want to discount the paper on the basis of perceived bias.

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Diagnosis and early management of hyperglycaemic emergencies in the emergency department

Sir,

We were interested to read the recent articles on the confidence of junior doctors in managing diabetes in hospitals.\(^1\)\(^2\) We have also been concerned about the knowledge of junior doctors in managing hyperglycaemic emergencies in the emergency department (ED). We would like to share the results of an audit we have conducted on the early recognition and management of diabetic ketoacidosis (DKA) and hyperosmolar hyperglycaemic state (HHS). Early recognition and correct management of such emergencies is key to successful outcomes.\(^3\) In particular, a clear distinction between DKA and HHS must be made early, as treatment for the two conditions is very different. DKA requires rapid high-dose insulin therapy to be instituted immediately, while HHS requires no, or extremely low-dose insulin, to prevent rapid shifts in osmolarity and sodium concentrations.\(^4\)

We retrospectively reviewed the notes and ED records of adult (≥18 years) patients presenting to the ED of a large teaching hospital with a coded diagnosis of ‘diabetic ketoacidosis’, ‘hyperosmolar hyperglycaemic syndrome’, ‘hyperosmolar non-ketotic coma’ and ‘hyperglycaemic emergency’ over a 12-month period. All patients were referred to the ED by their local primary care physician, or self presented to the ED. All patients were initially seen by the ED team, and were discussed with the on-call diabetes team, usually within 8 h of admission during daylight hours, or if admitted overnight were seen the next morning.

Data on demographics, type, duration and treatment of diabetes were collected. Plasma osmolality was calculated from admission biochemistry. Diagnosis and initial management undertaken by ED doctors was noted, and compared with diagnosis subsequently made by the diabetes team, according to the 2004 American Diabetes Association (ADA) criteria (Table 1).\(^5\)

A total of 48 patients were admitted with hyperglycaemic emergencies. Mean age was 45.05 (SD 20.25) years, and 30 (62.5%) were female, 21 (43.75%) were White European, 12 (25.0%) were African-Caribbean, 9 (18.75%) were South Asian and 6 (12.5%) were uncoded. Ten (20.8%) patients were newly diagnosed with diabetes on this admission (type 1, 8; type 2, 2). Two-thirds of the cohort (32) had type 1 diabetes, with the remaining (16) having type 2 diabetes.

Of the 48 patients reviewed, 32 patients presented with clear DKA (mild, 9; moderate, 17; severe, 6) and all cases were correctly classified and treated within the ED. The remaining 16 patients presented with diagnostic criteria for HHS. Nine (56.25%) of these patients were incorrectly classified as having DKA, and commenced on high-dose intravenous insulin therapy prior to the involvement of the diabetes team. Of these patients, we assessed that one patient came to significant harm as a result of precipitous fall in glucose concentration. The

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### Table 1  ADA diagnostic criteria for DKA and HHS

<table>
<thead>
<tr>
<th>Biochemical measure</th>
<th>DKA</th>
<th></th>
<th></th>
<th>HHS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mild</td>
<td>Moderate</td>
<td>Severe</td>
<td>HHS</td>
</tr>
<tr>
<td>Plasma glucose (mmol/l)</td>
<td>&gt;14</td>
<td>&gt;14</td>
<td>&gt;14</td>
<td>&gt;33</td>
</tr>
<tr>
<td>pH</td>
<td>7.25–7.30</td>
<td>7.0–7.24</td>
<td>&lt;7.0</td>
<td>&gt;7.30</td>
</tr>
<tr>
<td>Serum HCO₃ (mEq/l)</td>
<td>15–18</td>
<td>10 to &lt;15</td>
<td>&lt;10</td>
<td>&gt;15</td>
</tr>
<tr>
<td>Serum ketones</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
<td>Small</td>
</tr>
<tr>
<td>Urine ketones</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
<td>Small</td>
</tr>
<tr>
<td>Serum osmolarity (mOsm/kg)</td>
<td>Variable</td>
<td>Variable</td>
<td>Variable</td>
<td>&gt;320</td>
</tr>
<tr>
<td>Anion gap</td>
<td>&gt;10</td>
<td>&gt;10</td>
<td>&gt;12</td>
<td>Variable</td>
</tr>
<tr>
<td>Mental state</td>
<td>Alert</td>
<td>Alert/drowsy</td>
<td>Stupor/coma</td>
<td>Stupor/coma</td>
</tr>
</tbody>
</table>

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remaining eight patients were rapidly converted to appropriate low-dose insulin regimens once the diabetes team had seen the patient, and outcome was successful in these patients.

While the actual numbers of hyperglycaemic emergency admissions is not large in our hospital, errors in diagnosis may extrapolate to errors in management. This is especially noted in insulin therapy, which is significantly divergent in DKA and HHS. The results of our survey suggest that recognition and management of DKA within the ED appears to be good. Of concern, however, is the fact that HHS is poorly recognized, and inappropriate therapy with rapid insulin infusion is being commenced.

Following the results of our survey, education and support has been provided for staff within the ED, with a new pathway instituted with rapid involvement of the diabetes team for all hyperglycaemic emergencies admitted at any time. ED staff are now more aware of the importance of distinguishing and managing DKA and HHS, and more ready to enlist rapid advice from the diabetes specialist team.

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