



Addressing Cardiometabolic Risk in Children and Adolescents: CHALLENGES AND SOLUTIONS

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Use of Technology for Managing Obesity & Cardiometabolic Risk: Challenges, Advances & Perspectives

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Learning Objectives

- Summarize the need for technology to improve care models in pediatric obesity and cardiometabolic risk.
- Describe how to overcome challenges brought on by the use of technology in the treatment of pediatric obesity.
- Discuss practical approaches for the application of technology in the treatment of pediatric obesity.

“Never has there been a sharper double-edged sword than technology in the lives of children”

Dr. Kevin Miller

iGen by Jean Twenge PhD.

The Coddling of the American Mind by Jonathan Haidt and Greg Lukianoff




Use of educational technologies in the promotion of children's cardiovascular health: a systematic review

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- *Review*-Eight articles were selected for this review. The identified technologies were based on low-tech interventions, such as play workshops, using tools such as CARDIOKIDS, the SI! program, MOVI-2, and activities with wide-ranging digital tools such as Fooya!, Fit2Play™, and the exergame cycling program.
- *Conclusion*-It is noteworthy that all of the analyzed interventions were effective and those that involved playing were better accepted by the children.

	IVR 	SMS/Text 	Smartphone 
Secondary Prevention	Monitoring of health and self-care using validated scales. Tailored behavior change messages using recorded voice to present complex messages.	SMS requests for reporting blood pressures. Adherence reminders and encouragement reinforcing behavior change.	Dashboards for tracking adherence, blood pressures and other indicators of CVD risk. Social media for peer support. Online information about self-care.
Primary Prevention	Monitoring and goal setting for diet, physical activity, and weight management with tailored reminders and reinforcement related to behavioral goals.	Frequent reminders, encouragement, and advice for how to prevent CVD, e.g., smoking cessation and activity promotion.	Risk calculators and apps to track efforts toward behavior change goals. Feedback on dietary choices and weight changes.
Primordial Prevention	Banks of information about accessing resources to promote CVD health. Testimonials from others about using these services.	Messages promoting knowledge and demand for community-based programs promoting healthy lifestyles, e.g., public fitness centers.	GPS for locating sources of healthy food, bike/walking paths, and places to exercise nearby.

Mobile Health Devices as Tools for Worldwide Cardiovascular Risk Reduction and Disease Management- a review of all published literature since 2004

John D. Piette, PhD,^{1,2,3} Justin List, MD,⁴ Gurpreet K. Rana, MLIS,⁵ Whitney Townsend, MLIS,⁵ Dana Striplin, MHSA,^{1,2} and Michele Heisler, MD, MPA^{1,2,3,4}

PMCID: PMC5234768

NIHMSID: NIHMS834708

PMID: [26596977](https://pubmed.ncbi.nlm.nih.gov/26596977/)

Conclusion

People with cardiovascular diseases and their risk factors – like the rest of the societies in which they live – are increasingly mobile, and mobile patients require mobile health support to meet their ongoing needs for assistance with self-management.

A solid body of evidence has shown that targeted telehealth delivered by trained clinicians can improve cardiovascular outcomes, but cost constraints will continue to limit the availability of these services. mHealth tools could fill the gap between what patients need and what their health systems can provide given cost constraints.

IVR, SMS, smartphones, and social media each provide a unique platform for developing mHealth services, and a variety of trials indicate that such tools may provide a low-cost and effective solution to the challenges of providing ongoing patient care at a distance.

Research on new models of mHealth should emphasize creative approaches to addressing the epidemic of cardiovascular diseases in LMICs.

In addition, researchers should develop new systems that take advantage of advances in artificial intelligence as well as behavioral theory to ensure that mHealth services are as personalized and effective as possible.

Dysmetabolism

Screen Media Exposure and Obesity in Children and Adolescents

Thomas N. Robinson, MD, MPH,^{a,b} Jorge A. Banda, PhD,^a Lauren Hale, PhD,^c Amy Shirong Lu, PhD,^{d,e} Frances Fleming-Milici, PhD,^f Sandra L. Calvert, PhD,^g and Ellen Wartella, PhD^h

PMCID: PMC5769928 NIHMSID: NIHMS931685 PMID: 29093041

“Current evidence suggests that screen media exposure leads to obesity in children and adolescents through increased eating while viewing; exposure to high-calorie, low-nutrient food and beverage marketing that influences children's preferences, purchase requests, consumption habits; and reduced sleep duration.”

Weight Reduction in Children

- **Goal is to slow down weight gain, maintain current weight, or weight reduction:** *Obese: Body mass index (BMI) > 2 standard deviations above the WHO growth standard median ; Overweight: BMI > 1 standard deviation*
 - **Adolescents 1-2 pounds week**
 - **Grade school obesity specialist to determine reduction goals.**
- **Get the entire family on board.** You don't want your child to feel singled out because of their weight. Talk with the whole family about the importance of healthy choices. And remember: Children copy their parents' habits.
- Limited information with smart phone applications and children, some evidence with adolescents
- According to the [World Health Organization](#), more than 80% of the world's adolescent population is insufficiently physically active.

Wearables for children

The Rundown

Best Overall: [Garmin Vivofit jr. 2 at Amazon](#) ([See Price](#)).

↓ [Jump to Review](#)

Best Fitness: [Fitbit Ace at Amazon](#) ([See Price](#)).

↓ [Jump to Review](#)

Best For Games: [VTech Kidizoom DX2 at Amazon](#) ([\\$48](#)).

↓ [Jump to Review](#)

Best GPS Tracker: [Jiobit Location Tracker at Amazon](#) ([\\$130](#)).

↓ [Jump to Review](#)

Best Budget Fitness: [Gizmo Watch 2 at Verizon](#) ([See Price](#)).

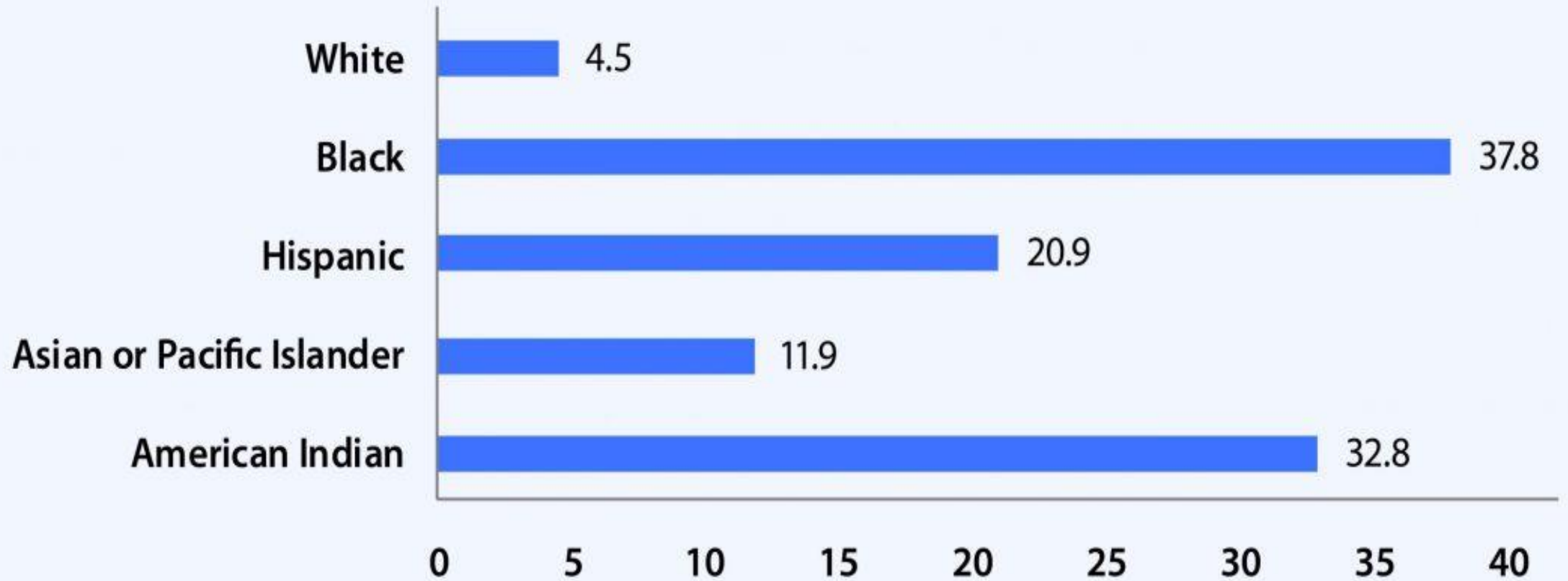
↓ [Jump to Review](#)

Glycemic Dysregulation Conditions and Type 2 DM

- Early Type 2 diabetes (Stage 1 / Stage 2) the new “Pre DM definition”?

The goal is early risk identification, staging and prevention of progression

- Sensitivity and specificity of the screening criteria for detecting any hyperglycemia were low for both HbA1c $\geq 5.7\%$ (sensitivity = 55.5%, specificity = 76.3%) and FPG ≥ 100 mg/dL (sensitivity = 35.8%, specificity = 77.1%). Confirmed undiagnosed diabetes (HbA1c $\geq 6.5\%$ and FPG ≥ 126 mg/dL) was rare, $<0.5\%$ of youth. Most ($>85\%$) cases of diabetes were diagnosed. Associations with cardiometabolic risk were consistently stronger and more specific for HbA1c-defined hyperglycemia (specificity = 98.6%; sensitivity = 4.0%) than FPG-defined hyperglycemia (specificity = 90.1%; sensitivity = 19.4%)
- One-quarter of US youth are eligible for screening for diabetes and prediabetes; however, few will test positive, especially for diabetes. HbA1c is a specific and useful non-fasting test to identify high-risk youth who could benefit from lifestyle interventions to prevent diabetes and cardiovascular risk in adulthood.,



Incidence of Type 2 Diabetes per 100,000 Persons Among Children and Adolescents Younger Than Age 20 Years, by Racial or Ethnic Group, United States, 2014–2015

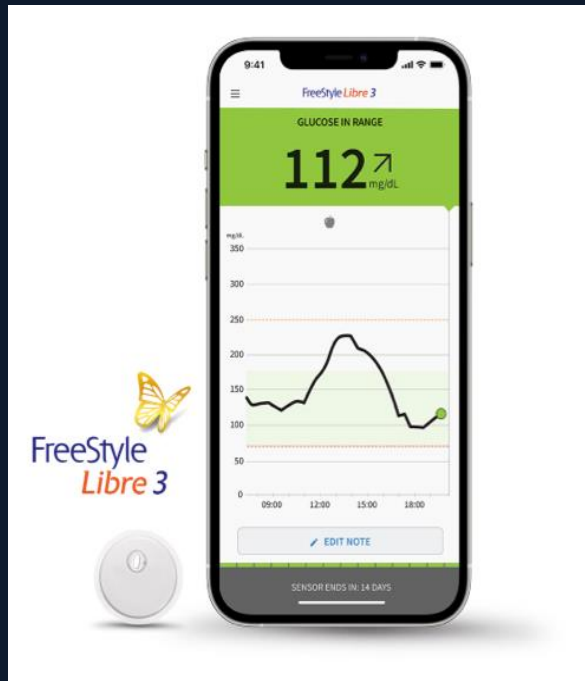
Interventional opportunities

- Online Diabetes Prevention Programs currently only approved adults
 - <https://www.cdc.gov/diabetes/prevention/index.html>
 - Adult participants were encouraged to achieve the 7% weight loss
 - At least 150 min of moderate physical activities similar in intensity to brisk walking.
- Personal CGM (Continuous Glucose monitoring)
 - identification of dietary food choice, physical activity, illness, stress, and medication impacts of glycemia
- One time, Intermittent, or Continuous

Freestyle
Libre 14
and Libre 2



Dexcom G6

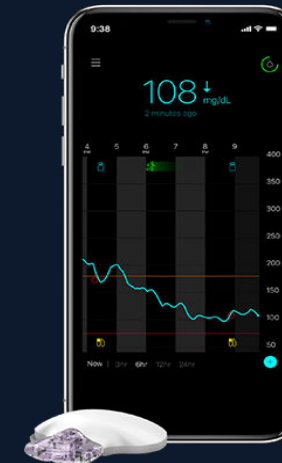


Currently approved for use in children

FLS 4 years and above

Dexcom 2 years and above

Medtronic Guardian 14 years and above



Medtronic
Guardian
Connect

What Do the Person and Provider Get with CGM?



- CGM brings diabetes from the past into the present and helps persons anticipate the future
 - Individually driven
 - Trend arrow up/stable/down showing current rate of change
 - Glycemic effects of food, time of day, activity level, and illness
 - Ease of mind for loved ones or care givers to monitor

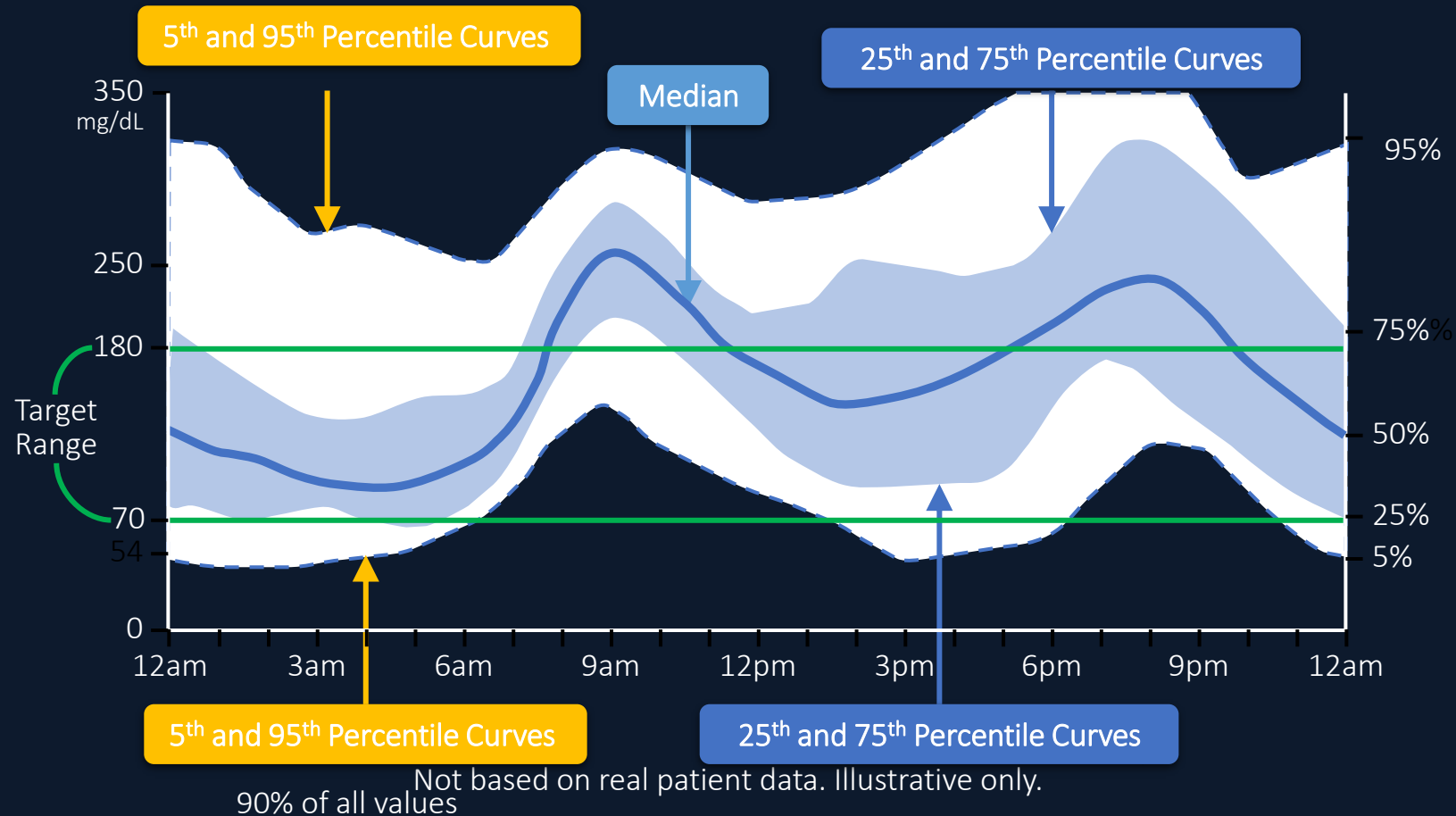


- Opportunity for increased individual engagement with their disease
- Increased hypoglycemic awareness that can improve prevention
- Reveals therapeutic impacts on glucose management
- Compiled printable data revealing hypoglycemic risk, glycemic excursion (high to low), time-in-range, and data visualization known as the AGP

Ambulatory Glucose Profile

Illustrates trends, patterns and glycemic variability

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



17-year-old female
with new onset T2 DM
A1c diagnosis 2 week prior
7.8%

Medications:

Metformin 500mg BID

(poor second dose
compliance)

AGP with personal
Dietary log-book

GLUCOSE STATISTICS AND TARGETS

August 8, 2019 - August 21, 2019

14 Days

% Time CGM is Active

87%

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

Average Glucose

172 mg/dL

Glucose Management Indicator (GMI)

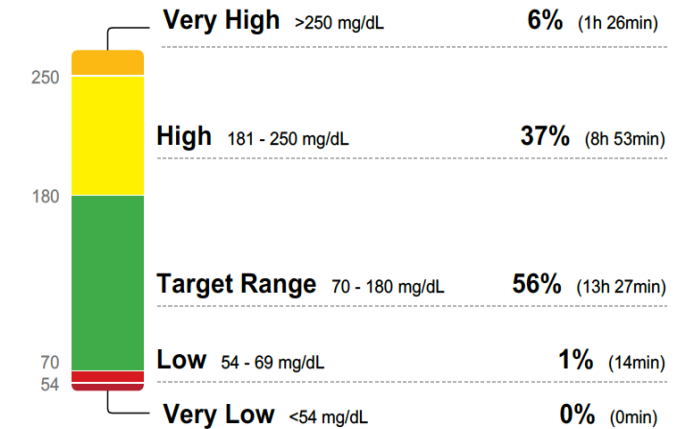
7.4%

Glucose Variability

27.9%

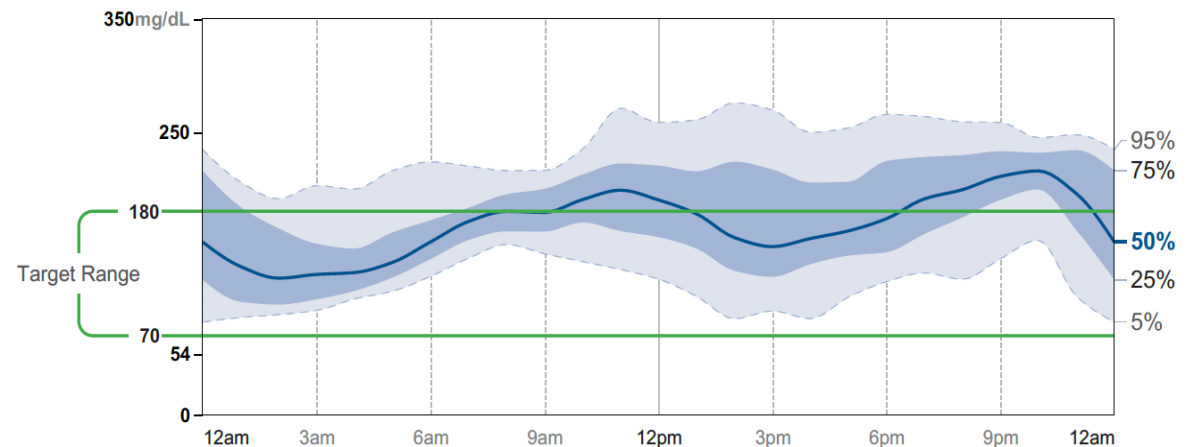
Defined as percent coefficient of variation (%CV); target $\leq 36\%$

TIME IN RANGES



AMBULATORY GLUCOSE PROFILE (AGP)

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



Hypertension

Device — ABPM uses a portable automated device that records blood pressure (BP) over a specific time period (usually 24 hours). ABPM monitors most commonly used in children, they are small oscillometric devices, which are worn on a belt in a pouch.

Oscillometric ABPM devices directly measure the mean arterial pressure and back-calculate the systolic and diastolic BP using an algorithm that is unique to each device manufacturer.

Pulse wave amplitude and the elastic properties of the arterial wall, which are important factors in algorithm development, are different in children and adults. Thus, both the monitors and algorithms used in ABPM need to be validated using a standard protocol in children

Seven Habits for Children and Adolescents

1. Be Positive- This is a group and family effort....celebrate all the change
2. Limit screen time-Children and teens are growing up immersed in the digital world, exposed to digital media at all hours of the day, including computers, smartphones and television. Parents play an important role in teaching their children how to use screen time in a healthy way that can enhance daily life. The American Academy of Pediatrics (AAP) has tools to help you create a personalized family media use plan. <https://www.healthychildren.org/English/media/Pages/>
3. Read with your child every day- It's never too early to start reading to your baby. The AAP recommends starting parent-child reading at birth and continuing at least through kindergarten.

4. Make meals a colorful collage- Filling a plate with brightly colored foods translates into health benefits and nutritional value, especially when the items are in season. Think red (apples), blue and purple (eggplant and grapes), green (beans), yellow and orange (carrots and squash), and white (cauliflower). *Five servings fruits and veggie challenge*

5. Eat breakfast- Eating a balanced breakfast with protein is a good way for your child to start the day

6. Enjoy physical activities-Expose your kids to a range of physical activities, from swimming to hiking, and enjoy them together as a family. Every child is different, so there is bound to be something they will enjoy. Just Play!!!!

7. Read food labels-Teach your child about nutrition by looking at the food labels for their favorite packaged snacks. You can focus on a few important parts of the label, such as the amount of sugar, saturated fat, calories and serving size

Clinical pearls for practice



The Body likes normal

- Have the parent and child set goals together as everyone can be healthier
 - Start small- it is a marathon not a sprint
- Use Technology if it helps engagement, encourage and provides success
- Be familiar with multiple tools for each interventional condition
- Technology can be helpful and harmful so match the technology option with what the person needs and could benefit from.
- I tell pediatric clients, “All kids need to be healthy, and you are taking the steps to improve your health. Not may kids chose to do that, you are uniquely smart.”