Use of a simplified local guideline improves "front door" management of diabetes and hyperglycaemia in people admitted to hospital with COVID-19

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Background

COVID-19, caused by the severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2), was declared a pandemic on 11th March 2020. COVID-19 increases risk of hyperglycaemia regardless of prior diabetes diagnosis. Following results of the RECOVERY trial showing survival benefit in people with COVID-19 who required oxygen, dexamethasone has been used to improve outcomes.[1] Dexamethasone (a glucocorticoid) may exacerbate hyperglycaemia in people with diabetes and can precipitate glucocorticoid-induced diabetes in others. In the context of COVID-19 infection, stress-related hyperglycaemia increases risk of mortality during hospitalization.[2] In order to improve recognition and management of COVID-19-related hyperglycaemia, the National Diabetes Inpatient COVID response team published relevant guidance.[3]

Aim

Awareness and implementation of the National Diabetes Inpatient COVID guidance within our Trust was lacking. Our aim was to see whether introducing a simplified local guideline (Figure 1), based on national recommendations, would improve compliance and clinical care for patients.

Methods

Audits were carried out before and after introduction of our simplified local guideline. The first audit included all inpatients present on 13th November 2020 (regardless of admission date) in South Tyneside and Sunderland NHS Foundation Trust with COVID-19 and a prior diagnosis of diabetes. A simplified version of the ABCD National Front Door Guidance was written by our team and approved by the Trust for use effective 24 February 2021. The audit was then repeated, and data were analysed from all patients admitted with COVID-19 between 3rd March and 25th March 2021.

The following details were retrieved from electronic health records (including e-prescribing and primary care medication records): age, gender, type of diabetes, oxygen support required, whether capillary blood glucose and ketones were measured on admission, whether people with diabetes were taking SGLT2-inhibitors and metformin pre-admission, and whether these were reviewed during admission. Events and management of hyperglycaemia (defined as a blood glucose reading >12mmol/L) were also documented. Statistical analysis was done using chi-square test to determine whether there were significant differences in compliance before and after guideline implementation. Formal ethics approval was not required, as this was deemed to be a retrospective data analysis towards quality improvement of routine patient care.

Results

There were 71 people included across both audit cycles. Table 1 describes baseline characteristics of the cohorts, as well as comparison of compliance to key elements of guidance.

There were numerical improvements (72% to 90%) in admission measurement of capillary blood glucose in all people with suspected COVID-19 infection who had a prior diagnosis of diabetes; and in ketone checking for appropriate patients (19.4% to 27%). 6-hourly blood glucose monitoring improved from 19.4% to 26.1%. There was a statistically significant improvement (36.1% to 100%, p=0.0004) in checking of HbA_{1c} in people with known diabetes on admission. We observed a decline in compliance with review of metformin and hyperglycaemia management, but this did not reach statistical significance.

Discussion

Our quality improvement project illustrates that simplifying guidelines to suit local use can help to improve awareness and compliance with national recommendations.

We found improvements in capillary blood glucose measurement on admission and 6-hourly capillary blood glucose monitor-

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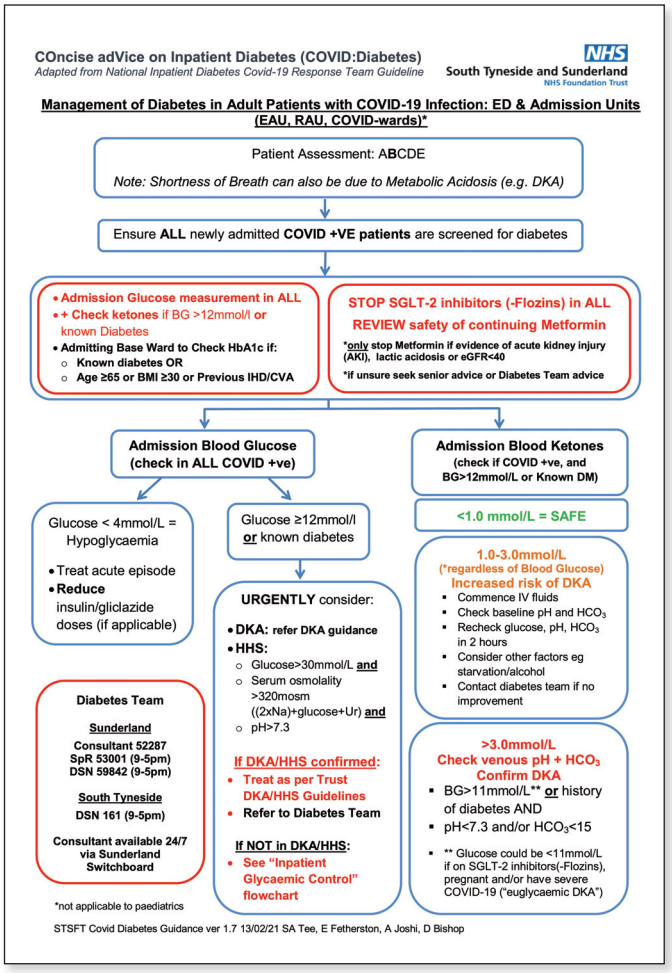
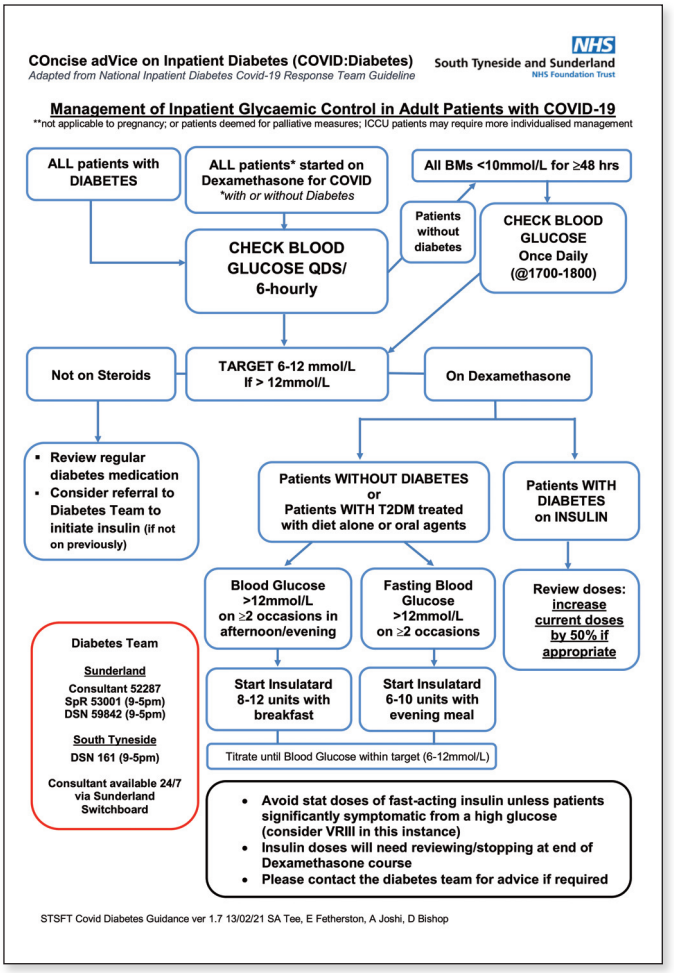
Figure 1. Local guideline





ing, and significantly higher assessment of HbA_{1c} in people with diabetes (p=0.0004) following implementation of our local guidance. Measuring baseline HbA_{1c} is important as large analyses have demonstrated that higher HbA_{1c} (7.5% or above) is associated with a nearly twofold increase of COVID-19-related death (hazard ratio 1.95; 95% CI: 1.83-2.08).[4] Another study showed significant association between pre-infection HbA_{1c} and risk of severe COVID-19 despite adjustment for demographics, chronic illness, diabetes complications or treatment.[5]

There was a slight decline in review of metformin and compliance with recommended hyperglycaemia management. The reasons for this are unclear, though we note that the decline is not statistically significant, and a larger sample size may have given us more representative information.

This quality improvement project highlighted the need for better access to ketone meters across the Trust. Urgent funding was used to purchase additional ketone meters for medical wards, which will benefit care of all people with diabetes beyond the pandemic.

Limitations

Limitations include the small numbers of people involved. We acknowledge that the initial snapshot audit did not capture longitudinal data, in contrast to the post-guideline audit over a longer period. The relatively small number of people included in the post-guideline cohort in our opinion reflects the overall decline in COVID-19 infection rates (and therefore hospitalisation) during the second period of data collection (February-March 2021), compared to the initial audit in November 2020.[6] We propose that the differences in methodology do not affect the positive results seen in this project.

Conclusions

A simplified guideline based on national recommendations improved management of hyperglycaemia COVID-19 within our Trust. Implementation of local guidance led to improvements in capillary blood glucose measurement on admission, 6-hourly capillary blood glucose monitoring and significantly more frequent assessment of HbA_{1c} in people with diabetes (p=0.0004).

Table 1 Comparison of baseline characteristics and compliance to recommendations pre- and post-introduction of local guideline

	Pre-guideline n=36 (%)	Post-guideline n=35 (%)	p value
Gender			
M	21 (58.3%)	19 (54.3%)	0.73
F	15 (41.7%)	16 (45.7%)	
Age, years (average ± SD)	77.1 ± 11.3	60.7 ± 20.0	**$9.6x10^{-5}$**
Diabetes, type 1	1/36 (2.8%)	1/10 (10%)	N/A
Diabetes, type 2	35/36 (97.2%)	9/10 (90%)	
No diabetes	0	25	
Respiratory support required			
• None	12 (33.3%)	15 (42.9%)	0.41
• Oxygen only	24 (66.7%)	15 (42.9%)	**0.04**
• CPAP	0	4 (11.4%)	**0.04**
• Intubation	0	1 (2.8%)	0.31
Received dexamethasone	21 (58.3%)	16 (45.7%)	0.29
"Front door guidance"			
• Glucose measurement in all people with diabetes and COVID-19	26/36 (72%)	9/10 (90%)	0.24
• Ketone check in patients with known diabetes OR blood glucose >12mmol/L	7/36 (19.4%)	4/15 (27%)	0.57
• Check HbA_{1c} in patients with diabetes	13/36 (36.1%)	10/10 (100%)	**0.0004**
Medication review			
• Stop SGLT-2 inhibitor	2/2 (100%)	N/A (no patients taking)	N/A
• Review of metformin	11/18 (61%)	3/5 (60%)	0.96
Glucose monitoring			
• 6-hourly capillary blood glucose monitoring for people with diabetes OR anyone on dexamethasone	7/36 (19.4%)	6/23 (26.1%)	0.55
Appropriate hyperglycaemia management	15/24 (62.5%)	6/10 (60%)	0.89

Key messages

- COVID-19 related hyperglycaemia increases the risk of mortality during hospitalisation.
- Within our Trust, implementation of National guidelines to recognize and manage COVID-19 related hyperglycaemia required improvement.
- We propose that a simplified guideline adapted to local needs has the potential to improve compliance with National standards.

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