pediatric weight management refined the ideas into a carefully curated set of 35 high-priority research questions along with suggested research protocols, outcome measures, and clinical tools needed to address the most pressing and actionable evidence gaps. This white paper describes the deliberation process and proposes gaps that can guide near-term research, support evidence generation, and accelerate improvements in the quality, consistency, and effectiveness of pediatric OM utilization.

Rather than an exhaustive list of research questions, NCCOR's central emphasis is timeliness and applicability. Clinicians—particularly those on the front lines of pediatric care—need evidence that can directly inform decision-making in the near term, especially in the context of emerging pharmacotherapies such as GLP-1–based treatments. If addressed, these 35 high-priority research questions have the strong potential to generate evidence that can equip practitioners with the knowledge necessary to deliver standardized, high-quality, evidence-based care to the children and families they serve.

Academic journals, professional societies, and research funders are encouraged to consider not only the prioritized research questions, but also the collected research protocols, outcome measures, and tools presented in this white paper. When studies publish sufficient details to replicate successful interventions, it helps ensure translation and dissemination of research findings to real-world practice. Together, NCCOR's collection of research questions, protocols, and outcomes to address gaps in pediatric obesity pharmacotherapy is a resource to guide future research and accelerate improvements in the quality and consistency of care for youth with obesity.

Background and Impetus for Project

In recent years, the treatment landscape for pediatric obesity has shifted rapidly with the U.S. Food and Drug Administration (FDA) approval of newer generation, highly effective obesity medications (OMs) for youth, including glucagon-like peptide-1 (GLP-1) receptor agonists in December 2022. These advances have expanded treatment options for youth who do not achieve meaningful or sustained improvements in health outcomes through behavioral and lifestyle changes alone. In 2023, the American Academy of Pediatrics (AAP) released the Clinical Practice Guideline for the Evaluation and Treatment of Children and Adolescents with Obesity, which recommends offering pharmacotherapy as an adjunct to health behavior and lifestyle treatment for youth aged 12 years and older with obesity, when medically appropriate. As a result, there has been a rapid rise in the proportion of adolescents aged 12–17 years with obesity receiving prescriptions for these medications; one study of a large electronic health record dataset found a >300% increase in OM prescriptions between 2020 and 2023. However, the absolute percentage of adolescents with obesity who received a prescription remained low (0.5% in 2023).[2] A 2026 study examining only prescriptions for GLP-1 receptor agonists in a large electronic health record dataset similarly found a rapid rate of rise of prescriptions but low overall prescription prevalence (from 0.12% in 2021 to 1.38% in 2025). Importantly, there were substantial disparities in prescribing by sex, race/ethnicity, socioeconomic factors, and insurance coverage.[3]

Although clinical developments in obesity treatment represent important progress, they also have created a growing gap between regulatory approval, clinical guidance, and the evidence needed to support day-to-day decision-making in real-world health care settings. Clinicians are increasingly prescribing OMs to youth, yet there is little evidence-based guidance to inform how best to initiate, titrate, discontinue, and monitor these therapies over time. Critical questions unique to the pediatric population remain unanswered regarding medication selection, optimal dose and duration of treatment, strategies for withdrawal or dose reduction, and monitoring for side effects and adverse events, including potential impacts on muscle mass, bone health, micronutrient status, mental health, pubertal development, and more.

These gaps are particularly salient in pediatric care, as treatment must also account for ongoing growth and development, family dynamics such as parenting, and broader community contexts like schooling and after-care. Much of the existing evidence base for obesity pharmacotherapy has not adequately addressed contextual factors at the family and community level, such as how the food environment, opportunities for physical activity, mental health supports, and insurance coverage influence treatment effectiveness, adherence, and safety. As a result, clinicians lack clear guidance on how to support youth and their families when taking OMs in ways that promote healthy behaviors, mitigate risks, and reduce differences in access and outcomes.

The need to address these challenges was highlighted during the 2023 workshop, "Pharmacotherapy for Obesity in Children and Adolescents: State of the Science, Research Gaps, and Opportunities," hosted by the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK).[4] The workshop convened scientific experts, clinicians, and patient advocates to assess the current evidence base

and identify priority research needs that could build a strong evidence base to guide treatment decisions and collect data on long-term safety.

The NIDDK workshop identified substantial gaps related to clinical trial design, long-term safety, treatment outcomes beyond body mass index (BMI), care delivery models, and ensuring access to pharmacotherapy. Importantly, it also emphasized patient and caregiver perspectives, underscoring the importance of transparency, shared decision-making, stigma-free care, and research that reflects the lived experience.

Although the NIDDK workshop provided a critical synthesis of the state of the science, it also made clear that additional work was needed to operationalize these findings into practical, prioritized research questions that could inform clinical practice and implementation.

To address these challenges, NCCOR (National Collaborative on Childhood Obesity Research) convened a workshop titled "Clinical Research Gaps in Pediatric Obesity Pharmacotherapy." This workshop brought together a small multi-disciplinary group of experts for an intensive set of presentations, reflections, and discussions centered on pediatric clinical obesity care, with special attention to provider and patient perspectives. The objective of the workshop was to understand current practice and identify research gaps and priority research questions that, when answered, could help health care practitioners over the next two to three years in the process and practice of prescription, maintenance, and discontinuation of GLP-1s and other OMs for youth, and support for their caregivers.

Building on the NIDDK workshop and related NCCOR efforts, this workshop was designed to move beyond high-level identification of gaps toward the development of actionable research questions that reflect real-world clinical challenges. Drawing a parallel to the evolution of evidence-informed practice in pediatric bariatric surgery, NCCOR sought to support a similar trajectory for obesity pharmacotherapy—one in which research, quality improvement cycles, and implementation science collectively inform standardized, expert-informed approaches to care, including appropriate adjunct nutrition, physical activity, and behavioral interventions.

WHAT DO WE MEAN WHEN WE SAY "LIFESTYLE SUPPORT?"

Lifestyle support refers to the behavioral treatment components aimed at improving health outcomes by modifying daily activities and environmental factors. This approach focuses on physical activity, nutrition, sleep, stress management, and/or related habits, recognizing that these behaviors are shaped by individual, social, cultural, and contextual influences.

Throughout this whitepaper we have purposefully chosen to discuss lifestyle supports as distinct from the term intensive health behavior and lifestyle treatment (IHBLT). IHBLT refers to an evidence-based multidisciplinary and multicomponent health and behavior intervention that offers a minimum of 26 contact hours over 3–12 months in youth with overweight and obesity. The primary studies showing the effectiveness of IHBLT included populations that were not taking obesity medications (OMs). To date, studies of youth taking OMS have included varying levels of nutrition and physical activity supports. Little is known about what type of lifestyle supports are needed that will work together with OMs to improve eating habits, dietary quality, physical activity, maintain lean muscle mass, and prevent disordered eating or other unintended side effects.

Overview of Workshop Structure

NCCOR's "Clinical Research Gaps in Pediatric Obesity Pharmacotherapy" workshop was designed as a year-long collaborative process that combined three virtual meetings, a two-day in-person convening, and six months of sustained post-meeting engagement to identify and prioritize research gaps in pediatric obesity pharmacotherapy. The project brought together 27 multidisciplinary experts representing clinical medicine, nutrition, physical activity, mental health, public health, and lived experience with obesity (see **Appendix A** for full list of experts). Participants were selected based on their expertise in prescribing OMs, including GLP-1 receptor agonists, to youth or in caring for pediatric patients receiving these treatments. Seven participants served as workshop co-chairs, helping to design the process, guide discussions, and oversee the identification, refinement, and prioritization of research gaps.

A foundation of the structure for the workshop series was the five-step Nominal Group Technique, a process in which each step progressively refined the workshop focus through participant input, expert review, discussion, and prioritization. This iterative process enabled the group to move from broad idea generation to the development of a focused set of high-priority research gaps and recommendations for the field.

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A Closer Look at the "Nominal Group Technique"

The agenda, structure, and direction of the workshop were based on input from workshop attendees via the five-step Nominal Group Technique. In this format, each step further refined the workshop focus through participant input, expert review, and prioritization.

Below are highlights of how the Nominal Group Technique was applied. Detailed descriptions of each phase of the workshop are included throughout the white paper.

1. Idea generation: The prioritization survey

Workshop participants completed an initial prioritization survey based on their expertise, ranking their top three priority gap areas to explore related to the prescription of and treatment with GLP-1s among youth. Three topic areas were overwhelmingly selected by participants: GLP-1 treatment initiation, selection, duration, and discontinuation; GLP-1 treatment effects and outcomes; and behavioral and lifestyle interventions.

2. Idea clarification: Case studies and participant reflections

During virtual meetings 2 and 3, workshop co-chairs presented case studies of their experiences prescribing GLP-1s and/or treating youth already on GLP-1s, with a specific focus on each of the three priority gap areas mentioned above. The case studies provided insights into provider, patient, and parent perspectives and shed light on current practice.

During the case study presentations, workshop participants were asked to capture their reflections in an online form that included the following questions:

- What was the most eye-opening part of the case study to you?
- Based on the case study, what is a research question you think is important to consider?
- What tools or resources exist in this area to support clinicians?
- What tools or resources are needed in this area to support clinicians?

3. Idea prioritization: Collation and processing of participant input

The workshop planning committee compiled participants' case study reflections into a single document for each question prompt and used artificial intelligence (AI) to efficiently review and consolidate responses. This process generated the following documents:

- A list of 117 prospective research questions, grouped by commonly recurring themes
- A list of existing tools and resources in the field to support clinicians prescribing GLP-1s to youth
- A list of tools and resources that are needed to support clinicians prescribing GLP-1s to youth

All three documents underwent multiple rounds of review by the workshop planning committee to ensure scientific accuracy, rigor, and relevance. The 117 research questions were condensed into a final list of 105 and organized into five categories that largely aligned with the priority gap areas identified by workshop participants in the initial prioritization survey: 1) GLP-1 treatment initiation, selection, duration, and discontinuation; 2) GLP-1 treatment effects and outcomes; 3) mental and behavioral health; 4) nutrition and physical activity assessment, monitoring, and counseling; and 5) health behavior and lifestyle treatment. The five categories became the foundation for the in-person meeting agenda.

4. Idea selection: In-person discussion and idea refinement

The in-person meeting represented step four of the process. Participants were divided into multidisciplinary teams (e.g., primary care clinicians, exercise specialists, mental health clinicians, etc. seated at each table) for structured, small-group discussion around the five categories of gaps generated from the case study response forms: 1) GLP-1 treatment initiation, selection, duration, and discontinuation; 2) GLP-1 treatment effects and outcomes; 3) mental and behavioral health; 4) nutrition and physical activity assessment, monitoring, and counseling; and 5) health behavior and lifestyle treatment. Each discussion was facilitated by a workshop co-chair, while participant feedback and new ideas were captured by a notetaker in Miro boards. In the final session of the in-person meeting, participants also generated ideas for dissemination and implementation of the research priorities and prospective tools they discussed.

5. Idea implementation: Translating ideas into actionable research products

Following the in-person workshop, participants participated in a six-month implementation and refinement phase to transform prioritized research gaps into actionable resources for the field. During this phase, workshop co-chairs and participants engaged in a series of virtual small-group meetings, writing activities, and iterative reviews to further develop and refine the outputs generated during the workshop. This work focused on translating broad research priorities into specific research questions, related sub-questions, study protocols, outcomes, and practical tools that could guide future pediatric obesity pharmacotherapy research. Throughout the process, the workshop co-chairs played a central role in reviewing and synthesizing feedback, ensuring that the final products remained grounded in both clinical practice and patient-centered perspectives.

Setting the Stage for Prioritization of Research Needs: Summary of Virtual Workshop Convenings

In September and October 2025, workshop participants engaged in three virtual meetings to begin the idea generation and prioritization process and set the groundwork for the in-person convening.

Virtual Meeting 1: Setting the Stage: Workshop Overview and Purpose

In September 2025, the first virtual meeting in NCCOR's "Clinical Research Gaps in Pediatric Obesity Pharmacotherapy" workshop series established the scientific, clinical, and patient-centered foundation for the project. The session focused on framing the need for additional evidence, summarizing prior national efforts, and introducing a case study-driven methodology to identify practical clinical research gaps.

Opening Remarks and Workshop Context

Capt. Alyson Goodman, MD, MPH, *Centers for Disease Control and Prevention (CDC)*

Capt. Alyson Goodman opened the meeting by outlining the rapid growth in OM prescription for youth, following recent FDA approvals and expanding clinical use of OMs,[1] including GLP-1s. She emphasized that while regulatory guidance exists for prescribing OM, evidence-based clinical guidance for day-to-day patient management remains limited, particularly around medication initiation; duration; tapering or discontinuation; and monitoring for side effects such as muscle loss, bone health changes, and micronutrient deficiencies.

Capt. Goodman also shared results from the pre-meeting survey that workshop participants were asked to complete. In the survey, based on their expertise, participants prioritized a list of seven research gaps[2] related to the treatment of obesity in youth with medications:

1. GLP-1 treatment selection, initiation, dose, duration, and discontinuation
2. GLP-1 treatment effects and outcomes
3. Behavioral and lifestyle interventions
4. Contextual factors
5. Technology and delivery approaches
6. Safety
7. Special populations

Based on survey results, the workshop participants agreed to prioritize the following three domains:

1. Treatment selection, initiation, dose, duration, and discontinuation
2. Treatment effects and outcomes
3. Lifestyle measures

[1] The terminology used in this workshop evolved over time; anti-obesity medications (AOMs) was replaced with obesity medications (OMs) based on expert guidance.

[2] Access to OMs was not included as a possible domain of focus in this workshop. Instead, the scope focused on gaps in OM research and clinical practice.

Capt. Goodman closed by outlining the workshop's dual goals of engaging clinical experts to prioritize key research questions based on real-world gaps and producing a white paper, both aimed at better supporting clinicians prescribing pediatric OMs to youth.

Overview of the 2023 NIDDK Workshop: Pharmacotherapy for Obesity in Children and Adolescents: State of the Science, Research Gaps, and Opportunities

Stavroula (Voula) Osganian, MD, ScD, MPH, *National Institutes of Health (NIH)*

Dr. Voula Osganian summarized findings from the 2023 NIDDK workshop, which examined the state of the science, research gaps, and opportunities in pediatric obesity pharmacotherapy. That national convening identified critical limitations in the current evidence base, including uncertainty about which youth should receive medications, which medications to prescribe, how long to treat, when to modify or stop treatment, and how to ensure long-term safety during growth and development.

Dr. Osganian highlighted four overarching categories of research gaps emerging from the NIDDK workshop:

1. **Treatment outcomes**, including impacts on growth, puberty, body composition, mental health, quality of life, and preservation of muscle and bone mass
2. **Clinical use guidance**, including biomarkers for treatment selection, optimal dose and duration, and integration with lifestyle interventions
3. **Care delivery improvements**, such as provider confidence, training, and telehealth approaches
4. **Clinical trial design considerations**, including long-term effectiveness, real-world access and adherence, participant diversity, and cultural relevance

She also emphasized the central role of patient and caregiver perspectives, which called for stigma-free care, greater transparency in treatment decision-making, meaningful outcomes beyond weight loss, inclusion of patients as research partners, and improved access to affordable medications.

Dr. Osganian explained that the NCCOR workshop is intended to build upon findings from the NIDDK workshop to identify specific and actionable research questions that are patient-centered and can generate the data, and ultimately, the clinical guidance that practitioners need in this emerging field.

Whole Child Approach to Obesity Treatment

Sarah Hampl, MD, FAAP, *Children's Mercy Kansas City; University of Missouri–Kansas City*

Dr. Sarah Hampl presented on the importance of a whole child, family-centered approach to pediatric obesity treatment. She emphasized that children are not "small adults" and that obesity treatment must account for developmental stage, family dynamics, and community context.

Drawing on parental feedback research, Dr. Hampl outlined key principles for clinician-family communication, including using respectful, nonjudgmental language; focusing on health rather than weight; honoring parental expertise; addressing timing and sensitivity in conversations; and offering concrete, individualized recommendations. Framing obesity as a complex chronic disease shaped by genetics, environment, social drivers of health, and structural inequities, she argued for longitudinal, non-stigmatizing, multidisciplinary care that integrates all treatment options as appropriate, including behavioral treatment, pharmacotherapy, and metabolic and bariatric surgery.

Her presentation reinforced the importance of monitoring not only physical health, but also

developmental, emotional, behavioral, relational, and patient-reported outcomes, positioning obesity pharmacotherapy within a broader continuum of holistic child and family well-being and underscoring the unique aspects of obesity care in youth.

Case Study Framework for Identifying Research Gaps

Brook Belay, MD, *Centers for Disease Control and Prevention (CDC)*

Dr. Brook Belay introduced the workshop's case study-based methodology, which would serve as a core tool for surfacing real-world clinical challenges and translating them into prioritized research questions that are actionable and relevant to frontline providers and families. Dr. Belay previewed how virtual meetings 2 and 3 would feature co-chair-led case studies representing diverse clinical perspectives, including pediatric medicine, nutrition, mental health, physical activity, and lived experience. The case studies would detail real-life clinical scenarios, practical challenges, and dilemmas for providers, patients, and families related to obesity pharmacotherapy. Each case would explore what is known, what is currently being done, what remains unknown, and what additional evidence is needed. Immediately following each case study presentation, participants would be asked to reflect on the case using a fillable response form. Their insights and ideas would subsequently be used to develop discussion topics for the in-person convening and inform the workshop deliverables. Reflection prompts included:

- The most eye-opening part of the case study
- Research questions that emerged
- Tools/resources that exist or are needed
- Where data exists or should exist

Closing Reflections and Participant Feedback

Renee Porter, RN, MS, DNP, *Centers for Disease Control and Prevention (CDC)*

Dr. Renee Porter closed the session by reinforcing the collaborative nature of the workshop series and the importance of ongoing participant input. Attendees raised key themes, including the need to emphasize patient-reported outcomes, safety across developmental stages, clarity around lifestyle guidance alongside medication use, and inclusion of special populations. Participants were reminded that the workshop was intended to collect and prioritize research gaps rather than resolve them, laying the groundwork for future scientific inquiry and evidence development.

Virtual Meeting 2: Case Studies on Patient Experience, GLP-1 Initiation, and Lean Mass

The second virtual meeting in NCCOR's "Clinical Research Gaps in Pediatric Obesity Pharmacotherapy" workshop series in October 2025 centered on clinical case studies using real-world patient scenarios to surface practical clinical challenges and research gaps related to GLP-1 use in youth. Workshop participants were asked to reflect on each case study in an online fillable form using structured prompts to address what is known, what is being done, what remains uncertain, and what evidence is needed to guide practice.

> I really appreciated the reminder about the power differential and unwillingness to share about side effects for fear that the medication would be taken away.
>
> **Participant Reflection**

Case Study 1: Patient and Parent Perspectives

Faith Anne Heeren, PhD, *Wake Forest University School of Medicine*

Shannon Newsome, *Patient advocate and parent*

The first case study centered on lived experience. It was jointly presented by Dr. Faith Anne Heeren—patient advocate, obesity researcher, and founder of Outreach, Community Engagement, Advocacy and Non-discriminatory Support (OCEANS), a teen support and advocacy group—and her mother, Shannon Newsome. Together, they shared a multigenerational narrative of obesity treatment involving lifestyle interventions, bariatric surgery, and OM.

> [What was eye-opening for me:] [The] life-changing quality of life of GLP-1s for people living with obesity, and the devastating effect of stigma in the medical setting and other settings (school, peers, athletics). [T]heir story brings to life the real the harm that pediatricians or other providers can cause, often through lack of understanding of obesity as a disease.
>
> **Participant Reflection**

Dr. Heeren described experiencing obesity from early childhood, navigating stigma, bullying, and fragmented care, and frequently relying on self-directed research rather than collaborative clinical partnerships. She underwent bariatric surgery at age 16, which led to substantial improvements in physical activity, confidence, and quality of life. Later, during graduate school and the COVID-19 pandemic, she experienced weight regain and began GLP-1 treatment with tirzepatide, which she described as "life-changing" in reducing appetite, increasing satiety, and improving confidence around food and movement.

A key theme in her remarks was the power imbalance between patients and providers, particularly fear that disclosing side effects could result in discontinuation of medication. She emphasized the importance of trust, shared decision-making, patient-centered goals, stigma-free communication, and open dialogue about risks and benefits.

Dr. Heeren's mother, Mrs. Newsome, shared her experience as a parent advocating for a child with obesity amid stigma from peers, the public, and even health care professionals. She described extensive efforts to support healthy eating and activity, despite persistent weight gain in her daughter from infancy onward. She highlighted the emotional burden of parental blame, the multi-dimensional intergenerational impacts of obesity, and the transformative impact of bariatric surgery and GLP-1s on both her own and her daughter's health. Together, Dr. Heeren and Mrs. Newsome reinforced the need for improved access, compassionate care, recognition of obesity as a biological and chronic condition, and meaningful inclusion of patients and caregivers in research and clinical design.

Case Study 2: Journey to Starting GLP-1s with Mental Health Considerations

Meredith Dreyer Gillette, PhD, *Children's Mercy Kansas City*

Dr. Meredith Dreyer Gillette presented a case study involving a 15-year-old adolescent male with class 3 obesity, autism, attention-deficit/hyperactivity disorder (ADHD), anxiety, depression, fatty liver disease, and a history of suicidality. The case illustrated the complexity of initiating GLP-1 therapy in youth with neurodevelopmental and mental health comorbidities.

Over multiple clinical visits, providers addressed concerns including needle phobia, food selectivity, mood stability, family beliefs, and fears about medication scarcity prior to initiating

semaglutide. Behavioral strategies included small, incremental goal setting, protein intake targets, environmental supports, meal pattern stabilization, and interventions to reduce loss-of-control eating.

> We also need studies evaluating the safety and efficacy of GLP-1s in youth with depression and/or suicidal ideation. We excluded these kids in the regulatory trials but in the real world, GLP-1s are prescribed to kids with these issues.
>
> **Participant Reflection**

The patient reported reduced hunger, decreased "food noise," improved eating patterns, increased willingness to try vegetables, and meaningful engagement in food preparation and family meals. Family members observed reductions in food-related conflict and emotional dysregulation. BMI decreased during treatment, but weight rebounded after abrupt medication discontinuation due to insurance loss, underscoring vulnerabilities in accessing medication and treatment.

Dr. Dreyer Gillette highlighted several research and evidence gaps, including:

- The need to measure "food noise" as a patient-reported outcome
- Understanding GLP-1 effects among youth taking atypical antipsychotics
- Determining optimal timing and intensity of behavioral interventions alongside medication
- Improving monitoring of side effects, disordered eating risk, and body image concerns
- Generating evidence to guide insurance coverage expectations and timelines

Case Study 3: What About Lean Mass?

Webb Smith, PhD, ACSM-CEP, *University of Tennessee Health Science Center; Le Bonheur Children's Hospital*

Dr. Webb Smith presented a case involving a 15-year-old male with severe obesity, narcolepsy, and sleep apnea, with a focus on body composition changes during GLP-1 treatment. After multiple failed medication trials and insurance barriers to bariatric surgery, treatment was initiated with semaglutide, resulting in substantial reductions in total body weight and fat mass.

However, detailed body composition analysis revealed notable losses in lean mass and skeletal muscle, raising concerns about muscle preservation during adolescent growth. Dr. Smith emphasized that some lean mass loss is expected during weight reduction, but adolescent physiology, growth trajectories, and long-term functional outcomes remain insufficiently studied.

He outlined emerging clinical strategies to mitigate lean mass loss, including resistance training, adequate protein intake, individualized exercise prescriptions, and structured physical activity counseling.

> Most physicians do not fully understand body composition, methods of measuring body composition, etc. This is a gap that needs to be addressed.
>
> **Participant Reflection**

Dr. Smith identified critical research and evidence needs, including:

- Randomized trials examining GLP-1 plus resistance training in youth
- Standardized body composition measurement protocols

- Clearer guidance on timing, safety, and adherence when combining pharmacotherapy with intensive exercise programming
- Better understanding of how effects differ in adolescents compared to adults, taking into account issues such as growth impairment, hormonal changes, and bone health

Closing Reflections

The three case studies presented during virtual meeting 2 reinforced the importance of integrating the patient voice, behavioral health, family context, and physical development into pediatric obesity pharmacotherapy clinical care and research. The session highlighted urgent gaps in treatment personalization, safety monitoring, outcome measurement, insurance policy alignment, and lean mass preservation, setting the stage for deeper prioritization during subsequent convenings.

Virtual Meeting 3: Case Studies on Combination Therapy, Social Context, Surgery Pathways, and Nutrition

In October 2025, the third virtual meeting in NCCOR's "Clinical Research Gaps in Pediatric Obesity Pharmacotherapy" workshop continued the case study-driven exploration of real-world pediatric obesity treatment. Participants were again asked to reflect on the cases using structured prompts in an online form, with a focus on research questions that could realistically yield insights within a two- to three-year timeframe.

Case Study 1: 13-Year-Old on Combination Pharmacotherapy

Jaime Moore, MD, MPH, *University of Colorado School of Medicine; Children's Hospital Colorado*

Dr. Jaime Moore presented the case of a 13-year-old female with severe obesity, prediabetes, obstructive sleep apnea, dyslipidemia, and anxiety. The patient's clinical course illustrated the use of layered anti-obesity pharmacotherapy—including semaglutide, phentermine, and topiramate—to address both metabolic risk and weight trajectory.

> For patients living with obesity, the obesity is likely just one area of health that the patient may be experiencing. Thus, the treatment can be complex and there may be a need for multiple conversations between the patient and provider to agree on an acceptable treatment plan.
>
> **Participant Reflection**

Initial lifestyle-focused care resulted in minimal weight change and family frustration. Given rising diabetes risk, treatment goals centered on preventing progression from prediabetes to diabetes. Semaglutide was selected as first-line therapy due to evidence for glycemic improvement, tolerability, and access. After modest BMI response and persistent prediabetes, phentermine and topiramate were added, resulting in further BMI reduction, improved hunger regulation, and meaningful metabolic improvements—including a reduction in A1C and resolution of severe sleep apnea.

Dr. Moore emphasized several research and evidence needs:

- Tools to predict individual treatment response
- Clearer thresholds for BMI reduction linked to comorbidity remission
- Evidence-based strategies for de-escalating combination therapy
- Comparative data on GLP-1s versus other medications for diabetes prevention in youth

- Whether puberty represents a time-limited therapeutic window during which GLP-1 treatment could produce durable metabolic benefits

Case Study 2: Pediatric Obesity Treatment in Social Context

Lauren Shomaker, PhD, *Colorado State University; University of Colorado Anschutz Medical Campus; Children's Hospital Colorado; Colorado School of Public Health*

Dr. Lauren Shomaker presented two cases illustrating how social, geographic, and mental health contexts shape treatment feasibility and outcomes. One adolescent lived in a rural agricultural setting with limited access to specialty follow-up care. Another young adult faced depression, binge eating, and challenges transitioning to college-based care.

Across both cases, GLP-1 therapy contributed to improvements in portion control, binge eating behaviors, and selected cardiometabolic indicators, but progress was constrained by access barriers, mental health burden, and life transitions. Dr. Shomaker underscored that medications alone are insufficient and must be integrated with behavioral and mental health monitoring and interventions, as indicated.

> Family history, food insecurity, and disordered eating are important to consider to be thoughtful. That said, I think it is really important not to deny treatment because of these concerns but rather to study how these factors may affect outcomes.
>
> **Participant Reflection**

Dr. Shomaker identified several key research and evidence gaps, including:

- How to match patients with the right intensity and type of behavioral support
- How to scale culturally and contextually tailored health behavior and lifestyle treatments
- How to support transitional care for older adolescents and young adults

She emphasized that obesity treatment must account for family systems, trauma exposure, rurality, and structural barriers, as opposed to solely individual behavior.

Case Study 3: 14-Year-Old Presenting for Surgery

Brooke Sweeney, MD, FAAP, FACP, DABOM, *Children's Mercy Kansas City; University of Missouri Kansas City, Children's Center for Healthy Lifestyles & Nutrition*

Dr. Brooke Sweeney presented the case of a 14-year-old girl initially seeking bariatric surgery, whose clinical pathway shifted toward medication-based management due to high risk for eating disorders and complex family history involving disordered eating across generations.

> This was a wonderful example of how the full social, transitional, and psychological context of the patient and their environment matter. This information is critical for moving beyond canned recommendations in care.
>
> **Participant Reflection**

After screening positive for binge eating behaviors and receiving new diagnoses of ADHD and sleep apnea, the patient was treated with a combination of liraglutide, semaglutide, lisdexamfetamine, and topiramate, alongside intensive psychological and social work support.

Over time, she experienced substantial BMI reduction, metabolic improvements, and improved relationship with food, although concerns emerged around muscle strength, micronutrient status, and long-term weight targets.

Dr. Sweeney highlighted several research gaps, including:

- How low BMI should be targeted in youth nearing a healthy range
- How to determine when to taper or transition medications
- How to balance weight reduction goals with preservation of physical function, nutrition, and mental health

She also emphasized the value of body composition monitoring, eating disorder screening, and longitudinal psychological support in high-risk patients.

Case Study 4: Review of Research on GLP-1 Receptor Agonists on Nutrition

Katherine Balantekin, PhD, RD, *University at Buffalo*

Dr. Katherine Balantekin examined the nutritional implications of GLP-1 therapy, highlighting that evidence-based dietary guidance for pediatric patients on GLP-1s is limited. Adult data suggest an increased risk of micronutrient deficiencies, particularly vitamin D, yet dietary intake data in youth remain sparse.

She emphasized that few GLP-1 clinical trials systematically assess diet quality, macronutrient intake, or protein adequacy, making it difficult to distinguish between pharmacologic effects and behavioral change. Because children are still growing, nutritional adequacy—especially protein intake—is essential for supporting height velocity, lean mass development, and pubertal health.

Dr. Balantekin outlined urgent research priorities, including:

- Understanding how GLP-1s influence dietary intake and nutrient needs in youth
- How nutritional requirements vary by age, sex, and pubertal stage
- How to integrate registered dietitians more consistently into pediatric obesity care

> The existing nutrition recommendations on anti-obesity medications are not based on primary literature.
>
> **Participant Reflection**

Closing Reflections

The four case studies presented during virtual meeting 3 reinforced the complex, individualized nature of pediatric obesity pharmacotherapy, highlighting the interplay of biological response, mental health, family context, nutrition, and developmental stage. The session underscored the need for predictive tools, treatment sequencing guidance, nutrition-focused research, and scalable behavioral health supports, setting the stage for prioritization and synthesis during the in-person workshop convening.

The seven case studies are included in **Appendix D**.

In-Person Meeting: Exploring and Consolidating Research Needs

The in-person convening of NCCOR's "Clinical Research Gaps in Pediatric Obesity Pharmacotherapy" workshop took place on November 3 and 4, 2025, in Atlanta, Georgia.

In preparation for the in-person meeting, participants' case study reflections from the three virtual meetings were sorted into topic areas by the workshop planning committee and then further consolidated using AI, yielding a total of 117 prospective research questions. AI was used to help format questions and concepts, use unbiased and consistent language, identify overlap, and reduce redundancy. Following multiple rounds of expert review by workshop co-chairs for scientific accuracy, rigor, and relevance, the research questions were further edited and condensed into a final list of 105.

The research questions were organized into five topics (and key themes within those topics) that largely aligned with the initial three priorities identified at the start of the workshop series but included several important issues that emerged from the case study reflections over the course of the virtual meetings:

1. GLP-1 treatment initiation, selection, duration, and discontinuation
2. GLP-1 treatment effects and outcomes
3. Mental and behavioral health
4. Nutrition and physical activity assessment, monitoring, and counseling
5. Health behavior and lifestyle treatment

During the meeting, experts participated in structured small-group discussions to prioritize the most pressing research questions and the most useful and needed tools and resources for research and practice. A workshop co-chair facilitated discussion at each table, while a scribe from the workshop planning committee captured notes using Miro boards.

The complete in-person meeting agenda is included in **Appendix E**.

Opening Remarks and Workshop Framing

Amanda Sharfman, director of the NCCOR Coordinating Center, described how insights from the past two months of surveys and case study reflections shaped the in-person discussion agenda. Dr. Faith Anne Heeren, a workshop co-chair and postdoctoral fellow at Wake Forest University School of Medicine, representing the lived experience, summarized key themes from participant reflections and urged participants to center the patient perspective in their deliberations, especially considering how youth and caregivers may prioritize different questions than clinicians or researchers.

Jeanne Lindros, director of the Institute for Healthy Weight at the American Academy of Pediatrics, and Dr. Sarah Armstrong, chief of the Division of General Pediatrics and Adolescent Health at Duke University, contextualized the workshop within prior efforts to develop clinical guidelines, emphasizing the need for clearer

clinical data on dosing, timing, unintended consequences, and real-world outcomes. They encouraged participants to prioritize research questions that could meaningfully inform future clinical guidance.

The meeting sessions were organized into five topics. Each session began with an overview of the topic by a workshop co-chair. Participants were provided with the consolidated list of 105 prospective research questions, a list of current commonly reported research outcomes, and the list of tools and resources collated from the case study response forms. Participants were then assigned to a multidisciplinary table for a facilitated discussion using the following prompts:

1. Using the provided list of proposed research questions, which three to five questions do you think are the highest priority to address? You may edit questions as needed to strengthen them or add new questions if your top priorities are not reflected in the list.
2. For studies that address the prioritized questions, are there specific details about clinical protocols that would particularly inform clinical care?
3. For studies that address the prioritized questions, which outcomes would be most useful in informing clinical care? Please review the provided list of commonly reported outcomes and suggest additional outcomes that should be considered.
4. What clinical tools would help practitioners provide the best quality of care?

To aid in the discussion, participants were provided with the consolidated list of 105 prospective research questions, a list of current commonly reported research outcomes, and a list of tools and resources collated from the case study response forms.

Session Highlights

Session 1: GLP-1 Treatment Initiation, Selection, Duration, and Discontinuation

A brief overview of the topic was provided by Dr. Brooke Sweeney, workshop co-chair. Dr. Sweeney noted three key themes that generated a total of 17 research questions for consideration:

Theme 1: Timing and Criteria for Initiation of GLP-1 Therapy. When and for whom GLP-1s should be introduced in pediatric populations, including how to consider obesity class, comorbidities, and prior behavioral interventions

Theme 2: Selection of Therapy and Personalization. How to tailor medication choice and dosing to the individual, considering genetic, behavioral, developmental, and comorbid factors

Theme 3: Treatment Dose, Duration, Weaning, Discontinuation Effects, and Shared Decision-Making. What systematic and psychosocial barriers exist to starting and maintaining therapy, including insurance coverage, provider knowledge, and communication challenges; how long GLP-1 treatment should continue; what happens when it stops; how to safely manage discontinuation or switching; and how to communicate with patients/caregivers

Session 2: GLP-1 Treatment Effects and Outcomes

A brief overview of the topic was provided by workshop co-chair, Dr. Jaime Moore. Dr. Moore noted five key themes that generated a total of 28 research questions for consideration:

Theme 1: Body Composition, Growth, and Physical Development. How GLP-1s affect lean body mass, fat distribution, bone health, and overall growth, as well as how to best measure

and interpret these changes. These questions needed to be addressed by age and sex and by developmental and pubertal stage.

Theme 2: Combination and Comparative Medical and Surgical Treatment Outcomes. What outcomes occur when GLP-1s are used in combination with other OMs, or surgery, and how effectiveness compares across settings and populations

Theme 3: Outcomes. What factors affect real-world outcomes

Theme 4: Monitoring, Safety, and Practical Management. How real-world monitoring, functional outcomes, and safety indicators can guide care during and after treatment

Theme 5: Preserving Lean Body Mass, Bone Health, and Physical Function. What risk of muscle and bone loss is associated with appetite suppression and rapid weight loss, and how to protect lean mass and optimize strength and metabolism through nutrition and physical activity

Session 3: Mental and Behavioral Health

A brief overview of the topic was presented by workshop co-chair, Dr. Lauren Shomaker. Dr. Shomaker noted five key themes, which generated 26 prospective research questions:

Theme 1: Addressing Disordered Eating and Screening for Risk. The need for better tools and evidence to screen, monitor, and manage eating disorders and disordered eating behaviors among youth receiving obesity treatment, especially those who take medications like GLP-1s or recently had surgery; the need to understand how these treatments interact with disordered eating behavior and risk over time

Theme 2: Integrating Mental and Behavioral Health into Obesity Care. The need for co-management of obesity and mental health conditions and the importance of integrating behavioral health professionals and monitoring mental health outcomes alongside physical outcomes.

Theme 3: Mental and Behavioral Health Outcomes. The importance of psychosocial and psychiatric impacts of GLP-1 use, particularly in youth with mental health conditions or a history of eating disorders, as these were often excluded from research trials

Theme 4: Supporting Healthy Psychosocial Development and Reducing Stigma. The need to help youth navigate the psychosocial burden of obesity, including bullying, bias, and stigma, while fostering resilience, positive self-image, and supportive environments in school, home, and care settings

Theme 5: Providing and Tailoring Behavioral Interventions. The need for guidance for clinicians on providing behavioral supports for youth on OMs and their families and on adapting these interventions for youth with unique needs or social challenges

Session 4: Nutrition and Physical Activity Assessment, Monitoring, and Counseling

A brief overview of the topic was provided by workshop co-chairs, Dr. Katherine Balantekin and Dr. Webb Smith. Drs. Balantekin and Smith noted four themes that emerged on the topic, which generated a total of 18 prospective research questions:

Theme 1: Monitoring Nutrient Intake, Quality, and Deficiency Risks. The need for evidence and standardized guidance on how to assess and

monitor nutritional adequacy in youth undergoing pharmacologic treatment, with particular concern for micronutrient deficiencies, reduced energy intake, and potential effects on growth and development

Theme 2: Developing Evidence-Based Nutrition Guidance for GLP-1 Therapy Use in Youth. The need for pediatric-specific nutrition guidelines for youth receiving GLP-1 therapy, including clinicians' need for evidence to define safe dietary patterns, supplementation needs, and monitoring protocols that can inform future clinical practice guidelines

Theme 3: Expanding Access and Multidisciplinary Support. The broad recognition that access to specialized nutrition and behavioral support remains limited, creating a need to understand how additional staffing, team-based care models, and scalable implementation strategies can improve outcomes and expand access to behavior health and lifestyle treatment

Theme 4: Physical Activity Counseling and Preserving Lean Mass and Bone Health During Treatment. The need to better understand the impacts of GLP-1s and rapid weight loss on muscle and bone development in youth, as well as strategies to preserve lean mass through tailored interventions, including exercise and nutrition interventions

Session 5: Health Behavior and Lifestyle Treatment

Dr. Meredith Dreyer Gillette, workshop co-chair, provided a brief overview of health behavior and lifestyle treatment for the group's understanding and noted that four themes were generated on the topic, with a total of 18 prospective research questions.

Theme 1: Health Behavior and Lifestyle Treatment Intensity and Tailoring. The need to identify the optimal dose and sequencing of health behavior and lifestyle treatment components (nutrition, physical activity, behavioral support) in combination with pharmacotherapy and to understand how to tailor intervention intensity to patient needs, avoid one-size-fits-all models, and balance comprehensiveness with feasibility

Theme 2: Sleep, Screen Time, and Parenting. The need to understand sleep and screen time, which are understudied but influential lifestyle factors that affect appetite regulation, treatment adherence, and overall metabolic health, and the importance of integrating these behaviors into health behavior and lifestyle treatment monitoring and guidance

Theme 3: Social Connectedness and Support. The importance of understanding how social context—including peer relationships, family cohesion, and access to community spaces—might moderate treatment success and how social support can buffer stress and enhance adherence to lifestyle programs

Theme 4: Stress Reduction and Coping. The role of stress and emotional burden as barriers to sustained lifestyle change and the need for health behavior and lifestyle treatment to intentionally incorporate stress reduction, mindfulness, and emotional regulation strategies, especially for youth managing weight stigma or rapid changes in body image

Results

Findings generated during the in-person workshop were extracted from the Miro boards used to collect and organize them, then underwent a 6-month iterative, collaborative process of expert review and refinement. Final outputs of the workshop include the following:

1. Prioritized research questions
2. Outcomes
3. Research protocols
4. Tools

Recognizing the rapidly evolving nature of pediatric obesity pharmacotherapy and the novelty of GLP-1 use among youth, the refinement process of the above outputs was intentionally iterative. Workshop outputs were revisited and revised multiple times as participants considered emerging evidence, feasibility, clinical relevance, and alignment with the lived experiences of youth and their families affected by obesity.

The resulting outputs represent the culmination of the workshop's consensus-building process. They are intended to serve as practical resources for researchers, funders, clinicians, and other stakeholders seeking to advance the evidence base for pediatric obesity pharmacotherapy, recognizing that these resources will continue to evolve as the field rapidly changes.

NCCOR's collection of research questions, research protocols, outcomes, and provider tools to address gaps in pediatric obesity pharmacotherapy is summarized on the pages that follow and in **Appendices F through I**.

Specific methods used to achieve the final iteration of each document are described below.

Research questions

Following the in-person convening, the NCCOR Coordinating Center (CC) placed the generated research questions (RQs) and additional design considerations into a Word document organized by session, with similar or duplicate questions noted for further review. Dr. Faith Heeren, workshop co-chair, further organized the research questions into a structured table with a dedicated space to capture additional considerations, factors, and questions. Each co-chair then worked on the RQs from their respective workshop session to combine, clarify, and streamline questions. Over the course of the next six months, co-chairs convened in virtual meetings to review questions as a group, discussing areas of overlap, potential gaps, and opportunities for synthesis. At this stage, the table was reorganized to group new similar questions, enabling duplicates to be eliminated or combined. To optimize the output, AI was used to refine the language, ensuring the resulting questions were clearly structured, unbiased, and easy to interpret. A final review of the refined list from each workshop session was conducted by the session's co-chair, making any necessary revisions to improve clarity, consistency, and precision in wording.

Using this process, the initial list of 105 prioritized research questions was consolidated into 35 primary RQs (see **Table 1**). Each primary research question is accompanied by 3–5 related research questions that provide more specific details for consideration related to the following domains: patient and developmental factors; disease severity and clinical risk factors; treatment history and therapeutic context; medication-specific safety and feasibility; health behavior and lifestyle treatment-specific content, structure, delivery, and feasibility; psychological, family, and social factors; and health systems and delivery factors. The order of primary research questions is intentionally organized to align with the workshop's five domains, with questions 1–14 focusing on treatment initiation, selection, duration, discontinuation, and treatment effects and outcomes; questions 15–21 focusing on mental and behavioral health; questions 22–27 focusing on nutrition and physical activity; questions 28–29 focused on health behavior and lifestyle treatment; and questions 30–35 focused on shared decision-making. The complete list of 105 research questions, 35 consolidated research questions, and related questions are included in **Appendices F and G**.

To ensure that the final product reflected the collective expertise and perspectives of all workshop participants, the finalized set of research questions and additional considerations was then circulated to the full group of workshop attendees for review and input. Attendees were asked to pay particular attention to whether the research questions reflected the current state of the science and gaps in understanding, whether they were easy to comprehend, and whether they could be enhanced to ensure better understanding for clinical audiences. The feedback from experts was reviewed by the workshop co-chairs and incorporated into the final table.

Table 1. Final list of 35 research questions

Question No.	Primary Research Question
1	When should obesity medications (OMs) be initiated in youth?
2	Which health factors, genotypes, and phenotypes inform obesity medication (OM) selection, dosing, treatment schedule, titration, and monitoring in youth?
3	In younger children, what is the relationship between earlier initiation of obesity medication (OM) treatment and BMI trajectories, comorbidities, and health outcomes?
4	What is the relationship (e.g., correlation, causation, mechanism) between obesity medication (OM) treatment and 1) cardiometabolic outcomes and 2) comorbidities in youth?
5	How does treatment response vary (effects and side effects) among youth on obesity medications (OM), what accounts for this, and how can it be modified?
6	Among youth with medical complexity, which factors guide obesity medication (OM) treatment? Examples of medical complexity: • Neurodevelopmental conditions (e.g., autism spectrum disorder, ADHD, intellectual disability) • Genetic syndromes associated with hyperphagia or obesity (e.g., Prader–Willi syndrome, Bardet–Biedl syndrome) • Endocrine or hypothalamic disorders (e.g., panhypopituitarism, hypothalamic obesity after central nervous system tumors) • Serious mental illness (e.g., major depressive disorder, bipolar disorder) • Treatment-related factors (iatrogenic) (e.g., chronic steroid use, atypical antipsychotics, chemotherapy, cranial irradiation) • Cancer and cancer-treatment sequelae (e.g., craniopharyngioma, pituitary injury)
7	Which factors guide when and how obesity medication (OM) therapy is tapered or discontinued, and what supports are needed?
8	What is the relationship between obesity medication (OM) discontinuation and clinical, psychological, and psychosocial functioning outcomes in youth?
9	What is the relationship between obesity medication (OM) treatment and body composition (e.g., fat mass, lean mass, bone mass) and physical function in youth?
10	What is the relationship between nutrition and physical activity interventions and body composition outcomes in youth using obesity medications (OM)?
11	What is the relationship between obesity medication (OM) associated body composition changes and clinical outcomes?
12	What criteria (e.g., comorbidities, risk factors) can guide the selection of combination obesity medication (OM) for youth with obesity?
13	What clinical, developmental, psychological, psychosocial, and surgical or other factors should guide when, how, and for whom obesity medications (OM) are used in combination with metabolic or bariatric surgery in youth?
14	What safety monitoring is needed for youth on obesity medications (OM)?
15	What is the relationship between obesity medication (OM) use and 1) psychosocial functioning; and 2) psychological comorbidities in youth throughout treatment?
16	What is the relationship between obesity medications (OM) and disordered and dysregulated eating-related behaviors in youth?

Question No.	Primary Research Question
17	What is the relationship between obesity medication (OM) use and addictive or other risk-related behaviors in youth?
18	What psychological screening and monitoring approaches are needed for youth receiving obesity medication (OM) treatment?
19	Which psychological interventions are associated with improved outcomes for youth receiving obesity medication (OM) therapy?
20	What is the relationship between chronic stress and clinical, behavioral, and psychosocial outcomes in youth receiving obesity medication (OM) treatment?
21	What is the relationship between social connectedness (e.g., family cohesion, peer support, parent support, community engagement) and outcomes for youth receiving obesity medication (OM) treatment?
22	What is the relationship between obesity medication (OM) use and malnutrition, including macronutrient or micronutrition deficiencies, in youth?
23	What factors inform the risk assessment and identification of malnutrition in youth on obesity medications (OM)?
24	For youth receiving obesity medication (OM) treatment, when, where, how, and what nutrition education should be delivered to optimize outcomes, including non-weight outcomes?
25	For youth receiving obesity medication (OM) treatment, when, where, how, and what physical activity counseling should be provided to optimize outcomes, including non-weight outcomes?
26	What is the relationship between diet quality, eating patterns, and fluid intake and the side effects experienced by youth receiving obesity medication (OM) therapy?
27	What is the relationship between obesity medication (OM) use and sleep outcomes (e.g., sleep duration, sleep quality, and sleep timing) in youth?
28	For youth on obesity medications (OM), which elements of health behavior and lifestyle treatment (HBLT) format and structure, including intensity, frequency, duration, timing, and provider type, are associated with improved outcomes, including non-weight outcomes?
29	For youth on obesity medications (OM), what health behavior and lifestyle treatment content and curricula are needed to support health, wellbeing, and improved outcomes and mitigate risk?
30	What models of co-management between health professional services (e.g., nutrition, behavioral health, physical activity) and the obesity medicine clinical prescribing practitioner lead to better outcomes for youth being treated with OMs?
31	From the patient and family perspective, what factors influence their choice of HBLT, obesity medication (OM) treatment (including selection of a specific medication), or bariatric surgery for youth?
32	From the clinical perspective, which factors (e.g., medical, behavioral, and operational) enable best practices for shared decision-making in obesity medication (OM) treatment?
33	From the multidisciplinary team perspective, what factors (e.g., clinical, operational, and safety) could enable best practice for initiating and monitoring obesity medication (OM) treatment in youth?
34	Which factors (e.g., patient-directed, clinical, behavioral, operational, and safety) should define “success” for youth receiving obesity medication (OM) treatment?
35	How do youth and their caregivers characterize their experiences of obesity medication (OM) treatment?

Outcomes

"For studies that address the prioritized questions, which outcomes would be most useful in informing clinical care?"

To more accurately track and measure the impact of (OMs) on patients, workshop participants generated a list of outcomes researchers should consider assessing when a patient is being treated with OMs. The list captures typically reported outcomes and outcomes that capture non-weight-related health factors. Consistent with the approach used for the other workshop outputs, the NCCOR CC organized the list of outcomes and associated measures into an Excel spreadsheet by category, removing duplications and redundancies. The full workgroup reviewed and recategorized the list, ensuring all outcomes were comparable and met the same level of detail. Workshop co-chairs then reviewed the list for clarity and comprehensiveness. Finally, the list was circulated to the full group of workshop attendees for review and input, to ensure it captured the full range of ideas shared during the workshop, was current and comprehensible, and could be enhanced for clinical audiences. The feedback from experts was reviewed by the workshop co-chairs and incorporated into the final list.

The final list (**Appendix H**) includes a range of outcome categories, including anthropometrics; body composition; vital signs; laboratory values; liver imaging variables; mental and behavioral health history and assessment; social, emotional, psychological conditions or factors; parent/caregiver; education; sleep health; nutritional intake, status, and eating behaviors; physical activity fitness, function, and behaviors; developmental; medical and psychological history; quality of life measurements; global health and function assessment; treatment/intervention-related delivery and implementation; health care quality and costs; and other contextual factors.

Table 2. Outcomes examples (full list **Appendix H**)

Anthropometrics
Weight (kg)
Height (cm)
Body mass index (BMI; kg/m2)
Change in BMI (absolute (kg/m2); relative (%))
Body Composition
Total fat mass, kg (mean; % change)
Visceral fat area, cm2 (mean; % change)
Visceral adipose tissue, kg (mean; % change)
Vital Signs
Blood pressure, mmHg (systolic/diastolic), percentile, and/or pediatric BP category
Heart rate, beats/min
Laboratory Values
Lipids: total cholesterol, LDL-C, HDL-C, non-HDL-C, and triglycerides (mg/dL)
Absolute and % change in lipid levels
Free fatty acids
Apolipoprotein A, mg/DL
Apolipoprotein B, mg/DL

Liver Imaging Variables
VAT, cm3 (visceral adipose tissue)
SAT, cm3 (subcutaneous adipose tissue)
Liver fat content, %
Mental & Behavioral Health History and Assessment
Eating disorders – validated screening tools when available (such as EAT-26, EDE-Q)
Body dysmorphia
Mood disorders/symptoms (e.g., depression, anxiety)
Suicidality
Substance use
Nutritional Intake, Status, and Eating Behaviors
Macronutrient/micronutrient intake and status (e.g., insufficiency or deficiency assessed at baseline and throughout treatment)
Measures of appetite, satiation (e.g., fullness during a meal/snack), and satiety (e.g., fullness between eating episodes)
Food noise (cravings, thinking about food without the sensation of hunger, bored eating, etc.)
Physical Activity Fitness, Function and Behaviors
Physical function and mobility
Muscular strength
Flexibility
Sedentary activity (e.g., screen time, phone use, schoolwork, or television viewing)
Developmental
Pubertal status (e.g., Tanner staging)
Sexual maturation (e.g., nocturnal emissions, facial/body hair, true gynecomastia)
Developmental assessments (e.g., cognitive, gross motor, social-emotional)
Menstrual history, menstrual regularity, and symptoms of hyperandrogenism or PCOS when relevant
Medical and Psychological History
History of prediabetes or diabetes, hypertension, dyslipidemia, metabolic dysfunction-associated steatotic liver disease (MASLD), obstructive sleep apnea, PCOS, and other obesity-related comorbidities and/or baseline obesity associated nutritional deficiencies (e.g., vitamin D, folate, iron)
Mental and behavior health history (e.g., eating disorders, anxiety, depression)

Research protocols

"For studies that address prioritized questions, are there specific details about clinical protocols that would particularly inform clinical care?"

To enhance accurate, thorough, and transparent reporting by researchers of care protocols that would particularly inform clinical care, the NCCOR CC compiled all protocol-related ideas generated during the in-person workshop in an Excel spreadsheet, condensing the content, eliminating duplicates, and organizing entries by workshop session. The NCCOR CC also reorganized the list into tables that cross-tabulated each item by session and by key thematic domains such as fidelity, frequency, modality, and other topics. The two topical areas that emerged were medication related-protocols and health behavior and lifestyle treatment-related protocols. Workshop co-chairs reviewed the tables independently for clarity and completeness, then convened to collaboratively edit and standardize the list.

The list of protocols underwent many iterations to ensure practical application, including being informed by the Consolidated Criteria for Reporting Qualitative Research (COREQ) and other similar reporting guidelines.[5] This version of the list was circulated to the workshop co-chairs and attendees for their input. The finalized resource outlines the major potential domains that research protocols may address, including the level of content and detail that should be reported more thoroughly to support replication and validation. This list includes details of the lifestyle intervention, such as format, modality, and content, as well as protocol details related to OM, including dose, provider type, and inclusion and exclusion criteria. The final format aims to provide researchers with an organized list of research protocols to share so other clinical researchers and clinicians can understand not only how to replicate the study but also compare different protocols across studies. The list of research protocols is included in **Appendix I**.

Tools

"What clinical tools would help practitioners provide the best quality of care?"

During the virtual and in-person workshop convenings, participants discussed a wide range of existing and prospective tools aimed at advancing provider understanding of pharmacotherapy for pediatric obesity. With input from the CC, the workshop planning committee member representing the American Academy of Pediatrics (AAP) led the effort to develop a final catalog of tools reflecting the breadth of ideas generated during the workshop and the collective expertise of participants. Multiple layers of subject matter expert (SME) review and AI (i.e., Copilot) were used at key intervals to further categorize inputs, reduce redundancies, and consolidate key ideas. First, SMEs categorized ideas by focus area (i.e., primary care providers, multidisciplinary teams, patients and families, and research supports), then AI was used to suggest key themes and categories. The SMEs subsequently reviewed and refined these outputs to identify the desired types and formats of tools, the specific content needed within those tools, and additional strategies for engagement. The current tables represent the final output of this synthesis.

Unlike the other outputs, the ideas shared in these tables also include responses from the online forms used during the first phase of the workshop.

The final tools catalog includes three separate tables. **Table 3** highlights the types of tools that are desired for clinicians and the key content for those tools, along with strategies for building capacity. **Table 4** provides a high-level summary of the types of tools needed for patient education, describing format, content, and strategies to build connections. Lastly, **Table 5** provides a high-level summary of research tools needed to improve measurement and surveillance, standardize measurement and reporting templates, and support the development of normative datasets.

Table 3. High-level summary of the types of tools that are desired for clinicians, the key content for those tools, and strategies to build capacity

	Types and Formats of Tools	Desired Content	Strategies to Build Capacity
Clinical Supports Experts want easy-to-use clinical decision support tools that align to practice workflows and clinical care on key topics, as well as training and mentoring opportunities to build capacity.	• Algorithms • Checklists • Workflows/pathways • Tables • Health information technology (Fast Healthcare Interoperability Resources, electronic medical records templates, etc.) • Screeners and questionnaires • Tailoring/ personalization of decision tools • Sample letters and/or scripts • Patient explanation/ shared decision-making scripts • National consultation network • Care model and plans	• Initiation, selection and associated baseline assessments • Monitoring: – Nutrition status and dietary intake – Physical activity – Safety (side effects, eating disorders, etc.) – Effectiveness (dose adjustment, responders vs nonresponders, etc.) – Psychosocial • Anticipatory guidance counseling supports • Developmentally appropriate and specific evidence-informed nutrition, PA, and behavioral protocols • Care coordination and engagement of multidisciplinary teams • Specialty care referrals and criteria • Navigating and advocating for insurance coverage	• CME* opportunities • Maintenance of Certification opportunities • ECHO* virtual learning communities • National consultation network • Digital hubs • Collaborative learning opportunities • Train-the-Trainer networks • Hub and spoke models

** CME – continuing medical education; ECHO – Extension for Community Healthcare Outcome*

Table 4. High-level summary of the recommended content and format of tools for youth and families along with strategies to build connections

	Types and Formats of Tools	Desired Content	Strategies to Build Capacity
Clinical Supports Experts identified patient education supports which were not specifically Clinical Decision Support tools, as well as global strategies to support families.	• Handouts • Websites • Patient portal • Apps • Digital social media assets	• Basic information on physiology of obesity and role of pharmacotherapy • Understanding stigma and weight bias (as well as bias related to medication use) • Information on specific drug administration, side effects monitoring, etc. • Nutrition and physical activity guidance along with general health behaviors and social-emotional wellness guidance (developmentally appropriate) • Tracking tools (nutrition, physical activity, etc.)	• Peer networks • Social supports and campaigns • Mentors/ coaches

Table 5. High-level summary of the types and tools necessary to improve research

Improved Tools and Measures	• Development or refinement of eating disorder surveillance tools (e.g., Eating Disorder Examination Questionnaire (EDE-Q, brief vs. full versions) to track behavioral changes during obesity treatment • Research to determine which behaviors may improve or worsen during treatment and what level of assessment is needed • Wearable health devices or physical activity monitors for tracking • Development of surveillance biomarkers to identify and monitor nutrient deficiency risk during OM treatment, accounting for inflammatory markers such as CRP, albumin, and fibrinogen • Development of a new measure of functional sarcopenia for kids
Standardized Measurement & Reporting Templates	• Templates for describing behavioral interventions (dose, timing/ frequency, delivery format, personnel, setting, mode of communication) • Standardized outcome measurement checklists to ensure consistency in both clinical and research settings
Normative Data Development	• Creation of comprehensive normative datasets for youth (body composition, nutrient status, energy needs) to improve interpretation of treatment response and growth/development trajectories

Conclusions and Next Steps

This whitepaper presents a carefully curated set of research questions that, if addressed, have strong potential to improve the clinical care of youth with obesity, particularly in the context of emerging pharmacotherapies such as GLP-1–based treatments. The research questions identified through this process are not intended to be exhaustive; rather, they reflect a deliberate prioritization of the most pressing and actionable evidence gaps—those that must be addressed now to meaningfully translate research into clinical practice. Additionally, while this workgroup did not address ethical issues and study design, these considerations remain critical to future pediatric obesity research and clinical care.

This workshop was meant to be timely and applicable. Clinicians, particularly those on the front lines of pediatric obesity care, require evidence that can directly inform decision-making in the near term. The research questions outlined in this whitepaper are grounded in the realities of pediatric clinical practice and represent the areas in which new data are most urgently needed to improve patient care. Generating evidence in these domains will equip practitioners with the knowledge necessary to deliver high-quality, personalized, and safe evidence-based care to the youth and families they are serving today.

This work also represents a substantial collaborative effort, drawing on the expertise and engagement of a diverse group of contributors. While the list does not encompass every possible research question, it offers a focused and expert-driven roadmap for advancing the field.

The prioritization of research questions reflects the collective insight of expert clinicians and stakeholders convened through this process, underscoring what providers need to know in the current clinical landscape. Researchers, professional societies, and funding organizations can use this prioritized set of questions to inform their research agendas with the most immediate needs in clinical practice.

In parallel, thanks to input gathered from workshop participants, additional resources are in development to support the translation of evidence into practice. Using NCCOR's findings as a springboard, the AAP Institute for Healthy Childhood Weight is creating tools designed to assist frontline practitioners in integrating emerging evidence into patient care, further advancing the impact of this work.

Finally, academic journals, professional societies, and research funders are encouraged to consider not only the prioritized research questions, but also the collected research protocols, outcome measures, and tools presented in this whitepaper. When studies publish sufficient details to replicate and measure successful interventions, it helps ensure completeness, transparency, and consistency in applying research findings to real-world practice.

Together, NCCOR's collection of research questions, protocols, and outcomes to address gaps in pediatric obesity pharmacotherapy—along with much-needed tools from the AAP—provides a comprehensive framework to guide future research and accelerate improvements in the quality and consistency of care for youth with obesity.

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Appendix A: Acknowledgments

NCCOR gratefully recognizes the NCCOR members who developed the idea for this workshop and contributed to the success of the project and final products. NCCOR also extends its sincere thanks to the following individuals for their contributions.

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Appendix B: Glossary

Atypical antipsychotics, aka second-generation antipsychotics: A range of medications typically used to treat schizophrenia, bipolar disorder, and depression, which may be associated with weight gain/metabolic side effects.

Body composition: The relative amounts of fat mass, lean mass, water, and bone in the body, making up total body weight.

Body mass index (BMI): BMI is a calculated measure of a person's body weight (in kilograms) divided by the square of their height (in meters). BMI categories for children and teens are based on sex-specific BMI-for-age percentiles (or BMI percentiles).

BMI categories for children and teens age 2 through 19:

BMI Category	BMI Range (% or absolute, whichever is lower)
Underweight	Less than the 5th percentile
Healthy weight	5th percentile to less than the 85th percentile
Overweight	85th percentile to less than the 95th percentile
Obesity	95th percentile or greater, or 30-34.9 kg/m2
Severe obesity	120% of the 95th percentile or greater, or 35 kg/m2 or greater

Cardiometabolic adaptation: Physiologic changes in cardiovascular and metabolic function that occur in response to disease, weight change, treatment, or environmental stressors.

Clinical best practices: Health care strategies and treatments supported by evidence, clinical expertise, patient safety, outcomes, and the needs and preferences of the patient and family.

Clinical effectiveness: The degree to which an intervention improves meaningful health outcomes in real-world clinical practice.

Clinical judgment: The use of professional knowledge, experience, and understanding of an individual patient's situation to guide care decisions.

Combination therapy*: The use of two or more obesity medications together to treat obesity (*for the purposes of this paper).

Comorbidities: The presence of two or more distinct medical and/or psychiatric conditions in a patient at the same time.

Dietary pattern: The quantities, frequency, timing, method, proportions, variety, or combination of foods, drinks, and nutrients a person typically consumes.

Disordered eating: A range of problematic or unhealthy eating behaviors and attitudes about food, eating, body shape, or weight that can result in poor physical and/or mental health and impair healthy growth and development.

Dose: The amount of a medication or intervention delivered at one time or over a defined period, such as medication dose, number of visits, or minutes of treatment.

Evidence-based medicine: The integration of the best available research evidence, clinical expertise, and patient values to guide care decisions.

Fidelity: The degree to which an intervention, program, or study protocol is implemented as intended

Food noise: A patient-described term for persistent, intrusive, or unwanted thoughts about food, eating, cravings, or meal timing. It is not a formal diagnosis.

Glucagon-like peptide-1 receptor agonists (GLP-1): Medications that mimic the effects of GLP-1 hormone and are used to treat conditions such as type 2 diabetes and obesity.

Indirect calorimetry: A test that measures an individual's resting energy expenditure, or how many calories are burned to maintain the body's basic functions, by determining oxygen consumption and carbon dioxide production.

Intensive health behavior and lifestyle treatment (IHBLT): An evidence-based treatment approach that educates and supports families in nutrition and physical activity changes that improve weight status and comorbidities and promote long-term health. IHBLT is most often effective when it occurs face-to-face, engages the whole family, and delivers at least 26 hours of nutrition, physical activity, and behavior change lessons over 3 to 12 months.

Lean body mass: Total body weight minus fat mass. It includes muscle, bone, organs, connective tissue, and body water.

Lifestyle support or health behavior and lifestyle treatment (HBLT): Lifestyle support refers to the health and behavioral lifestyle treatment (HBLT) components aimed at improving health outcomes by modifying daily activities and environmental factors. This approach focuses on physical activity, nutrition, sleep, stress management, and/or related habits, recognizing that these behaviors are shaped by individual, social, cultural, and contextual influences.

Macronutrients: Nutrients required in relatively large amounts, including carbohydrates, protein, fat, and dietary fiber. They support energy needs, growth, body structure, metabolism, and other essential body functions.

Metabolic and bariatric surgery: Surgical treatments for severe obesity that produce substantial improvement in obesity and associated medical co-morbidities.

Micronutrients: Essential vitamins and minerals, including trace elements, required by the body in small quantities for healthy growth, development, and disease prevention.

MyActivity Pyramid: A visual guide designed to help individuals embed physical activity into their everyday life. The pyramid is organized into four levels: Everyday Activities (level 1, base), Active Aerobics and Sports (level 2), Strength and Flexibility (level 3), and Sedentary Lifestyle (level 4, top).

Nutrition education: A set of learning experiences designed to help individuals and communities voluntarily adopt healthy eating habits and food-related behaviors. Nutrition education translates complex nutritional science into practical life skills, such as understanding food labels, planning balanced meals, and safely preparing food.

Obesity medication (OM): Food and Drug Administration-approved pharmacological treatment for obesity.

Patient values: Goals, concerns, preferences of patients, and their families, which should be priorities that are considered when developing care plans and medical decision-making.

Pharmacotherapy: The treatment of a medical condition with medications.

Physical activity counseling: A collaborative, behavior-change strategy where a health care provider or wellness professional advises and supports a patient in increasing their physical activity and reducing sedentary behavior. Physical activity counseling involves assessing current activity levels, setting personalized goals, identifying barriers, and building the confidence to maintain long-term, healthy lifestyle habits.

Randomized controlled trial (RCT): A type of scientific experiment that measures the effect of an intervention or treatment by randomly assigning study participants into two or more groups—such as an experimental group receiving an intervention and a control group receiving a placebo or standard care.

Skeletal muscle mass: The amount of muscle attached to bones that supports posture, movement, strength, and physical function.

Whole child approach: A framework that prioritizes a child's social, emotional, cognitive, physical, and academic needs to support overall health and well-being.

Appendix C: Acronyms

AAP	American Academy of Pediatrics
ACE	Adverse childhood experience
ADHD	Attention-deficit/hyperactivity disorder
ADL	Activities of daily living
AI	Artificial intelligence
AOM	Anti-obesity medication
BMI	Body mass index
CC	NCCOR Coordinating Center
CBT	Cognitive behavioral therapy
CDC	U.S. Centers for Disease Control and Prevention
CDS	Clinical decision supports
ChEAT	Children's Eating Attitudes Test
CNS	Central nervous system
ED	Eating disorder
EDE-Q	Eating Disorder Examination Questionnaire
FDA	U.S. Food and Drug Administration
GLP-1	Glucagon-like peptide-1 receptor agonists
HBLT	Health behavior lifestyle treatment
HDL	High-density lipoprotein
HIT	Health information technology
HRQoL	Health-related quality of life
IHBLT	Intensive health behavior lifestyle treatment
IWQOL	Impact of Weight on Quality of Life
LDL	Low-density lipoprotein
MASLD	Metabolic dysfunction-associated steatotic liver disease
NCCOR	National Collaborative on Childhood Obesity Research
NIDDK	National Institute of Diabetes and Digestive and Kidney Diseases
NIH	National Institutes of Health
OM	Obesity medication
PA	Physical activity
PCP	Primary care provider
PROMIS	Patient-Reported Outcomes Measurement Information System
QOL	Quality of life
RCT	Randomized control trial
RQ	Research question
SDOH	Social determinants of health
SME	Subject matter expert
TSH	Thyroid-stimulating hormone

Appendix D: Seven Case Studies

Patient and Parent Perspectives

Faith Anne Heeren, PhD
Wake Forest University School of Medicine

Shannon Newsome
Patient advocate and parent

Patient overview

I remember the first day after I took a GLP-1 medication. I woke up with a pounding head, an aching body, and– for the first time in my life—a quiet mind.

I have lived with obesity my entire life. My mother knew my weight was going to be a struggle from an early age; even as a newborn, I never seemed to be satiated. Throughout my school years, I experienced social stigma. In elementary school, field day—which was usually an exciting day for young children—was my least favorite day of the year. I was picked last for every team that day, and my peers were consistently annoyed by my lack of athletic ability. In middle school, a boy used to throw paper balls at me in class and called me a whale.

In high school, I had an opportunity. My mother found a clinic that offered metabolic and bariatric surgery for adolescents. I took a leap of faith, undergoing Roux-en-Y gastric bypass surgery at age 16, and it changed my life. In my junior year of high school, I joined the tennis team. I spent college running 5Ks, going to workout classes with my friends, and learning how to cook foods that nourished my post-operative body.

For almost a decade, I maintained most of my weight loss. In 2020, I started a PhD program and moved seven hours away from home during a global pandemic. Slowly, the weight came back on. After my wedding in 2022, I decided to reestablish obesity care. I started by taking topiramate (Topamax®/Trokendi XR®/Qudexy XR®), then added phentermine (Adipex-P®/Lomaira®/Suprenza®), and eventually ended up on tirzepatide (Mounjaro®/Zepbound®). I lost 80 pounds of regain before I got pregnant with my daughter. Today, I am back on tirzepatide and navigating postpartum weight loss.

Key takeaways for practitioners

1. These are life-changing medications. My GLP-1 has had an impact on my appetite and satiety in a way that surgery did not.

2. It is crucial to address body image and mental health. I have been many different sizes in my life. On a GLP-1, I have learned that the weight I feel best at and the weight when I feel confident in my appearance are two different numbers. Navigating this has been challenging.

3. It is incredibly tempting to just stop eating when taking a GLP-1. My whole life I have been told, "If you just stopped eating...." Now, I could go all day without eating and not notice. I have to fight to be aware of the messages I have internalized, combat them, and make sure I'm fueling my body.

4. It can be difficult to be honest with your provider. There is a power dynamic, and I fear that if I disclose adverse events (e.g., nausea) that may affect my ability to receive my medication.

5. It is exhausting when experts' opinions and social messaging do not agree. I know and understand that obesity is a multifactorial, complex disease that requires evidence-based treatment. Despite this knowledge, I am often bombarded with social media content that suggests taking a GLP-1 is "cheating." It is easy to internalize these messages and think I should be managing my weight without any additional interventions.

6. It is difficult for an adolescent to conceptualize that obesity is a lifelong, chronic disease. I erroneously believed that once I had surgery, I would no longer have to worry about my weight. Even adults can be eager to get off GLP-1s, and weight loss can be mistaken as a cure for obesity.

Thank you for reading my story. I hope that these key takeaways are helpful as we begin to think about important research questions for this patient population.

Parent perspective

As a young mother, I followed every instruction from the pediatricians. I listened to the exact protocols about what and when to feed my children. But, even with all that guidance, I knew very early on that my daughter was going to struggle. She was born at 6 pounds, 13 ounces, and by her first birthday, she was already 33 pounds.

I found myself in an impossible position. Do I restrict food for a toddler? Do I deny her fruit because of natural sugars? Should she miss out on birthday cake with her friends? I even baked sugar-free cupcakes so she could fit in at parties.

I knew the uphill battle she faced because I had lived it myself. I had struggled with obesity my entire life and eventually underwent gastric bypass at age 29. I didn't want her to live the same fate. But, despite every effort—limiting sweets, baking differently, following every tip and trick—nothing changed.

Obesity wasn't something she could grow out of, and it wasn't something I could fix as a parent.

If I could tell every pediatrician in the world one thing, it would be this: obesity is a disease. It is not caused by bad parenting. When parents are blamed, children internalize that guilt and feel shame for something they cannot control—the constant "food noise" in their heads telling them to eat.

I knew my daughter wasn't eating just to eat. Her brain was sending her relentless signals, pushing her to crave food in ways that weren't normal compared to her peers. It wasn't fair to ask her to only eat perfectly "clean" foods while every other child enjoyed pizza or french fries. Children with obesity shouldn't feel punished for having different biology.

Eventually, my daughter had weight-loss surgery. However, like many, she experienced weight regain. It wasn't until she started a GLP-1 that everything shifted. I can say the same from my own experience. After my gastric bypass, I also regained weight and began a GLP-1. What these medications do is nothing short of miraculous. For the first time, the food noise went silent.

Imagine what that means for a child: They can finally focus on school, friendships, and being a kid without guilt about being hungry or shame for not sticking to impossible diets. They can go shopping with friends, try on clothes, and feel "normal." These little things change a child's mental health and quality of life in profound ways.

If GLP-1s had been available when my daughter was 12, I truly believe she would never have needed surgery. That is how powerful they are.

For those who have never struggled with obesity, it is difficult to understand the impact. GLP-1s quiet cravings that feel impossible to resist. They give children control over their own lives and futures, and they offer us, as parents and practitioners, a chance to change the course of the obesity epidemic in the next generation.

Key takeaways for practitioners

1. Obesity is a disease, not a parenting failure. Blame only deepens shame and does nothing to address the biology driving the condition.
2. Children with obesity may experience constant "food noise." Their brains send relentless hunger signals that cannot be overcome by willpower or diets alone.
3. Weight-loss surgery is not the only option. For many children, GLP-1s could prevent the need for invasive surgery.
4. GLP-1s restore quality of life. They quiet food noise, reduce cravings, and allow children to simply be kids– participating fully in everyday life without guilt or shame.
5. Early access can change outcomes. Introducing GLP-1s in adolescence may help rewrite the future of pediatric obesity and give children healthier, happier lives.

Journey to Starting GLP-1s

Meredith Dreyer Gilette, PhD
Children's Mercy Kansas City

Patient description

The patient is a 15-year-old White male who was initially referred for treatment to prepare for bariatric surgery. He lives with his mother, father, and younger sister. He is currently in grade 10 and is very active in his school's theater program. He has "dual exceptionality," meaning he receives services through both the special education and gifted programs at school.

He has been followed by our interdisciplinary weight management clinic for two and a half years. When he first presented to the clinic, he was taking 30 milligrams of lisdexamfetamine (Vyvanse®) and 20 milligrams of fluoxetine (Prozac®). His diagnoses include attention-deficit/hyperactivity disorder (ADHD), anxiety disorder, autism, class 3 obesity, depression, elevated thyroid-stimulating hormone (TSH), fatty liver disease, and vitamin D deficiency. His weight-related family history is positive for obesity (mother, father, maternal grandmother, maternal grandfather, paternal mother, and paternal grandfather), bariatric surgery (mother), diabetes (father, maternal grandfather), and use of GLP-1s (mother, father). The patient's dietary history revealed some loss-of-control eating and large portions of foods, particularly at night. He was also a "choosy eater," struggling to eat vegetables and preferring higher carbohydrate foods and highly processed foods.

GLP-1 treatment, initiation, selection, and duration

Upon initial presentation, the patient was vehemently opposed to pursuing bariatric surgery. The patient, his parents, and the treatment team planned to work together on behavioral, dietary, and medication treatments.

> One of the great programs our hospital has is called Comfort Promise, which offers a bundle of evidence-based treatments to decrease distress around blood draws and injections. Given how frequently we take labs relative to other hospital departments, we regularly use the program. The bundle includes distraction techniques, devices such as the Buzzy Bee or shot blocker, comfort positioning, use of numbing creams and sprays, support personnel such as child life specialists, and medications (oral, such as lorazepam [Ativan®] or midazolam [Versed®] and inhaled, such as nitrous).

From a behavioral standpoint, we addressed his mood concerns by connecting him to therapy services and referring him to our psychiatry team. As GLP-1s were discussed from one of his earliest visits, we addressed his very significant needle phobia.

In addition to utilizing the Comfort Promise bundle for labs and providing psychologist and child life support, we demonstrated how a GLP-1 pen works several times. This allowed the patient to grow comfortable enough to administer the pen to fake skin before he received a prescription.

The patient also expressed concern that if he were to take a GLP-1, he would be taking the medication away from someone who "really needed it." Note that we had worked with the patient for over two years to make the decision to start a GLP-1, so the media messaging about a shortage was still relevant to him. His weight management physician initially optimized his medication outside of a GLP-1. The patient's course included higher doses of lisdexamfetamine, optimizing his fluoxetine, and adding topiramate, which he quickly stopped due to side effects. The patient was also referred to psychiatry for management of his psychotropic medications. His fluoxetine was weaned to duloxetine (Cymbalta®), and aripiprazole (Abilify®) was added for treatment-resistant depression in the context of autism. His duloxetine was changed to bupropion XL (Wellbutrin XL®). The weight management team added metformin.

The patient started semaglutide and followed the typical dose escalation schedule. Semaglutide was selected by the treating provider based on available data, approval, and insurance coverage. The patient's insurance approved semaglutide for eight weeks, but the re-authorization had to be appealed as he did not meet the initial weight loss goal. Unfortunately, after only six months on semaglutide, the patient lost insurance coverage and demonstrated rapid weight regain. His initial BMI change from 172 percent of the 95th percentile to 162 percent returned to 171 percent when medication was stopped.

GLP-1 treatment effects and outcomes

The patient and his parents reported that he successfully decreased snacking and overeating episodes while taking the GLP-1, while still maintaining a schedule of eating three times per day. He denied experiencing nausea or vomiting at each of our monthly check-ins. He was able to increase his daily water consumption to 64 ounces per day. With the decrease in hunger, he was also able to try more vegetables and took an interest in preparing healthy meals for the family that included a lean protein and vegetable. He still had the occasional dessert and favorite snack food, but his parents set him up for success by not keeping those foods around the house as often. When he did eat these foods, he was able to have smaller quantities. We assessed for the medication's impact on the patient's overeating/loss-of-control episodes, mood, and emotional eating. No concerns were reported by the patient or his family. Since the patient had worked with our team for quite some time prior to starting the GLP-1, he had a framework for setting behavioral goals and was able to maintain this momentum.

Lifestyle and behavioral supports plan

The patient often had long days with school followed by theater practice; he would come home very hungry, which led to overeating. Additional behavioral and nutritional strategies included planning for a more structured meal and snack schedule, especially on these days. We also worked on environmental controls to limit the foods that triggered overeating episodes. It was also critical that the patient had other strategies to cope with stress and high emotions other than food. We guided the family in implementing strategies to increase vegetable consumption through repeated exposure, choosing vegetables that are most similar in taste and texture to ones that he already ate. We worked on pairing protein foods with his snacks and decreasing sugary drinks to increase feelings of satiety.

Discussion

What we need to know

It is important to look at patients being treated concurrently with GLP-1s and atypical

antipsychotics. Given the power differential between providers and patients (many patients fear that their medication will be taken away if they honestly report side effects), how can we best assess for side effects? Additionally, the first measure of food noise among adults was recently published (Diktas et al., 2025), but more research is needed to determine if this measure will reliably change in response to GLP-1s and how this measure might be adapted for teens.

GLP-1 Therapy in an Adolescent Male with Obesity: What About Lean Mass?

Webb Smith, PhD, ACSM-CEP
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Patient description

The patient is a 15-year-old African American male, currently in 10th grade with normal academic progress. His medical history is notable for obesity due to excess calories (BMI greater than the 99th percentile for age), type 2 narcolepsy, and mild obstructive sleep apnea (OSA). He has no history of surgical interventions. His family history is significant for cardiovascular disease and hypertension, increasing his long-term cardiometabolic risk.

The patient has previously trialed several weight management medications with limited or unsustained weight reduction, including topiramate (Topamax®/Trokendi XR®/Qudexy XR®); liraglutide (Victoza®/ Saxenda®), which was denied by insurance; and metformin (Glucophage®/Glumetza®/Riomet®). His primary care provider previously prescribed sertraline (Zoloft®) for anxiety. Currently, the patient is prescribed Modafinil (Provigil®) and calcium oxybate, magnesium oxybate, potassium oxybate, and sodium oxybate (Xywav®) for narcolepsy management; semaglutide (Ozempic®/ Rybelsus/®Wegovy®) for weight management; and vitamin D supplementation for deficiency. The patient initially expressed interest in bariatric surgery, but his insurance denied approval. This prompted a pharmacologic treatment pathway emphasizing GLP-1 therapy.

GLP-1 treatment, initiation, selection, and duration

Semaglutide was selected because Mississippi Medicaid had previously approved coverage of the medication, and the patient had inadequately responded to other therapies. The insurance coverage process required two appeals before approval in April 2025. The patient was initiated on a semaglutide titration schedule beginning at 0.25 milligrams weekly with gradual increases every four weeks, until reaching the therapeutic dose of 2.4 milligrams weekly at week 17. The patient was followed every two months. He tolerated titration well, reporting transient gastrointestinal upset and some vomiting after the first dose of each escalation, which resolved within 24 hours. He has been adherent and motivated to continue treatment.

GLP-1 treatment effects and outcomes (at six months)

The patient's anthropometric and body composition changes were significant. He experienced a total body weight reduction of 17.3 kilograms (11.8 percent), BMI reduction of 5.9 kilograms per square meter (11.9 percent), body fat mass reduction of 10.8 kilograms (14.3 percent), lean body mass reduction of 6.5 kilograms (9.1 percent), skeletal mass reduction of 3.4 kilograms (10.6 percent), and body fat percentage reduction of 1.5 percent (2.9 percent). Although the patient achieved clinically significant weight loss, the reductions in lean and skeletal mass highlight the importance of structured support therapies to protect lean mass and promote healthy weight loss.

Lifestyle and behavioral supports plan

Prior to GLP-1 therapy, the patient endorsed poor nutritional habits, including skipping meals, consuming soda and sweetened beverages, and minimal physical activity except for school band participation (without engaging in marching routines). Although he made several attempts, his diet and activity patterns did not change significantly. He described a lack of motivation as the leading factor. Following initiation of GLP-1 therapy, he reported improved appetite regulation and healthier food choices, notably eliminating soda. He began walking regularly with a peer at the gym and is now fully participating in school band activities. He expresses pride in these lifestyle improvements and has shown increased motivation to sustain healthy behaviors.

Discussion

What we know and what we are doing

This case highlights the multifactorial management of adolescent obesity and illustrates both the promise and possible areas of concern around prescribing GLP-1s in this population. For this patient, semaglutide resulted in meaningful weight and fat mass reduction with only mild, transient side effects. Importantly, the patient reported subjective improvements in energy, confidence, and social participation, which may reinforce adherence.

However, the loss of lean body mass and skeletal mass is consistent with adult data on GLP-1 therapy and raises concerns in the context of adolescent growth and development. There is a consensus in the literature that some lean mass loss is inevitable with GLP-1 use or any significant weight loss. It is also widely believed that resistance training and adequate protein intake are effective countermeasures to attenuate muscle and bone losses during pharmacologic weight reduction. However, there is limited direct supporting evidence.

Building on the consensus, our clinical approach is to prescribe exercise along with medication. We typically begin with an assessment of health behaviors, including activity patterns, followed by general counseling to reduce inactive periods while increasing lifestyle activities like walking. As a consistent activity pattern emerges, an exercise prescription is developed based on the patient's current abilities, barriers to exercise, and resources available. Typical objectives are to activate as much muscle as possible with full-body movements, with a balance of aerobic and resistance training. SMART goals are built into the programming. Ideally, these programs are supervised to start and transition to home-based programs, but flexibility is a key to tailoring to the patient's needs.

What we need to know

While lifestyle interventions were used, the patient was not successful early on and only made significant lifestyle changes after medication helped control appetite and weight loss appeared to increase his motivation.

This highlights the knowledge gaps and the need for future research to explore optimal timing, protein requirements, and adherence strategies during combined pharmacologic and lifestyle interventions. Additionally, there are multiple, reasonable hypotheses for lean mass protective strategies in adolescents, including greater plasticity and anabolic potential. However, there is limited research evaluating the impact of GLP-1 therapy combined with structured resistance training on lean mass in adolescents. These are vital points in determining the adequate dose of exercise to preserve lean mass and how baseline growth and development may confound treatments. Further, adolescence may present a unique opportunity for lean mass preservation or gain, given teens' growth potential and responsiveness to exercise interventions. However, this is not routinely assessed, necessitating the use of standardized methods for body composition assessment

(e.g., dual-energy X-ray absorptiometry [DXA], bioimpedance) in pediatric trials.

Conclusion

This case demonstrates the clinical benefit of semaglutide in an adolescent with severe obesity and comorbid sleep disorders, with meaningful reductions in weight and BMI. The patient also achieved behavioral changes and increased physical activity, underscoring the synergistic potential of pharmacologic and lifestyle interventions. The case highlights that there are treatment stages where patients are most able to implement intensive lifestyle interventions. Ongoing monitoring and integration of exercise and nutrition support appear to be essential complementary strategies to ensure sustainable outcomes and to mitigate lean mass loss during weight reduction therapy.

13-Year-Old on Combination Pharmacotherapy

Jaime Moore, MD
University of Colorado School of Medicine; Children's Hospital Colorado

Patient description

The patient is a 13-year-old female with severe obesity and prediabetes on semaglutide (Ozempic®/Wegovy®/Rybelus®), phentermine (Adipex-P®/Lomaira®/Suprenza®), and topiramate (Topamax®/Trokendi XR®/Qudexy XR®).

- **Maternal pregnancy history** was notable for the absence of (pre)eclampsia and gestational diabetes. She was born at term, appropriate for gestational age, with no acute perinatal complications.
- **Family history** included hypertension, type 2 diabetes, dyslipidemia (grandparents), and asthma (brothers).
- **Social history** included a school shooting threat requiring a lockdown, which led to panic attacks and eating in response to strong emotions, for which she has been engaged in psychotherapy.
- **Past medical history** included anxiety with panic attacks and obesity-related complications, including obstructive sleep apnea (OSA) requiring positive airway pressure (PAP) therapy; prediabetes; and elevated non-HDL and triglycerides. Review of her growth curves from birth to younger than age 2 showed a weight-for-length that was not elevated (maximum of the 87th percentile). From age 2 and on, her height was consistently at the 85th percentile. Starting between age 2 and 3, her BMI was greater than or equal to the 95th percentile. Severe obesity started at age 11, concurrent with onset of puberty (thelarche at age 11, menarche at age 12).

Obesity program engagement

The family was initially referred to our Lifestyle Medicine program when the patient was aged 6 years. They engaged with a medical provider and a registered dietitian (RD) from ages 6 to 8. The patient's mother recalled that the family-based lifestyle interventions they made during this time included smaller portions; snacks on a schedule; and reducing intake of bread, cookies, and candy. She noted that this did not result in significant weight loss, and the family felt disillusioned, frustrated, and like they were "actually going backwards." Of note, a review of the patient's BMI showed stability during this period. There was a gap in care in our program, but the patient was re-referred at age 12 after identification of an A1c level in the prediabetes range. Her mother hoped for a different, biologically focused approach this second time around, including indirect calorimetry and adjunct medications.

Workup

With an A1c level of greater than or equal to 6 percent, we obtained autoantibodies to rule out possible evolving type 1 diabetes. The patient had

negative antibodies. Historically, our program has not routinely used body composition testing by bioelectrical impedance analysis (BIA) or other modality. However, we use indirect calorimetry (canopy method) to objectively measure resting metabolic rate through measurement of oxygen consumption and carbon dioxide exhalation. We added an activity factor of 1.3–1.4 based on detailed history.

This test was completed after the patient started taking 0.5 milligrams of semaglutide but had not experienced significant BMI reduction, which, if present, could have triggered metabolic adaptation.

We used the National Institute of Diabetes and Digestive and Kidney Diseases' (NIDDK) body weight planner tool (developed by Kevin Hall et al.), which is validated in adults. There is an opportunity to expand this tool to children and to include mechanisms of loss when entering weight target. The patient's resting metabolic rate was 1,781 kilocalories per day. Targeting a one pound per week weight loss over six months and factoring in activity, our estimated energy intake for her was 1,546 kilocalories per day. The patient's RD utilized this target to tailor her "nutrition prescription."

GLP-1 treatment, initiation, selection, and duration

The patient began taking semaglutide and followed the usual dose escalation without side effects. This was chosen as a first-line agent in the setting of untreated (at the time) severe OSA; history of anxiety and panic attacks; adolescent randomized control trial (RCT) data of semaglutide (not phentermine and topiramate) demonstrating A1c reduction; and a mechanism to obtain this (the Colorado Medicaid Early and Periodic Screening, Diagnostic and Treatment [EPSDT] benefit).

She experienced an approximately four percent reduction in BMI on 2.4 milligrams of semaglutide and plateaued there. Her A1c level improved initially but then recurred in the prediabetes range while on semaglutide. She initiated treatment for OSA, including PAP therapy and tonsillectomy/adenoidectomy. We then added 8 milligrams of phentermine and 50 milligrams of immediate-release topiramate. The patient tolerated all three medications very well with no significant side effects, met her nutrition goals, and had an additional 6 percent reduction in BMI.

GLP-1 treatment effects and outcomes

Compared to baseline, after 10 months of treatment (semaglutide initially, followed by the addition of phentermine and topiramate), the patient's BMI decreased by 11 percent, her A1c went from 6 percent to 5.4 percent, and her fasting triglycerides (258) and non-HDL cholesterol (126) were about to be repeated. Her OSA hypopnea index went from 28.2 per hour to 1.2 per hour, her blood pressure went from 114/70 to 106/64, and her bicarbonate went from 26 to 19 (very likely secondary to topiramate). Her mood was stable to improved, and her family expressed an improved sense of control and satisfaction with the treatment options.

Lifestyle and behavioral support plan

While on anti-obesity pharmacotherapy, she continued to meet individually with an RD. The indirect calorimetry result allowed us to more precisely understand whether appetite suppression on medication was too potent for the patient. The RD helped to support meal routine and adequacy of intake (i.e., volume and valence). Our program now also prescribes all patients starting a GLP-1 a complete multivitamin. The patient also met individually with an exercise physiologist for activity planning and continued engaging with her therapist for ongoing mental health support.

Discussion

What we know and what we are doing

- Before starting medication
  - Medication selection:
    - Does the patient have a contraindication/caution to starting phentermine or topiramate?
      - Personal history of kidney stones (topiramate), untreated hypertension (phentermine), untreated severe OSA or signs/symptoms of pulmonary hypertension (phentermine), severe/untreated anxiety or depression (either)
      - Concurrent use of high-dose stimulant (attention-deficit/hyperactivity disorder [ADHD])
  - Four-question disordered eating screen
    - Eating in response to strong emotions?
    - Loss-of-control eating?
    - Binge-eating episodes?
    - Compensatory behaviors with the intent of losing weight?
  - Micronutrient assessment (shared responsibility between the medical provider and RD)
    - Iron, vitamin D, and others selectively based on history
    - Review of systems (ROS) and nutrition-focused physical exam

What we don't know and what we need to know

- How will individual patients respond to the treatment options presented?
  - Can we develop tools to predict treatment response by medication class and obesity comorbidity burden?
  - Minimum percentage of BMI reduction necessary to achieve improvement/remission of each obesity comorbidity?
- Standardized guidance for de-escalation of anti-obesity medications (i.e., combination therapy after a certain percentage of BMI reduction and health improvement)
- Are GLP-1s superior to phentermine/topiramate (or other comparator) for the prevention of diabetes or progression from prediabetes to diabetes?
  - DISCOVERY Trial (NCT06525259)
- Could a subset of patients benefit from GLP-1s specifically during puberty (physiologic insulin resistance) for complications strongly associated with insulin resistance?
  - Prediabetes, metabolic syndrome-associated steatosis liver disease (MASLD)/metabolic syndrome-associated steatohepatitis (MASH), PCOS
- Could there be a lasting positive impact post-puberty upon GLP-1 discontinuation?

Pediatric Obesity Treatment in Social Context: Case Comparison

Lauren Shomaker, PhD
Colorado State University; University of Colorado Anschutz Medical Campus; Children's Hospital Colorado; Colorado School of Public Health

Patient descriptions

Patient 1 is a 14-year-old non-Hispanic White male in eighth grade who lives with his mother and younger brother in an agricultural community of approximately 850 people. His social history is significant for parental divorce. He presented with a BMI of 37 (greater than the 99th percentile, 139 percent of the 95th percentile) and was referred to a children's hospital's lifestyle medicine tertiary care program for comorbidities of obesity, including hypertension, low HDL cholesterol, hypertriglyceridemia, and vitamin D insufficiency. There are no known medical or genetic causes of obesity. The patient and his family denied patient and/or family mental or behavioral health concerns.

Patient 2 is an 18-year-old non-Hispanic White female in 12th grade, who lives with her mother, father, and younger sister in a rural community of approximately 19,000 people. Her family psychiatric history is significant for mood and substance use disorders. She presented with a BMI of 32 (96th percentile, 107 percent of the 95th percentile) and was referred to the same lifestyle medicine tertiary care program for comorbidities of obesity, including prediabetes and vitamin D insufficiency. The patient has a history of past and current gastrointestinal problems, which had been recently diagnosed as gastroesophageal reflux disease (GERD). Her mental health history is significant for past and current depression and binge eating disorder, with some attention/executive functioning difficulties consistent with subthreshold or diagnostic inattentive-type attention-deficit/hyperactivity disorder (ADHD). There are no known medical or genetic causes of obesity.

GLP-1 treatment, initiation, selection, duration

Patient 1's medical treatment plan included initiation of semaglutide (Ozempic®/Wegovy®/Rybelus®) in line with the typical dosage and dosage escalation schedule. In addition, the physician prescribed a vitamin D supplement and ordered ambulatory blood pressure monitoring.

Patient 2's medical treatment plan involved initiation of tirzepitide (Mounjaro®/Zepbound®) in line with the typical dosage and dosage escalation schedule. The patient had previously been on semaglutide with reported side effects that were not well tolerated. Patient 2 continued adjunct specialty care for GERD and ongoing medication treatment for mental health co-morbidities (duloxetine [Cymbalta®/Drizalma®/Irenka®], lisdexamfetamine [Vyvanse®]).

Lifestyle and behavioral supports plan

Both patients were seen for initial assessments in the children's hospital lifestyle medicine outreach specialty clinic. This clinic provides lifestyle medicine physician, dietitian, and psychology services in-person three times per year at a community pediatric practice in this agricultural/rural area. Between in-person outreach clinics, patients receive a lifestyle medicine physician and dietitian telehealth follow-up. Psychology services focus on health and behavior assessment, brief counseling related to presenting medical concerns and comorbidities, and referring to local/external care for follow up as indicated. This case comparison describes the course of approximately one year of treatment in this program-of-care for each patient.

Patient 1's behavioral health treatment plan included brief diet/nutrition and physical activity education, with SMART goal setting around increasing fruits and vegetables consumption, increasing fiber, consuming meals on a schedule (versus one to two times per day), less screen time, and more daily movement. The family declined dietitian or psychology multidisciplinary services; they reported access to a school counselor for stress related to the divorce.

Patient 2's behavioral health treatment plan included diet/nutrition and psychology sessions. The diet/nutrition sessions focused on SMART goal setting to increase fruits, vegetables, and protein; reduce screen time; and maintain current, regular physical activity. Psychology provided external resources, including bibliotherapy, telehealth therapy, and college counseling center resources; behavioral strategies for managing mood/anxiety and binge eating episodes (e.g., self-monitoring of triggers, alternative coping strategies); and interpersonal strategies to bolster social support and decrease loneliness, which in turn affect mood, anxiety, and disordered eating behaviors.

Treatment effects and outcomes

Patient 1's adherence to medical treatment was adequate with minimal reported barriers. His adherence to the behavioral treatment plan was modest. The family reported an increase in

the patient's agricultural work-related physical activity and a slightly better meal routine. His fruit and vegetable consumption remained a challenge. Over the course of approximately one year, the patient showed reduced BMI from greater than the 99th percentile to the 96th percentile. His LDL cholesterol and triglycerides went from elevated to normal. The patient continued to show elevated blood pressure.

Patient 2's adherence to medical treatment was challenging, primarily due to difficulties accessing tirzepatide regularly, which was related to the transition to college and barriers to medical care coverage in a different state. Her adherence to the behavioral treatment plan was adequate; she reported improved portion control and reduced binge-eating episodes. However, she had not connected to ongoing therapy support during the college transition. In the course of approximately one year, the patient showed continued excess weight gain, moving from a BMI at the 96th percentile to greater than the 99th percentile. She continued to have prediabetes, although her A1C level was elevated but stable, and she had not developed additional obesity-related comorbidities.

Discussion

What we need to know

- Co-management of mental health concerns:
  - Co-management of mental health concerns is critical to health outcomes in pediatric obesity treatment.
  - Patient 1 had access to a trusted mental/behavioral health counselor at his school, presumably for support in coping with social/family stressors (e.g., divorce). However, the family was not interested in engaging in psychology or dietitian specialty services. It is essential to understand the **perspectives and characteristics of rural families** regarding all facets of lifestyle medicine treatment, including mental/behavioral health components, to **tailor** treatment content and delivery processes to optimize engagement.
  - Patient 2 had a history of receiving mental health treatment (i.e., medication and therapy), but until she was referred for specialty care with lifestyle medicine, had not received treatment tailored to depression and binge eating in the context of comorbid obesity and prediabetes. The patient reported that accessing **high-quality mental/behavioral health care** was challenging in the rural setting. The transition to college and living outside of the home introduced new barriers to mental health treatment access.
  - **Adverse childhood experiences**—such as living with a parent with mental illness or addiction or interpersonal violence in the home—affect mental health and obesity, and likely the course of pediatric obesity treatment. However, clinicians do not have good systems in place to assess and address trauma and its impacts on health behavior, medication, treatment adherence, health outcomes, etc.
- Developmental timing:
  - The difference between age 14 and age 18 is vast—biologically, physiologically, cognitively, and socially. This period in the life cycle is a time of rapid and dynamic growth.
  - Patient 1 received specialty treatment for obesity at age 14, just prior to starting high school.
  - Patient 2 received specialty treatment for obesity and its complications at age 18, after middle and high school, with college on the horizon.
  - We know developmental timing matters, but we don't fully understand how or why, or how to factor this into treatment.
- Combination of behavioral treatment with medication in social context:

- Although medication for obesity is recommended in combination with behavioral supports, how can we make culturally/contextually tailored intensive health behavior and lifestyle intervention (IHBLT), or its components, available to more families?
- What are the other effective, pragmatic options for families who cannot commit to or access IHBLT?
- Medical and lifestyle treatment of an individual child cannot be considered out of social context. Social context includes factors such as:
  - Rurality
  - Cultural values
  - Family
  - Society
  - History
  - Education
  - Income

14-Year-Old Presenting for Surgery

Brooke Sweeney, MD, FAAP, FACP, DABOM
Children's Mercy Kansas City; University of Missouri Kansas City, Children's Center for Healthy Lifestyles & Nutrition

Patient description

A 14-year-old girl presents to bariatric surgery interested in gastric sleeve surgery. After her initial visit, she was sent to the weight management team for pre-surgical preparation. At her consultation one month later, she completed the Adolescent Binge Eating Disorder (ADO-BED) measure. In her screener, she endorsed guilt, eating alone, eating large portions, and feeling out of control while eating twice per week. There were no compensatory behaviors, including no vomiting, laxatives, diuretics, or excessive exercise noted.

She is very active. She plays softball and goes to the gym after school. When discussing sleep, she reports that she wakes up and does not feel well-rested. She naps for 1 to 1.5 hours after school several days per week. Therefore, a sleep study was ordered. Her family history includes depression (mother) and alcohol use disorder (biological father). The patient has a history of early-onset severe obesity. Therefore, genetic testing was ordered. The results came back negative. Her labs were normal except for the following results: ALT of 52, HDL of 33, and triglycerides of 185.

Four months into treatment, the patient completed the Behavior Assessment System for Children (BASC) surveys in preparation for a psychological evaluation. She received a new diagnosis of ADHD. Of note, she was known to the psychologist from our clinic at age 9 years. At this time, she also completed the sleep study, which showed moderate obstructive sleep apnea. However, she was unable to tolerate a mask, and Continuous Positive Airway Pressure (CPAP) was never initiated. This became less of a critical point because it was determined the patient would undergo intensive medication management rather than bariatric surgery.

Five months into her treatment and following the psychological evaluation, the patient (now age 15) came to the clinic with her maternal grandmother. Her grandmother provided additional family history by sharing a letter about her own history and the patient's mother's history of eating disorders. The letter was quite detailed. The grandmother reported that she had obesity and was abused by her husband. She also experienced significant periods of food insecurity, growing up during the Great Depression and often going without food to ensure her brothers were fed.

The grandmother grew up internalizing weight bias, believing that people with obesity were lazy and stupid. She saw obesity as the worst possible outcome and therefore began managing her own weight at around age 14. She reported that she constantly counted calories, had an unhealthy relationship with food, and was never able to

look at herself in the mirror. The grandmother also shared that her daughter (the patient's mother) began restricting during high school and developed anorexia. When the grandmother took the patient's mother for treatment, she was 20 pounds underweight. The patient's mother still has a disordered relationship with food and constantly walks on a treadmill while working. The patient grew up with locks on the fridge in addition to experiencing food insecurity.

When the patient was aged 9 years, her mother remarried. Her stepfather did not limit food in the house and ate a lot of junk food, making tempting foods much more available. The patient experienced rapid weight gain during this period, which was very distressing for her mother. This coincides with the first time they sought treatment at the clinic. As mentioned, the ADO-BED measure was positive for binge eating disorder at this visit.

GLP-1 treatment, initiation, selection, and duration

At her initial visit, the patient was prescribed 0.6 milligrams of liraglutide (Victoza®/Saxenda®) daily, injected subcutaneously. At her follow-up visit one month later, her weight had decreased by 2.2 kilograms. The liraglutide dosage was increased to 1.2 milligrams daily. At this time, the patient was able to make some lifestyle changes, including eating a higher quality diet, with increased protein and water intake. At both the first and second visits, she was accompanied by her stepfather. She continued with monthly visits in preparation for bariatric surgery, with a slow titration of liraglutide over four months, until she reached 3 milligrams daily.

At the four-month mark, given her diagnosis, bariatric surgery was considered too high risk. Instead, she began more intensive medication management and was closely followed in the weight management clinic with psychological support. With a new diagnosis of ADHD and a history of binge eating, she was prescribed 20 milligrams of lisdexamfetamine (Vyvanse®) daily. The patient experienced rebound hunger and cravings, so she began daily topiramate (Topamax®/Trokendi XR®/Qudexy XR®) each afternoon. Both medications were titrated over time (see **Figure 1**).

Figure 1

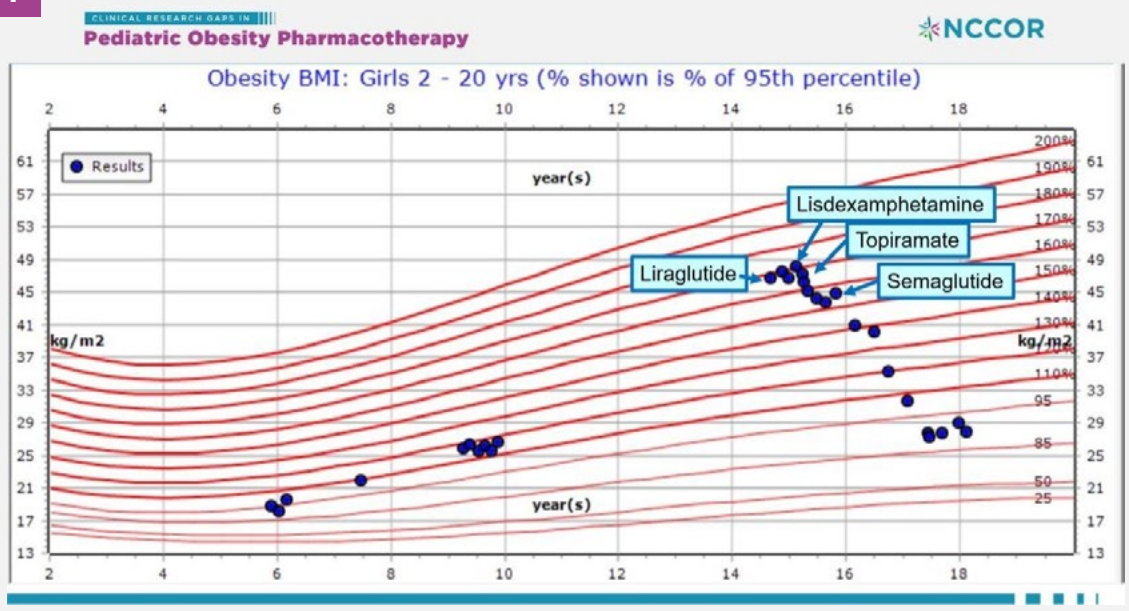
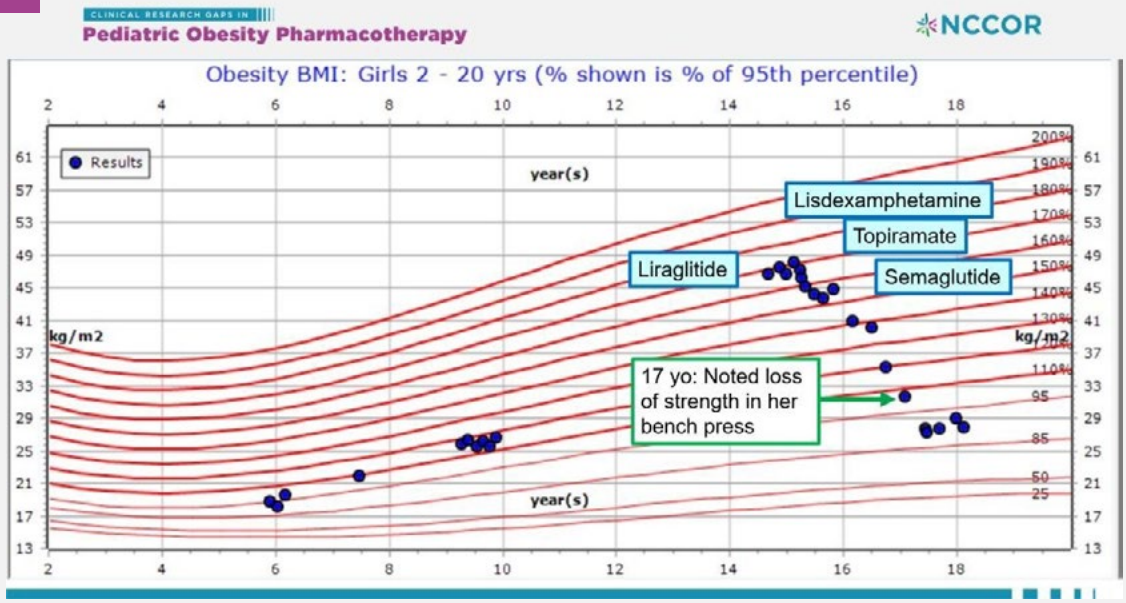


Figure 2



She continued intensive treatment with almost monthly visits over the next 10 months. Then, two months before turning 16, she reached a plateau. At that time, she was taking 40 milligrams of lisdexamfetamine daily and 15 milligrams of topiramate each afternoon. With semaglutide (Ozempic®/Wegovy®/Rybelus®) now available, the patient began taking semaglutide instead of liraglutide, titrating to 2.4 milligrams weekly over five months (see **Figure 2**).

GLP-1 treatment effects and outcomes

The patient underwent intensive monitoring by social work and psychology throughout the treatment period, with no signs of eating disorder or body dysmorphia. She was very open in her conversations about this. At age 17, she reported decreased muscle function (including decreased maximum weight for her bench press) while taking the 2.4 milligrams of semaglutide weekly. At this visit, body composition and labs were completed and revealed ALT of 16 and HDL of 30, which were very similar to her baseline levels. However, her triglyceride and hemoglobin A1c were improved, at 75 and 5.3%, respectively. Her vitamin D and zinc were low at 27 and 57, respectively. Low zinc typically indicates inadequate protein intake in surgery and medically managed patients. Her other vitamin levels were normal. Her body composition measured by seca scale showed her skeletal muscle mass was in the normal range. However, this was a baseline level, as the clinic did not have the machine previously.

Seven months later, repeat body composition and labs showed improvement. Psychology and social work continued to carefully monitor the patient's mental health, body image, and any signs of disordered eating. Her vitamin D remained low at 27, and hemoglobin was low at 12.5 with normal ferritin. Her HDL increased to 50 and then 60 over the next six months. She was prescribed a bariatric multivitamin with 45 milligrams of iron and 3,000 international units of vitamin D daily (see **Figure 3**).

At age 17.5, the patient plateaued on 2.4 milligrams of semaglutide weekly. After turning 18, her BMI was 28 (i.e., the 90th percentile), and she expressed interest in switching to tirzepitide (Mounjaro®/Zepbound®). See **Figure 4**.

Figure 3

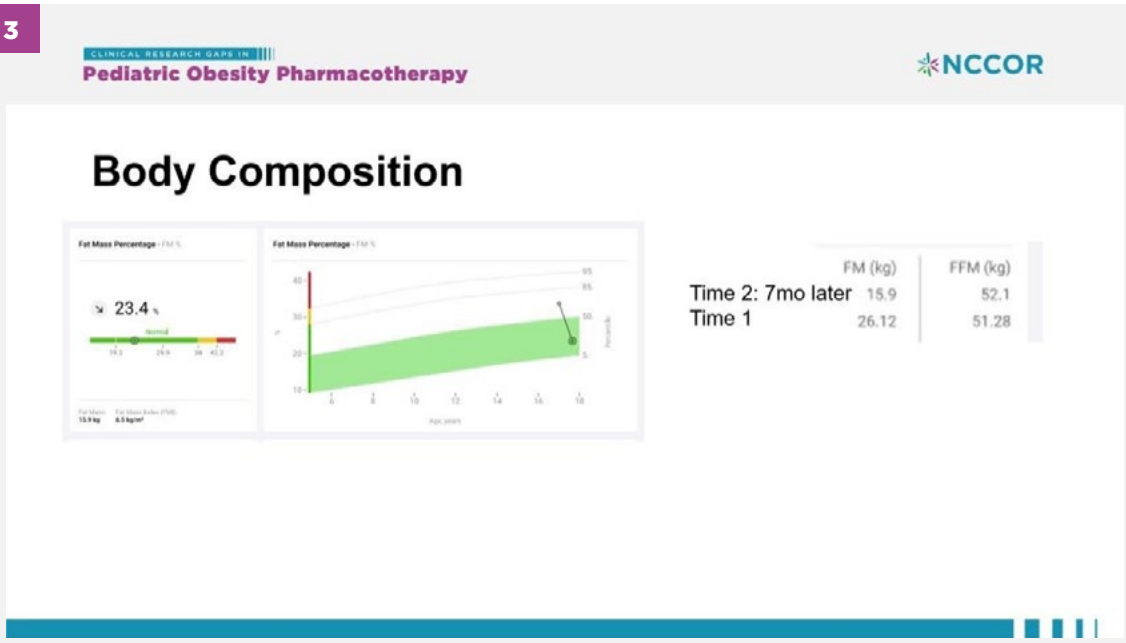
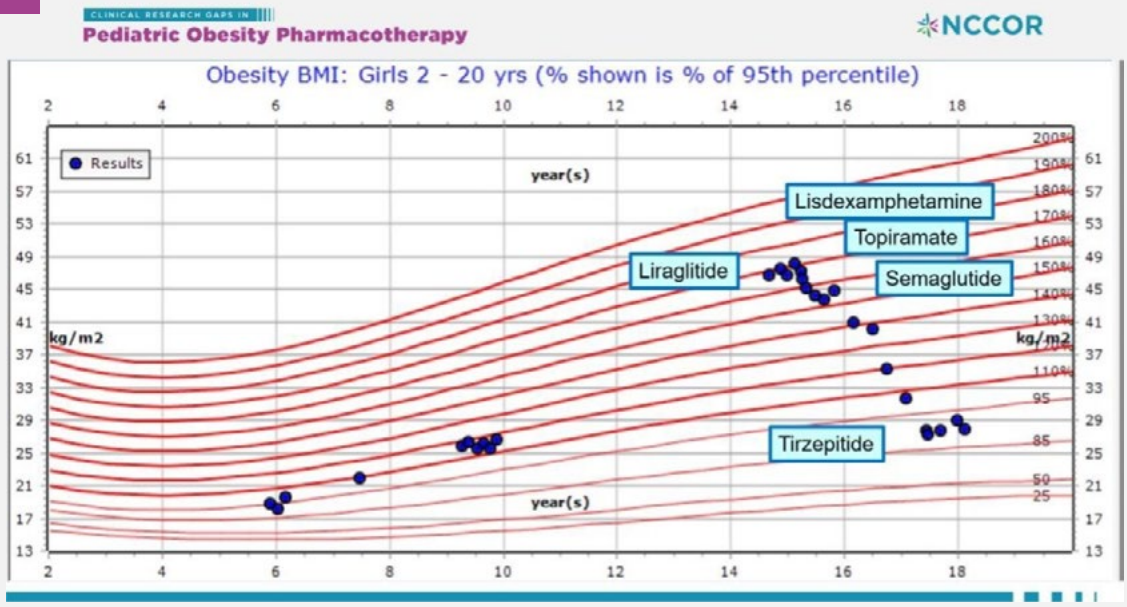


Figure 4



Lifestyle and behavioral supports plan

The patient underwent intensive monitoring at regular visits with the bariatric dietitian. Her labs were consistently monitored every six months, including vitamin levels. The patient assured the care team she would eat three to four times daily with protein at each meal to achieve a daily goal of 80 grams. She also used additional protein supplements, including protein shakes and protein bars, and increased her water intake goal to 100 ounces daily. Since she was already quite active, the care team continued to monitor her exercise and ensured adequate intake to support her physical activity. When decreased muscle function was reported, lifestyle intervention was intensified to include increased protein intake, increased water, and closer monitoring.

What we don't know

We must determine what BMI to target for maintenance. Would this be under the 85th percentile or even lower? We must also determine how best to change and titrate medications over time.

Impact of GLP-1 RAs on Nutrition

Katherine Balantekin, PhD, RD
University at Buffalo

What are the nutrition recommendations?

Due to the relatively new nature of this current wave of GLP-1 RAs, we do not yet have evidence-based nutrition recommendations. Rather, the nutrition recommendations/priorities for adults taking GLP-1s have been based on clinical recommendations for patients following bariatric surgery.[1,2] These recommendations include baseline nutrition assessment, management of gastrointestinal side effects, understanding of dietary preferences/cultural needs, prevention/mitigation of nutritional deficiencies, focus on preserving muscle and bone, and using a patient-centered approach to GLP-1 therapy.[2] Other recommendations include focusing on promotion of nutrient-dense food groups (e.g., fruits, vegetables, whole grains, lean dairy products, lean proteins, nuts and seeds, plant fats/oils), reducing intake of energy-dense foods (e.g., refined carbohydrates, sugar-sweetened beverages, processed meat, fast foods, foods high in added sugar), and focusing on eating smaller meals at regular times and staying hydrated.[2]

Notably, there are no consensus papers suggesting nutrition recommendations for children and adolescents taking GLP-1s. Nutrition considerations for this group are even more complex given different needs based on developmental stage, and this is a critical priority area. Moreover, diet quality, as assessed by the Healthy Eating Index, is lowest for children and adolescents aged 9 to 18 years compared to other age groups. This highlights the importance of maintaining high diet quality for children and adolescents on these medications.

What we know about nutrition and eating behavior in those taking GLP-1s

Again, we only have information about the impact of GLP-1s on nutrition among adults. Use of GLP-1s increases the risk of nutritional deficiencies compared to other therapies.[3] In a retrospective observational study of adults with type 2 diabetes taking GLP-1s, rates of new nutrition deficiencies were 12.7 percent at six months and 22.4 percent at 12 months, with vitamin D deficiency being the most common deficiency.[3]

[1] Almandoz, J. P., Wadden, T. A., Tewksbury, C., Apovian, C. M., Fitch, A., Ard, J. D., Li, Z., Richards, J., Butsch, W. S., & Jouravskaya, I. (2024). Nutritional considerations with antiobesity medications. Obesity.
[2] Mozaffarian, D., Agarwal, M., Aggarwal, M., Alexander, L., Apovian, C. M., Bindlish, S., Bonnet, J., Butsch, W. S., Christensen, S., & Gianos, E. (2025). Nutritional priorities to support GLP-1 therapy for obesity: a joint Advisory from the American College of Lifestyle Medicine, the American Society for Nutrition, the Obesity Medicine Association, and The Obesity Society. Obesity Pillars, 100181.
[3] Butsch, W. S., Sulo, S., Chang, A. T., Kim, J. A., Kerr, K. W., Williams, D. R., Hegazi, R., Panchalingam, T., Goates, S., & Heymsfield, S. B. (2025). Nutritional deficiencies and muscle loss in adults with type 2 diabetes using GLP-1 receptor agonists: A retrospective observational study. Obesity Pillars, 100186.

Two different reviews have focused on the inclusion of dietary data in GLP-1 clinical trials. In the scoping review by Babazadeh and colleagues,[4] they reported that, of the 129 studies included in the scoping review, only 36 reported collecting dietary data, with only 10 of those reporting the dietary outcomes. Of those 10, half reported data from single-time points, like an ad libitum meal, without any self-reported typical intake. In these studies, energy intake was reduced by 16 to 39 percent compared to placebo.[5] Only four of the studies reported changes in macronutrient intake, with inconsistent results.[5] In addition, 17 reported some other aspects of eating behavior, such as food cravings.

What we need to know

- How do GLP-1s affect dietary intake and quality in children?
- Are there unique nutrient needs for children taking GLP-1s? If so, what are they? Do they depend on the child's age, sex, pubertal status, and/or weight status?

[4] Babazadeh, D., Wyatt, S., & Steinberg, F. M. (2025). Examining the Omission of Dietary Quality Data in Glucagon- Like Peptide 1 Clinical Trials: A Scoping Review. Advances in Nutrition, 100491. https://doi.org/https://doi.org/10.1016/j.advnut.2025.100491

[5] Christensen, S., Robinson, K., Thomas, S., & Williams, D. R. (2024). Dietary intake by patients taking GLP-1 and dual GIP/GLP-1 receptor agonists: a narrative review and discussion of research needs. Obesity Pillars, 11, 100121.

Appendix E: In-Person Workshop Agenda

Clinical Research Gaps in Pediatric Obesity Pharmacotherapy Workshop

NCCOR (National Collaborative on Childhood Obesity Research) November 3–4, 2025

Location: Omni Atlanta Hotel at Centennial Park, 190 Marietta St. NW, Atlanta, GA 30303 Dogwood B Meeting Room

Workshop series goal: The objective of this workshop is to understand current practice and identify research gaps and priority research questions that, when answered, can help health care practitioners in the process and practice of prescription, maintenance, and discontinuation of GLP-1 and other obesity medications (OMs) for children and adolescents, and support for their caregivers.

Day 1: Monday, November 3

1:00–1:20 **Welcome and Overview of the Workshop**

- Amanda Sharfman, MS, MPH, *NCCOR Coordinating Center*
- Faith Anne Heeren, PhD, *Wake Forest University School of Medicine*

Session 1: GLP-1 Treatment Initiation, Selection, Duration, and Discontinuation

1:20–1:25 **Overview of Themes Related to GLP-1 Treatment Initiation, Selection, Duration, and Discontinuation**

- Brooke Sweeney, MD, FAAP, FACP, DABOM, *Children's Mercy Kansas City; University of Missouri Kansas City, Children's Center for Healthy Lifestyles & Nutrition*

1:25–2:30 **Table Discussion**

Related to initiation, selection, duration, and discontinuation…

1. Using the provided list, which three to five research questions do you think are the highest priority to address? You may edit questions as needed to strengthen them or add new questions if your top priorities are not reflected in the list.
2. For studies that address the prioritized research questions, are there specific details about **clinical protocols** that would particularly inform clinical care (e.g., algorithms used to guide dose escalation or detailed information that guide medication selection)?
3. For studies that address the prioritized questions, which **outcomes** would be most useful in informing clinical care (e.g., body composition, school presenteeism)? Please review the provided list of commonly reported outcomes and suggest additional outcomes that should be considered.

4. What **clinical tools** specific to initiation, selection, duration, and discontinuation would help practitioners provide the best quality of care (e.g., decision algorithms, flow diagrams)?

2:30–2:40 **Break and Move Tables**
Table #2

Session 2: GLP-1 Treatment Effects and Outcomes

2:40–2:45 **Overview of Themes Related to GLP-1 Treatment Effects and Outcomes**

- Jaime Moore, MD, MPH, *University of Colorado School of Medicine; Children's Hospital Colorado*

2:45–3:50 **Table Discussion**

Related to treatment effects and outcomes…

1. Using the provided list, which three to five research questions do you think are the highest priority to address? You may edit questions as needed to strengthen them or add new questions if your top priorities are not reflected in the list.
2. For studies that address the prioritized questions, are there specific details about clinical protocols that would particularly inform clinical care (e.g., content of the nutrition curriculum; specific provider types delivering care; time, in minutes, of face-to-face care; modality)?
3. For studies that address the prioritized questions, which outcomes would be most useful in informing clinical care (e.g., body composition, school presenteeism)? Please review the provided list of commonly reported outcomes and suggest additional outcomes that should be considered.
4. What clinical tools would help practitioners provide the best quality of care (e.g., tables of expected therapeutic outcomes and potential adverse effects)?

3:50–4:00 **Break**

Session 3: Mental and Behavioral Health

4:00–4:05 **Overview of Themes Related to Mental and Behavioral Health**

- Lauren Shomaker, PhD, *Colorado State University; University of Colorado Anschutz Medical Campus; Children's Hospital Colorado; Colorado School of Public Health*

4:05–5:10 **Table Discussion**

Related to mental and behavioral health…

1. Using the provided list, which three to five research questions do you think are the highest priority to address? You may edit questions as needed to strengthen them or add new questions if your top priorities are not reflected in the list.

2. For studies that address the prioritized questions, are there specific details about **clinical protocols** that would particularly inform clinical care (e.g., baseline and longitudinal mental/behavioral health assessments or screeners, protocols for screening and referring for mental/behavioral health symptoms)?
3. For studies that address the prioritized questions, which **outcomes** would be most useful in informing clinical care (e.g., self-esteem, improvements in mental health symptoms)? Please review the provided list of commonly reported outcomes and suggest additional outcomes that should be considered.
4. What **clinical tools** would help practitioners provide the best quality of care (e.g., practical training on validated youth mental health screening tools, clinical decision support tools, brief counseling protocols)?

3:50–4:00 **Around the Room: What stood out to you today?**

- Jeanne Lindros, MPH, *American Academy of Pediatrics*

5:25–5:30 **Wrap-Up and Reminders for Tomorrow**

- Amanda Sharfman, MS, MPH, *NCCOR Coordinating Center*

Day 2: Tuesday, November 4

8:00–8:05 **Welcome and Logistics**

- Amanda Sharfman, MS, MPH, *NCCOR Coordinating Center*

Session 4: Nutrition and Physical Activity Assessment, Monitoring, and Counseling

8:05–8:10 **Overview of Themes Related to Nutrition and Physical Activity Assessment, Monitoring, and Counseling**

- Katherine Balantekin, PhD, RD, *University at Buffalo*
- Webb Smith, PhD, ACSM-CEP, *University of Tennessee Health Science Center; Le Bonheur Children's Hospital*

8:10–9:15 **Table Discussion**

Related to Nutrition and Physical Activity Assessment, Monitoring, and Counseling…

1. Using the provided list, which three to five research questions do you think are the highest priority to address? You may edit questions as needed to strengthen them or add new questions if your top priorities are not reflected in the list.
2. For studies that address the prioritized questions, are there specific details about **clinical protocols** that would particularly inform clinical care (e.g., detailed content of nutrition counseling curriculum, guidance for children on OMs, physical activity guidance related to lean mass or bone health)?

3. For studies that address the prioritized questions, which **outcomes** would be most useful in informing clinical care (e.g., changes in micronutrient labs, lean muscle mass)? Please review the provided list of commonly reported outcomes and suggest additional outcomes that should be considered.
4. What **clinical tools** would help practitioners provide the best quality of care (e.g., training models for clinicians on nutrition and physical activity best practices for children on OMs, digital nutrition and activity self-monitoring tools linked to electronic health records)?

9:15–9:20 Break

Session 5: Intensive Health Behavior and Lifestyle Treatment (IHBLT)

9:15–9:20 Overview of Themes Related to IHBLT

- Meredith Dreyer Gillette, PhD, *Children's Mercy Kansas City*

9:25–10:30 Table Discussion

Related to IHBLT…

1. Using the provided list, which three to five research questions do you think are the highest priority to address? You may edit questions as needed to strengthen them or add new questions if your top priorities are not reflected in the list.
2. For studies that address the prioritized questions, are there specific details about **clinical protocols** that would particularly inform clinical care (e.g., duration and dosage of IHBLT, format (group/individual), modality (virtual/in-person)?
3. For studies that address the prioritized questions, which **outcomes** would be most useful in informing clinical care (e.g., retention, lifestyle behavior change)? Please review the provided list of commonly reported outcomes and suggest additional outcomes that should be considered.
4. What **clinical tools** would help practitioners provide the best quality of care (e.g., care coordination models, referral systems)?

10:30–10:40 Break and Move Tables
Table #4 (by specialty)

10:40–11:10 Brainstorm: What other supports or resources could assist with multidisciplinary practice improvement (e.g., learning networks, peer-to-peer supports)?

11:10–11:15 Break and Move Tables
Table #5

11:15–12:15 Prioritization Activity

12:15–12:30 Closing

- Jeanne Lindros, MPH, *American Academy of Pediatrics*

Appendix F: Original 105 Research Questions

**This document was generated with assistance from AI tools. The content has been reviewed and edited by the workshop planning committee.*

***Over the course of the year, the term IHBLT shifted to HBLT, as this service and intervention components have yet to be defined for this population and IHBLT is defined for youth with obesity, not necessarily on OMs*.

Session 1: GLP-1 Treatment Initiation, Selection, Duration, and Discontinuation

Using the provided list, which three to five research questions do you think are the highest priority to address? You may edit questions as needed to strengthen them or add new questions if your top priorities are not reflected in the list.

Theme 1: Timing and Criteria for Initiation of GLP-1 Therapy

This theme explores when and for whom GLP-1s should be introduced in pediatric populations, including how to consider obesity class, comorbidities, and prior behavioral interventions.

1. When is it appropriate to start obesity medications (OMs) in children—by age, body mass index (BMI) class, or clinical indicators?
2. In children and adolescents, should pharmacologic treatment follow an initial course of intensive behavioral and lifestyle therapy (IHBLT), or occur concurrently?
3. In children with obesity (including younger children or those with class 1 obesity), can earlier intervention with OMs prevent worsening obesity and comorbidities?
4. In children and adolescents, what health measures beyond BMI (e.g., metabolic markers, psychosocial variables) can inform treatment initiation?

Theme 2: Selection and Personalization of Therapy

This theme examines how to tailor medication choice and dosing to the individual, considering genetic, behavioral, developmental, and comorbid factors.

5. In children and adolescents receiving care for obesity, what health factors inform medication selection (e.g., when is semaglutide appropriate vs. phentermine/topiramate vs. combination therapy)?
6. Can results of obesity genetic testing predict response to, best timing for, and side effects of GLP-1 treatment?

7. What factors should guide dose titration in children and adolescents?
8. Could lower or personalized dosing minimize adverse effects, such as those on bone and muscle mass?
9. In children and adolescents with medical complexity due to physical, mental, or behavioral health concerns, how can OM selection be tailored to account for the therapeutic effects and side effects of various therapies?

Theme 3: Treatment Duration, Weaning, Discontinuation Effects, and Shared Decision-Making

This theme focuses on systemic and psychosocial barriers to starting and maintaining therapy, including insurance coverage, provider knowledge, and communication challenges. The questions investigate how long GLP-1 treatment should continue, what happens when treatment stops, how to safely manage discontinuation or switching medications, and patient/provider communication.

10. How can we reduce discontinuation rates due to side effects or adverse events?
11. What are the consequences of treatment discontinuation on physical health, mental health, and quality of life?
12. What are the most effective supports for families navigating medication access barriers, medication changes, and care transitions?
13. How are patients and families accessing and interpreting information about GLP-1s and other medications (e.g., online sources, social media)?
14. What new medical or psychological risks emerge after weight regain post-discontinuation?
15. How should we determine when (if ever) to taper or discontinue treatment, and what supports should accompany that process?
16. How can step-down or maintenance strategies be designed to sustain benefits and reduce relapse risk?
17. What patient-provider communication strategies improve early conversations about titration pace, side effects, and expectations for medication management?

Session 2: GLP-1 Treatment Effects and Outcomes

Using the provided list, which three to five research questions do you think are the highest priority to address? You may edit questions as needed to strengthen them or add new questions if your top priorities are not reflected in the list.

Theme 1: Body Composition, Growth, and Physical Development

This theme addresses how GLP-1s affect lean body mass, fat distribution, bone health, and overall growth. It also explores how to best measure and interpret these changes. *Note: these questions must be addressed by age and sex, and by developmental and pubertal stage.

1. What are the short- and long-term effects of GLP-1 therapy on lean body mass, fat mass, bone mineralization, and skeletal maturation in children and adolescents?
2. How do changes in body composition (e.g., muscle, bone, fat) relate to overall health outcomes during treatment?
3. What percentage of lean or skeletal mass loss is expected and clinically acceptable relative to total weight loss?
4. Are observed lean mass reductions harmful, or do they represent loss of "low-quality" (i.e., fat-infiltrated) tissue, which may be metabolically beneficial?
5. What tools and methods are most accurate for longitudinally tracking body composition in youth on GLP-1 medications, accounting for puberty and age-related growth?
6. How can we optimize maintenance of muscle and bone mass (e.g., through nutrition, strength training, or timing of intervention)?
7. With OM-associated rapid weight loss, what are the effects on skeletal maturation, final adult height, exercise capacity, and physical function?
8. Can body composition tools like bioelectrical impedance analysis (BIA) be standardized and validated for children and adolescents (e.g., to account for hydration status and developmental stage)?

Theme 2: Combination and Comparative Medical and Surgical Treatment Outcomes

This theme looks at outcomes when GLP-1s are used in combination with other OMs or surgery and compares their effectiveness across settings and populations.

9. How do GLP-1s compare with bariatric surgery in terms of weight, metabolic, and short- and long-term psychosocial outcomes? Does this differ for certain sub-populations?
10. How do medication-plus-surgery approaches perform in refractory obesity cases?
11. What are the benefits or risks of combining GLP-1s with other agents (e.g., phentermine/topiramate, antipsychotics, stimulants)?
12. Does baseline eating disorder (ED) history or psychological treatment modify GLP-1 response?
13. How do combination therapies (e.g., GLP-1 with phentermine/topiramate, GLP-1 with sleep apnea treatment, GLP-1 with behavioral/lifestyle interventions) interact to influence outcomes?
14. How can clinicians recognize and address factors such as polypharmacy, drug-drug interactions, and compounding side and therapeutic effects in multi-drug treatment regimens (e.g., overlapping effects on appetite, mood, or sleep)?

Theme 3: Outcomes

This theme focuses on factors that affect real-world outcomes.

15. What is the optimal BMI or health metric to target in treatment? Should function, body composition, or other outcomes be prioritized over BMI reduction?
16. How can we better predict and define treatment responders versus non-responders in youth?
17. How do puberty stage, treatment duration, and comorbidity profiles influence OM treatment outcomes?
18. How can coordination between medical, behavioral, nutrition, and physical activity professionals during GLP-1 therapy lead to improved outcomes?

Theme 4: Monitoring, Safety, and Practical Management

This theme focuses on real-world monitoring, functional outcomes, and safety indicators that guide care during and after treatment.

19. How do we ensure patients' appetites are not over-suppressed, and they are not under-eating to the point of nutrient or energy deficits?
20. What practical, clinic-based tools (e.g., indirect calorimetry, BIA, handgrip strength) can help monitor nutritional adequacy and functional health?
21. Does GLP-1 treatment in children and adolescents change pubertal progression and growth in such a way that routine growth monitoring should be adjusted?
22. Which routine labs and assessments (e.g., vitals, cardiac function, orthostatic signs) best detect adverse effects such as hypotension, bradycardia, or fatigue?

Theme 5: Preserving Lean Body Mass, Bone Health, and Physical Function

This theme addresses the risk of muscle and bone loss associated with appetite suppression and rapid weight loss. Clarity is needed around protecting lean mass and optimizing strength and metabolism through nutrition and physical activity.

23. Which nutrition and physical activity strategies best minimize lean mass and skeletal muscle loss in youth on GLP-1s?
24. What protein and other micro- or macronutrient targets are ideal to maintain muscle mass and bone health?
25. What measurement tools are best for monitoring bone density and muscle mass during OM treatment (e.g., dual-energy X-ray absorptiometry [DXA], strength metrics)?
26. What rate of weight loss is physiologically safe for adolescents?

Session 3: Mental and Behavioral Health

Using the provided list, which three to five research questions do you think are the highest priority to address? You may edit questions as needed to strengthen them or add new questions if your top priorities are not reflected in the list.

Theme 1: Addressing Disordered Eating and Screening for Risk

This theme addresses the need for better tools and evidence to screen, monitor, and manage eating disorders (ED) and disordered eating behaviors among youth receiving obesity treatment, especially those on medications like GLP-1s or post-surgery. There is also a need to understand how these treatments interact with eating behavior and risk over time.

1. What are the best validated tools to screen for and monitor for EDs or disordered eating during obesity treatment with medications?
2. How prevalent are EDs or disordered eating before, during, and after treatment with OMs?
3. How should patients with active or prior ED symptoms be screened and monitored during GLP-1 treatment?
4. How do medications like GLP-1s affect ED or disordered eating risk, symptoms, or restrictive behaviors?
5. How can clinicians manage emerging EDs or disordered eating symptoms during obesity treatment with medications?
6. Does family history of EDs or disordered eating predict treatment outcomes with OMs?
7. How can clinicians ensure appetite suppression does not lead to under-eating or nutritional compromise?

Theme 2: Integrating Mental and Behavioral Health into Obesity Care

This theme centers the co-management of obesity and mental health conditions, highlighting the importance of integrating behavioral health professionals and monitoring mental health outcomes alongside physical ones.

8. Does the co-occurrence of neurodevelopmental, mental, or behavioral health conditions require modified treatment approaches among children and adolescents being considered for OMs? If yes, how should treatment be modified?
9. What models of co-management between mental health professionals and obesity care teams lead to better outcomes?
10. How do untreated mental health concerns impact obesity treatment success?
11. What outcomes related to mental health and quality of life should be routinely assessed in patients using OMs?

12. Should pediatric obesity care include standardized adverse childhood experience (ACE) screening, and would it influence management or outcomes?

Theme 3: Mental and Behavioral Health Outcomes

This theme focuses on the psychosocial and psychiatric impacts of GLP-1 use, particularly in youth with mental health conditions or eating disorder histories who were excluded from early trials.

13. What are the safety and efficacy profiles of GLP-1s in youth with depression, suicidality, or other life-threatening psychiatric concerns?
14. How do GLP-1s interact with other psychotropic medications (e.g., atypical antipsychotics, attention-deficit/hyperactivity disorder [ADHD] stimulants, mood stabilizers)?
15. Can GLP-1s mitigate the metabolic side effects of psychotropic drugs, or do they introduce new behavioral risks?
16. How do medication and surgical interventions impact emotional well-being, self-perception, and eating behaviors over time?
17. What are the psychological consequences of rapid weight loss during OM treatment?

Theme 4: Supporting Healthy Psychosocial Development and Reducing Stigma

This theme focuses on helping children navigate the psychosocial burden of obesity, including bullying, bias, and stigma, while fostering their resilience, positive self-image, and supportive environments at school, home, and in care.

18. What interventions and support strategies during OM treatment can effectively reduce weight-based bullying and stigma among children and adolescents, and help youth cope with obesity- related stigma?
19. What are the most effective, evidence-based interventions to reduce weight-based bullying and stigma for children undergoing obesity care, including OM treatment?
20. How can OM treatment promote body acceptance and self-compassion without diminishing motivation for healthy behavior change?
21. What training models help providers recognize and mitigate their own weight bias in pediatric obesity care?

Theme 5: Providing and Tailoring Behavioral Interventions

This theme addresses the need for clinical guidance around providing behavioral supports for children on OMs and their families and around adapting interventions for children with unique needs or social challenges.

22. What types of support and educational tools are most effective in helping parents during their child's OM treatment (e.g., teaching aids)?

23. How can behavioral supports for those on OMs be made more culturally responsive to improve trust and participation?

24. What is the impact of cognitive behavioral therapy (CBT) and resilience training (e.g., self-compassion, positive framing) on medication adherence and psychological wellbeing?

25. How can supports for families with children on OMs be adapted for children with special circumstances, such as restricted food repertoires or low physical activity tolerance?

26. What are effective ways to address psychosocial challenges that limit participation in treatment?

Session 4: Nutrition and Physical Activity Assessment, Monitoring, and Counseling

Using the provided list, which three to five research questions do you think are the highest priority to address? You may edit questions as needed to strengthen them or add new questions if your top priorities are not reflected in the list.

Theme 1: Monitoring Nutrient Intake, Quality, and Deficiency Risks

This theme addresses the need for evidence and standardized guidance on how to assess and monitor nutritional adequacy in youth undergoing pharmacologic treatment. There is particular concern about micronutrient deficiencies, reduced energy intake, and the downstream effects on growth, bone, and brain health.

1. What are the short- and long-term nutritional implications of GLP-1 therapy in adolescents?

2. What micronutrients and macronutrients (e.g., zinc, fat-soluble vitamins, protein, fiber) should be routinely monitored in youth on GLP-1s or other OMs? How often?

3. How does diet quality, meal timing, and nutrient density change during and after treatment with OMs?

4. What are the long-term effects of altered nutritional intake due to OMs on growth, bone density, and cognitive development?

Theme 2: Developing Evidence-Based Nutrition Guidance for GLP-1 Use in Youth

Currently, there are no pediatric-specific nutrition guidelines for GLP-1 use. This theme addresses the need for evidence to define safe dietary patterns, supplementation needs, and monitoring protocols, which can inform future clinical practice guidelines.

5. How should nutrition recommendations differ for GLP-1 vs. other OMs?

6. What practical, clinic-based methods can help detect undernutrition early (e.g., resting metabolic rate [RMR] assessment, dietary recall tools)?

7. What frameworks can guide comprehensive nutrition monitoring and reporting in OM research studies?

8. How can nutrition counseling support healthy relationships with food for children taking OMs and experiencing treatment effects (e.g., changes in appetite or taste preferences)?

9. How does "food noise" change during and after GLP-1 treatment, and how should it be measured (e.g., self-report, ecological momentary assessment [EMA], functional MRI)?

Theme 3: Expanding Access and Multidisciplinary Support

There is broad recognition that access to specialized nutrition and behavioral support is limited. This theme addresses the need to understand how additional staffing and care models improve outcomes in order to scale health behavior and lifestyle treatment delivery.

10. Do multidisciplinary care models that include diverse practitioner types (e.g., registered dietitians, physical activity specialists, behavioral counselors) improve outcomes for children on OMs compared to physician-only care?

11. How does access to specialty staff (e.g., nutrition, physical activity, behavioral health) improve the effectiveness of obesity treatment programs?

12. What effective methods/models (e.g., telehealth) can we use to expand access to nutrition counseling for children on OMs?

13. What are the most valid and practical tools for real-world data collection on a child's nutrition and physical activity during OM treatment in community settings?

Theme 4: Physical Activity Counseling and Preserving Lean Mass and Bone Health During Treatment

This theme emphasizes the need to better understand the impacts of GLP-1s and rapid weight loss on muscle and bone development in youth, as well as strategies to preserve lean mass through tailored exercise and nutrition interventions.

14. Which physical activity and nutrition interventions are most effective in minimizing lean mass loss and preserving bone mineralization in adolescents using GLP-1s?

15. What is the critical period to prioritize strength training—before, during, or after pharmacotherapy?

16. How can we design exercise prescriptions or physical activity programs that are fun, social, and developmentally appropriate for adolescents during OM treatment?

17. What are effective strategies for involving families and addressing barriers related to social drivers of health in physical activity promotion?

18. What is the impact of reframing physical activity as stress relief, fun, or social engagement rather than calorie expenditure?

Session 5: Health Behavior and Lifestyle Treatment (HBLT)

Using the provided list, which three to five research questions do you think are the highest priority to address? You may edit questions as needed to strengthen them or add new questions if your top priorities are not reflected in the list.

Theme 1: Health Behavior and Lifestyle Treatment Intensity and Tailoring

This theme highlights the need to identify the optimal dose and sequencing of HBLT components (e.g., nutrition, physical activity, behavioral support) in combination with pharmacotherapy. Guidance is needed around tailoring intervention intensity to patient needs, avoiding one-size-fits-all models, and balancing comprehensiveness with feasibility.

1. What degree of HBLT intensity (i.e., dose over time) is necessary when paired with GLP-1 or other pharmacotherapies to achieve sustainable outcomes?
2. What modifications to the content of HBLT curricula, program components, or other adaptations are needed for children on OMs?
3. In HBLT programs with mixed participants (i.e., some taking GLP-1s and some not), what are important considerations to keep in mind (e.g., group dynamics, therapeutic approaches, lived experiences, stigma, perceived treatment success)?
4. Are "low-touch" (i.e., lower dose) behavioral, nutrition, and physical activity supports as effective as full-intensity HBLTs for youth on pharmacotherapy?
5. What models of care coordination best support the delivery of comprehensive, multidisciplinary HBLT programs for children on OMs?
6. How can we structure stepwise, individualized lifestyle programs that integrate nutrition, physical activity, and behavioral components without overwhelming patients who are on OMs?
7. What is the most effective timing of lifestyle intervention elements for children on OMs to ensure sustainable engagement?
8. How does HBLT impact what happens to weight and dietary intake when GLP-1 treatment stops?
9. How do youth describe the experience of lifestyle change while on GLP-1 treatment? What makes lifestyle change easier or harder than before they were on medication?
10. How can HBLT be interwoven with additional behavioral and medical supports to provide care optimized to an individual's needs?

Theme 2: Sleep, Screen Time, and Parenting

Sleep and screen time emerged as understudied but influential lifestyle factors that affect appetite regulation, treatment adherence, and overall metabolic health. This theme highlights the importance of integrating these behaviors into HBLT monitoring and guidance.

11. How do sleep patterns and screen time behaviors influence weight loss and maintenance among youth receiving HBLT and GLP-1 treatment?

12. Can improving sleep quality enhance the effectiveness of pharmacotherapy or HBLT components?

13. How can parent training be tailored to maximize engagement, trust, and cultural responsiveness in HBLT programs for children on OMs?

Theme 3: Social Connectedness and Support

This theme seeks to identify the role of social context—including peer relationships, family cohesion, and access to community spaces—as key moderators of treatment success. There is interest in understanding how social support can buffer stress and enhance adherence to lifestyle programs.

14. How does social connectedness (e.g., family cohesion, peer support, community engagement) affect outcomes in HBLT for youth on OMs?

15. How can HBLT interventions be structured to foster positive social interactions and peer support during behavior change for children on OMs?

16. How does access to safe, affordable community resources (e.g., recreation centers) influence adherence to and sustainability of lifestyle change for children during or after treatment with OMs?

Theme 4: Stress Reduction and Coping

This theme covers stress and emotional burden as barriers to sustained lifestyle change. HBLT should intentionally incorporate stress reduction, mindfulness, and emotional regulation strategies, especially for adolescents managing weight stigma or rapid changes in body image.

17. How can stress management and coping skills be integrated into HBLT to improve adherence and wellbeing for children on OMs?

18. How does chronic stress influence appetite, sleep, and metabolic outcomes in youth undergoing obesity treatment with medications?

Appendix G: 35 Primary Research Questions and Related Research Questions

Research Questions, Related Questions, and Design Considerations:

This appendix outlines the primary research questions as well as related research questions and design considerations that were discussed at the November 2025 workshop and iteratively reviewed and revised. This list of research questions, related research questions, and design considerations is not all-inclusive; rather, it is a consolidation of examples that were developed during the year-long workshop. Additional factors to consider for the pediatric population specifically, when applicable, include the following domains.

Additional Factors for Consideration:

- **Individual pediatric patient and developmental factors** – Characteristics intrinsic to children or adolescents (e.g., age, developmental stage, pubertal status, genetics, disability status, and special health care needs) that influence treatment appropriateness and risk–benefit considerations.
- **Disease severity, functional status, and clinical risk factors** – Indicators of obesity severity and associated medical or psychiatric burden (e.g., quality of life, body mass index [BMI] class, comorbidities, genetics, family history, laboratory values, nutritional biomarkers, imaging, metabolic markers such as blood pressure, and other screening results such as mental health and eating disorders) that inform clinical urgency, therapeutic need, and treatment intensity.
- **Treatment history and therapeutic context** – Factors related to prior and concurrent interventions (e.g., response to lifestyle treatment, role of Health Behavior and Lifestyle Treatment (HBLT), sequencing of therapies, and timing within the treatment course) that shape escalation or modification decisions (this includes previous or current obesity medication use, combination obesity medication (OM) use, surgery, or other treatments that influence decision making).
- **Medication-specific safety, feasibility, and longitudinal management** – Drug-level considerations (e.g., contraindications, route of administration, anticipated adverse effects, drug-drug interactions, and adherence feasibility) that influence whether and how a pharmacologic agent can be safely initiated. Longitudinal management includes considerations for initiation, escalation/de-escalation, maintenance strategies, relapse prevention, transitions between treatments, and long-term follow-up.

- **HBLT-specific components, delivery, and feasibility** – The "what, how much, how, where, when, and by whom" of HBLT delivery for youth on obesity medications, including feasibility and access factors.
- **Psychological, family, and social factors** – Psychological, relational, and social factors (e.g., mental health status, family readiness, parental treatment for obesity, weight stigma and bias, cultural context, health literacy, and treatment preferences) that affect engagement, adherence, and shared decision-making. This also includes functional status (e.g., mobility, activities of daily living) health-related quality of life (HRQoL), and symptom burden (fatigue, pain, etc.).
- **Health system and care delivery factors** – Ethical, regulatory, structural, and practice-level considerations that may affect access to and delivery of treatment. For example, these may include care setting, including telemedicine; provider type and availability for treatment initiation and management, such as obesity specialty care or primary care; multidisciplinary capacity; insurance coverage and affordability; care coordination models; and structural drivers of health, such as access to healthy food and other resources that may influence a patient's ability to initiate, receive, and continue treatment.

Question No.	Primary Research Question	Related Research Question
1	When should obesity medications (OMs) be initiated in youth?	• What clinical, developmental, and contextual factors should guide decisions about when to initiate OMs in children and adolescents? • What roles should different clinical settings (e.g., primary care vs. specialty care) play in initiating OMs, and how should pharmacotherapy be sequenced or paired with behavioral or lifestyle interventions? • What evidence-informed methods are needed to refine clinical practice guidelines and improve the precision, consistency, and equity of decisions regarding initiation, delay, or avoidance of OMs in youth? • What indicators—such as BMI classification, metabolic markers, functional status, or psychosocial factors—help determine when OM treatment may not be appropriate for youth? • How can genetic testing or other biological markers improve the precision of determining the optimal timing for initiating OMs in youth? • In earlier phases of elevated BMI, such as in youth with overweight and comorbidities or in youth with short-term or rapid-onset obesity, what is the relationship between earlier initiation of OM treatment and BMI trajectories, comorbidities, and long-term health outcomes?

Question No.	Primary Research Question	Related Research Question
2	Which health factors, genotypes, and phenotypes inform obesity medication (OM) selection, dosing, treatment schedule, titration, and monitoring in youth?	• Which factors help determine the most appropriate OM choice and dosing strategy for youth? • How do different classes of OMs vary in safety, and effects on outcomes such as weight change, metabolic markers, and muscle mass or function? • How can genetic testing or other biological markers improve the precision of determining the optimal timing of OM use in youth across the treatment course (e.g., initiation, titration, adjustment, or discontinuation)? • To what extent could personalized dosing approaches, including the use of lower doses, minimize adverse effects in youth? • How should the magnitude of weight reduction be considered in relation to non-weight/weight independent outcomes when making dosing, titration, and timing decisions for OMs in youth? • How can the potency of different OMs be aligned with the severity of obesity and the presence of specific comorbidities to ensure youth receive the most appropriate treatment? • How should OM doses and lifestyle support be adjusted as BMI, clinical status, or comorbid conditions change over time? • In earlier phases of elevated BMI, such as in youth with overweight and comorbidities or in youth with short-term or rapid-onset obesity, how do health factors, genotypes, and phenotypes inform OM selection and management strategies, and how are these decisions associated with long-term weight and health outcomes? • What frequency and components of clinical monitoring, such as laboratory testing, physical examination, and assessment of treatment response, are needed to guide titration, continuation, or discontinuation of OMs in youth? • Which clinical monitoring elements, such as laboratory testing and physical examination, provide the information needed to guide these decisions? • What clinical red flags should prompt closer monitoring or adjustment of OM dosing in youth?
3	In younger children, what is the relationship between earlier initiation of obesity medication (OM) treatment and BMI trajectories, comorbidities, and health outcomes?	• What medical, developmental, or psychological risks and benefits are associated with initiating OMs earlier in childhood? • What dosing strategies are most appropriate for early initiation of OMs, and how should dose selection account for developmental stage (e.g., psychological, physical, organ development, pharmacokinetic), treatment goals, and safety considerations? • What long-term treatment, monitoring, maintenance, or follow-up is needed when OMs are initiated at an early age, and how does age and length of exposure influence outcomes over time? • To what extent can genetic testing or other biological markers inform expected treatment response or optimal timing of initiation, in young children on OM?

Question No.	Primary Research Question	Related Research Question
4	What is the relationship (e.g., correlation, causation, mechanism) between obesity medication (OM) treatment and 1) cardiometabolic outcomes and 2) comorbidities in youth?	• Comorbidities of interest may include, but are not limited to, hypertension, metabolic dysfunction–associated steatotic liver disease (MASLD), polyendocrine metabolic ovarian syndrome (PMOS), asthma, type 2 diabetes, obstructive sleep apnea, and orthopedic conditions. • What is the minimal clinically important BMI change that is associated with comorbidity change in youth treated with OM? • To what extent is the resolution of specific comorbidities in youth attributable to the direct pharmacological effects of OM versus effects mediated by total body weight reduction? • Which clinical, demographic, and physiological factors influence the likelihood of comorbidity resolution versus non-resolution in pediatric populations receiving obesity medicine treatment? • How do cardiometabolic outcomes associated with OM compare to those achieved through lifestyle-based interventions or metabolic bariatric surgery in youth? • What frequency and types of monitoring (e.g., laboratory measures, vital signs, anthropometrics, body composition, imaging, physical exam) are needed to assess treatment response and safety in youth on OMs? • What differences in cardiometabolic adaptation (e.g., energy expenditure, hunger/fullness hormones, metabolic substrate utilization) are observed across OM treatment phases (early, active weight loss, maintenance), and how do these differences relate to comorbidity outcomes independent of weight change? • To what extent do pre existing comorbidities (e.g., obstructive sleep apnea, type 2 diabetes) moderate the relationship between OM treatment and cardiometabolic and comorbidity outcomes in youth?
5	How does treatment response vary (effects and side effects) among youth on obesity medications (OM), what accounts for this, and how can it be modified?	• What distinct trajectories of treatment response (e.g., weight outcomes, weight-independent outcomes, and side-effect patterns) emerge among youth on OMs, and what factors contribute to these variations? • What is the relationship between biological, behavioral (e.g., eating behaviors), developmental and environmental characteristics, dosing/titration strategies, and 1) BMI response trajectories (e.g., early response, plateau, diminishing response, non-response) and 2) heterogeneity of non-weight outcomes among youth using OMs? • How do different treatment response patterns vary among youth, such as early response, plateau, or weight regain, inform clinical decisions to maintain, adjust, switch, or combine OMs? • How does variation in youth treatment response patterns and the tolerability/safety profile (benefit–risk balance) shape clinical decision-making, medication continuation or modification, and real-world treatment trajectories? • What is the relationship between patterns of side effects, treatment tolerability, and patterns of side effects and 1) real-world barriers to optimal use of OMs and 2) differences in treatment response trajectories (e.g., early response, plateau, non-response, or regain) among youth?

Question No.	Primary Research Question	Related Research Question
6	Among youth with medical complexity, which factors guide obesity medication (OM) treatment? Examples of medical complexity: • Neurodevelopmental conditions (e.g., autism spectrum disorder, ADHD, intellectual disability) • Genetic syndromes associated with hyperphagia or obesity (e.g., Prader–Willi syndrome, Bardet–Biedl syndrome) • Endocrine or hypothalamic disorders (e.g., panhypopituitarism, hypothalamic obesity after central nervous system tumors) • Serious mental illness (e.g., major depressive disorder, bipolar disorder) • Treatment-related factors (iatrogenic) (e.g., chronic steroid use, atypical antipsychotics, chemotherapy, cranial irradiation) • Cancer and cancer-treatment sequelae (e.g., craniopharyngioma, pituitary injury)	In youth with medical complexity: • What specific factors determine the timing for OM initiation and the selection of pharmacotherapy? • How do drug-drug interactions and concurrent treatment burdens guide the selection and safety monitoring of OM in youth? • Do altered developmental status and needs necessitate deviations from standard OM algorithms (e.g., titration, dosing, care delivery models)?

Question No.	Primary Research Question	Related Research Question
7	Which factors guide when and how obesity medication (OM) therapy is tapered or discontinued, and what supports are needed?	• What adverse effects/red flags (e.g., eating behaviors, rate of BMI reduction, new complicating diagnosis) serve as indicators to initiate the tapering or discontinuation of OMs in youth? • What obesity-related factors (e.g., BMI and comorbidity response) serve as indicators to initiate the tapering or discontinuation of OMs in youth? • Do age and pubertal status influence decisions about when and how OM therapy should be tapered or discontinued in youth? • What are the most effective and safe pharmacological protocols for tapering or adapting OM dosages in youth? • Which maintenance or supportive strategies, such as behavioral therapy, nutrition support, or HBLT components, are most effective in sustaining outcomes during OM tapering or discontinuation in youth?
8	What is the relationship between obesity medication (OM) discontinuation and clinical, psychological, and psychosocial functioning outcomes in youth?	• What medical or psychological risks are associated with weight regain or changes in health status following the discontinuation of OMs in youth? • What is the relationship between the underlying reason for discontinuing OMs (e.g., side effects, lack of response, access barriers, patient preference) and the outcomes observed after treatment discontinuation? • Is there a relationship between starting OMs earlier in life and long-term weight and health outcomes following tapering or discontinuation?
9	What is the relationship between obesity medication (OM) treatment and body composition (e.g., fat mass, lean mass, bone mass) and physical function in youth?	• How does use of OMs affect functional mobility, body composition, including fat mass, lean mass (skeletal muscle and organs), and bone health in children and adolescents? • How do specific components of body composition—such as fat mass (quality, magnitude, rate, regional distribution), lean mass (including skeletal muscle and organ tissue quality), and bone health (architecture, strength, linear growth)—change in youth undergoing OM treatment? • What are the impacts of OMs on functional mobility and physical performance in youth, and how do these changes relate to shifts in body composition? • Which body composition changes (e.g., magnitude, regional distribution, quality of tissue) are most strongly associated with clinically meaningful outcomes in youth using OMs? • What methods, measurement intervals, or clinical tools are most appropriate for tracking body composition and related functional outcomes over time in youth receiving OMs?

Question No.	Primary Research Question	Related Research Question
10	What is the relationship between nutrition and physical activity interventions and body composition outcomes in youth using obesity medications (OM)?	• Which components of usual clinical practice, such as higher protein intake, resistance training, or routine micronutrient supplementation, most effectively support preservation of lean mass and overall body composition in youth on OMs? • How does timing—such as initiating nutrition or resistance-training interventions during titration, active weight loss, or weight stabilization—affect body composition outcomes among youth on OMs? • What guidance can be drawn from bariatric surgery or other rapid-weight-loss interventions to inform nutrition and physical activity recommendations for youth treated with OMs, and where do OM-specific patterns differ?
11	What is the relationship between obesity medication (OM) associated body composition changes and clinical outcomes?	• Are there developmental periods during which youth are more vulnerable to changes in muscle mass, bone health, or other structural adaptations during OM treatment?
12	What criteria (e.g., comorbidities, risk factors) can guide the selection of combination obesity medication (OM) for youth with obesity?	• How do different combinations of OMs influence clinical effectiveness and safety? • Are there youth-specific factors (e.g., phenotype, genotype, behavioral traits, comorbidity profiles) that help determine when combination therapy should be selected over monotherapy? • Are there sequencing strategies, such as adding, replacing, or tapering medications, that improve outcomes for youth?
13	What clinical, developmental, psychological, psychosocial, and surgical or other factors should guide when, how, and for whom obesity medications (OM) are used in combination with metabolic or bariatric surgery in youth?	• What are the clinical indications for the postoperative use of OMs in youth (e.g., thresholds for suboptimal BMI reduction, early plateau or increasing BMI, persistent or incident comorbidities, ongoing hyperphagia or loss of control eating)? • Are there youth-specific factors (e.g., genetics, developmental stage, metabolic profile, behavioral/eating patterns) that inform whether OMs should be initiated pre- or postoperatively to optimize outcomes? • Should OM selection, timing, route, or dosing be adapted when used as adjunct therapy in the preoperative or postoperative period for youth? • What safety considerations or monitoring needs arise when OMs are used in combination with the physiological changes that occur after bariatric surgery (e.g., pharmacokinetics, over-suppression of appetite)?

Question No.	Primary Research Question	Related Research Question
14	What safety monitoring is needed for youth on obesity medications (OM)?	• What surveillance protocols are needed to routinely monitor safety, treatment response, and emerging concerns in youth receiving OMs? • How should adverse events be identified, tracked, and managed to ensure timely and appropriate clinical responses during OM treatment? • What clinical indicators or early warning signs should prompt additional monitoring, dose adjustment, or modification of OM treatment in youth? • How should medical teams assess and manage the effects of concurrent medications on the safety, tolerability, and effectiveness of OM treatment in youth?
15	What is the relationship between obesity medication (OM) use and 1) psychosocial functioning; and 2) psychological comorbidities in youth throughout treatment?	• How do youth describe changes in identity, motivation, self-confidence, or sense of agency as they progress through OM treatment phases? • How do emotional responses to rapid or substantial body changes shape youths' coping strategies, psychological adjustment, and overall treatment experience with OMs? • What is the effect of OM treatment on standardized measures of daily functioning, school engagement, and peer interactions in youth? • How do social dynamics, such as peer feedback, stigma reduction or emergence, and family reactions, affect psychosocial outcomes for youth receiving OMs? • To what extent does OM use relate to the clinical severity of pre-existing psychological comorbidities (e.g., major depressive disorder, generalized anxiety disorder, ADHD) in youth across different treatment phases? • What is the relationship between the physiological mechanisms of OMs (e.g., appetite suppression) and the incidence, resolution, or clinical masking of eating disorder psychopathology (e.g., binge eating disorder, extreme cognitive restraint) during active treatment? • Does the emergence of new-onset psychological symptoms, such as suicidal ideation or acute anxiety, correlate with specific OM classes or specific phases of treatment (e.g., rapid titration) in youth without a prior psychiatric history? • How do baseline psychological comorbidities and baseline psychosocial distress levels predict a youth's adherence to OM dosing protocols and their overall retention across longitudinal treatment phases?

Question No.	Primary Research Question	Related Research Question
16	What is the relationship between obesity medications (OM) and disordered and dysregulated eating-related behaviors in youth?	• To what extent does OM use change pre-existing dysregulated eating patterns (e.g., loss of control eating, eating in the absence of hunger) in youth? • How frequently do new-onset disordered eating symptoms, specifically restrictive presentations consistent with atypical anorexia, emerge across the phases of OM treatment in youth? • What biological, psychological, or treatment-related factors predict the development, worsening, or improvement of dysregulated and disordered eating behaviors during OM therapy in pediatric populations? • How do youth and caregivers qualitatively describe changes in hunger cues, food noise, and the daily experience of dysregulated and disordered eating behaviors following the initiation of OM? • How do present or emerging disordered eating behaviors influence a youth's adherence, clinical engagement, and overall metabolic response to OM treatment? • What is the association between a history of preexisting eating disorders and outcomes of OM treatment in youth? • What clinical criteria and patient-level factors are identified as necessary by health care providers to guide decision-making regarding OM treatment for youth with preexisting eating disorders?
17	What is the relationship between obesity medication (OM) use and addictive or other risk-related behaviors in youth?	• How do markers of brain development and neurobehavioral regulation (e.g., reward and impulse systems) manifest in youth on OMs? • What specific changes emerge in the frequency or intensity of chemical substance use (e.g., vaping, alcohol) and behavioral risk-taking (e.g., sexual risk behaviors, behavioral cross-addictions) among youth receiving OMs? • What developmental, psychological, familial, and environmental factors moderate the relationship between OM use and a youth's vulnerability to, or protection from, addictive and risky behaviors? • How do established or newly emerging patterns of addictive and risk-related behaviors impact the safety, tolerability, and overall clinical effectiveness of OM treatment in pediatric populations? • How do youth qualitatively perceive changes in their own motivation, reward-seeking, and risk tolerance while on OMs, and how can these patient-reported insights inform targeted clinical monitoring strategies?

Question No.	Primary Research Question	Related Research Question
18	What psychological screening and monitoring approaches are needed for youth receiving obesity medication (OM) treatment?	• How can baseline psychological factors (e.g., depression, anxiety, suicidality, and trauma history) inform the frequency and intensity of psychological monitoring for youth receiving OM treatment? • What level of ongoing monitoring is needed for youth on OMs, based on their baseline psychological risk factors? • What targeted monitoring approaches, utilizing validated tools (e.g., Eating Disorder Examination Questionnaire (EDE-Q), Children's Eating Attitudes Test (ChEAT)) and specific clinical red flags, are required to safely manage youth with active or historical eating disorder symptoms, and to proactively detect disordered eating during OM therapy? • What specific evidence-based screening protocols (e.g., Car, Relax, Alone, Forget, Friends/Family, Trouble (CRAFFT) questionnaire) and assessment cadences are necessary for the longitudinal detection and monitoring of shifts in addictive, impulsive, or risk-related behaviors during pediatric OM treatment? • What standardized clinical escalation pathways and multidisciplinary follow-up protocols must be implemented immediately when psychological, behavioral, or safety-related red flags emerge during OM therapy? • What are the critical methodological gaps in currently available psychological screening tools when applied to pediatric OM populations, and what specific adaptations or novel instruments must be developed to ensure accurate risk detection?
19	Which psychological interventions are associated with improved outcomes for youth receiving obesity medication (OM) therapy?	• How do structured individual psychological approaches, such as cognitive-behavioral therapy (CBT), skills-based training, and resilience-building programs, improve emotional regulation and behavioral outcomes in youth receiving OM therapy? • Which specific family-based psychological interventions and caregiver support strategies are most effective at sustaining youth engagement, medication adherence, and treatment continuity across the different phases of pediatric OM therapy? • To what extent do group-based psychological interventions and peer-support models mitigate weight-related stigma and enhance psychosocial well-being for youth navigating the physical changes of OM therapy? • How should a youth's specific emotional needs, baseline coping styles, and clinical preferences guide the personalized selection and tailoring of psychological interventions to maximize OM treatment success?

Question No.	Primary Research Question	Related Research Question
20	What is the relationship between chronic stress and clinical, behavioral, and psychosocial outcomes in youth receiving obesity medication (OM) treatment?	• How do adverse childhood experiences (ACEs), historical trauma, and superimposed acute stressors modify the baseline metabolic and psychosocial trajectories of youth initiating OM treatment? • Which biologically plausible biomarkers (e.g., indicators of allostatic load or systemic inflammation) and clinical screening tools can most accurately identify youth on OMs who are at heightened risk for stress-mediated adverse outcomes? • How do observed patterns of chronic stress, including links to sleep, circadian rhythms, and metabolic functioning, relate to clinical considerations regarding potential OM dose adjustments for youth? • How does chronic stress interact with the pharmacological mechanisms of OMs to influence appetite regulation, override physiological satiety cues, and drive stress-induced eating behaviors in pediatric patients? • How do psychological responses to chronic stress, such as emotional reactivity, irritability, and maladaptive coping patterns, impact treatment adherence, engagement, and the overall clinical experience for youth receiving OM therapy?
21	What is the relationship between social connectedness (e.g., family cohesion, peer support, parent support, community engagement) and outcomes for youth receiving obesity medication (OM) treatment?	• What is the relationship between family-level factors (e.g., family cohesion, caregiver support) and clinical engagement, medication adherence, and the overall metabolic response in youth receiving OMs? • In what ways do peer relationships, friend-based social support, and structured peer-mentorship programs shape a youth's motivation, psychological resilience, and long-term persistence during OM treatment? • How does active participation in health behavioral lifestyle treatment programs, community programs, and neighborhood or cultural support networks impact the clinical outcomes and treatment experiences of youth on OMs? • To what extent does robust multi-level social connectedness (the combination of family, peer, and community support) buffer against weight-related stigma and predict long-term weight maintenance for youth undergoing OM therapy?
22	What is the relationship between obesity medication (OM) use and malnutrition, including macronutrient or micronutrition deficiencies, in youth?	• Which biological or physiological markers should be monitored to detect nutrient deficiencies in youth receiving OMs, and how should these findings inform clinical care? • What testing frequency is appropriate for monitoring nutrient-related biomarkers during OM treatment? • To what extent do nutrient biomarker levels correspond with youth self-reported dietary intake while on OMs? • Is there a relationship between OM use in youth and nutrient absorption?

Question No.	Primary Research Question	Related Research Question
23	What factors inform the risk assessment and identification of malnutrition in youth on obesity medications (OM)?	• How does the risk and presentation of malnutrition during OM treatment compare to what is known from other pediatric rapid weight change interventions such as very low-calorie diets, other medications, or bariatric surgery? • What safety concerns, adverse events, or clinical red flags may indicate emerging malnutrition among youth treated with OMs? • What physiological or behavioral factors contribute to the risk of malnutrition among youth undergoing intentional weight loss with OMs? • Does risk for malnutrition vary across development (e.g., age, pubertal status)? • How do pre existing or emerging eating disorder behaviors (e.g., restrictive intake, loss of hunger cues, food avoidance) influence the assessment of nutritional risk and early identification of malnutrition in youth on OMs?
24	For youth receiving obesity medication (OM) treatment, when, where, how, and what nutrition education should be delivered to optimize outcomes, including non-weight outcomes?	• Are there any indicators, such as declines in food noise, appetite suppression, gastrointestinal tolerance, or treatment milestones, that help determine the most effective point to introduce nutrition education? • Should nutrition education be tailored differently across treatment phases (preceding OM initiation, maintenance, and dose escalation)?
25	For youth receiving obesity medication (OM) treatment, when, where, how, and what physical activity counseling should be provided to optimize outcomes, including non-weight outcomes?	• Are there any indicators such as gastrointestinal tolerance or treatment milestones that help determine the most effective point to introduce physical activity interventions? • Should physical activity interventions be tailored differently across treatment phases (precede OM initiation, occur during dose escalation)?
26	What is the relationship between diet quality, eating patterns, and fluid intake and the side effects experienced by youth receiving obesity medication (OM) therapy?	• How can nutrition intake, eating patterns, and fluid consumption be reliably measured in youth receiving OM therapy? • Which micronutrient or macronutrient deficiencies—or other nutrition-related factors—elevate the risk of OM-associated side effects? • What insights from bariatric-surgery nutrition management (e.g., nutrient deficiencies, eating-pattern adjustments, hydration strategies) can inform optimal outcomes for youth using OMs? • Which aspects of diet quality, meal timing, and eating behaviors are associated with improved tolerance or reduced side effects during OM treatment?

Question No.	Primary Research Question	Related Research Question
27	What is the relationship between obesity medication (OM) use and sleep outcomes (e.g., sleep duration, sleep quality, and sleep timing) in youth?	• How does OM use alter specific sleep-related behaviors in youth, specifically regarding the reduction of night eating, adherence to consistent sleep schedules, and the adoption of adaptive versus maladaptive sleep habits? • How do the effects of OMs on sleep outcomes vary across developmental stages, and what are the distinct comparative differences in sleep responses between early childhood, adolescence, and adulthood? • To what extent do specific pharmacological variables (e.g., medication type, dosing timing) and underlying clinical comorbidities influence the overall sleep outcomes and quality in youth receiving OMs? • How does baseline sleep quality influence the clinical efficacy of OMs, and conversely, how do the physiological changes driven by these medications subsequently alter sleep quality? • In pediatric patients with preexisting dysregulated sleep, does optimizing sleep health prior to initiating OMs yield superior clinical outcomes compared to initiating both interventions concurrently?
28	For youth on obesity medications (OM), which elements of health behavior and lifestyle treatment (HBLT) format and structure, including intensity, frequency, duration, timing, and provider type, are associated with improved outcomes, including non-weight outcomes?	• What specific dose of health behavior and lifestyle treatment—defined by total contact hours, session frequency, and duration—optimizes clinical and metabolic outcomes when paired with OM therapy in youth? • What modality of health behavior and lifestyle treatment—such as video, in-person, or other digital—optimizes outcomes and for whom, when paired with OM therapy in youth? • What unit of intervention of lifestyle support, including individual patient, caregiver/child, peer group, optimizes outcomes and for whom, when paired with OM therapy? • Do lifestyle supports mitigate risk for youth and improve non-BMI outcomes such as psychosocial function, eating disorder risk, and patient-centered outcomes among youth on OMs? What setting for lifestyle support—such as home, primary care, community, or specialty care—optimizes outcomes and for whom, when paired with OM therapy in youth? • What is the optimal timing for health behavior and lifestyle treatment initiation (e.g., before medication, concurrent, after) to maximize long-term outcomes of OM therapy in youth? • How do clinical, behavioral, and psychosocial outcomes differ for youth on OMs when adjunct health behavior and lifestyle treatment is delivered by clinically licensed providers (e.g., psychologists, registered dietitians) compared to non-clinical interventionists (e.g., health coaches, community health workers)?

Question No.	Primary Research Question	Related Research Question
29	For youth on obesity medications (OM), what health behavior and lifestyle treatment content and curricula are needed to support health, wellbeing, and improved outcomes and mitigate risk?	Within health behavior and lifestyle treatment: • How are success and outcomes described (e.g., non-weight-related outcomes, QOL, resilience) for youth on OMs? • What nutritional content is needed to address the nutritional needs, mitigate risk (e.g., associated side effects), and alter satiety for youth on OMs? • What physical activity content (e.g., resistance training and functional mobility) is needed to address the body composition changes and mitigate risk (e.g., lean mass and overall body composition changes) in youth on OMs? • What other behavioral routine content (e.g., sleep habits/hygiene, meal timing and screen time) is needed to support improved outcomes in youth on OMs? • What psychosocial skills and content (e.g., building resilience and managing weight-stigma and bias) are needed to support youth with rapid weight loss and the accompanying physical and emotional changes while on OMs? • What health literacy and self-management tools are needed to support youth and their families regarding OM mechanisms? • What curriculum topics are needed for specific clinical phenotype and developmental stage of youth on OMs? • What curriculum topics and skills are needed for the patient and/or caregiver while on OMs? • What curriculum topics and skills are needed to support the patient, caregiver, and family of youth on OMs who also have intellectual or developmental disabilities? • What curriculum topics and skills are needed to support the patient and/or caregiver during OM treatment? • What curriculum topics and skills are needed to prepare youth on OMs and their caregivers for the behavioral and metabolic shifts that occur across medication treatment phases (e.g., initiation, tapering, discontinuation)?
30	What models of co-management between health professional services (e.g., nutrition, behavioral health, physical activity) and the obesity medicine clinical prescribing practitioner lead to better outcomes for youth being treated with OMs?	• Do integrated care structures (e.g., co-location and communication pathways) relate to the effectiveness of co-management between health professional services and obesity medicine specialists for youth receiving OM treatment? • Which task-sharing approaches between health professionals and obesity medicine specialists best support coordinated care for youth receiving OMs? • How can multidisciplinary best practices for initiating and monitoring OMs be organized into clear and actionable clinical pathways for youth? • What training models and competency frameworks facilitate the delivery of integrated care by various health professionals for youth receiving OM treatment? • What reimbursement approaches and financial structures are associated with the sustainable delivery of integrated OM care across health professional services?

Question No.	Primary Research Question	Related Research Question
31	From the patient and family perspective, what factors influence their choice of HBLT, obesity medication (OM) treatment (including selection of a specific medication), or bariatric surgery for youth?	• How do youth and caregiver beliefs, values, prior treatment experiences, and expectations shape decisions to pursue OMs instead of HBLT or bariatric surgery (or vice versa, i.e., pursue HBLT or bariatric surgery instead of OMs)? • How do factors such as youth and caregiver beliefs, values, prior treatment experiences, and expectations inform treatment selection within a continuum of care that includes OMs, HBLT, and bariatric surgery? • How do factors such as access to specialty care, insurance coverage, program availability, travel burden, and waiting periods inform treatment selection within a continuum of care that includes OMs, HBLT, and bariatric surgery? • How do clinical factors such as comorbidities, severity of obesity, developmental stage, and anticipated long-term outcomes inform treatment selection for youth within a continuum of care that includes OMs, HBLT, and bariatric surgery?
32	From the clinical perspective, which factors (e.g., medical, behavioral, and operational) enable best practices for shared decision-making in obesity medication (OM) treatment?	• How can expectations for different evidence-based obesity treatments, including OMs, be clearly communicated to youth and their caregivers to support informed decision making? • Which communication strategies best support shared decision making about dose titration, anticipated side effects, and ongoing medication management in youth? • At what point in the clinical care process should health care providers begin discussions about OMs as a treatment option for youth, and what factors should guide the timing of these conversations? • How do youth and caregivers access, interpret, and weigh information about OMs, including information from online sources, social media, or peers, when making treatment decisions? • How do youth, caregivers, and clinicians define treatment success within a shared decision-making framework, and how do these definitions influence treatment choices? • What supports help families navigate access barriers, medication changes, and care transitions while participating in shared decision-making about OM therapy?
33	From the multidisciplinary team perspective, what factors (e.g., clinical, operational, and safety) could enable best practice for initiating and monitoring obesity medication (OM) treatment in youth?	• How are youth and their support systems currently integrated into safety monitoring protocols during OM treatment (e.g., side effect reporting, nutritional intake)? • What clinical and operational strategies support the development of a collaborative relationship between health care providers, youth, and their support systems throughout OM treatment? Providers and youth and their support systems?

Question No.	Primary Research Question	Related Research Question
34	Which factors (e.g., patient-directed, clinical, behavioral, operational, and safety) should define "success" for youth receiving obesity medication (OM) treatment?	• Which time periods, including short-term, intermediate, and long-term phases, are most relevant when evaluating success for youth receiving OMs? • How does the definition of success vary across developmental stages such as childhood, puberty, and late adolescence, and how does this differ from adult expectations of treatment success? • How do different stakeholders, including youth, caregivers, clinicians, and payers, define and prioritize treatment success in the context of OM use?
35	How do youth and their caregivers characterize their experiences of obesity medication (OM) treatment?	• How do youth and caregivers describe changes in physical, mental, and psychosocial well-being while using OMs? • How do youth and caregivers view their long-term treatment trajectory, including whether and when they anticipate continuing, tapering, or discontinuing OMs?

Appendix H: Outcomes to Inform Clinical Care

The outcomes below were derived from workshop attendees' responses to the following question: "For studies that address the prioritized questions, are there specific outcomes that would particularly inform clinical care?" These outcomes include those that are typically reported as well as beyond what is typically reported. This list was iteratively modified by the workshop organizers and co-chairs.

Note: This list is not comprehensive.

Anthropometrics
Weight (kg)
Height (cm)
Body mass index (BMI; kg/m2)
Change in BMI (absolute (kg/m2); relative (%))
% change in BMI as a percentage of the 95th percentile (%BMIp95)
Change in BMI standard deviation score (e.g., extended BMI z-score; absolute or relative (%))
Change in body weight (absolute (kg) or relative (%))
% participants with reduction in bodyweight or BMI (#participants/total #)
Linear growth, height velocity, and attainment of expected growth targets
Waist circumference (cm)
Change in waist circumference (cm)
Waist-to-hip ratio
Bone age
Body Composition
Total fat mass, kg (mean; % change)
Visceral fat area, cm2 (mean; % change)
Visceral adipose tissue, kg (mean; % change)
Subcutaneous adipose tissue, kg (mean; % change)
Lean body mass, kg (mean; % change)
Muscle quality (e.g., strength, fat infiltration)
Organ fat infiltration
Bone mineral density
Vital Signs
Blood pressure, mmHg (systolic/diastolic), percentile, and/or pediatric BP category
Heart rate, beats/min

Laboratory Values
Lipids: total cholesterol, LDL-C, HDL-C, non-HDL-C, and triglycerides (mg/dL)
Absolute and % change in lipid levels
Free fatty acids
Apolipoprotein A, mg/DL
Apolipoprotein B, mg/DL
% change in Apolipoprotein A or B, mg/DL
Glucose, mg/dl (fasting)
Insulin, µIU/mL (fasting)
Hemoglobin A1C (HbA1C) %
Percent change in hemoglobin A1C level %
β-cell function on HOMA (HOMA-B)
Insulin resistance on HOMA (HOMA-IR)
C-peptide (fasting)
C-reactive protein
AST (U/L)
ALT (U/L)
GGT (U/L)
% change in ALT, AST, or GGT level
Enhanced Liver Fibrosis
Complete blood counts (e.g., white blood cell, platelets)
Renal function metabolic labs (e.g., creatinine, BUN, electrolytes)
Inflammation markers (e.g., high-sensitivity CRP)
Micronutrient status (e.g., iron panel, zinc, vitamin D, calcium, thiamine, folate, 25-hydroxyvitamin D, vitamin C, copper)
Sex hormones (e.g., total and free testosterone, LH, follicle-stimulating hormone (FSH), estradiol, SHBG)
Pregnancy testing – HCG level
Broad genetic testing, when indicated, such as testing for Prader-Willi syndrome, Melanocortin 4 Receptor pathway variants, or other monogenic and /syndromic disorder causes of obesity
Detection of leptin resistance
Historical lab values related to comorbidities
Liver Imaging Variables
VAT, cm3 (visceral adipose tissue)
SAT, cm3 (subcutaneous adipose tissue)
Liver fat content, %

Mental & Behavioral Health History and Assessment
Eating disorders – validated screening tools when available (such as EAT-26, EDE-Q)
Disordered eating
Body dysmorphia
Body image
Mood disorders/symptoms (e.g., depression, anxiety)
Suicidality
Self-harm
Substance use
Victim of psychological bullying
Child executive functioning
Social, Emotional, Psychological Conditions or Factors
Social connectedness
Self-esteem
Social confidence
Stress
Peer relationships, bullying
Peer support
Risk-taking behavior
Resilience and coping skills
Weight-related stigma and/or internalized weight bias
Cognitive function
Parent/Caregiver
Parent/caregiver BMI
Parent/caregiver overall psychological health
Parent/caregiver stress
Family chaos or household organization
Parent/caregiver sleep measures
Parent/caregiver nutrition and eating behavior measures
Parent/caregiver nutrition literacy
Parent/caregiver physical activity and sedentary behavior measures
Family functioning
Education
School attendance
School performance
Home school, homebound, or alternative schooling
School participation, accommodations, or individualized education supports when relevant
Sleep health
Sleep duration
Sleep quality
Obstructive sleep apnea diagnosis, symptoms, severity, or treatment status

Nutritional Intake, Status, and Eating Behaviors
Macronutrient/micronutrient intake and status (e.g., insufficiency or deficiency assessed at baseline and throughout treatment)
Hydration status
Diet quality using validated screening tools, such as Healthy Eating Index
Eating patterns (e.g., meal skipping; duration between meals, timing of eating)
Measures of appetite, satiation (e.g., fullness during a meal/snack), and satiety (e.g., fullness between eating episodes)
Food noise (cravings, thinking about food without the sensation of hunger, bored eating, etc.)
Physical activity, fitness, function and behaviors
Physical function and mobility
Pain (e.g., muscular, joint, back)
Frequency, intensity, time, and type (FITT) of physical activity, using FITT principles
Habitual activity patterns
Cardiorespiratory fitness
Muscular strength
Flexibility
Functional capacity, such as walk test performance
Fitness relative to body size or lean mass, when appropriate
Enjoyment of physical activity
Sedentary activity (e.g., screen time, phone use, schoolwork, or television viewing)
Developmental
Pubertal status (e.g., Tanner staging)
Sexual maturation (e.g., nocturnal emissions, facial/body hair, true gynecomastia)
Developmental assessments (e.g., cognitive, gross motor, social-emotional)
Menstrual history, menstrual regularity, and symptoms of hyperandrogenism or PCOS when relevant
Medical and psychological history
History of prediabetes or diabetes, hypertension, dyslipidemia, metabolic dysfunction-associated steatotic liver disease (MASLD), obstructive sleep apnea, PCOS, and other obesity-related comorbidities and/or baseline obesity associated nutritional deficiencies (e.g., vitamin D, folate, iron)
Mental and behavior health history (e.g., eating disorders, anxiety, depression)
History of pregnancy
Medication history (such as antipsychotics, glucocorticoids, insulin, or other weight-promoting medications)
Polypharmacy, medication-medication interactions
Quality-of-Life Measurements
Total score on Impact of Weight on Quality of Life-Kids (IWQOL-Kids questionnaire)
Change in IWQOL-Kids questionnaire score (by domain: physical comfort, body esteem, social life, family relations; total score)

Global Health and Function Assessment (Mental, Physical, and Social Well-Being)
Patient-Reported Outcomes Measurement Information System (PROMIS)/patient-centered outcomes
Clinical condition status (e.g., improvement or worsening) – Clinical Global Impression of Change
Activities of daily living (ADLs)
Loneliness assessment
Treatment/Intervention-Related Delivery and Implementation
Engagement in intervention (such as treatment attendance or visit completion, dose of intervention received, intervention fidelity, participant engagement, and retention)
Implementation and dissemination outcomes (such as acceptability, adoption, appropriateness, feasibility, fidelity, penetration, cost, and sustainability)
Sustainability of effects
Adherence, such as persistence of pharmacotherapy use
Attrition, such as discontinuation of pharmacotherapy use
Parent and child expectations
Medication-specific outcomes: dose escalation, maximum tolerated dose, discontinuation, side effects, adherence, persistence, and weight regain after discontinuation.
MBS-specific outcomes: referral completion, surgical evaluation completion, procedure type, perioperative complications, micronutrient monitoring, remission/improvement of comorbidities.
Patient/family-centered outcomes: treatment satisfaction, decisional regret, family burden, caregiver confidence, child readiness, shared decision-making quality.
Safety outcomes & reporting: growth/puberty effects, hypoglycemia, GI adverse effects, gallbladder disease, pancreatitis, mood changes/suicidality monitoring, eating disorder emergence or worsening.
Adverse events reporting: including serious adverse events and poison control contacts
Health Care Quality, Coverage and Costs
Health care utilization (such as outpatient visits, emergency department visits, urgent care visits, hospitalizations, and subspecialty referral)
Insurance coverage, approval/denial, prior authorization, out of pocket costs
Medication availability and/or shortages
Cost-effectiveness
Contextual Factors
Family history (e.g., history of obesity, obesity medicine use, metabolic and bariatric surgery)
Adverse childhood experiences (ACEs)
Social determinants (or drivers) of health (SDOH)
Food insecurity
Nutrition insecurity
Degree of family involvement
Family dynamics (perceived improvement)
Insurance type
Socioeconomic status
Rurality
Race and ethnicity
Language

Appendix I: Research Protocols

This checklist is designed to be used by studies investigating obesity medications (OMs) in youth when describing their research protocols (e.g., in manuscripts), with the goal of enhancing accurate, thorough, and transparent reporting. These suggested reporting details may be included in the main manuscript text or appendices/supplementary materials. The table was inspired by the consolidated criteria for reporting qualitative research (CORE-Q).

The columns represent the major potential domains that research protocols may address. The checklist was derived from workshop attendees' responses to the following question: "For studies that address the prioritized research questions, are there specific details about clinical protocols that would particularly inform clinical care?" These responses were iteratively modified by the workshop organizers and co-chairs. It is expected that only a subset of protocols will be applicable to any given study.

Topic	Major Potential Domains	Clinical Protocol Details
Obesity Medication Treatment and Supports		
Medication Dose	Medical	**Did you report the dose of medication?** • Dose escalation schedule • Discontinuation schedule • Criteria for increasing, maintaining, decreasing, or discontinuing
Frequency and Follow-Up	Medical, Nutrition, Physical Activity, Behavioral and Mental Health	**Did you report the frequency of contact points for each intervention component?** • Whether participants received clinical or research contact in between visits • How and by whom were participants contacted (e.g., enrollment, initiation, dose escalation, maintenance, post study/follow up plan) • Research protocol or implementation timeline
Modality	Medical, Nutrition, Physical Activity, Behavioral and Mental Health	**Did you report on the delivery modality (in-person or telehealth) of the contact points for each component?** • Tools utilized • Best practices used for telehealth • Was the intervention individual or group-based (e.g., classes, group chat)? • Was the contact synchronous (e.g., audio, video, facilitated/hybrid, in-person)? • Was the contact asynchronous (e.g., email, texting, message portal)?
Type of Practitioner	Medical, Nutrition, Physical Activity, Behavioral and Mental Health	**Did you report on the type of provider delivering lifestyle treatment components (e.g., nutrition education, behavioral support, PA education)?** • E.g., registered dietitian, exercise physiologist, psychologist, medical provider, health coach, community health worker, research coordinator

Topic	Major Potential Domains	Clinical Protocol Details
Training	Medical, Nutrition, Physical Activity, Behavioral and Mental Health	**Did you report on the training provided to all providers who deliver OM treatment/support?** • Training content • Training duration/frequency • Assessment of mastery (e.g., include tool used for assessment) • Follow-up/booster training provided (if any)
Protocol Implementation Fidelity	Medical, Nutrition, Physical Activity, Behavioral and Mental Health	**How was the fidelity of protocol implementation assessed for providers who deliver OM treatment/support?** • Description of any fidelity measurements/tools • Appointment attendance • Specific modifications allowed for children with special needs (if any)
Inclusion and Exclusion Criteria	Medical, Nutrition, Physical Activity, Behavioral and Mental Health	**Did you list the specific inclusion and exclusion criteria for OMs?** • E.g., age, complex health care needs, mental health, eating disorder
Engagement and Retention	Medical, Nutrition, Physical Activity, Behavioral and Mental Health	**Did you report how participant engagement was measured and how retention was achieved?** • Objective measures of adherence (e.g., wearable health trackers, pill counting) • Definitions of adherence differ for youth with special health care needs (if applicable) • Retention strategies
Goals/Targets of Health Behavior and Lifestyle Treatment with OM	Medication, Nutrition, Physical Activity, Behavioral and Mental Health	**Did you report whether there were any goals or targets related to OM treatment and supports?** • Obesity related comorbidities • Nutrition education and activities • Eating behaviors • Physical activity • Sleep • Emotional health • Stress management • Screen time • Overall (e.g., weight loss, such as reduction of binge eating episodes by 50%) • Mental health improvements • Improvements in self-internalization of weight stigma, body shape/size satisfaction or acceptance, and externalized weight bias.
Statistical Analysis and Data Processing	Medical, Nutrition, Physical Activity, Behavioral and Mental Health	• Intent-to-treat analyses • Wearable health trackers used for monitoring (if any) • Timing and frequency of labs

Topic	Major Potential Domains	Clinical Protocol Details
Safety and Monitoring	Medical, Nutrition, Physical Activity, Behavioral and Mental Health	**Did you report on screening and monitoring tools used to assess adverse events?** • Frequency of labs, vitals • Validated instruments/questionnaires (e.g., eating disorder, mental health) and protocol used for baseline; threshold for rescreening • Pre-specified "red flags" (e.g., excess weight loss/gain, minimum nutrition/hydration requirements) • Adverse event monitoring and reporting approach (e.g., checklist, diary) • Next steps after a red flag or adverse event occurs (e.g., referrals, increased intensity of follow-up, documentation of subsequent decision points and resolution)
Patient Experience and Shared Decision Making	Medical, Nutrition, Physical Activity, Behavioral and Mental Health	**Did your protocol include any shared decision-making strategies with the patient and family?** • Details on how communication and shared decision making occurred in real-world scenarios • Decision-making process for multidisciplinary teams and how that could translate to primary care providers • Details on targets and medical outcomes • Strategies for shared decision making when the goals of the patient, family, and/or medical team do not align
Clinical Decisions and Integration into Care Plans	Medical, Nutrition, Physical Activity, Behavioral and Mental Health	**Did you report on the clinical decisions and tools that were used?** • Algorithm or clinical protocol used (e.g., dosing changes, imaging modality, consults) • Implementation and clinical decision supports that facilitate adoption • Details on care coordination in the clinic, community, or research site (e.g., who, what, where, when, and how did it work?)
Health behavior and lifestyle treatment with OMs		
Structured Health Behavior and Lifestyle Intervention	Nutrition, Physical Activity, Behavioral and Mental Health	**If your study used a structured lifestyle intervention, did you report the content with enough detail to be replicated?** • Lifestyle component details for nutrition, sleep, screen-time, emotional health, the specific physical activity protocol, etc. (e.g., physical activity protocol: 15-minute guided videos of body weight-based resistance exercises, twice weekly) **Format:** • Audience(s) (e.g., parent/caregiver only, parent/caregiver +child) • MI or other behavior change techniques (e.g., SMART goal-setting, tracking, problem-solving) • Resources provided to the patient/family (e.g., study backpack including a food guide, accelerometer (model, company), and sleep diary) • Timing (e.g., when intensive phases are delivered, when intervention delivered related to OM treatment phases)

Topic	Major Potential Domains	Clinical Protocol Details
		Delivery modality (in-person or telehealth) of the health behavior and lifestyle intervention: • Tools utilized • Best practices used for telehealth • Was the intervention individual or group-based, caregiver involvement (e.g., classes, group chat)? • Was the contact synchronous (e.g., audio, video, facilitated/hybrid, in-person)? • Was the contact asynchronous (e.g., email, texting, message portal)? **Type of health behavior and lifestyle interventionist (e.g., registered dietitian, exercise physiologist, psychologist, medical provider, health coach, community health worker, research coordinator)** • Training provided to all interventionists • Training content • Training duration/frequency • Assessment of mastery (e.g., include tool used for assessment) • Follow-up/booster training provided (if any) **Duration of each of the behavioral intervention components?** • Length of each contact • # of contact points for each component • Length of time over which contact points were provided **Dose of behavioral intervention** • Total contact hours • Dose escalation, maintenance, discontinuation • Resources provided to the patient/family (e.g., study backpack including a food guide, accelerometer (model, company), and sleep diary)
Goals/Targets of Health Behavior and Lifestyle Treatment with OM	Medication, Nutrition, Physical Activity, Behavioral and Mental Health	**Did you report whether there were any goals or targets related to any of the intervention components?** • Obesity related comorbidities • Nutrition education and activities • Eating behaviors • Physical activity • Sleep • Emotional health • Stress management • Screen time • Overall (e.g., weight loss, such as reduction of binge eating episodes by 50%) • Mental health improvements • Improvements in self-internalization of weight stigma, body shape/size satisfaction or acceptance, and externalized weight bias

SEPTEMBER 2026