

Guidance for the prevention and emergency management of adult patients with adrenal insufficiency

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ABSTRACT

Adrenal insufficiency (AI) is an often-unrecognised endocrine disorder, which can lead to adrenal crisis and death if not identified and treated. Omission of steroids in patients with AI, particularly during physiological stress such as an intercurrent illness or surgery, can also lead to an adrenal crisis. The National Reporting and Learning System (NRLS) identified 78 incidents including two deaths and six incidents of severe harm to patients in a recent 4-year period. This guidance will go through causes of adrenal insufficiency, groups at risk of an adrenal crisis, emergency management and management for surgical procedures. A new NHS Steroid Emergency Card has been developed to be carried by patients at risk of adrenal crisis. We hope the new emergency card and this guidance will increase awareness of the need to start steroids promptly in patients at risk of an adrenal crisis, particularly those presenting in the emergency department or to acute medicine teams and those undergoing surgery or invasive procedures.

KEYWORDS: Adrenal insufficiency, adrenal crisis, emergency management, steroids

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- > failure to take into account the patient's need for increased steroid doses during surgical stress in peri-operative plans, or failure to implement this aspect of the peri-operative plan
- > inadequate admission and discharge medication-reconciliation practices
- > omitted or delayed administration of prescribed doses, with causes including medicines being unavailable from ward stock and alternative routes of administration not being used when patients were nil by mouth
- > emergency hydrocortisone injections not being available in ambulances
- > inappropriate 999/111 response categorisation leading to treatment delays.

Substantial resources exist, including clinical guidance.^{2–6} However, clinical staff are not always aware of the risk of adrenal crisis and do not refer to the available literature and guidelines or implement the correct clinical response should one occur. In view of this, there is a need for a change in the way all healthcare professionals are alerted to patients who have AI and are at risk of an adrenal crisis. This guidance is primarily for the management of adults, but for completeness we have added recommendations for managing children.

Background

Adrenal insufficiency (AI) is an often-unrecognised endocrine disorder, which can lead to adrenal crisis and death if not identified and treated.¹ Omission of steroids in patients with AI, particularly during physiological stress such as an intercurrent illness or surgery, can also lead to an adrenal crisis. The National Reporting and Learning System (NRLS) identified 78 relevant incidents including two deaths and six incidents of severe harm to patients in a recent 4-year period. Multiple themes were present including:

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Causes of adrenal insufficiency

The commonest causes of primary AI include Addison's disease, congenital adrenal hyperplasia, bilateral adrenalectomy and adrenal haemorrhage (Table 1). Causes of secondary AI are pituitary disease, pituitary tumours and their treatment (surgery and radiotherapy), and, also termed tertiary AI, hypothalamic–pituitary–adrenal axis (HPA) suppression from exogenous steroids or, more rarely, from treatment of primary brain or nasopharyngeal tumours with radiotherapy when the hypothalamus and/or pituitary is included in the treatment field. Hypothalamo-pituitary disorders account for 60% of patients with AI, while 40% have primary adrenal failure due to Addison's disease (0.9–1.4 per 10,000) or congenital adrenal hyperplasia (0.7–1.0 per 10,000). Clinical findings of patients presenting with AI and laboratory investigations are summarised in the supplementary material (S1, S2).³ If AI is suspected, then prompt treatment should not be delayed by performing or waiting for the results of diagnostic testing. This can be performed at a later date when the patient is clinically stable. There are no adverse consequences of initiating life-saving hydrocortisone treatment.

Key points

Omission of steroids in patients with adrenal insufficiency (AI) or steroid dependence, particularly during physiological stress such as an intercurrent illness or surgery, can lead to an adrenal crisis and death.

All patients with AI or steroid dependence are at risk of an adrenal crisis during intercurrent illness or an invasive procedure/surgery.

Patients with AI include patients with primary adrenal insufficiency such as Addison's disease and congenital adrenal hyperplasia, and hypothalamo-pituitary damage from tumours or surgery.

A new NHS Steroid Emergency Card is being launched, to be carried by patients at risk of adrenal crisis.

Patients taking exogenous steroids are also at risk of AI. Patients taking prednisolone 5 mg/day or equivalent for 4 weeks or longer across all routes of administration (oral, topical, inhaled or intranasal) should be issued with an NHS Steroid Emergency Card.

Patients taking inhaled beclomethasone >1000 mcg/day or fluticasone >500 mcg/day are at risk of adrenal insufficiency due to hypothalamo-pituitary axis suppression and should be issued with an NHS Steroid Emergency Card.

Patients thought to be having an adrenal crisis should be treated promptly with 100 mg hydrocortisone by iv or im injection, followed by 200 mg hydrocortisone/24 h continuous iv infusion in glucose 5%/24 h, or 50 mg 6 hourly im (or iv) and intravenous fluid (sodium chloride 0.9%).

Emergency treatment should not be delayed while waiting to confirm a diagnosis of adrenal insufficiency.

All healthcare professionals should be aware of the patient groups at risk of an adrenal crisis.

All doctors should be aware of the need to start steroids promptly in patients at risk of an adrenal crisis, either at replacement or stress doses, particularly when presenting in the emergency department or to acute medicine teams, undergoing surgery, or invasive procedures.

Patient education is a key part of management. Patient resources are available on the Addison's Disease Self Help Group (www.addisonsdisease.org.uk) and Pituitary Foundations' websites (www.pituitary.org.uk).

Glucocorticoid preparations

Glucocorticoid preparations include hydrocortisone (most similar to cortisol), prednisolone and dexamethasone. They vary in their immunosuppressive and metabolic properties; 10 mg hydrocortisone is roughly equivalent to 2.0 mg prednisolone and to

0.2 mg dexamethasone. All have excellent oral bioavailability, with rapid absorption. Patients with AI are treated with physiological doses of glucocorticoids, predominantly hydrocortisone (average 15–25 mg/day in divided doses), prednisolone (3–5 mg/day) and rarely dexamethasone (0.25–0.5 mg/day). Patients with primary AI may also have aldosterone deficiency and, therefore, require fludrocortisone replacement.

Many patients other than those with adrenal and hypothalamic-pituitary causes of AI receive glucocorticoids as treatment for other medical conditions. Seven per 1000 population are prescribed long-term oral glucocorticoid therapy, approximately 100 times the number with intrinsic deficiency, creating a large population at risk of adrenal crisis.⁸ Prescribed glucocorticoid therapy, across all routes of administration (oral, inhaled, topical, intranasal and intra-articular), can cause suppression of the HPA axis.^{9–12} Oral glucocorticoids cause HPA axis suppression at a dose of prednisolone 5 mg/day or even less.¹³ Inhaled corticosteroid therapy is very common, although it has been claimed not to endanger the functioning of the HPA axis when administered within recommended dose ranges. Budesonide and ciclesonide are approximately equipotent with beclomethasone (BDP), while fluticasone propionate (FP), mometasone and ultrafine particle BDP-HFA inhalers (Qvar[®] and Fostair[®]) are twice as potent as standard BDP inhalers. Recent evidence has shown that partial suppression of the adrenal response to ACTH is common.^{14,15} Furthermore, it can occur at commonly prescribed high doses and in a dose-dependent manner. Guidance exists from the London Respiratory network and others in this regard advising carrying a steroid card at doses >1000 mcg for beclomethasone, and >500 mcg/day for fluticasone.¹⁶

Drugs affecting glucocorticoid metabolism

In addition, certain drugs affect glucocorticoid metabolism. The commonest group are those affecting the activity of the drug-xenobiotic-metabolising enzyme CYP3A4. Anticonvulsants, rifampicin, topiramate and mitotane are well known to increase downstream metabolism of cortisol through induction of CYP3A4 activity.^{15,17} If a drug induces CYP3A4 activity and is administered together with exogenous glucocorticoids which suppress the HPA axis suppression, stopping the exogenous glucocorticoids but continuing the CYP3A4-inducing drug can result in adrenal crisis.

Similarly, drugs that delay steroid metabolism by inhibiting CYP3A4 activity, such as antifungals including itraconazole and voriconazole, can result in iatrogenic Cushing's.^{18,19} Antiretroviral therapy using protease inhibitors such as ritonavir can also inhibit glucocorticoid metabolism, leading to iatrogenic Cushing's Syndrome.²⁰ This has also been reported for steroid eye drops, fluticasone, triamcinolone and budesonide.²¹ Hence, if these CYP3A4-inhibiting drugs are stopped, the HPA axis of these patients is suppressed and they can experience adrenal crisis, which can be prevented by initiation of hydrocortisone replacement.

There is currently little evidence to support increased doses of glucocorticoids in all patients on drugs affecting CYP3A4, but clinicians should have a high degree of clinical suspicion and give stress doses of hydrocortisone if there is any concern with regards to the development of an adrenal crisis during an intercurrent illness or a procedure.²²

Table 1. Commonest causes of adrenal insufficiency. Adapted from Charmandari *et al*⁷

Cause	Examples and notes
Primary adrenal insufficiency	
Autoimmune/Addison's Disease	
APS Type 1 (APECED)	
APS Type 2	
Infections (adrenitis)	TB, HIV/AIDS, CMV, fungal infections, syphilis
Bilateral adrenal haemorrhage	Adrenal haemorrhage sepsis, anticoagulants, anti-phospholipid syndrome
Bilateral adrenal metastases	Primarily metastases from lung, stomach, breast and colon cancers
Bilateral adrenal infiltration	Primary adrenal lymphoma amyloidosis, haemochromatosis
Bilateral adrenalectomy	
Drug induced	Anticoagulants, adrenal enzyme inhibitors: mitotane, ketoconazole, itraconazole, voriconazole, metyrapone, etomidate, aminoglutethimide, phenobarbital, phenytoin, rifampicin
Genetic disorders	Congenital adrenal hyperplasia (commonest cause in children), adrenoleukodystrophy
Secondary adrenal insufficiency/pituitary disorders	
Pituitary tumours	Adenoma, cysts, craniopharyngioma, ependymoma, meningioma, pituitary metastases
Pituitary surgery	
Pituitary irradiation	
Trauma	
Infections/infiltration	Lymphocytic hypophysitis, sarcoidosis, histiocytosis X, haemochromatosis, TB
Pituitary apoplexy	
Sheehan's syndrome	
Genetic disorders	Transcription factors involved in pituitary development
Tertiary adrenal insufficiency	
Hypothalamic tumours	Craniopharyngiomas, germinomas, meningiomas
Hypothalamic surgery	Primary brain tumours or nasopharyngeal tumours
Hypothalamic irradiation	Primary brain tumours or nasopharyngeal tumours
Infections/infiltration	Lymphocytic hypophysitis, sarcoidosis, histiocytosis X, haemochromatosis, TB
Trauma	Traumatic brain injury, particularly base of skull fracture
Cushing's disease/syndrome	
Drug induced	Glucocorticoid therapy (any route), mifepristone, chlorpromazine, imipramine

Adrenal crisis (acute adrenal insufficiency)

An adrenal crisis is a medical emergency. All steroid-dependent patients are at risk of adrenal crisis. White and Arlt reported that 47% of 275 patients with Addison's disease in the UK had had at least one admission with adrenal crisis.²³ Others have reported an incidence of adrenal crisis in primary AI of 8.3 crises in 100 patient years and 3.6–5.2 per 100 patient years in secondary AI.^{24,25}

Moreover, one in every 6–12 patients with AI will have an adrenal crisis within the next 12 months, while one in 200 patients will die from such a crisis, with 5,526–10,647 expected deaths from adrenal crises in the coming decade in the EU, if the current situation prevails.²⁶ The commonest causes of crisis in known AI are gastrointestinal illness (23%), other infections (25%), peri-surgery (10%) and physiological stress/pain (9%).²³

Who should be considered to be at risk of adrenal crisis?

- Patients with an established or suspected diagnosis of primary AI (eg Addison's disease, congenital adrenal hyperplasia (CAH), bilateral adrenalectomy or adrenal haemorrhage).
- Patients with an established or suspected diagnosis of AI due to hypopituitarism due to hypothalamo-pituitary disease who are either on permanent glucocorticoid replacement or require glucocorticoid replacement during illness or stress such as a surgical procedure.
- Patients taking exogenous glucocorticoid therapy equivalent to or exceeding a dose of prednisolone 5 mg/day for 4 weeks or longer across all routes of administration (oral, topical, inhaled, intranasal, intra-articular) as they are likely to have suppressed HPA function (ie tertiary AI).

- > Patients taking more than 40 mg prednisolone of equivalent for longer than 1 week or repeated courses of short oral doses
- > Patients taking a course of oral glucocorticoid within 1 year of stopping long-term therapy.

All patients, in particular pregnant patients, considered at risk of or with suspected incipient adrenal crisis should be treated immediately; a single high dose hydrocortisone administration has no adverse effects on the developing fetus (and is mostly inactivated in the placenta), but not treating rapidly could result in the loss of life of the mother and the unborn child.

Which patients require additional investigations to clarify risk of adrenal crisis?

If a diagnosis of acute AI is suspected on clinical grounds, glucocorticoids in a dose appropriate for major stress should be given immediately as there are no adverse effects from short-term administration of glucocorticoids. No additional testing is required in the acute situation.

Management of adrenal crisis in adults

An adrenal crisis is a medical emergency. Management of adrenal crisis includes prompt administration of glucocorticoids, 100 mg hydrocortisone iv or im, and crystalloid fluid (Box 1). If an adrenal crisis is being considered in a patient not previously known to have AI, treatment should not be delayed while trying to make a diagnosis. Investigations can be initiated once the patient is clinically stable.³

Particular care is required in patients who have diabetes insipidus as well as AI, which is usually patients with AI due

Box 1. Emergency treatment of adrenal crisis

- > 100 mg hydrocortisone by iv injection, followed by 200 mg hydrocortisone/24 h continuous iv infusion in glucose 5%/24 h, or 50 mg* 6 hourly im†
- > Rapid rehydration with sodium chloride 0.9% providing no evidence of hyponatraemia:
 - > Resuscitation with 500 ml fluid bolus of sodium chloride 0.9% over 15 minutes and then replacement of any electrolyte deficits
 - > Rehydration (3–4 litres of sodium chloride 0.9% solution in 24 h); careful monitoring of electrolytes and fluid balance
 - > Drinking ad libitum
- > Cardiac monitoring (if necessary transfer to the intensive care unit for monitoring)
- > Refer to endocrinology for further advice on diagnosis, starting regular oral steroids or tapering steroids back to usual dose, and education regarding 'sick day rules' prior to discharge

More detailed information can be found at www.endocrinology.org/adrenal-crisis. See also NICE guidance on intravenous fluid therapy in adults in hospital²⁷ and guidance for management of hyponatraemia.²⁸

*In severe obesity consider substituting 50 mg hydrocortisone with 100 mg hydrocortisone.

†While it is recommended hydrocortisone 50 mg every 6 h is given im, hydrocortisone can be given iv if patients are anticoagulated or clinically indicated.

to hypothalamic-pituitary disease. This is because cortisol is required to excrete a water load. Adults and children with AI and diabetes insipidus related to hypothalamic/pituitary disease who are treated with D-amino D-arginine vasopressin (DDAVP) administration are at risk of uncontrolled diabetes insipidus, if doses of DDAVP are omitted, or hyponatraemia, if excess fluid is given. Strict fluid balance with adequate cortisol replacement is mandatory to avoid hyponatraemia, which may otherwise be associated with significant morbidity. DDAVP should be continued as prescribed and advice of an endocrinologist sought. Strict fluid balance with adequate cortisol replacement is mandatory to avoid hyponatraemia, which may otherwise be associated with significant morbidity. Further guidance for emergency management of diabetes insipidus is available from the Society for Endocrinology website.²⁹

Recommended clinical treatment for patients with adrenal insufficiency when undergoing surgery or an invasive procedure

Surgery and sepsis are major physiological stressors, activating the hypothalamo–pituitary–adrenal axis to produce glucocorticoid, the major one being cortisol.³⁰ Patients with AI of any cause are unable to mount an endogenous cortisol stress response to surgery or invasive procedures, and subsequent hypotension and shock can be fatal. Therefore, all patients with AI of any cause, or considered at risk of AI, are at risk of adrenal crisis, and should be given stress doses of exogenous glucocorticoids for a surgical or invasive procedure as per the Guidelines from the Association of Anaesthetists, the Royal College of Physicians and the Society for Endocrinology, which are to maintain as near physiological concentration of cortisol as possible (Tables 2 and 3).^{30,31}

Patients with primary AI who are additionally aldosterone deficient may be susceptible to post-operative fluid balance issues and hyponatremia. A tendency to water retention and hyponatraemia induced by anti-diuretic hormone is very common after surgery, and thus patients with insufficient aldosterone production will be particularly susceptible to hyponatraemia.

All patients at risk of adrenal crisis should be given extra glucocorticoid when undergoing surgery or an invasive diagnostic procedure. One suggested exception is for patients on supraphysiological exogenous steroids undergoing colonoscopy, in whom it is suggested to continue their usual dose and have parenteral hydrocortisone if they are expected to remain nil by mouth for a prolonged period of time. If in doubt about the need for stress dose steroids, they should always be given without delay, as there are no long-term adverse consequences of short-term extra hydrocortisone administration.

Patients with a long-standing diagnosis of AI are often well-informed about their disease. All HCPs involved in a patient's care should enquire closely about the patient's history of steroid self-management, any previous episodes of adrenal crisis, and how practised they are at medication adjustments for illness, injury or postoperative recovery. As far as possible other teams should liaise with the patient's endocrinologist when planning scheduled surgery, and when caring for post-surgical cases.

All AI patients, both adults and children, should have 'first on the list' priority in order to minimise fasting or dehydration, which they tolerate poorly. Children with AI are at particular risk of hypoglycaemia when fasted and thus should have regular capillary

Table 2. Recommended doses for intra- and postoperative steroid cover in adults with primary AI including congenital adrenal hyperplasia, and hypothalamo-pituitary disease³¹

	Intra-operative steroid replacement	Postoperative steroid replacement
Surgery under anaesthesia (general or regional), including joint reduction, endoscopy, IVF egg extraction	Hydrocortisone 100 mg intravenously on induction, followed by immediate initiation of a continuous infusion of hydrocortisone 200 mg.24 h ⁻¹ . Alternatively, hydrocortisone 50 mg im 6 hourly	Hydrocortisone 200 mg.24 h ⁻¹ by intravenous infusion while nil by mouth or for patients with postoperative vomiting. Alternatively, hydrocortisone 50 mg im 6 hourly Resume enteral glucocorticoid at pre-surgical therapeutic dose if recovery is uncomplicated. Otherwise continue double oral dose for up to a week
Bowel procedures requiring laxatives/enema	Bowel prep under clinical supervision. Consider intravenous fluids and injected glucocorticoid (hydrocortisone 50 mg im or iv 6 hourly) during preparation, especially for fludrocortisone or vasopressin-dependent patients Hydrocortisone 100 mg intravenously or intramuscularly at the start of procedure	Resume enteral double hydrocortisone doses for 24 h
Labour and vaginal delivery	Hydrocortisone 100 mg intravenously at onset of labour, followed by immediate initiation of a continuous infusion of hydrocortisone 200 mg.24 h ⁻¹ Alternatively, hydrocortisone 100 mg intramuscularly followed by 50 mg every 6 h im	Resume enteral double hydrocortisone doses for 48 h
Caesarean section	See surgery under anaesthesia	

Table 3. Recommended doses for intra-operative and postoperative steroid cover in adults receiving adrenosuppressive doses of steroids (high dose inhaled steroids, or those on combined inhaled steroids and interfering drugs; prednisolone equivalent ≥ 5 mg for 4 weeks or longer)

	Intra-operative steroid replacement	Postoperative steroid replacement
Major surgery	Hydrocortisone 100 mg intravenously at induction, followed by immediate initiation of a continuous infusion of hydrocortisone at 200 mg.24 h ⁻¹ Alternatively, hydrocortisone 50 mg im 6-hourly Alternatively, dexamethasone 6–8 mg intravenously, if used, will suffice for 24 h	Hydrocortisone 200 mg.24 h ⁻¹ by intravenous infusion while nil by mouth. Alternatively, hydrocortisone 50 mg im 6-hourly Resume enteral glucocorticoid at pre-surgical therapeutic dose if recovery is uncomplicated. Otherwise continue double oral dose for 48 h
Body surface and intermediate surgery	Hydrocortisone 100 mg, intravenously at induction, followed by immediate initiation of a continuous infusion of hydrocortisone 200 mg.24 h ⁻¹ Alternatively, hydrocortisone 50 mg im 6-hourly Alternatively, dexamethasone 6–8 mg intravenously, if used, will suffice for 24 h	Double regular glucocorticoid dose for 48 h, then continue usual treatment dose
Bowel procedures requiring laxatives/enema	Continue normal glucocorticoid dose. Equivalent intravenous dose if prolonged nil by mouth. Treat as per primary adrenal insufficiency (see above) if concerned about HPA axis function, and risk of adrenal insufficiency	
Labour and vaginal delivery	Hydrocortisone 100 mg intravenously at onset of labour, followed by immediate initiation of a continuous infusion of hydrocortisone 200 mg.24 h ⁻¹ Alternatively, hydrocortisone 100 mg intramuscularly followed by 50 mg every 6 h im	
Caesarean section	See major surgery	

In severe obesity consider substituting 50 mg hydrocortisone with 100 mg hydrocortisone. While it is recommended hydrocortisone 50 mg every 6 h is given im, hydrocortisone can be given iv if patients are anticoagulated or clinically indicated.

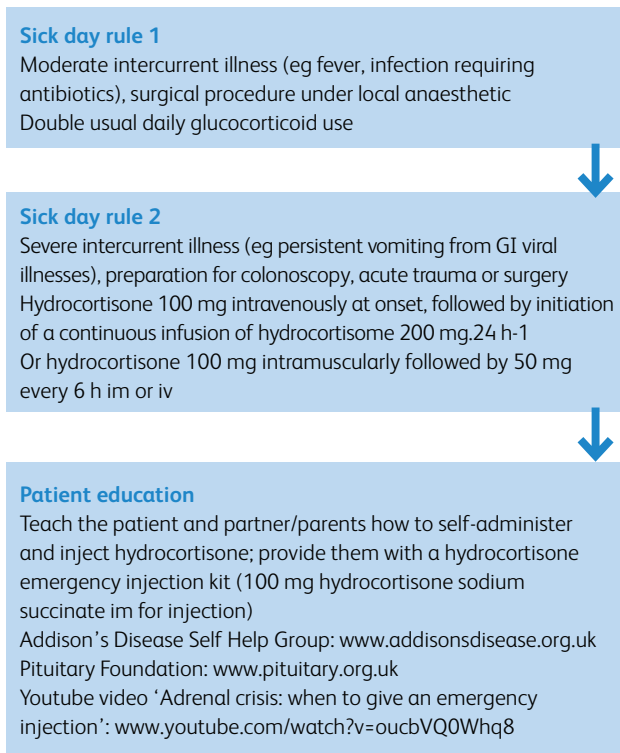


Fig 1. Management of patients with adrenal insufficiency and intercurrent illness: 'sick day rules'.

blood glucose checks. No child with adrenal insufficiency should be fasted for more than 6 h. After surgery, capillary blood glucose should be checked every 2 hours until enteral intake is resumed.

Management of patients with adrenal insufficiency and intercurrent illness – 'sick day rules'

There is also a need to highlight the importance of stress dose steroids for all patients at risk of adrenal crisis during an intercurrent illness, as again they are unable to mount a stress response by increasing endogenous glucocorticoid production. Patient education is a critical part of management of patients with AI and they should be taught 'sick day rules' (supplementary material S3) to double oral glucocorticoid if there are unwell (Fig 1). If on a low dose hydrocortisone replacement such as 15 mg/day or less, consider total of 40 mg a day: 20 mg on rising, 10 mg at lunchtime, 10 mg at teatime. Patients on long-acting hydrocortisone preparations such as plenadren should take the more rapidly absorbed hydrocortisone during an intercurrent illness. During the coronavirus pandemic, it has become clear that higher doses of hydrocortisone than usual are needed to prevent adrenal crisis in patients who have become unwell with COVID-19, as described by Arlt *et al*.³² Patients with AI should carry an NHS Emergency Steroid Card (Table 4), and may also wear a medic alert bracelet or necklace and use mobile phones to create a medical ID for use in an emergency. Patients with AI are particularly at risk from diarrhoea and vomiting illnesses, as they are unable to absorb their oral steroids. Patients with established

Table 4. Patients in whom new emergency steroid card should be given

Primary adrenal insufficiency	All causes. Commonest causes are Addison's disease, congenital adrenal hyperplasia, bilateral adrenalectomy and adrenal haemorrhage
Pituitary/hypothalamic disease	Patients with hypothalamo-pituitary dysfunction known to be steroid dependent Patients with hypothalamo-pituitary dysfunction advised to take steroids for intercurrent illness
Other causes	Exogenous steroids <ul style="list-style-type: none"> > Prednisolone 5 mg/day or more > Dexamethasone 0.5 mg/day or more > Hydrocortisone 15 mg/day or more Inhaled steroids <ul style="list-style-type: none"> > Fluticasone >500 mcg/day > Beclomethasone >1000 mcg/day > Nasal steroids > 1000mcg/day Drugs known to inhibit cortisol clearance (eg antifungals such as itraconazole, antiretroviral drugs) on exogenous steroid that may be stopped Repeated doses of exogenous steroids or where there are clinical concerns about AI

AI and their carers/family members should be educated about the risks of intercurrent illness, trained in (self) administration of 100 mg im hydrocortisone (efcortisol or solucortef) and told that if the vomiting and diarrhoeal illness persists they should attend their local hospital, as they will need parenteral hydrocortisone and intravenous fluids without delay. Patients and their relatives or carers can be taught how to self-inject by their endocrine clinical nurse specialist.

Glucocorticoid replacement during stress

There is a group of patients, usually with secondary or tertiary AI, including treatment with exogenous steroids or other drugs such as high dose steroid inhalers or antiretroviral medication, who, after assessment by an endocrinologist, are found to have suboptimal cortisol response do not need regular glucocorticoid replacement. These patients are advised to inform other HCPs with whom they come into contact in emergency situations that they require hydrocortisone during an intercurrent illness and to have steroid cover for surgery or invasive procedures, and to carry an NHS Emergency Steroid Card.

A pragmatic approach to glucocorticoid replacement during major stress is required, considering the evidence available; blanket recommendations would not be appropriate, and it is essential for the clinician to remember that hydrocortisone stress dose cover is administered in addition to the usual glucocorticoid dose in patients with HPA suppression due to exogenous glucocorticoid treatment.

Children with AI

This document is for adults with AI. The British Society for Paediatric Endocrinology and Diabetes are working on similar materials for children, as the emergency management plan will vary with age. We recommend regular contact of parents and child with their local paediatrician and/or regional paediatric endocrine team overseeing the care of their child with AI to establish, review and update an appropriate emergency management plan including the hydrocortisone and fluid regimen. Peri-operative management and management around procedures for children with AI should follow surgical guidelines.³⁰

Increasing awareness in healthcare professionals and patients of adrenal crisis and its avoidance

Two deaths and sixteen incidents of severe harm to patients with AI in a 2-year period have been reported to national learning systems recently. Any harm or death from acute AI is not acceptable and is preventable in most, if not all, cases. Many healthcare professionals care for patients with AI, including GPs, acute medicine teams, emergency departments, medical specialities, surgeons and anaesthetists to name but a few. We all need to improve the management of patients with adrenal insufficiency. Patients and HCPs should have the following readily available to them:

- background information for professionals and patients on the prevention and emergency treatment of adrenal crisis
- guidance on the use of the NHS Steroid Emergency Card, medic alert bracelets/necklaces and mobile phone medical ID
- education on sick day rules
- hydrocortisone emergency self-injection kits where clinically appropriate, and training for patients and carers/families on their use
- the emergency contact telephone number of their regular endocrine care team.

Patient resources are available on the Addison's Disease Self Help Group (www.addisonsdisease.org.uk) and Pituitary Foundation (www.pituitary.org.uk) websites. Additionally there is a Youtube video on when to give an emergency hydrocortisone injection.³³ Hydrocortisone IM for emergency use should be added to the patient's prescription for patients with primary adrenal insufficiency and those with hypothalamo-pituitary disease for emergency use (Table 5). In addition, patients should be issued

Table 5. Patients who should have a steroid emergency injection kit

Primary adrenal insufficiency	All causes. Commonest causes are Addison's disease, congenital adrenal hyperplasia, bilateral adrenalectomy and adrenal haemorrhage
Pituitary/hypothalamic disease	Patients with hypothalamo-pituitary dysfunction known to be steroid dependent Patients with hypothalamo-pituitary dysfunction advised to take steroids for intercurrent illness

Clinical discretion should be used and steroid emergency injection kit given to other high risk patients as clinically appropriate.

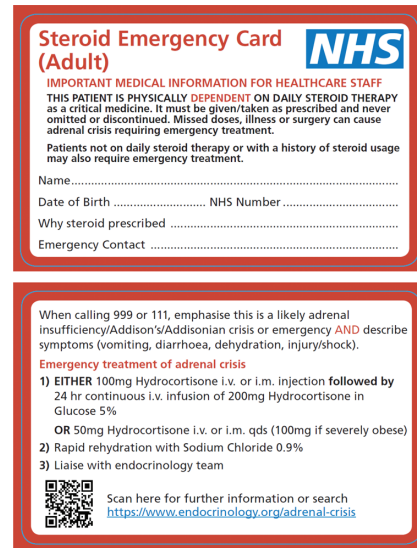


Fig 2. New NHS Steroid Emergency Card

with extra oral hydrocortisone for emergency use. Patients can also register with their local ambulance trust so that they are 'red flagged' as potentially needing emergency parenteral hydrocortisone. The Addison's Disease Self Help Group and Pituitary Foundation websites have further information on how to do this.

This document and the others listed are a source of valuable information for HCPs. Some secondary and tertiary care centres are developing automatic alert systems in their institutions' electronic patient records to ensure a patient with AI is clearly flagged upon admission and receives appropriate hydrocortisone cover if clinically unwell or undergoing surgery. Patients can be encouraged to keep clinic letters with them as images on their smart phones, or to use patient-held medical records to inform HCPs as appropriate.

New NHS Steroid Emergency Card

A new NHS Steroid Emergency Card has been developed (Fig 2). It will be held by patients at risk of adrenal crisis (Table 4) and includes a management summary for the emergency treatment of adrenal crisis alongside a link to the Society for Endocrinology emergency management guidelines. It can be issued by any HCP managing patients with AI or prescribing steroids. Ordering will be through NHS Business Services Authority and Primary Care Support England. If there is any doubt as to who should carry an Steroid Emergency Card, prompt liaison with the local endocrinology team would be advised. In addition, if there is uncertainty about a diagnosis of AI in any patient, this should be discussed with the local endocrinology team. This guidance and the NHS Steroid Emergency Card should prompt all healthcare professionals to consider adrenal crisis in patients carrying the card, initiate appropriate management for surgery or invasive procedures and treat patients rapidly and appropriately when presenting as an emergency. In this way, avoidable deaths in patients with AI will hopefully be a thing of the past. ■

Supplementary material

Additional supplementary material may be found in the online version of this article at www.rcpjournals.org/clinmedicine:

- S1 – Clinical presentation in adrenal insufficiency
- S2 – Investigations for adrenal insufficiency
- S3 – Example of a patient information sheet for sick day rules

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