



**SCHOOL NURSE**  
*Workshop*

## **Adrenal Insufficiency**

Sarah Sparks, MSN, CRNP, FNP-C

&

Leslie Pitts, MSN, CRNP, CPNP-AC, CDCES

June 20, 2024



Children's  
of Alabama®



# Adrenal Insufficiency Training

Sarah Sparks, MSN, CRNP, FNP-C  
&

Leslie Pitts, MSN, CRNP, CPNP-AC, CDCES

# Objectives

After completion of this training, the learner will be able to:

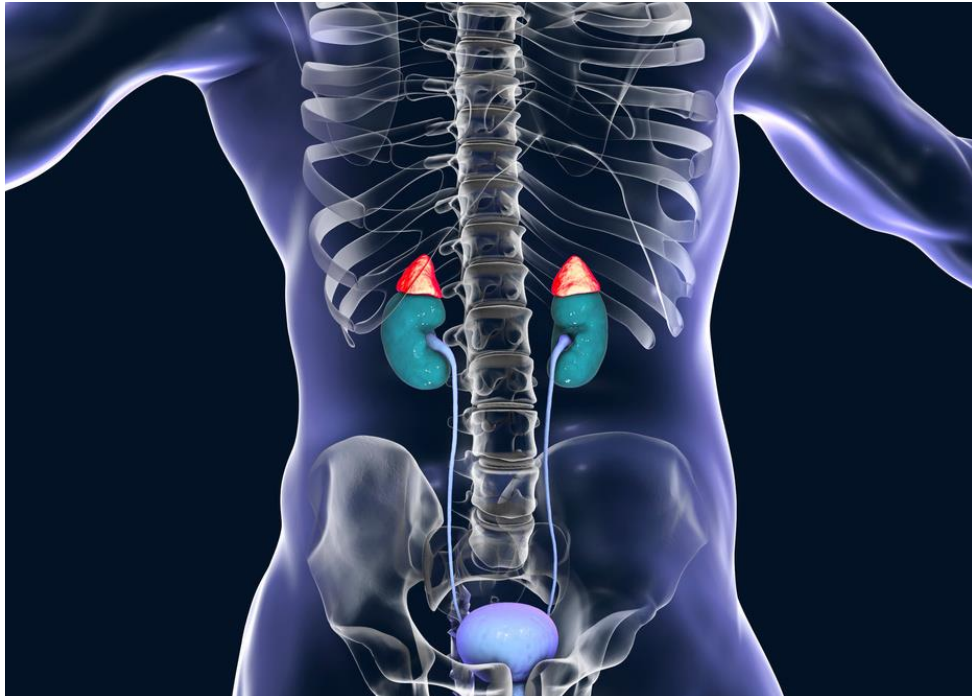
- 1 Describe adrenal gland function.
- 2 Recall adrenal pathophysiology and pharmacology.
- 3 Manage adrenal insufficiency appropriately.
- 4 Dose and administer Solu-Cortef emergency injection for adrenal crisis events.

# Adrenal Insufficiency School Training

- [Alabama Senate Bill 52](#)
- Amended the Alabama Safe Schools Act.
- Mandates adrenal insufficiency and adrenal crisis training for school staff.
- Authorizes trained school personnel to administer injectable medication to students with adrenal crisis.
- [Alabama Health Services Safe Schools Adrenal Insufficiency Curriculum](#)



# The Adrenal Glands



The adrenal glands are small organs that rest on the upper poles of the kidneys.

Each adrenal gland is composed of two distinct parts:

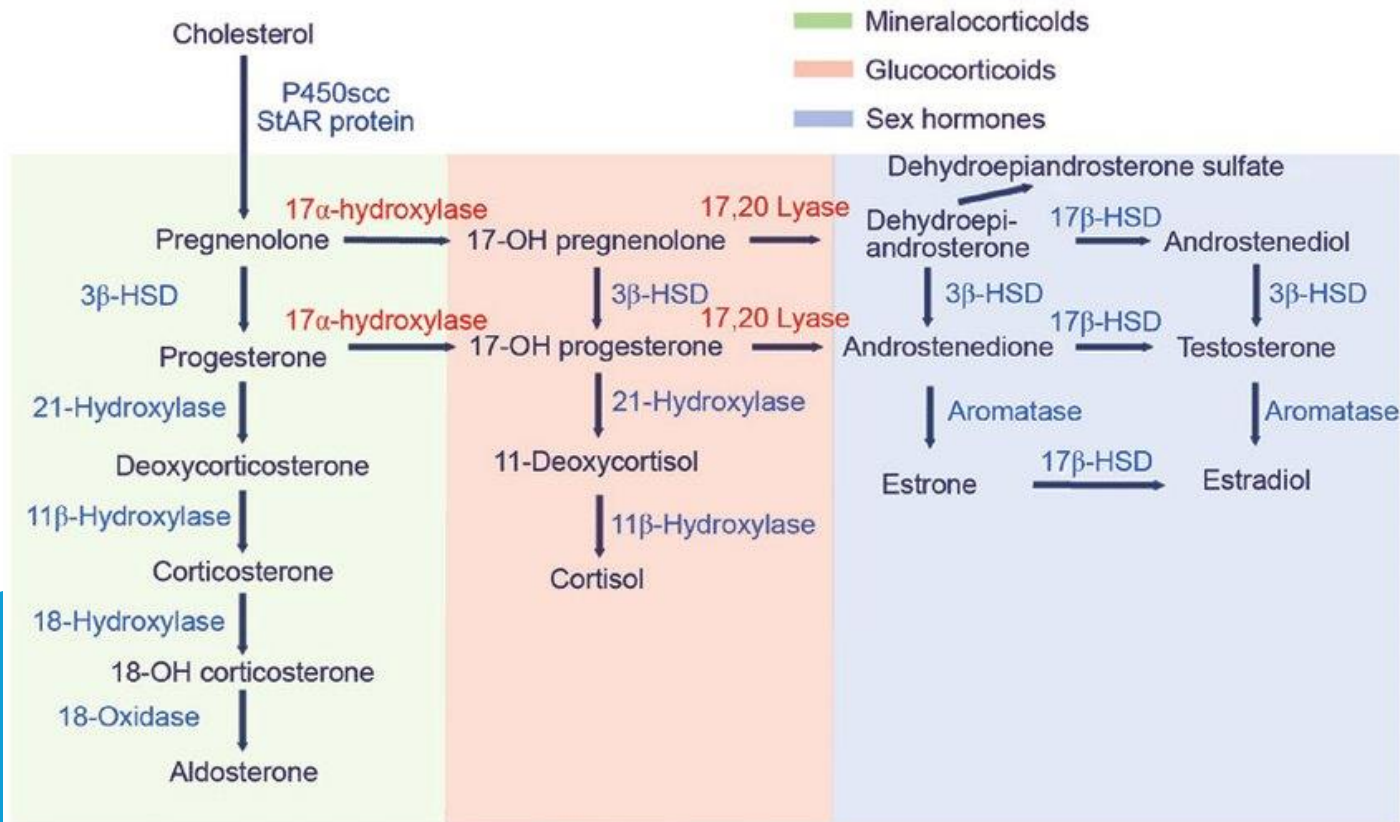
- The Adrenal Cortex
- The Adrenal Medulla

# The Adrenal Cortex

The three main adrenal hormones are:

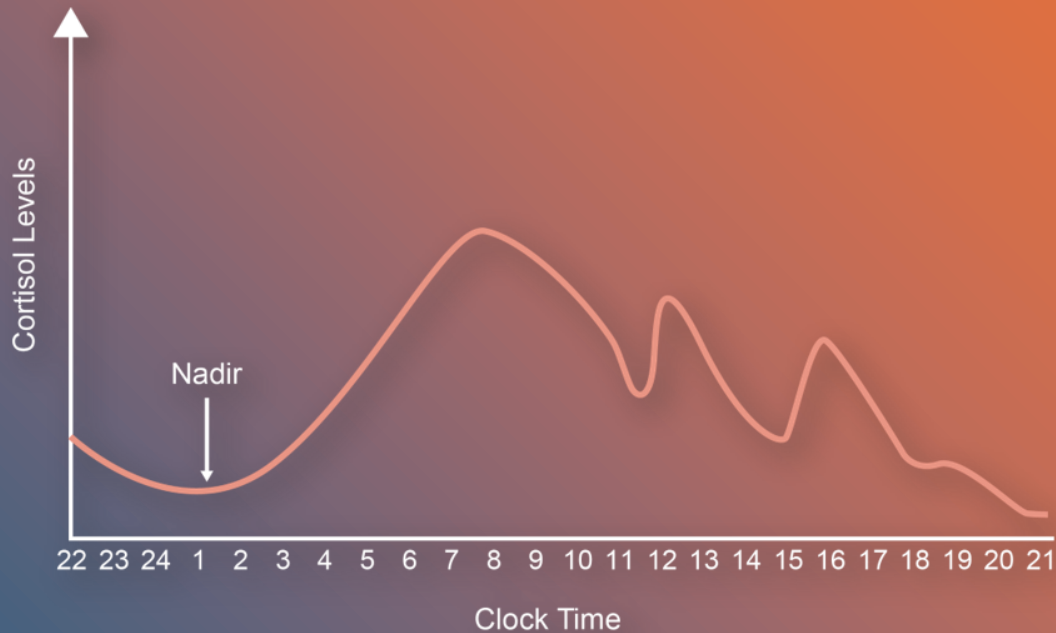
- Mineralocorticoids = Aldosterone
- Glucocorticoids = Cortisol
- Adrenal Androgen = Dehydroepiandrosterone (DHEA)

Adrenal steroidogenesis pathway



All adrenocortical hormones are steroid compounds derived from cholesterol.

# Glucocorticoids



- Approximately 95% of glucocorticoid activity comes from cortisol.
- In normal situations, CRH, ACTH, and cortisol secretory rates demonstrate a **circadian rhythm**.
  - Peak- early morning (6-8 AM)
  - Trough – evening (10 PM - 2 AM)
- Stressors also increase cortisol secretion.

# Cortisol

Increases and sustains blood glucose by stimulating gluconeogenesis in the liver and decreasing glucose use in the body.

Anti-inflammatory effects

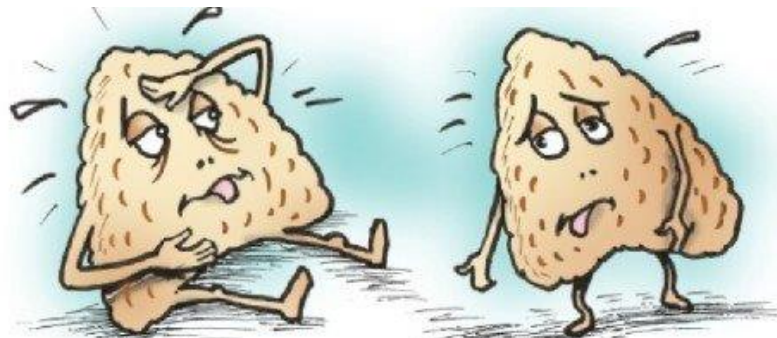
Decreases eosinophils and lymphocytes



# Glucocorticoids

## Deficiency

- Hypoglycemia
- Nausea, Vomiting
- Fatigue
- Muscle Weakness

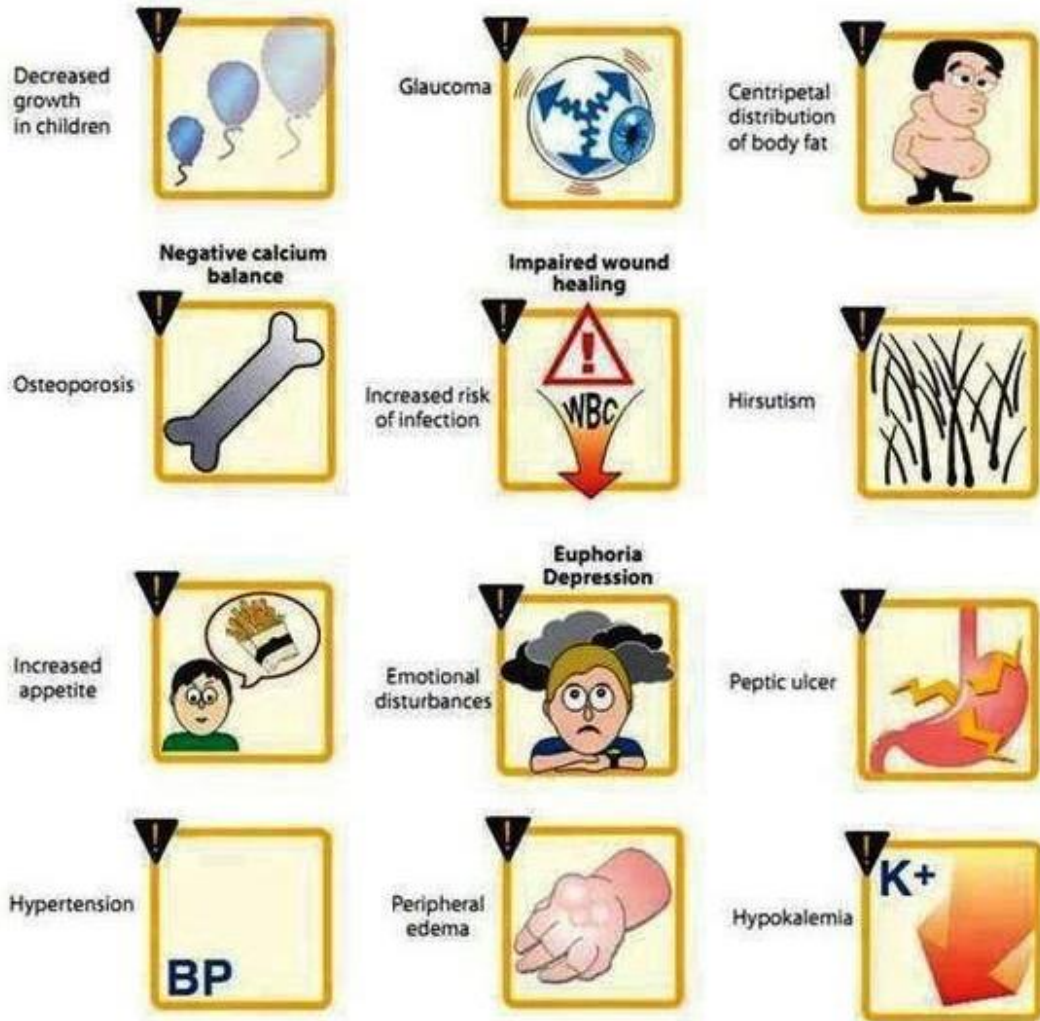


## Excess

- Hypertension
  - Weight Gain
  - Poor Growth
  - Stria
  - Sleep Disturbance
  - Anxiety
  - Menstrual Irregularity
-

# CORTICOSTEROIDS

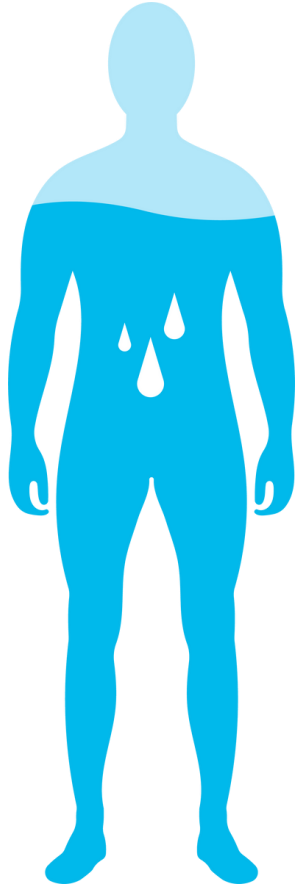
## Side Effects



## Steroid Risks

- Poor Growth
- Increased Weight Gain
- Decreased Bone Mineral Density
- Hypertension
- Adrenal Suppression

# Mineralocorticoids



Aldosterone accounts for 90% of mineralocorticoid activity

Aldosterone promotes sodium reabsorption and potassium excretion

Aldosterone also affects sodium absorption in the intestine, especially the colon.

Without aldosterone, the kidney loses excessive amounts of sodium and water.





# Mineralocorticoids

## Deficiency

- Weight Loss
- Fatigue
- Nausea, Vomiting, Anorexia
- Salt-Craving
- Hypotension
- Hyperkalemia, Hyponatremia
- Metabolic Acidosis with Normal Anion Gap

## Excess

- Hypertension
  - Elevated Sodium
  - Low Potassium
  - High Calcium
  - Fatigue
  - Headache
  - Muscle Weakness
-



# Adrenal Androgens

- The adrenal cortex continually secretes male sex steroid hormones:
  - DHEA
  - DHEA-Sulfate (DHEAS)
  - Androstenedione
  - 11-Hydroxyandrostenedione
- These hormones are converted to testosterone.
- Play a role in the onset of puberty.

# Adrenal Androgens

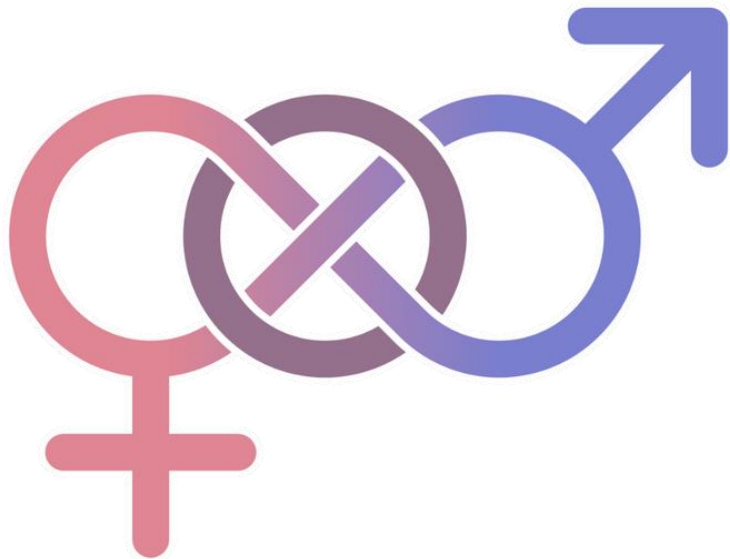


## Deficiency

- Decreased Pubic and Axillary Hair
- Under-virilized 46,XY Male

## Excess

- Premature Adrenarche
- Acne
- Body Odor
- Advanced Bone Age
- Precocious Puberty
- Virilization of 46,XX female



# Adrenal Medulla



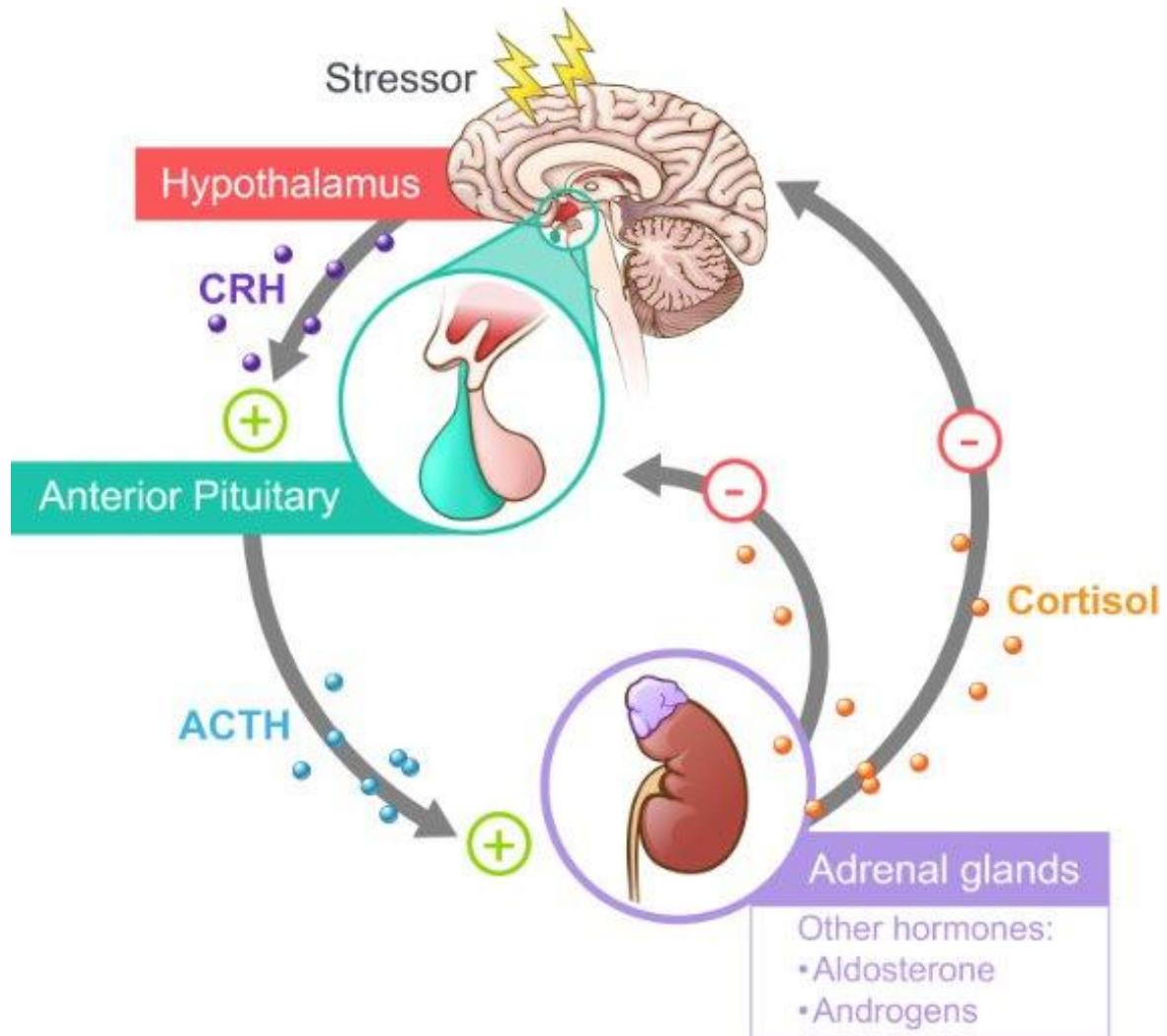
Epinephrine - 80%

Norepinephrine - 20%

Minimal amounts  
of Dopamine

## Function:

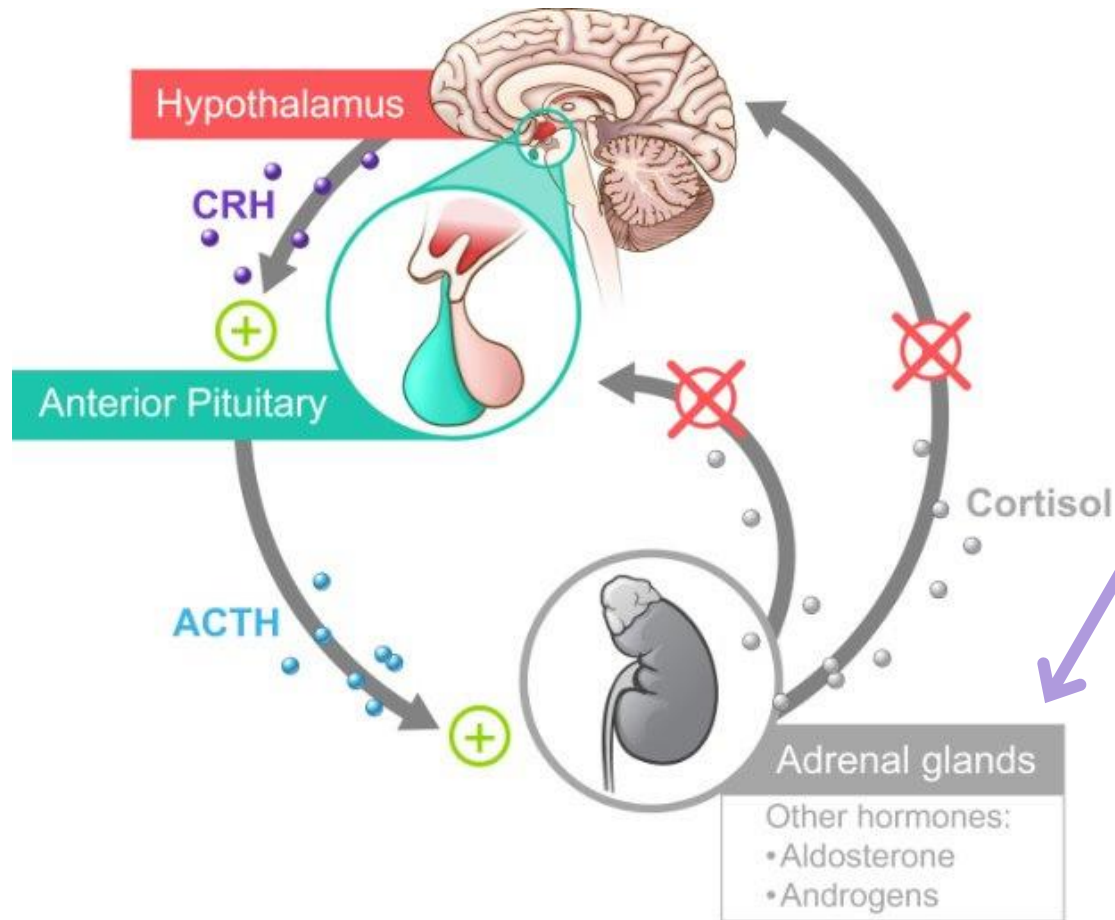
- Increase cardiac output and vascular resistance
- Physiologic stress response



# HPA Axis and Glucocorticoid Regulation



# Types of Adrenal Insufficiency



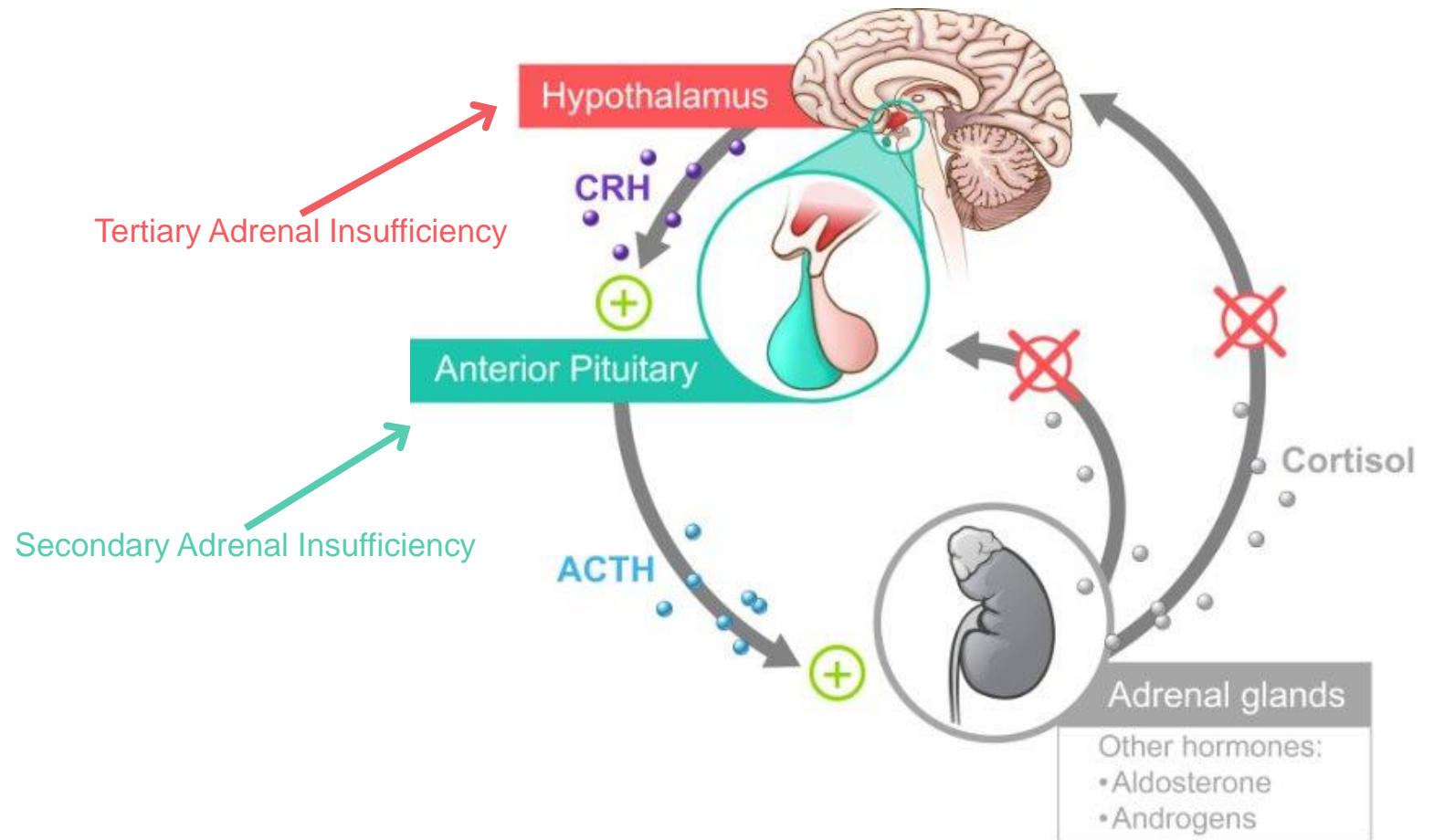
## Primary Adrenal Insufficiency

- Affects 10-15 per 100K individuals
- Causes include:
  - Impaired steroid synthesis (CAH)
  - Adrenal destruction/dysfunction (ALD, Addison's disease)

# Types of Adrenal Insufficiency

## Central Adrenal Insufficiency

- Secondary and tertiary AI
- 150-280 per 1M individuals
- Congenital
- Genetic
- Acquired
  - Sellar mass
  - Infiltrative
  - Autoimmune
  - Traumatic brain injury



# TREATMENT OF ADRENAL INSUFFICIENCY

- Treatment of adrenal insufficiency includes daily oral hydrocortisone replacement to mimic the body's natural stress response. This is called a “**maintenance dose**” and is divided every 8 hours.
- During times of fever, vomiting/diarrhea, trauma (i.e., broken bone), or surgery, children with adrenal insufficiency will need a “**stress dose.**” This is typically double or triple the maintenance dose, depending on the severity.
- Patients who are also deficient in aldosterone will require replacement with daily oral fludrocortisone. The fludrocortisone dose does not change with stress dosing.

### Corticosteroid Comparison Chart

		Potency relative to Hydrocortisone		Half-Life	
	Equivalent Glucocorticoid Dose (mg)	Anti-Inflammatory	Mineral-Corticoid	Plasma (minutes)	Duration of Action (hours)
<i>Short Acting</i>					
Hydrocortisone (Cortef, Cortisol)	20	1	1	90	8-12
Cortisone Acetate	25	0.8	0.8	30	8-12
<i>Intermediate Acting</i>					
Prednisone	5	4	0.8	60	12-36
Prednisolone	5	4	0.8	200	12-36
Triamcinolone	4	5	0	300	12-36
Methylprednisolone	4	5	0.5	180	12-36
<i>Long Acting</i>					
Dexamethasone	0.75	30	0	200	36-54
Betamethasone	.6	30	0	300	36-54
<i>Mineralcorticoid</i>					
Fludrocortisone	0	15	150	240	24-36
Aldosterone	0	0	400+	20	--

Reference: Adrenal Cortical Steroids. In Drug Facts and Comparisons. 5<sup>th</sup> ed. St. Louis, Facts and Comparisons, Inc.: 122-128, 1997

# Oral Stress Dosing

## When?

Illness  
Fever > 101  
Mild to Moderate Trauma  
Seizure  
Surgery

## How?

Double or triple the maintenance dose.

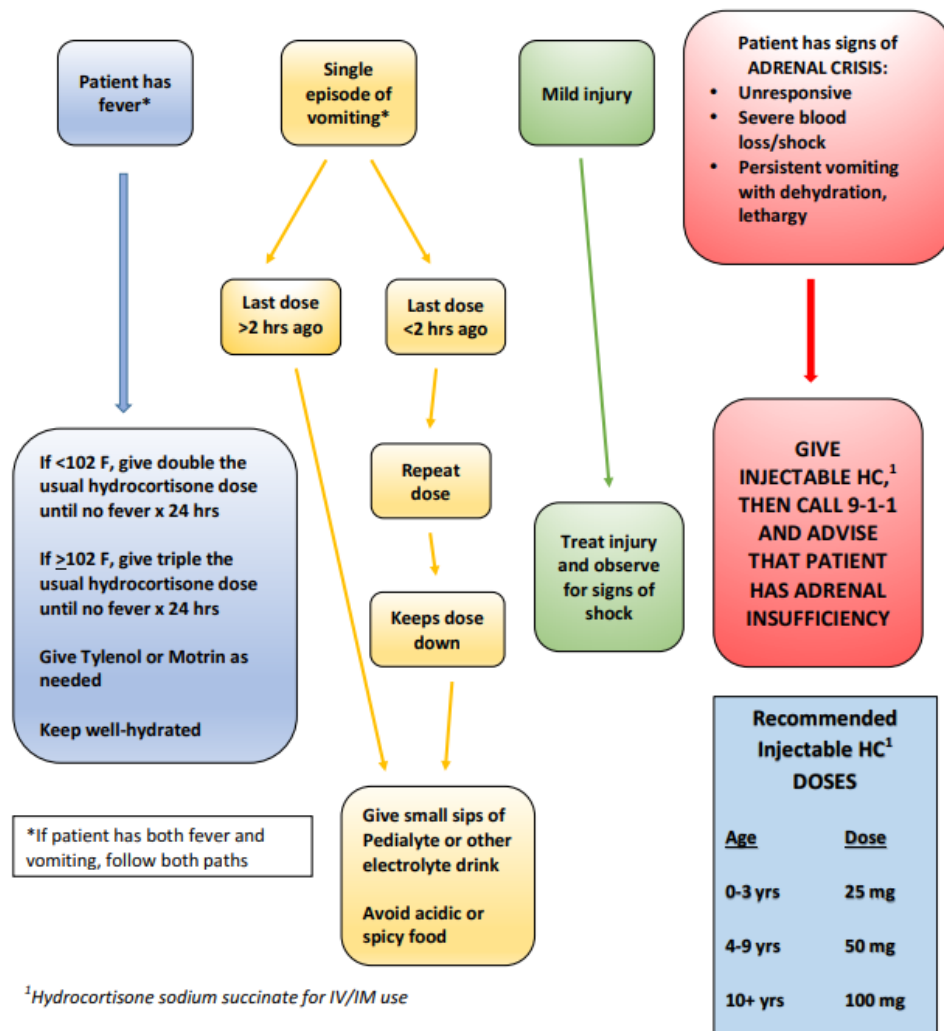
If on stress dosing for > 3 days will need to gradually taper dosing back to maintenance.

# EXAMPLES OF ORAL STRESS DOSING

	Normal Dose	Double Dose	Triple Dose
<b>Morning</b>	1 pill	2 pills	3 pills
<b>Afternoon</b>	½ pill	1 pill	1 ½ pills
<b>Bedtime</b>	½ pill	1 pill	1 ½ pill

	Normal Dose	Double Dose	Triple Dose
<b>Morning</b>	2 mL	4 mL	6 mL
<b>Afternoon</b>	2 mL	4 mL	6 mL
<b>Bedtime</b>	1 ½ mL	3 mL	4 ½ mL

## Stress Dose Guidelines for CAH



<sup>1</sup>Hydrocortisone sodium succinate for IV/IM use

Prepared by Karen Lin Su, M.D. (Medical Director, CARES Foundation)

Disclaimer: This document is intended for informational purposes only and should not be used in place of medical advice from the patient's physician or other health-care provider.

# Emergency Medical Services

## Alabama EMS Adrenal Insufficiency Protocol

- Current EMS protocols of many states do not :
  - Address adrenal insufficiency
  - Allow emergency medical response personnel to treat individuals with medical ID that say “Adrenal Insufficiency”
  - Administer patient-carried medication used to treat adrenal crisis

Treat underlying cause of crisis per appropriate protocol (i.e. sepsis, fracture, burn)

Cardiac monitor

Check blood glucose, if hypoglycemic treat per hypoglycemia protocol.

Establish IV

If patient has personal medications, administer per accompanying instructions. If patient does not have personal medications or dosing instructions, utilize the following:

Hydrocortisone Sodium Succinate

100mg IM or IV

2 mg/kg IM or IV, 100mg max

Methylprednisolone

125mg IM or IV

2 mg/kg IM or IV, 125mg max

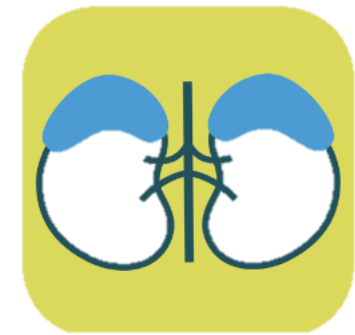
Dexamethasone

5mg IM or IV



# RESOURCES

---






# Adrenal Insufficiency Action Plan





## My Adrenal Insufficiency Action Plan





My Name:






My Medications:




 <p><b>I FEEL GOOD</b></p> <p>Normal Day</p>	<p>I take my <b>regular</b> doses</p> <p>Morning:</p> <p>Afternoon:</p> <p>Bedtime:</p>
 <p><b>I DO NOT FEEL GOOD</b></p> <p>Fever or Sick or Hurt</p>	<p>I take my <b>stress</b> doses</p> <p>Morning:</p> <p>Afternoon:</p> <p>Bedtime:</p> <p>Call the Endocrine doctor if you do this for more than 3 days</p>
 <p><b>I FEEL BAD</b></p> <p>Vomiting, Diarrhea, Fainting Unable to keep pills down</p>	<p>I take my <b>Emergency Shot</b></p> <p>Solu-Cortef Dose:</p> <p>Inject Solu-Cortef. Call (205) 638-9100 and ask for the "Endocrine Doctor On Call" Tell them you had to use Solu-Cortef. Go to the Emergency Room. Tell them you have "Adrenal Insufficiency" and you used Solu-Cortef.</p>

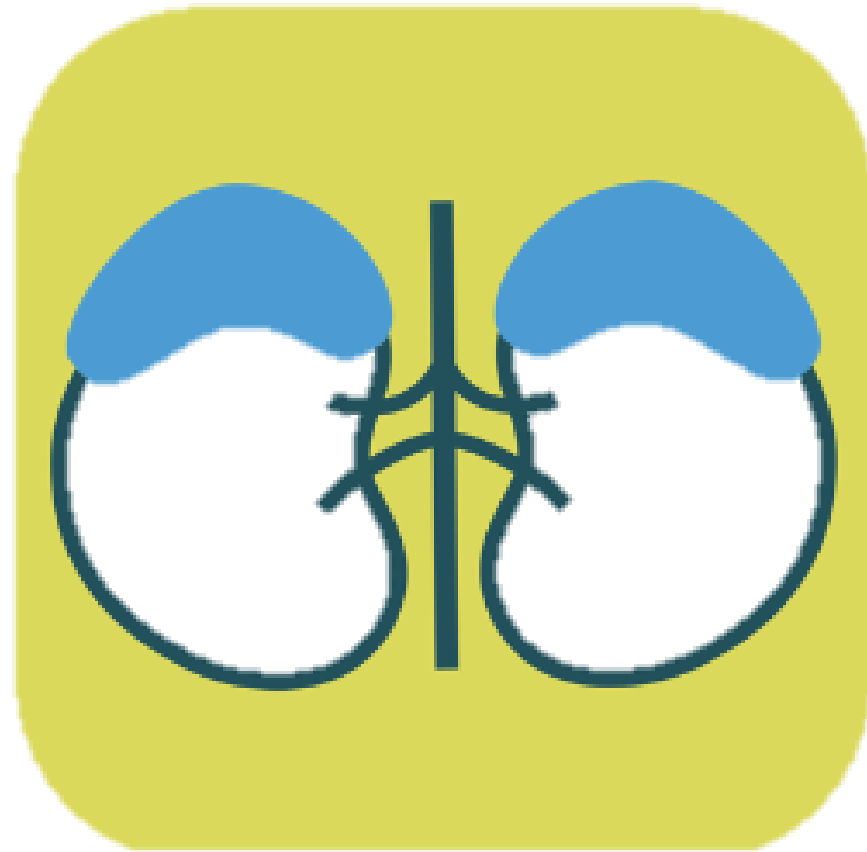
Patient Name: Anakin Skywalker Date of Birth: 05/04/2017 Today's Date: 09/27/2021  
 Clinician Name: Patrick T. Reeves Emergency Contact: 301-295-4959 Weight: 45 Kg Height: 155 cm BSA: 1.40m<sup>2</sup>  
 Special instructions if: ● *feeling good*, ● *sick day*, ● *emergency*, ● *having surgery*

GO						
GREEN ZONE	DAILY MEDICINES		HOW MUCH	WHEN	OTHER INSTRUCTIONS	
		Hydrocortisone	10 mg = 1	tab(s)	8:00 AM	
						
						
						
<ul style="list-style-type: none"> <li>• Normal activity</li> <li>• No fever</li> <li>• No abdominal pain</li> <li>• No nausea or vomiting</li> <li>• No diarrhea</li> </ul>					<input checked="" type="checkbox"/> Do NOT go to 'Sick Day' for emotional stress including: a test at school, feeling sad, etc.	

CAUTION						
YELLOW ZONE	SICKDAY MEDICINES		HOW MUCH	WHEN	OTHER INSTRUCTIONS	
		Hydrocortisone	15 mg = 3	tab(s)	Every 8 Hours	
						
						
						
<ul style="list-style-type: none"> <li>• Fever over 100.4°F(38°C)</li> <li>• Illness/infection that needs Antibiotics</li> <li>• Diarrhea</li> <li>• Broken bone</li> </ul>					<input checked="" type="checkbox"/> 'Stress' dose is usually needed for 24-48 hours. Return to GREEN zone when stress has resolved.	

STOP		Solu-cortef Injection Video
RED ZONE		<ul style="list-style-type: none"> <li>• Serious trauma or many broken bones</li> <li>• Loss of consciousness</li> <li>• Cannot take medicines by mouth</li> <li>• Vomiting</li> </ul>
		
		
		
<ul style="list-style-type: none"> <li>- Solu-Cortef (100mg/2mL): Give 50mg(1mL) by IM injection.</li> <li>- Go to the Emergency Department or Call 911.</li> <li>- Call the Endocrinology On-Call phone: 301-295-4959</li> </ul>		

SURGERY	PATIENT INSTRUCTIONS: Surgery/Procedure	CLINICIAN INSTRUCTIONS: Emergency Room
SURGERY	 <ul style="list-style-type: none"> <li>- Routine sedation and surgical procedures are stressful.</li> <li>- You may require higher doses of your medication.</li> <li>- Show your Action Plan to your surgical team.</li> <li>- Your team may call Endocrinology: 301-295-4959</li> </ul>	  <ol style="list-style-type: none"> <li>1. Obtain vital signs, IV access, POC glucose, &amp; STAT BMP.</li> <li>2. Correct shock. Give 900mL NS bolus (20 mL/kg); ***If hypoglycemic, bolus with 900mL D5NS (1g/kg Dextrose).</li> <li>3. Give IV Hydrocortisone sodium succinate 50mg, STAT.</li> <li>4. Start D5NS at 128-170mL/hr (1.5-2x maintenance).</li> <li>5. Call the Endocrinology On-Call phone: 301-295-4959</li> </ol>



## Preventing Adrenal Crisis Emergencies with the PACE App

- Apple or Android: Go to the app store and search: "**PACE by ChaiCore**"
- Available in English or Spanish
- The application is free and does not require cellular data or wireless internet.
- No data is collected by this application
- PACE by ChaiCore is a grant-funded research application studying efficacy of Adrenal Crisis content for informing patients about their disease.

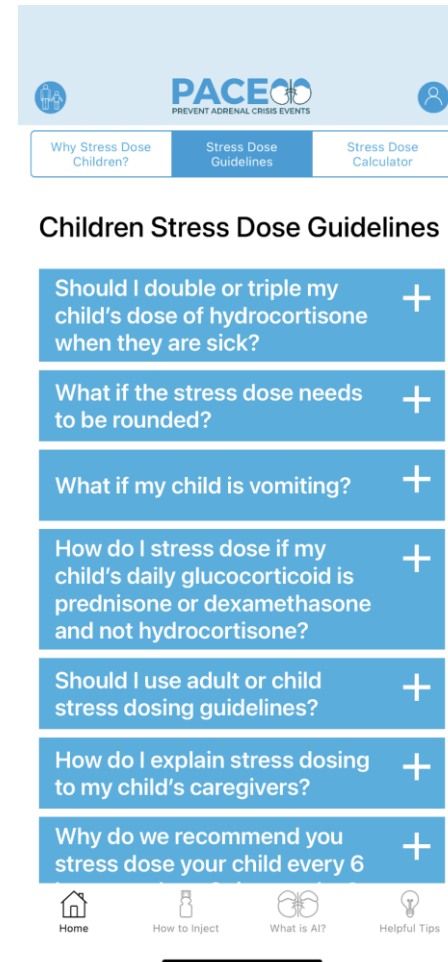
This app is part of a research study that you have consented to participate in. It should not be downloaded on devices that do not belong to you.

The information is intended for general patient education. No personal information is relayed to the developers.

This is not intended to replace medical advice or recommendations from you or your child's provider. Please tap agree to begin using.

version 1.4

AGREE

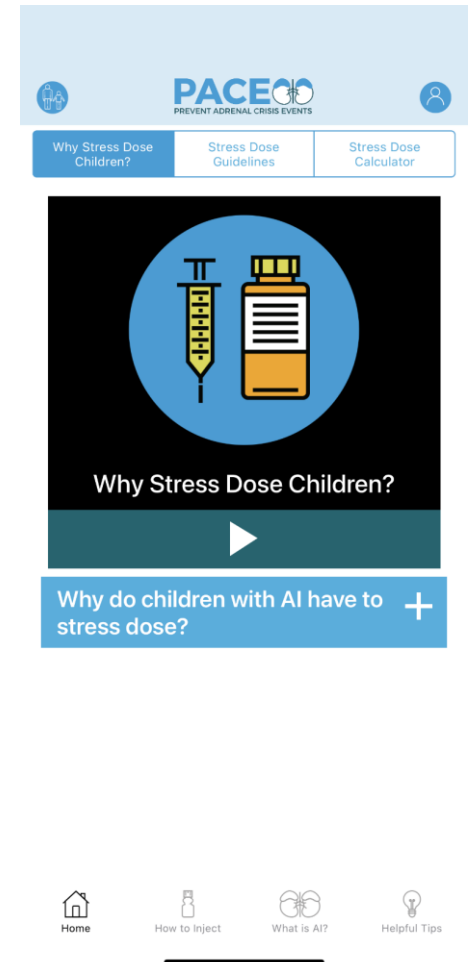
PACEO PREVENT ADRENAL CRISIS EVENTS

Why Stress Dose Children? Stress Dose Guidelines Stress Dose Calculator

### Children Stress Dose Guidelines

- Should I double or triple my child's dose of hydrocortisone when they are sick? +
- What if the stress dose needs to be rounded? +
- What if my child is vomiting? +
- How do I stress dose if my child's daily glucocorticoid is prednisone or dexamethasone and not hydrocortisone? +
- Should I use adult or child stress dosing guidelines? +
- How do I explain stress dosing to my child's caregivers? +
- Why do we recommend you stress dose your child every 6 +

Home How to Inject What is AI? Helpful Tips



PACEO PREVENT ADRENAL CRISIS EVENTS

Why Stress Dose Children? Stress Dose Guidelines Stress Dose Calculator

### Why Stress Dose Children?

Why do children with AI have to stress dose? +

Home How to Inject What is AI? Helpful Tips

Why Stress Dose Children?

Stress Dose Guidelines

Stress Dose Calculator

What is the child's daily dose of hydrocortisone?

XX.XX mg

SUBMIT



### Helpful Tips

- Always carry a day's supply of medicine
- Send sick day rules to school or college nurse or clinic. Suggest a standard triple dose for the nurse to give the student until parents or caregivers get there
- Tell other providers, like a dentist or surgeon, about the person's adrenal insufficiency diagnosis
- Drink liquids containing sugar and salt to prevent dehydration when sick (drinks like Gatorade, Pedialyte, Sprite, or 7-Up)
- Eat a carb and protein snack before exercising. Drink water and bring a salty snack (pretzels, nuts) to eat during exercise
- Tell emergency personnel if you or a loved one has adrenal insufficiency and is steroid dependent
- Wear a medical alert tag that identifies the person



### What is AI?

What are the adrenal glands? +

What is adrenal insufficiency (AI)? +

What causes AI? +

What are symptoms of not having enough cortisol and aldosterone? +

What happens if a person with +



1. Wash your hands.
2. Assemble your equipment.



### Adult Stress Dose Guidelines


- Why do adults with AI have to stress dose? +
- What dose of hydrocortisone do I use when I am sick? +
- What if I vomit? +

< Profile Edit


---

PATIENT NAME


---

EMERGENCY CONTACT 


---

EMERGENCY CONTACT 

---

PRIMARY PROVIDER 

---

ENDOCRINOLOGIST 

---

MEDICATIONS



# Getting Ready for School/Camp: Parent Tips



- Contact your local CARES Support Group Leader to talk with other parents of children with CAH
- Get Medical Alert Identification
- Build a team
- Give yourself time
- Keep records/make lots of copies
- Bring a friend
- Get feedback

# 504 Plan

- A child with classical CAH is at risk of adrenal crisis and requires appropriate monitoring and care to avoid serious illness and possible death
- Though CAH is not thought of as a *disability*, children with classical CAH are at serious risk for an adrenal crisis without proper medication, monitoring of health status, access to water, and appropriate emergency medical response
- Parents can advocate for 504 plans for their child to maintain his/her health and welfare



# Health Plan Worksheet

## Classroom Environment

- Acceptable caregiver/student ratio and group size: \_\_\_\_\_ # of teachers per \_\_\_\_\_ # of children with a group size of \_\_\_\_\_
- Seat student near the teacher to permit discreet monitoring of health
- Develop individualized rules for the student to meet student's needs
- Evaluate the classroom structure against the student's needs
- Seat student near a positive role model
- Additional accommodations:* \_\_\_\_\_

# Health Plan Worksheet

## Behaviors

- Modify school rules that may discriminate against the student (e.g. water bottle in the classroom; bathroom breaks; trips to nurse's office to take medications, etc.)
- Arrange for the student to leave the classroom voluntarily to go to the nurse's office or designated "safe place" when needing medication, not feeling well, or to change clothes
- Develop a system or a code to communicate key information between student and teacher (e.g. permission to take a bathroom break, go to the nurse's office, are you feeling okay, in need of help, etc.)
- Teacher awareness/monitoring of behavior changes that relate to medication or overall health
- Develop/Use self-monitoring strategies
- Implement a classroom behavior management system
- Additional accommodations:* \_\_\_\_\_

# Health Plan Worksheet

## **Personal Care**

- Provide access to water in classroom at all times
- Permit student unrestricted bathroom access
- Permit student to use bathroom in nurse's office or other designated "safe place"
- Change clothes/diapers in nurse's office or other designated "safe place"

## **Exercise and Physical Activity**

- Full participation in physical education classes and team sports without restrictions
- Participation in physical education classes and team sports with limitations due to temperature or humidity  
*Specify:* \_\_\_\_\_
- Provide PE instructors and sports coaches with training in monitoring and treatment of child
- Emergency Response Kit and water always to be available at the site of physical education class and team sports practices and games
- Additional accommodations:* \_\_\_\_\_

# Health Plan Worksheet

## **Field Trips and Extra-Curricular Activities**

- Full participation in field trips and extra-curricular activities without restriction
- Teachers/coaches for all field trips and extra-curricular activities will be trained in monitoring and treatment of student
- School nurse or other personnel trained in monitoring and treatment of student will accompany student on all field trips
- Parent/Guardian will be permitted to accompany student on field trips and during extra-curricular activities without restriction
- Emergency Response Kit and water always to be available at the site of field trips and extra-curricular activities
- Additional accommodations:* \_\_\_\_\_

# Health Plan Worksheet

## Communication

- Arrange "check-in/check-out" procedure to ensure parent↔teacher communication
- Keep student's medical information confidential, except to the extent that the student/parent/guardian decides to openly communicate about it with others
- Provide reasonable notice to parent/guardian when there will be change to the regular schedule such as a substitute teacher or field trips
- Provide each substitute teacher/caregiver with written instructions regarding the monitoring of student's health, a list of signs and symptoms of adrenal crisis and appropriate response as well as agreed upon accommodations.
- Attach photo of student to medical and accommodations information sheet(s) to facilitate instant recognition of student
- Student to wear medical alert bracelet to assist emergency personnel in responding properly
- Additional accommodations:* \_\_\_\_\_

# Health Plan Worksheet

## Emergency Evacuation and Shelter In-Place

- Parent/Guardian will supply school/camp with a Medical Supply Kit for the child
- In the event of emergency evacuation or shelter-in-place situation designated staff will ensure child's Medical Supply Kit is kept with the student and will provide monitoring and medications as needed
- Three days medication at stress-dose levels will be kept on school grounds at all times for use in case of emergency evacuation or shelter in-place
- Additional accommodations:* \_\_\_\_\_

## Additional Considerations

- Alert bus driver
- In-service training of teacher(s) on child's disability/condition
- Provide group/individual counseling
- Provide social skill group experiences
- Develop intervention strategies for transitional periods (e.g. cafeteria, physical education, etc.)
- Arrange for provision of at-home services in case of extended absence
- Additional accommodations:* \_\_\_\_\_

+

# • Causes of Adrenal Crisis

○

Unknown adrenal insufficiency

Untreated adrenal insufficiency

Undertreated adrenal insufficiency

Abrupt discontinuation of long-term steroids

Physiological Stress

- Vomiting
- Diarrhea
- Viral or Bacterial Infection
- Trauma
- Broken Bones
- Seizures
- Surgery

# Adrenal Crisis Symptoms



Dehydration

Hypotension

Shock

Nausea/  
Vomiting

Acute  
Abdominal Pain

Hypoglycemia

Hyponatremia

Hyperkalemia

Hypercalcemia

Fatigue

Anxiety

Weakness



What does adrenal crisis look like?



Adrenal Emergency  
Medication  
Intramuscular  
Solu-Cortef

(hydrocortisone sodium succinate)

Solu-Cortef injections are given for two basic reasons:

- Unable to absorb the oral dose (vomiting, repeated diarrhea)
- Decreased level of consciousness
  
- Prescription:
  - Act-O-Vial 100mg/2ml.
  - DOSE: 25mg, 50mg, or 100mg
  - Frequency: As needed

# Ensuring the Effectiveness and Safety of Solu-Cortef



- Storage and Stability
  - Room temperature (59-77°F) before reconstitution.
  - Protect from light and moisture to maintain stability. Do not freeze.
  - Check the expiration date printed on the vial or packaging. Do not use the medication past this date as it may not be effective or safe.
  - Once reconstituted, Solu-Cortef solution should be used immediately.
  - If not used immediately, Solu-Cortef should be stored in the refrigerator (36-46°F) and used within 3 days (72 hours). After this period, it should be discarded.
- Additional Notes
  - Visual Inspection: Before administration, inspect the reconstituted solution for any particulate matter or discoloration. If either is present, do not use the solution.
  - Handling: Always use aseptic techniques when handling and reconstituting the medicine to avoid contamination.

# Administering Solu-Cortef



# Future of Solu-Cortef Emergency Administration

CrossJet's Zeneo®

- Prefilled, automatic, disposable needle-free jet injector



SOLUtion Pre-filled Syringe



SOLUtion Medical TwistJect™





Questions

# References

Cares Foundation, Emergency instructions brochure.

<https://caresfoundation.org/wp-content/uploads/2022/08/EMERG-INSTRUCTIONS-BROCHURE-8.5.22.pdf>

Fleming, L. (2020). *Preventing Adrenal Crisis Events (PACE) [Mobile health application]*. Retrieved September 28, 2022 from <https://apps.apple.com/ae/app/pace-by-chaicore/id1490431010?platform=ipad>

Fleming, L. K., Rapp, C. G., & Sloane, R. (2011). Caregiver knowledge and self-confidence of stress dosing of hydrocortisone in children with congenital adrenal hyperplasia. *Journal of Pediatric Nursing*, 26(6), e55-60. <https://doi.org/10.1016/j.pedn.2011.03.009>

Kappy, M.S., Allen, D.B., and Geffner, M.E. (2010). *Pediatric practice: Endocrinology*. New York: McGraw Hill Medical.

Babler, E.K., Betts, K.J., Courtney, J.A., Flores, B.M., Flynn, C., et. al. (2013). *Clinical handbook of pediatric endocrinology* (2<sup>nd</sup> Ed.). Quality Medical Publishing, Inc.

Martin-Grace, J., Dineen, R., Sherlock, M., & Thompson, C. J. (2020). Adrenal insufficiency: Physiology, clinical presentation and diagnostic challenges. *Clinica Chimica Acta*, 505, 78-91. <https://doi.org/10.1016/j.cca.2020.01.029>

Miller, B. S., Spencer, S. P., Geffner, M. E., Gourgari, E., Lahoti, A., Kamboj, M. K., Stanley, T. L., Uli, N. K., Wicklow, B. A., & Sarafoglou, K. (2020). Emergency management of adrenal insufficiency in children: Advocating for treatment options in outpatient and field settings. *Journal of Investigative Medicine*, 68(1), 16-25. <https://doi.org/10.1136/jim-2019-000999>

NADF, Corticosteroid comparison chart.

[https://www.nadf.us/uploads/1/3/0/1/130191972/corticosteroid\\_comparison\\_chart.pdf](https://www.nadf.us/uploads/1/3/0/1/130191972/corticosteroid_comparison_chart.pdf)

Rushworth, R. L., Torpy, D. J., & Falhammar, H. (2019). Adrenal Crisis. *The New England journal of medicine*, 381(9), 852-861. <https://doi.org/10.1056/NEJMra1807486>

Widmaier, E.P., Raff, H., Strang, K.T. (2014). *Vander's human physiology: The mechanisms of body function*. McGraw-Hill.