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Sick day management for patients with diabetes

In this article we consider some of the central issues in dealing with patients with diabetes when they get sick. In approaching the problem, we have also attempted to highlight the difference in managing type 1 and type 2 diabetes.

Case study 1 – type 1 diabetes

Lee is 24 years of age and has recently been diagnosed with type 1 diabetes. She has commenced a four times per day insulin regimen of a short acting insulin analogue before each meal and intermediate acting insulin before bed. As part of Lee's diabetes self management education, a sick day management plan should be developed with her (Table 1).

Lee works full time as a personal assistant. She also plays netball at least once a week and goes to the gym 2–3 times a week. She has had to curtail this activity recently because she has not felt well enough, but is keen to return to her routine as soon as possible.

Three months following diagnosis, Lee rings you to say she has had vomiting and diarrhoea following a work function last evening and has stopped her insulin because she is not able to keep any food down. Her blood glucose level (BGL) is now 14.2 mmol/L. She usually takes 5–8 units of short acting insulin before meals and 18 units protaphane at night. What would your advice to her be?

The most important issue here is to advise Lee that under no circumstances should she cease taking insulin, especially when her BGL are more likely to rise in response to the illness. The second is to establish if Lee can tolerate fluids by mouth. If she can't, her illness cannot be managed at home and she should be advised to attend her nearest emergency department. If she can tolerate fluids, Lee should be reminded to follow her sick day plan.

Lee should also be reminded to increase the frequency

of blood glucose monitoring if she has not already done so and to monitor her ketones (by either urine or blood testing). Evidence suggests urine ketones showing small or greater levels may require giving an additional 5–20% of the total dose, depending on BGL. Blood ketone levels greater than 1 mmol/L also require giving an additional 5–20% of the usual dose depending on BGL.¹

Arrangements should be made to have Lee's sick day management guidelines reviewed, as she ceased her insulin despite advice on this being part of her original plan. You tell Lee to take her usual doses, monitor every second hour, drink lemonade and water to maintain hydration, and test for ketones. She is to contact you (or other contact person) with her BGL to advise regarding the need for any extra doses. It is likely she will not need extra insulin, but rather she must replace food with sweetened drinks, dependent upon BGL. Lee rings back in the early afternoon with a BGL of 9.8 mmol/L.

In this case, the precipitant seems clear – food poisoning – and further investigations are unnecessary, but you have asked to see Lee for assessment in the surgery later that day to assess hydration, check for any inconsistent physical signs and check her blood glucose monitoring results. On review, Lee seems adequately hydrated, there is no abdominal tenderness, guarding or rebound and her BGL is 7.4 mmol/L after her second usual injection. She has had moderate ketones at home but this has now settled. You advise her to continue normal insulin doses and to slowly return to eating normally and cease sweetened fluids.

Lee comes to your surgery 2 months later to obtain a prescription for her insulin. Since her last contact, she has been back to her diabetes educator for a further update on sick day management and now has a new plan with both the educator and yourself nominated as her support people should you be required in the future.

Case study 2 – type 2 diabetes

Shirley, 64 years of age, has had type 2 diabetes for 15 years. She has been on combination therapy of insulin and metformin for 3.5 years. Her current medication doses are:

Novomix 30 20 units – am
10 units – pm

Metformin 1 g twice per day

During the period of stabilisation on insulin injections, sick day management guidelines were reviewed with Shirley and a revised sick day plan was implemented. This included the need to have additional short acting insulin at home and steps to take with her metformin medication should they be required.

Shirley rings you to say that over the past few days her BGL have risen and are in the range of 15–17 mmol/L. What would you recommend to Shirley in this situation?

The first step is to establish Shirley's symptoms, including those of hyperglycaemia. You need to elicit changes in activity or diet that might contribute to the hyperglycaemia. You also need to establish if Shirley is tolerating food and/or fluids and if she knows what to do with metformin during this period.

Shirley tells you she is tolerating fluids by mouth, has no specific symptoms but doesn't want to eat as much, so you suggest a 2 unit increase in both her morning and evening insulin doses initially. You suggest she increases the frequency of blood testing to four times per day and that she calls you in 2 days. You also suggest that Shirley has her blood glucose meter checked to ensure it is working accurately and that she checks that her strips are in date.

Two days later you see Shirley in your surgery as she has not improved. She has no specific signs, but tells you she has urinary frequency (possibly related to glycosuria) with a little discomfort, so you send a microurine for analysis. She still feels nauseated and is still taking her metformin.

It is reasonable to suggest that Shirley

Table 1. Lee's sick day management plan

- Keep a small supply of lemonade at home as part of a sick day kit and try to continue fluid intake
- Test blood glucose every 2 hours
- Drink sugar free fluids if blood glucose is >15 mmol/L and switch to ordinary sweetened fluids when it drops <15 mmol/L
- Check urine (or blood) ketones if blood glucose is >15 mmol/L and when you feel sick (Why check for ketones? Because it is a sign of excess fat burning and excess acids that can lead to acidosis and vomiting. If ketones are present you may require an increase in your insulin dose)
- Keep short acting insulin available in case extra doses are required during periods of illness or infection
- Choose a contact support person (this person might be a diabetes educator or GP) to contact for advice. Examples of when you should ring for advice include:
 - if you are uncertain as to whether the situation can be managed at home
 - if you are too unwell to follow these guidelines
 - if the cause of being unwell is not clear
 - blood glucose levels are not improving despite giving extra insulin, or
 - you have moderate to large ketones on testing
- If hypoglycaemia occurs, it should be managed in the usual way
- If blood glucose levels are >15 mmol/L and/or ketones are present, it is advisable to avoid exercise (being insulin deficient at this time and undertaking exercise causes a stress response in the body and blood glucose levels will rise)
- It is useful to take your temperature and keep a list of what you drank and how often you were able to pass urine as well as documenting the presence or absence of ketones
- If blood glucose levels are rising, you need more insulin (not less) and the diabetes educator or GP can help to decide the amount of extra short acting insulin you need

Source: ADEA Sickday guidelines

cease her metformin and further increase her regular doses of insulin by 2 units morning and evening. While the incidence is low, dehydration, particularly in the elderly, can lead to renal failure and an increased risk of lactic acidosis, a potential complication of metformin therapy.

You receive the urine result – white cells are significantly elevated on microscopy and the culture grows *Escherichia coli* sensitive to amoxicillin, cephalexin or norfloxacin. You ask Shirley to come in to collect a prescription. What advice might you also give her in relation to the management of her diabetes?

Given that a mildly asymptomatic urinary tract infection is the most likely cause of Shirley's hyperglycaemia, she will need to be ready for the drop in BGL that will probably occur as the infection is treated. Shirley should be advised to continue more frequent monitoring until the infection and its impact have settled. Treatment will

almost certainly require a gradual drop in her insulin doses over the following few days. She will also require a gradual re-introduction of her metformin. Shirley should also see her diabetes educator to determine if her sick day plan requires any further adjustment in light of this recent episode.

Conflict of interest: none declared.

Reference

1. Laffel LM, Wentzell K, Loughlin C, Tovar A, Moltz K, Brink S. Sick day management using blood 3-hydroxybutyrate (3-OHB) compared with urine ketone monitoring reduces hospital visits in young people with T1DM: a randomised clinical trial. *Diabet Med* 2006;23:278–84.

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