Norfolk and Norwich University Hospitals NHS
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Dysglycaemia and Length of Hospital Admission, Mortality and Readmission

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Background: Previous research has demonstrated that admission hyperglycaemia is strongly associated with length of hospitalisation and short-term prognosis, regardless of the presence of diabetes [1,2]. We wanted to investigate this relationship in our large, secondary care institution

Objectives: To investigate the relationship between dysglycaemia and the length of hospital stay, short-term (28-day) mortality and readmission rates in an unselected Acute Medical Unit population. Additionally, we investigated the follow-up rate of individuals found to have new hyperglycaemia who did not have an existing diagnosis of diabetes. Other centres, both in the United Kingdom and internationally, have highlighted the poor rate of follow-up in such individuals [3,4].

Methods: Electronic records for all emergency admissions through the Acute Medical Unit at the Norfolk and Norwich University Hospital during February 2010 were reviewed for admission blood glucose, length of stay, readmission or death within 28 days, and whether an admission blood glucose above 11.1 mmol/l in individuals without a history of diabetes was followed-up by a fasting blood glucose or diabetes specialist review. Admission blood glucose was grouped using blood glucose levels from previous research to aid comparison [3].

Results: 1,502 patients were admitted to 11 medical specialty triage teams during the study period, accounting for 14,202 bed-days (Figure 1). Of these admissions, 240 patients (16%) had known type 1 or type 2 diabetes.
Admission blood glucose was measured in 893 patients (59%).
The mean average ages for groups with admission blood glucose less than 6.5 mmol/l, 6.5-7 mmol/l, 7.1-9 mmol/l, 9.1-11 mmol/l, 11.1-20 mmol/l and greater than 20 mmol/l were 69.6 years (SD 18.8), 72.7 years (15.5), 76.5 years (13.9), 74.9 years (13.7), 68.4 years (17.3), and 60.6 years (22.6) respectively.
There was a significant difference (p=0.002) in the length of stay for individuals with dysglycaemia above 6.5 mmol/l, resulting in a median length of stay of 6 days for those with admission blood glucose above 6.5 mmo/l compared with 4 days for those with a blood sugar below this level, whilst the mean length of stay was 10.8 days vs 8.8 days in these groups (Figure 2). Rates of 28-day readmission and mortality are shown in Figures 3 and 4.
Of the 37 individuals without diabetes where the admission blood glucose exceeded 11.1mmol/l, only 19 (51.4%) received further follow-up (Figure 5).

Discussion: We found that an admission blood glucose of above 6.5 mmol/l in an unselected Acute Medical Unit population was associated with a significantly longer length of stay. In addition, hyperglycaemia on admission was associated with higher rates of 28-day mortality and hospital readmission. Finally, hyperglycaemia is frequently under-recognised and under-investigated by admitting teams.

Figure 1. Number of hospital admissions by speciality

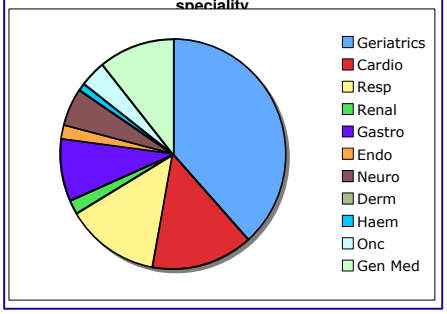


Figure 2. Mean length of stay against admission glucose

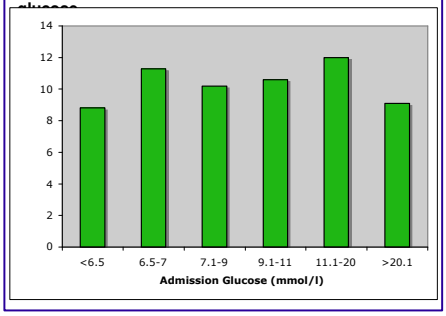


Figure 3. Rate of 28-day readmission against admission glucose

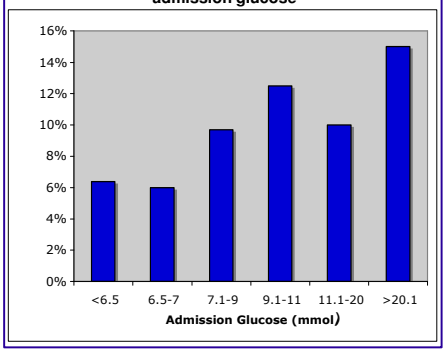


Figure 4. Rate of 28-day mortality against admission glucose

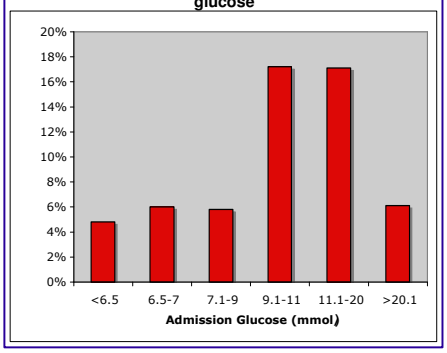
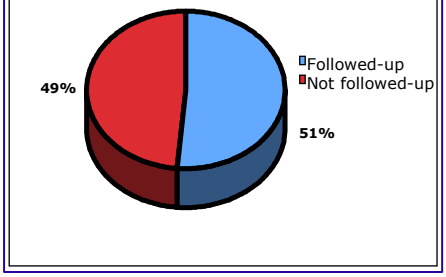


Table 1. Results by admission blood glucose level

Blood glucose (mmol/l)	Number of patients	Mean / median length of stay (days)	Readmission within 28 days	Mortality within 28 days
<6.5	455	8.8 / 4	29 (6.4%)	22 (4.8%)
6.5-7	116	11.3 / 7	7 (6%)	7 (6%)
7.1-9	155	10.2 / 5	15 (9.7%)	9 (5.8%)
9.1-11	64	10.6 / 5	8 (12.5%)	11 (17.2%)
11.1-20	70	12 / 5.5	7 (10%)	12 (17.1%)
>20	33	9.1 / 5	5 (15%)	2 (6.1%)

Figure 5. Proportion follow-up of individuals without a history of diabetes presenting with an admission glucose >11.1mmol/l



1. Umpierrez GE, et al. Hyperglycemia: an independent marker of in-hospital mortality in patients with undiagnosed diabetes. J Clin Endocrinol Metab 2002;897:978-82. 2. Eurich DT, et al. Dysglycaemia and 90 day and 1 year risks of death or readmission in patients hospitalised for community-acquired pneumonia. Diabetologia 2010;53:497-503. 3. Dyer P et al. Personal communication 4. Leite SA, et al. Impact of hyperglycemia on morbidity and mortality, length of hospitalization and rates of re-hospitalization in a general hospital setting in Brazil. Diabetol Metab Syndr 2010;2:49.