



1. Introduction

This guideline applies to those children undergoing surgery but who are on Steroid replacement treatment due to Adrenal conditions which include:

- Central Adrenal Insufficiency: Hypopituitarism (multiple pituitary hormone deficiencies)
- Primary Adrenal Insufficiency such as: Congenital Adrenal Hyperplasia (CAH), Addison's disease, adrenal hypoplasia congenita, previous history of adrenalectomy and other rare conditions (for example Smith-Lemli –Opitz on hydrocortisone replacement)

In addition, consider using these guidelines for those children who are at risk of adrenal suppression and adrenal crisis due to long-term steroid treatment such as:

- patient on long term systemic steroids (e.g. prednisolone)
- weaning regime of prednisolone or dexamethasone
- high doses of inhaled steroids (beclomethasone >800 micrograms/day or fluticasone >400 micrograms/day)

Please discuss with the Paediatric Endocrine Consultant On-call for advice in this group of patients.

2. Pre-admission

Children on long-term steroid replacement may need minor (short procedures of up to 30 minutes anaesthetic time) or major (surgery requiring prolonged anaesthetic time of more than 30 minutes or a procedure which is likely to cause post-operative nausea, vomiting or inability to feed adequately) surgery.

Girls with Congenital Adrenal Hyperplasia may require admission for surgery for the following indications:

A) Reconstructive genital surgery, which usually takes place initially at around 2 years of age with the potential for further corrective surgery in the teenage years. Such procedures should be regarded as **major surgery**.

B) Examination under anaesthetic (EUA) may also be required on some occasions. This is a brief procedure which would be regarded as **minor surgery**.

The following guidance should be followed in planning for such admissions on the surgical ward:

1. Notification of the date of admission to the named Paediatric Endocrine Consultant a few days prior to admission.
2. The patient should preferably be placed first on the surgical list in the morning. Prior liaison with the anaesthetist is essential.
3. Inform the family to ensure the child receives the normal hydrocortisone dose the evening before. If on the morning list, ensure the child has their normal morning dose of hydrocortisone and fludrocortisone with the last drink allowed. If the child is in the afternoon list, the normal dose of morning hydrocortisone and fludrocortisone should be given and the afternoon dose of hydrocortisone should be given with the last drink allowed.
4. Please check the up to date dose of the child's medication from the family and double check in medical notes. If any queries with the normal doses, please contact the endocrine secretary on 01162587737 so the record on clinical workstation can be checked for up to date doses.

2.1 On the day of the surgery:

Preoperative:

If there is a delay in going to theatre which involves fasting more than 6 hours, child should be commenced on full maintenance IV fluids (0.9% saline + 5% dextrose). Check blood glucose when IV fluids commenced and hourly thereafter. Ensure child has received the normal dose of Hydrocortisone in the morning or afternoon depending on the time of the operation as stated in guidance point 3 above.

Major Surgery

1. Ensure patient receives a stress dose of hydrocortisone at induction in anaesthetic room pre surgery.

IV hydrocortisone bolus induction dose:

Under 1 year: 25 mg

1-5years: 50mg

Over 5 years: 100mg

2. Commence IV maintenance fluids (5% dextrose + 0.9 % saline) in theatre, if the child has not been on it already.
3. If procedure is expected to exceed 4 hours, a further bolus of IV hydrocortisone (dose as stated above) during the procedure will be required. This will be prescribed and administered by anaesthetic team.

Postoperative:

1. Post operatively, continue IV fluids, IV hydrocortisone in above doses six hourly and check blood glucose 2 hourly until child is eating and drinking.

2. If there are concerns child is unstable or needs PICU care, please consider Adrenal crisis – *follow the Adrenal Crisis management please follow the link below:*

<http://insitetogether.xuhl-tr.nhs.uk/pag/pagdocuments/Adrenal%20Crisis%20UHL%20Childrens%20Medical%20Guidelines.pdf>

3. When the child is eating and drinking, stop the IV fluids and IV hydrocortisone and change to oral hydrocortisone which is double the normal dose of hydrocortisone the child is on at home. Restart the normal oral fludrocortisone dose that the child is on at home.
4. Reduce the oral hydrocortisone to normal oral doses at least 2 days after major surgery provided the child has remained well and eating/drinking. Some children may need a longer course and so please contact the Endocrine Consultant for advice.
5. In those children with suspected Adrenal suppression due to long-term steroid treatment for other medical conditions, prescribe hydrocortisone dose of 30mg/m²/day divided in three equal doses (m² - see Appendix for BSA calculation). Contact the Endocrine Consultant on call for advice on the course of length for this regimen and for advice on restarting their 'normal steroid treatment.'

Minor surgery

1. Ensure patient receives a stress dose of IV hydrocortisone at induction pre surgery (doses in the table above).
2. On return from theatre, give double 'normal' of hydrocortisone. Restart the normal dose of fludrocortisone, which the child is on at home, the next day or in the post-op period if that day's dose of fludrocortisone was not taken pre-op.
3. If child is unable to tolerate oral fluids 4 hours after theatre, commence IV maintenance fluids (0.9% saline + 5% dextrose) and give the doses of IV hydrocortisone used in major surgery (doses in table above). Check blood glucose every 2 hours whilst on IV fluids.

Change over to oral hydrocortisone and fludrocortisone as in 2, above when oral fluids tolerated.

4. Advise the parents to continue the double dose of oral hydrocortisone for 48 hours and then reduce to normal dose.
5. In those children with suspected Adrenal suppression due to long-term steroid treatment for other medical conditions, prescribe hydrocortisone dose of 30mg/m²/day divided in three equal doses (m² - see Appendix for BSA calculation) for 48 hours. Contact the Endocrine Consultant on call for advice on restarting their 'normal steroid treatment.'

2.2 Helpful Contact numbers:

- Endocrine Secretary : 01162587737 (tel)
01162587637 (fax)
- Pauline Jones, Paediatric Endocrine Specialist Nurse : 01162585326 (works part-time – please do not leave urgent messages out-of-hours)
- Out-of- hours - East Midlands Paediatric Endocrine Consultant on call: via Switchboard

3. Education and Training

No new training or education is required to implement this guideline.

4. Monitoring Compliance

What will be measured to monitor compliance	How will compliance be monitored	Monitoring Lead	Frequency	Reporting arrangements
Appropriate dose of hydrocortisone pre, during and postop care	Medical notes	Dr Shenoy - Consultant Paediatrician	5 yearly	Audit meetings
Appropriateness of swap over to oral hydrocortisone	Medical notes	Dr Shenoy – Consultant Paediatrician	5 yearly	Audit meetings

5. Supporting References

i) <https://www.bsped.org.uk/clinical/docs/SteroidCardForWebs.pdf>

6. Key Words

Congenital Adrenal Hyperplasia, Hydrocortisone, Adrenal Insufficiency,

CONTACT AND REVIEW DETAILS	
Guideline Lead (Name and Title) S. Shenoy Consultant Paediatrician	Executive Lead
Details of Changes made during review: <ol style="list-style-type: none">1) Stat dose of IV Hydrocortisone updated based on BSPED steroid card2) Introduced 'at risk of adrenal suppression group' children who would need a plan for surgery3) Type of IV fluids changed to 0.9% saline + 5% Dextrose	

Appendix 1.

BODY SURFACE AREA IN CHILDREN

Body-weight under 40kg

Body-weight (kg)	Surface area (m ²)
1	0.10
1.5	0.13
2	0.16
2.5	0.19
3	0.21
3.5	0.24
4	0.26
4.5	0.28
5	0.30
5.5	0.32
6	0.34
6.5	0.36
7	0.38
7.5	0.40
8	0.42
8.5	0.44
9	0.46
9.5	0.47
10	0.49
11	0.53
12	0.56
13	0.59
14	0.62
15	0.65
16	0.68

Body-weight (kg)	Surface area (m ²)
17	0.71
18	0.74
19	0.77
20	0.79
21	0.82
22	0.85
23	0.87
24	0.90
25	0.92
26	0.95
27	0.97
28	1.0
29	1.0
30	1.1
31	1.1
32	1.1
33	1.1
34	1.1
35	1.2
36	1.2
37	1.2
38	1.2
39	1.3
40	1.3