Association of Children's Diabetes Clinicians

Clinical Guideline

A practical approach to the management of skin reactions to diabetes technology.

In association with British Society of Cutaneous Allergy

FOR STAFF Health care professionals in diabetes services involved in the care of children and young people Type 1 or Type 2 diabetes using diabetes technology (Insulin pump, continuous glucose monitor)
Dermatologists

PATIENTS This guideline is intended for Children and young people with Type 1 or Type 2 diabetes using diabetes technology (Insulin pump CSII, continuous glucose monitor CGM).

Guidance

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1. Introduction

In parallel with the increased use of diabetes technology, an increasing number of patients are developing skin reactions to the devices [1]. This is recognised as a common reason for discontinuing the device. Skin reactions are a frequent topic in social media-based diabetes support groups. There is little evidence base to support clinicians in the management of these problems.

This guideline offers recommendations, based on our current experience, for diabetes services on

1. Prevention, assessment, initial investigation and treatment of skin reactions
2. Patient selection for referral to dermatology for further investigation
3. Patient selection for reporting to MHRA Yellow card scheme and manufacturer

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This guideline offers recommendations for dermatology services on

1. Investigation of allergic contact dermatitis
2. Patient selection for reporting to MHRA Yellow card scheme and manufacture

2. Causes of skin reactions

Skin problems range from hyperpigmentation, lipohypertrophy, lipoatrophy and scarring through to allergic contact dermatitis, irritant contact dermatitis and infection.

Allergic contact dermatitis (ACD)

This is a Type 4 hypersensitivity reaction mediated by T lymphocytes. It may take several months after initial sensitisation, for symptoms to develop. This is a lifelong allergy, and symptoms may worsen with each exposure.

The rash starts at the site of exposure of the allergen to the skin but importantly can spread beyond the confines of the device. The rash will usually be eczematous in nature (scaly, pink- red, inflamed, fissured) and may also present with vesicles. In patients with deeper skin tones the skin may look darker rather than red.

The only definitive way to prevent a reaction is to avoid the allergen by using an alternative device or placing a physical barrier between the skin and the device. Alternative device choice is challenging when manufacturers do not disclose the contents of the devices and potential allergens.

The allergen is most likely in the adhesive or in the plastic housing of the device. There is the potential for allergy to multiple devices if the same allergens are present in different devices [2,3].

Other sources of allergen should be considered, in which ingredients may not be known or declared [2].

1. Liquid adhesive eg Skin Tac (resins and rosins which are colophony derivatives)
2. Adhesive remover eg Lift Plus 360 Appeel, in particular if fragranced (e.g. Lift Plus 360 versus Lift Plus 360 Citrus).
3. Liquid barrier eg Cavilon: (Cavilon barrier cream contains more ingredients than the Cavilon no sting barrier film)
4. Adhesives in dressings used to help secure the device eg overlay patches
5. Adhesives / ingredients in the physical barrier used (many hydrocolloids contain colophony and resin / rosin derivatives)
6. Residue of personal care products such as soaps / moisturisers, or topical prescribed items e.g. steroid creams (ingredients usually available)

There is an increasing body of research from the dermatology community identifying both acrylates and non acrylates as allergens.

It is essential that diabetes teams and dermatologists investigating ACD keep up to date with the medical literature on potential allergens as manufacturing methods potentially change, new devices become available and new allergens are being identified all the time. As of 2023 the following allergens had been identified [3].

Acrylates	Non acrylates
Isobornyl acrylate (IBOA)	Colophonium
2-hydroxyethyl acrylate	Epoxy resin
N,N-dimethylacrylamide (DMAA)	Nickel
2,2 - methylenebis(6-tert-butyl-4-methylphenol) monoacrylate (MBPA)	Abitol
β-carboxyethyl acrylate (BCA)	Abietic acid
dipropylene glycol diacrylate (DPGDA)	1-Benzoylcyclohexanol
phenoxypoly(ethylenoxy) ethylacrylate (PEEA)	
Cyanoacrylates, including ethylcyanoacrylate	

A further review of known allergens was published in 2025 [2].

Isobornyl acrylate (IBOA) has been found to be present in several devices. IBOA was identified as the allergen in FreeStyle Libre (Abbot Diabetes Care FSL) associated ACD [4]. This was found to be in the plastic housing which seeped through to the skin. Since 2019 FSL has been IBOA free, allowing those who have IBOA allergy to start using this device again.

Prior to 2020, Dexcom G6 appeared to be IBOA free and was recommended as an alternative to those sensitised and unable to wear the FSL. ACD to Dexcom G6 was not a problem until 2020 when the manufacturing process was changed. This resulted in a surge of cases of ACD to this device. In 2024, this problem is ongoing. The company will not disclose the proprietary ingredients. Dermatology led research has identified potential allergens including IBOA [5], MPBA [6] and colophonium [5].

IBOA has also been identified over the years in other devices including Medtronic Enlite sensor [7], the Omnipod pump [8] and Ypso pump [9].

The first report of ACD to Dexcom G7 was published in 2024, with both IBOA and colophonium implicated [10].

Irritant contact dermatitis (ICD)

Irritant skin reactions are generally more common than allergic. This is not an allergy. It is due to the direct toxic effect of irritants in the adhesive which disrupts the skin barrier. Factors that increase the risk of ICD include occlusive dressings, increased humidity, trauma to the skin and damage to the skin from removing the device.

There is the concern that damage to the skin due to ICD will increase the risk of ACD by increasing the penetration of small molecule allergens through the broken skin and thereby increasing risk of sensitisation. Patients with an atopic background or history of infantile /flexural/atopic eczema are more prone to irritants.

Clinically the rash appears as red-pink, scaly and possibly fissured and stays localised to the areas of contact, rather than spreading beyond the device. ICD can occur at any time in a patient's use of the

medical device. Importantly the rash can be intermittent, meaning at times the device can be worn at certain sites without triggering a reaction.

Infection to Staphylococcus aureus

Colonisation with Staphylococcus aureus is common [11].

Risk factors include:

1. Younger age
2. Diabetes mellitus
3. Hospitalisation
4. Damaged skin barrier

This increases risk of infection at the site of the device, varying from occlusive folliculitis to local self-resolving infection at the site of the cannula to cellulitis requiring systemic antibiotics.

3. Prevention of skin reactions

Optimal skin care may minimise the risk of irritant contact dermatitis. There is little evidence base and many of the recommendations come from clinical experience. (see appendix 2: patient information skin care advice.)

Recommendations (Good practice point Appendix 3)

1. Site selection:
   Do not place device on broken skin
   Rotate sites- do not place on same site for at least a week
   If a skin reaction occurs do not use the affected site for at least 6 weeks

2. Make sure the device sticks well to minimise risk of traumatic removal or frequent replacement:
   Choose as flat a site as possible

   Offer prescription for liquid adhesive eg Skin Tac to increase the adhesion of the medical device, if the device frequently falls off - but be aware there are potential allergens in liquid adhesives (Skin Tac wipe: safety data sheet: Rosin and resin acid, partially hydrogenated, likely colophony derivatives and Turpenes such as linalool. Safety data sheet of other products not forthcoming)

3. Encourage good skin care: ensure maximum hydration of skin barrier
   Clean gently before applying device and on removal with fragrant free antimicrobial soap
   Dry thoroughly after cleaning
   Use a non-greasy moisturiser every day

4. Removal of device: minimise trauma to skin barrier:
   Remove slowly with low energy: 'low and slow'
   Use removal aid e.g. 'Lift off' especially if a liquid adhesive is used. Beware of potential allergens in removal aid products, e.g. citrus in Lift plus 360 Citrus but not in Lift Plus 360. Tac Away may irritate due to isopropanol and Ethanol.

5. Minimize excessive sweating to minimize irritant effect of sweat on the skin:
   Avoid occlusive dressings covering the whole device
   Apply unscented anti-perspirant to skin if prone to sweating before placing the device
6. Consider use of a barrier between adhesive and skin if history of irritant contact dermatitis to limit exposure to potential toxins: eg liquid barrier Cavilon No Sting barrier. Beware of potential allergens in these products. Cavilon barrier cream contains more ingredients than the no sting barrier film, but anything can irritate, not just be allergenic.

7. Advise patients to inform their diabetes team immediately should a reaction occur, so they can be assessed promptly.

Do not recommend

Steroid nasal spray (Fluticasone or Beconase). This is an off license use and may cause long term skin thinning. It has no role in the treatment of allergic contact dermatitis (see below).

4. Assessment by diabetes team:

History

A thorough history will help to differentiate the 3 main causes (table 1)

Key questions

1. Timing of onset, frequency, severity of the skin reaction.
2. Site of the skin reaction: infection may only occur in one area of the body. ACD will occur every time the device is worn, regardless of location. However, this may be more marked at sites previously exposed than "naïve skin" due to tissue resident memory cells
3. Previous history of reactions to other diabetes devices as the same allergens may be present in different devices
4. Use of additional dressings e.g. overlay patches or physical barriers which may contain allergens in adhesive, or occlusive dressings that may cause excessive sweating
5. Use of other products that may contain allergens: Liquid adhesive eg Skin tac, removal aid, waterproof, breathable barrier film e.g. Cavilon
6. History of atopy or other skin conditions.

Examination

Whilst ACD and ICD may be indistinguishable, the reaction to ACD may spread beyond the device, while ICD will be confined to the device.

Pus maybe be visible on removal of the device in cases of Staph. Aureus infection.

Causes	Allergic contact dermatitis	Irritant contact dermatitis	Staph aureus infection
History	Onset- delayed Frequency- persistent Severity- worsens Use of additional dressings or products containing allergens?	Onset-weeks/months Frequency- intermittent Severity-variable Additional dressings causing sweating?	Onset- immediate or delayed Frequency- intermittent or persistent Severity-variable Pus on removal
Examination	Inflamed Red Weepy Reaction may spread beyond the device	Indistinguishable from allergic contact dermatitis Alternatively, skin maybe dry and wrinkled Reaction confined to device	Eczematous Red Pus

Table 1: Key features in history and examination

5. Investigation by diabetes team

Perform nasal and skin swab (at affected site) for microscopy, culture and sensitivity for all skin reactions

1. At first presentation of a skin reaction
2. If previous history of infection/colonisation and skin reaction recurs after treatment.

Colonisation / infection with staph aureus may co-exist with ACD and ICD

6. Treatment by diabetes team

When a reaction is reported, the patient must be assessed promptly by the diabetes clinical team, in order that appropriate investigation and treatment can be commenced as soon as possible, to prevent ongoing skin damage.

Recommendations (Good practice point Appendix 3)

Contact dermatitis (allergic or irritant)

1. Treat the inflamed skin with potent topical steroids (betamethasone valearate 0.1% cream or mometasone furoate cream) once daily for 1 week.
2. Do not place device on affected skin for at least 6 weeks to allow skin to heal.
3. Apply emollient twice daily to the area to optimise skin condition and avoid soap if possible

Allergic contact dermatitis:

If the history is suggestive of ACD (delay in onset of symptoms, followed by persisting, worsening skin reaction each time the device is worn) then action must be taken immediately to prevent ongoing contact of the skin with the allergen.

1. Place a physical barrier of hydrocolloid dressing between the skin and the adhesive to prevent contact of the skin with the allergen e.g. Duoderm extra thin hydrocolloid dressing or Compeed for Medtronic Guardian or Dexcom G6. Be aware that hydrocolloid dressings may also contain allergens.

   A hole must be made in the in the hydrocolloid dressing. This must be made as small as possible to minimise exposure to the adhesive. See appendix 1 'how to guide'.

   Due to potential for allergy to constituents of the hydrocolloid dressing, consider a usage test prior to using if concern that it is causing a reaction [12]

2. If there is concern with the accuracy/function of the medical device with the physical barrier in place then stop using the barrier dressing immediately, and an alternative medical device will be needed.

3. If the barrier does not prevent exposure to the allergen, and the ACD persists then an alternative medical device will be needed.

4. Liquid barriers eg Cavilon and dressings such as Tegaderm do not provide a thick enough barrier and from experience will not be effective at preventing exposure to the allergen in the adhesive or preventing ongoing ACD

5. There are many commercial products available, marketed for the management of skin reactions to medical devices eg medical tapes. These may not be effective at preventing exposure to the allergen eg may have too large a hole or not provide a thick enough barrier.

6. Do not recommend steroid nasal spray (Fluticasone or Beconase). This is an off license use and may cause long term skin thinning. It is ineffective at preventing or treating allergic contact dermatitis.

Irritant contact dermatitis

1. Advise on optimal skin care (patient information leaflet appendix 2)
2. Discontinue use of additional dressings eg that may cause excessive sweating

Staphylococcus aureus

If Staphylococcus Aureus in identified on skin or nasal swab offer

1. Decolonisation regime (discuss with local microbiologist)

   For example,
   Octenisan- body wash (5 days), wash hair day 1 and 3
   Mupirocin nasal ointment – 3 times a day (5 days)

2. Oral or topical antibiotics (eg flucloxacillin or Fucidin) +/- topical steroids (fucibet)

Be aware that infection with Staphylococcus aureus may co-exist with ACD or ICD

If the infection recurs after an interval, repeat decolonisation.

If the infection persists despite decolonisation, consider treating other household members.

7. Referral to dermatology

Diabetes team should refer the following to dermatology for further investigation.

1. Cases of Allergic contact dermatitis
2. Cases of diagnostic uncertainty

8. Investigation by dermatology

If allergic contact dermatitis is suspected, offer patch testing to identify the allergen [12].

This will help in future device choice and support reporting to MHRA and manufacturers. Patch testing should include extended series to cover the possible allergens not included in the British Standard Series.

Limitation of patch testing:

Although patch testing is the gold-standard investigation in a patient in whom allergic contact dermatitis is considered, the test has a sensitivity and specificity of between 70-80% [13].

Determining ingredients and potential allergens not only in devices but also in adhesives, hydrocolloid and other physical barrier dressings, tackifiers etc. is challenging when manufacturers do not disclose these. Part disclosure may be given with full details withheld as a trade secret. (e.g. Skin Tac wipe SDS MS407-W 12.29.2021)

9. Report to MHRA and manufacturer

It is essential that all cases of Contact dermatitis (allergic or irritant) are reported to both the manufacturer and MHRA Yellow Card scheme.

Until the devices are made 'allergen free' the problem of ACD will continue.

Guidance on how to report suspected adverse incidents and safety concerns with diabetes management equipment to the Yellow Card scheme.

https://.gov.uk/government/publications/report-safety-concerns-with-insulin-pumps-and-continuous-glucose-monitoring-equipment

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Appendix

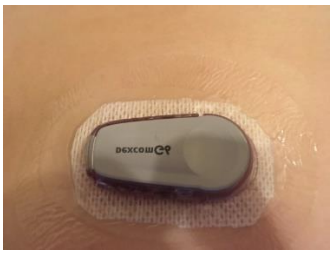
Appendix 1 - How to place hydrocolloid dressing

Trim down the Dexcom G6 adhesive patch with scissors so there's a small amount of patch left, enough to stick to a hydrocolloid dressing eg Compeed hydrocolloidal blister pad, but no overhang

Punch a hole in the centre of a hydrocolloid dressing eg Compeed pad using a leather hole punch (like this: https://smile.amazon.co.uk/Amtech-B1400-Revolving-Leather-Punch/dp/B003C82Y2O/ref=sr_1_6?crid=KTDZ4WT8Y3X9&dchild=1&keywords=leather+hole+punch&qid=1597170349&sprefix=leather+hole+%2Caps%2C163&sr=8-6)

Peel off the covering of the Dexcom adhesive patch and stick it to the Compeed pad, ensuring the hole lines up with the applicator needle

4. Apply the Dexcom applicator (with the Compeed pad already stuck to it) to the child/young person



Once sensor is in place, cover with an overpatch.

Appendix 2 Patient information Skin Care

How to avoid / minimise skin reactions when using insulin pumps or continuous glucose monitors (CGM)

Insulin pumps and CGM devices are held in place by an 'adhesive' patch. Some patients develop skin reactions to the adhesive. This reaction is called 'contact dermatitis' and it maybe either an 'allergic' or 'irritant' contact dermatitis. An allergic contact dermatitis typically develops after a few months of wearing the device as the skin gets sensitised to the adhesive. If it is an allergic contact dermatitis, then the skin will become very sore shortly after the device is applied and the reaction will get worse and worse . If it is an irritant dermatitis then the skin may look inflamed when the device is removed but the individual may cope with wearing the device. Skin infections can also occur under the dressing. Pus maybe visible when the cannula is removed.

To reduce the risk, we would advise:

- Make sure the device sticks properly so it doesn't need to be changed too frequently
- Prepare the skin well before applying device and look after the skin once device is removed
- Minimise trauma to the skin when the device is removed
- Rotate site of device

How to make sure the device sticks well:

- Choose the best location on as flat an area of skin as possible
- Consider liquid adhesive agent e.g. Skin Tac if the device frequently falls off

How to protect the skin and promote skin healing once device remove:

Beforehand

- Select the best site to place device- don't place on broken irritated skin (see below)
- Clean gently with fragrant free antimicrobial soap e.g. Simple
- Dry skin thoroughly
- Don't place straight after shower/bath
- Minimise humidity with hairdryer or apply in dry environment
- Use anti-perspirant (roll on or spray, sensitive/ non fragranced brands) if sweating a problem- apply 15 min before then wipe off

After removal

- Clean gently with fragrant free anti-microbial soap e.g. Simple, to remove the adhesive.
- Use a non-greasy unscented moisturiser every day e.g. Aveeno, Cetraben, Hydromol creams which can also be used as a soap substitute

Choice of site

- Rotate the area of skin used- do not use same site for at least a week after removal.
- Try and use at least 6 sites e.g. different area of skin on arm
- Avoid applying to broken irritated skin - try to avoid using inflamed area for at least 4-6 weeks if possible even if it looks like it has healed

Minimising trauma from removing the device:

Careful removal can reduce the likelihood of a reaction developing

- Remove slowly with low energy: 'low and slow'
- Use removal aid e.g. 'lift off' especially if Skin Tac used (avoid fragranced versions e.g. Lift Off 360 Citrus vs Lift Off 360) Clean gently after removal to remove oily residue

If skin becomes red and inflamed: contact diabetes team as soon as possible for advice:

Options to consider are:

- Steroid creams to treat inflamed skin
- Dressings placed under the device if there is an allergic reaction.
- Swab skin and nose to look for infection.
- Referral to dermatology for further investigation and alternative topical treatment options if needed.

Appendix 3: Criteria Used to Assess Levels of Evidence and Strength of Recommendations

Grades of evidence for recommendations used

LEVELS OF EVIDENCE

1++	High quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias
1+	Well-conducted meta-analyses, systematic reviews, or RCTs with a low risk of bias
1-	Meta-analyses, systematic reviews, or RCTs with a high risk of bias
2++	High quality systematic reviews of case control or cohort or studies High quality case control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal
2+	Well-conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal
2-	Case control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal
3	Non-analytic studies, e.g. case reports, case series
4	Expert opinion

GRADES OF RECOMMENDATIONS

A At least one meta-analysis, systematic review, or RCT rated as 1++, and directly applicable to the target population; *or*

A body of evidence consisting principally of studies rated as 1+, directly applicable to the target population, and demonstrating overall consistency of results

B A body of evidence including studies rated as 2++, directly applicable to the target population, and demonstrating overall consistency of results; *or*

Extrapolated evidence from studies rated as 1++ or 1+

C A body of evidence including studies rated as 2+, directly applicable to the target population and demonstrating overall consistency of results; *or*

Extrapolated evidence from studies rated as 2++

D Evidence level 3 or 4; *or*

Extrapolated evidence from studies rated as 2+

Good practice points

✔ Recommended best practice based on the clinical experience of the guideline development group