

Preventing diabetic ketoacidosis: do patients adhere to sick-day rules?

Diabetic ketoacidosis (DKA) is a major cause of morbidity and mortality in patients with diabetes.¹ Despite advances in diabetes care, the burden from DKA remains substantial. In 2009–2010, hospital admissions due to DKA accounted for over 66,000 bed days in England and Wales.^{2,3} Effective preventive strategies are therefore imperative. During illness, patients with type 1 diabetes are instructed to maintain adequate fluid and caloric intake, to administer supplemental amounts of insulin, and to monitor frequently for hyperglycaemia and ketosis. In most cases application of these sick-day rules will curtail ketoacidosis and forestall unwarranted hospital admissions. Yet it is unclear whether patients adhere to sick-day rules. Here we evaluated adherence to sick-day rules in patients with type 1 diabetes attending our diabetes clinic. Consecutive attendees were invited to complete an in-house multiple choice questionnaire, validated for consistency by a panel of clinicians and patients. The questionnaire tested five domains of sick-day self-management, namely glucose monitoring, ketone monitoring, fluid intake, caloric intake and supplemental insulin administration.

All 44 patients invited to participate in the study completed the questionnaire (24 males, 20 females, mean age 36.2 years, age range 18–67 years, median duration of diabetes 16.8 years). Questionnaires were filled in anonymously in the clinic waiting room and correct sick-day rules were discussed in the ensuing consultation. During illness the majority of our patients with diabetes stated that they increased their fluid consumption, maintained adequate caloric intake and frequently monitored blood glucose (Table 1). However, only 36% and 34% of patients tested urine and

Table 1. Number of patients with type 1 diabetes who reported adherence to sick day rules during illness (n=44).

Intervention	Number of patients (%)
Increase fluid intake	32 (73%)
Increase caloric intake	27 (61%)
Frequently test blood glucose	41 (93%)
Test urine ketones	16 (36%)
Test blood ketones	15 (34%)
Take extra insulin	18 (41%)

blood ketones respectively, and only 41% independently administered supplemental insulin on sick days (Table 1).

Our study reveals shortcomings in sick-day self-management in our patients with diabetes. The majority of patients did not independently administer extra insulin or monitor for ketones, either in blood or urine. Ketone testing is essential for early recognition of impending DKA. In acute illness a combination of insulin deficiency and counter-regulatory hormone release results in increased gluconeogenesis, lipolysis and ketone body production.⁴ Blood ketone tests are now available for rapid quantification of β -hydroxybutyrate (β -OHB), the predominant ketone body in DKA. Although these are yet to become universally available they offer greater sensitivity and facilitate more efficient sick-day management than conventional urine ketone testing.⁴ Accessibility to blood ketone reagents was, however, unlikely to have been a major factor in our study since low adherence rates was also seen with urine testing.

Our findings are likely to reflect unrecognised gaps in knowledge, since most patients (93%) reported that they felt confident in managing sick-days. However, our study was not designed to address factors responsible for poor adherence and while education may be fundamental it is likely that additional unexplored socioeconomic factors are contributory. Nonetheless, our results underpin the need for a concerted educa-

tional approach to DKA prevention. Such preventive strategies are likely to yield lasting health economic benefits especially if pursued in conjunction with the current drive for better in-patient DKA management.⁵

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