JBDS-IP Joint British Diabetes Societies for inpatient care

Joint British Diabetes Societies for In-Patient Care (JBDS-IP)

The Rowan Hillson Inpatient Safety Award 2022

'The Rowan Hillson Inpatient Safety Award – The best interventions: Redesigning, rebuilding and maintaining safe inpatient diabetes care during COVID'

How to enter:

1. Email your completed entry to: Christine Jones, JBDS Administrator at christine.jones@nnuh.nhs.uk

   All entries must be emailed by 28th February 2022

2. Please submit any supplementary materials to support your initiative, as these will be considered as part of the judging process.

3. **Please note this competition is only for projects undertaken during the COVID pandemic.**

Your contact details:

Name: Dr Punith Kempegowda on behalf of the DEKODE team

Trust name and address where work was undertaken:

University Hospitals Birmingham NHS Foundation Trusts, Mindelsohn way, Edgbaston, Birmingham, B152TH

Additional contributors:

DEKODE team consists of the following members
1. Amy Birchenough, Foundation year 2 doctor, Sandwell and West Birmingham Hospitals, Birmingham
2. Anjitha Anilkumar, 4th-year medical student, University of Birmingham
3. Carina Synn Cuen Pan, 4th-year medical student, University of Birmingham
4. Catherine Cooper, Foundation year 2 doctor, Walsall Manor Hospitals, Walsall
5. Dengyi Zhou, 5th-year medical student, University of Birmingham
6. Dineshwaran Rajendran, Junior Specialist Doctor, University Hospitals Birmingham NHS Foundation Trusts
7. Emily Warmington, 4th-year medical student, University of Birmingham
8. Francesca Pang, 4th-year medical student, University of Birmingham

9. Gobeka Ponniah, 5th-year medical student, University of Birmingham
10. Haaziq Sheikh, Year 12 student, Haberdashers' Adams' Grammar School, Birmingham
11. Jonathan Webber, Consultant, University Hospitals Birmingham NHS Foundation Trusts
12. Katrina Nash, 5th-year medical student, University of Birmingham
13. Lakshmi Rengarajan, Internal Medicine Trainee, University Hospitals Birmingham NHS Foundation Trusts
14. Maria Skaria, 4th-year medical student, University of Birmingham
15. Megan Owen, Foundation year 2 doctor, Walsall Manor Hospitals, Walsall
16. Meghnaa Hebbar, 5th year medical student, University of Birmingham
17. Muhammad Ali Karamat, Consultant, University Hospitals Birmingham NHS Foundation Trusts
18. My Chi Pham, 4th-year medical student, University of Birmingham
19. Parijat De, Consultant, Sandwell and West Birmingham Hospitals, Birmingham
20. Parth Narendran, Consultant, University Hospitals Birmingham NHS Foundation Trusts
21. Sanjay Saraf, Consultant, University Hospitals Birmingham NHS Foundation Trusts
22. SenthilKumar Krishnasamy, Consultant, Walsall Manor Hospital NHS Trust
23. Shamanth Soghal, Junior Specialist Doctor, University Hospitals Birmingham NHS Foundation Trusts
24. Vaishnavi Kumar, Specialist Registrar in Diabetes and Endocrinology, University Hospitals Birmingham NHS Foundation Trusts
25. Vina Soran, 4th-year medical student, University of Birmingham
26. WNA Yip, 4th-year medical student, University of Birmingham

Title of entry (20 words maximum)

Improving and sustaining improvement in diabetes-related ketoacidosis management through Quality Improvement Project across hospitals during COVID

Brief summary of entry

Provide a short summary of your initiative in **no more than 200 words (The box will expand)**

Diabetes-related ketoacidosis (DKA) is an acute complication of diabetes needing hospitalisation. We hypothesised that DEKODE (Digital evaluation of Ketosis and Other Diabetes Emergencies), a cloud-based DKA management monitoring system can bring uniformity in DKA management across hospitals and identify best practices across centres which can then be shared across all participating centres.

The project was initiated in January 2020 and includes six hospitals–Queen Elizabeth Hospital Birmingham (QH), City Hospital (CH), Sandwell Hospital (SH), Walsall Manor Hospital (WH), Heartlands Hospital (HH) and Good Hope Hospital (GH)– in West Midlands. Data regarding various aspects of DKA management were collected. Numerous interventions were introduced in participating hospitals to improve DKA care.

814 DKA episodes were built into the registry from January 2020 to November 2021. DEKODE helped bring uniformity of DKA duration across participating hospitals. Data comparison enabled identifying best practices and areas of concern for DKA management. Data aggregation to identify patterns in changes to precipitating factors of DKA and trends of hypoglycemia and potassium changes over time. The interventions delivered as part of DEKODE improved awareness about DKA amongst junior doctors. In summary, DEKODE is an excellent example of how learning from QIP can be shared across hospitals and trusts.

Background/Situation analysis/Innovation (300 words maximum)
Briefly provide the background and rationale for the initiative. From this, the judges should be able to understand why there was a need for the initiative to be undertaken. Explain what makes your initiative innovative or pioneering.

Diabetes-related ketoacidosis (DKA) is an acute complication of diabetes needing hospitalisation. Albeit improved management over the years, DKA continues to be a major problem in the UK with approximately 0.67% mortality outside the context of COVID. Our previous work has shown that regular performance feedback through a quality improvement programme (QIP) is key to sustaining improvements in DKA management (Kempegowda et al., 2019).

COVID 19 pandemic required prioritisation of inpatient clinical care, redeployment of junior doctors and all diabetes staff including community diabetes specialist nurses (DSN) to generalist ward care. This disrupted the established pathways to manage people with DKA. As a result, non-urgent services like outpatient clinics, quality improvement services were significantly affected. COVID-19 infection also predisposes people to develop hyperglycemia in those with and without a prior diagnosis of diabetes and is associated with a disproportionately worse prognosis.

Our centre, Queen Elizabeth Hospital Birmingham (QH) has an established quality improvement programme–DEKODE (Digital Evaluation of Ketosis and Other Diabetes Emergencies)–that focuses on sustaining good medical care for people with DKA. We realised that it was more crucial than ever to understand how inpatient care for people with DKA had been affected by the COVID pandemic in our region and to identify opportunities, areas of concern, and recommendations for the future with potential expansion to other hospitals in the region. Furthermore, to our knowledge, no studies have implemented a uniform auditing system for DKA or evaluated the expansion of interventions across multiple hospitals.

Objectives (200 words maximum)
State clearly the objectives of the initiative(s).

We hypothesised that DEKODE can help us continue to provide the best possible care to people with DKA during COVID. We further hypothesised this system can be shared with

other centres which can benefit in twofold– bring in uniformity in DKA management across centres and identify best practices across centres which can then be shared across all participating centres.

Overarching aim: To improve the safety and provide uniform care for people admitted with DKA in hospitals across West Midlands

Specific objectives:
1. To establish a DKA registry to collect data on DKA management across hospitals.
2. To improve the management of DKA across participating centres
3. To identify best practices across centres and share this with all participating centres

Project plan/methods (400 words maximum)
Please outline the method (s) you used to achieve your objectives. The judges will also be looking for a clear rationale for your method(s).

The project was initiated in January 2020 and is currently ongoing. In January 2020, we approached City Hospital (CH), Sandwell Hospital (SH) and Walsall Manor Hospital (WH) in the West Midlands inviting them to participate in the QIP. The lead consultant accepted the invitation and supported registering the QIP in the local centres. In November 2020, we extended the QIP to other hospitals in our trust- Heartlands Hospital (HH) and Good Hope Hospital (GH). The delay to extend the QIP to other hospitals in our Trust was to avoid the transition period of transfer from paper to electronic medical records in these hospitals.

Junior doctor leads were established in each of these hospitals. These junior doctor leads acted as liaisons between their team and the clinical service leads to facilitate the QIP. They identified other junior doctors and medical students to form a team to collect data and develop interventions to improve DKA management locally.

The list of people diagnosed with DKA was obtained by the junior doctor lead in each centre by liaising with their clinical service lead and local informatics team. Each of these patients was further vetted to confirm the diagnosis based on JBDS criteria. (blood glucose >11 mmol/L or history of diabetes, pH ≤7.3 or bicarbonate ≤15 mmol/L and ketonemia ≥3 mmol/L). DKA resolution was defined as blood ketones <0.6 and pH>7.3. Information on patient demographics, type of diabetes, biochemical parameters (ph, bicarbonate, lactate, sodium, potassium, urea), appropriateness of fluid, insulin prescriptions, kalaemic and glycaemic complications are collected by the local team in each of the participating hospitals.

All junior doctors and medical students from participating hospitals were provided with an induction meeting to explain to them about the QIP and the data collection process. They further attended biweekly meetings where progress with data collection was discussed, and various interventions were discussed to be deployed in the participating hospitals. Various interventions including regular feedback on various parameters of DKA

management, updated DKA guidelines based on latest JBDS recommendations, GIFs and presentations to junior doctors about DKA management were provided at regular intervals to participating hospitals following assessment of result patterns over time to improve DKA management in multiple centres. We attach some of the interventions as supporting evidence to the application. And here is the link to a video we have created to increase the awareness of DKA guidelines among junior doctors: https://www.youtube.com/watch?v=ZdBxqbRyLEc&ab_channel=SIMBAsimulation

Evaluation and results (400 words maximum)
Use this section to report the results and demonstrate how you measured the success of your initiative/project.

Data were analysed using Stata/SE 16.1 for Mac. To identify best practices in each of the participating hospitals, the Independent-Samples Kruskal-Wallis Test was performed. Statistical significance was accepted at a 95% confidence level ($p < 0.05$).

683 DKA episodes from four different centres (QH, CH, SH and WH) were added to the DKA registry from January 2020 to November 2021. A further 131 episodes were added from HH and HH from January 2021 to November 2021. We analysed the changes in various parameters associated with DKA between QH, CH, SH and WH in 2020 and 2021.

1. There was a significant change in the precipitating cause for DKA from 2020 to 2021 ($p < 0.001$). As expected, the number of DKA associated with COVID increased (9 in 2020 vs 26 in 2021). The number of DKA where a precipitating cause could not be identified reduced (44 in 2020 vs 27 in 2021). There was a decrease in the number of DKA due to suboptimal compliance to treatment (114 in 2020 vs 77 in 2021). The number of DKA associated with SGLT2 use doubled (3 in 2020 vs 6 in 2021)

2. A significant improvement in FRIII prescription (2020 vs 2021 median-96.0% vs 100%, $p = 0.028$) was seen in WH.

3. Fluids administered overshot the recommendations in WH (2020 vs 2021 median-87.5% vs 133.3%, $p < 0.001$). There was a decrease in proportion of fluid administered in QH (2020 vs 2021 median-87.5% vs 84.2%, $p = 0.04$).

4. Hourly glucose measurement improved in CH (2020 vs 2021 median-77.5% vs 89.1%, $p = 0.084$) and SH (2020 vs 2021 median- 76.1% vs 92.6%, $p = 0.006$)

5. Hourly ketone measurement significantly improved in all four hospitals (QH: 2020 vs 2021 median-56.0% vs 61.4%, $p = 0.001$; CH- 10% vs 67.3%, $p < 0.001$; SH- 10.5% vs 62.6%, $p < 0.001$; WH- 14.3% vs 69.6%, $p < 0.001$).

6. Prevalence of hypoglycaemia during DKA reduced in CH (2020 vs 2021 median-25.0% vs 13.3%, $p = 0.039$)

7. The prevalence of hyperkalemia increased in QH (2020 vs 2021 median- 17.6% vs 37.4%, $p < 0.001$)

8. DKA duration (2020 vs 2021 median- 11.1 hours vs 13.1 hours, $p = 0.024$) and length of stay (2020 vs 2021 median- 3.7 days vs 4.6 days, $p = 0.044$) increased in QH.

Impact (300 words maximum)

Describe the impact of the initiative(s) for in-patients with diabetes and how this was measured.

1. <u>Bringing in uniformity of care across hospitals</u>: One of the important impacts of our QIP is reducing the differential care of DKA across participating hospitals. For example, the difference in median DKA duration between WH and CH, both district general hospitals, was 3.2 hours in 2020 (p=0.016). This gap was reduced to 0.5 hours in 2021 (p=0.468).

2. <u>Data comparison enables identifying best practices and areas of concern</u>: we were able to identify hospitals that are outperforming others in certain areas of DKA care. For example, we identified CH has reduced hypoglycaemia during DKA. A discussion with the local team will now help us understand the measures they are undertaking to achieve this which can then be shared with other hospitals.

3. <u>Data aggregation to identify patterns</u>- Whilst the DEKODE model can help us improve management, its greater role will be in providing information to develop more robust and evidence-based guidelines which are tailored to current trends in the aetiology and management of DKA. For example, we are able to identify an increasing number of DKA with SGLT2 inhibitors which have led to developing better education regarding this for patients and doctors to increase awareness. Similarly, we were able to ascertain the impact of various factors such as age, sex, type of diabetes, COVID infection on DKA. These findings have now been published in peer-reviewed journals to share the findings to wider medical community (Kempegowda et al., 2021; Ooi et al., 2021).

4. <u>Improved awareness about DKA amongst junior doctors</u>: There were a significant improvement for correctly identifying diagnostic (median score- pre vs post=3.0 vs 4.0; p=0.012) and resolution (1.0 vs 2.0; p=.014] criteria for DKA following an educational intervention as part of DEKODE. Since junior doctors form the frontline staff managing DKA, we anticipate this change in knowledge to translate to better inpatient care.

Adaptability, Cost and Sustainability (300 words maximum)

How easily could your initiative(s) be adapted to other hospital Trusts? Please state whether any other Trust(s) has adapted your initiative(s) and/or any steps you have taken to promote wider dissemination of your initiative(s).

Please demonstrate the sustainability of your initiative(s). Include the cost incurred and the source of funding i.e. acute trust or CCG or any other means. Describe the process by which the funding has been sought and the challenges experienced.

The QIP was adapted by other participating hospitals with ease. Each hospital had to

register an audit to ensure information governance clearance was obtained before joining DEKODE. Only pseudonymised data with each DKA episode with a unique identification code was entered into the central database. Patient identifiable information linking the code was retained in the local hospital which can help us revisit the patient if needed. Hospitals with varying nature of medical records (entirely paper-based, entirely electronic, hybrid) are now part of DEKODE demonstrating the flexibility of the model. We have now liaised with the Association for British Clinical Diabetologists (ABCD) about the success of the model and expressed our interest to roll out DEKODE nationally so any interested centre can participate and benefit from regular feedback and early warning when care is deviating to the national median. The representatives of ABCD have responded positively to the proposal and we are currently underway to launch this.

DEKODE model has provided sustained improvement to inpatient care for those with DKA in QH for 8+ years (Kempegowda et al, 2021). Further, we were able to expand DEKODE to other trusts during the pandemic. Despite wide disruptions to clinical care during the COVID pandemic, DEKODE continued to function with minimal disruption and senior input demonstrating its sustainability.

All pseudonymised data is stored in a cloud-based network encrypted with password protection with access limited to only key members of the QIP team. The cloud service is provided freely by Google for academic purposes. The data was collected by volunteer medical students and junior doctors. Overall, no additional costs were incurred when conducting this QIP and hence no funding was obtained. On the contrary, the DEKODE model has been shown to reduce acute medical care costs by two-thirds by reducing the need for monitored beds from reduced DKA duration (Kempegowda et al, 2017).

Learning (300 words maximum)
One of the main aims of the competition is to enable the learning and sharing of initiatives for the benefit of inpatients with diabetes. Use this section to outline any learning(s) that can be taken from the initiative(s) and/or challenges faced along the way that could be transferred to other Trusts looking at introducing similar initiatives.

DEKODE is an excellent example of how learning from QIP can be shared across hospitals and trusts. The project is run mainly by junior doctors and medical students which enables them to understand the principles of QIP and learn not only the care of DKA for inpatient management but also the importance of good communication and teamwork. It also gives them a sense of ownership and responsibility as they are ultimately responsible to manage the QIP in the local centres. It also gives them an opportunity to develop good leadership skills in managing their team, interacting with the local informatics team and supervising consultants lobbying for interventions that can improve DKA management in their centre. Also, the interventions to improve DKA care also has additional benefits to educate a wider cohort of junior doctors about DKA as described in the impact of educational intervention as part of DEKODE on the knowledge of DKA diagnosis and resolution by junior doctors.

One of the challenges we faced in this model was to ensure the continuity in data collection to enable the comparison of performance across time. As junior doctors in

training rotate between hospitals, we promoted peer-to-peer learning to ensure a sufficient number of team members are available in each centre who can facilitate continuity of data collection. In this model, the current team of junior doctors are encouraged to identify their colleagues who can take over the data collection and intervention when they move on to another role or centre. This has worked well for our project and as an additional benefit; it provided additional leadership and mentorship opportunities for junior doctors and medical students who are recruiting their peers.

DEKODE registry not only helps us monitor standards of DKA management but it also facilitates identifying best practices for inpatient diabetes care across hospitals. We have described this in greater detail in the impact section of this application.

Feedback from staff and patients (300 words maximum)

Please include a summary of any patient feedback and evaluations of the initiative(s). It will be helpful if you can provide (as supporting materials) the tools used to gather this information. If available, please include a summary of staff feedback to demonstrate their perspective on the initiative(s)' impact on the care of inpatients with diabetes during the COVID pandemic.

We have not collected any patient feedback or evaluation as part of DEKODE yet. However, we are currently finalising an intervention as part of the QIP to perform semi-quantitative and qualitative data collection from people admitted with DKA in the participating centres. To the best of our knowledge, there is no such data available investigating the experience of people with DKA. This information will be crucial to developing patient-reported outcome measures that can be incorporated in future DKA guidelines.

We have presented the DEKODE model to stakeholders and frontline staff in the emergency department, acute medical unit and diabetes team in all participating centres. They have positively responded to the work. The supervising consultants were impressed with the intricate organisation and teamwork between medical students and junior doctors to deliver this project. They commended the various interventions delivered to improve and sustain good DKA management despite the COVID disruptions. The frontline staffs were particularly impressed with the simplified one-page DKA guidelines developed in QH as part of the QIP. Several junior doctors and consultants in QH have expressed their liking to the one-page guidelines. One of the junior doctors commented "This guideline is probably the simplest, easy to follow guidelines for DKA that I have ever seen. It breaks down action points in time order and is to the point without going into details of why something needs doing. The latter is important in an acute setting where we don't have time to search for what needs doing. At the same time, it also provides links to the full version of national guidelines to cater to those who wish to know more about the rationale behind each management recommendation." This guideline is now being adopted across all participating hospitals which will further potentiate uniform practice

for DKA management.

Supporting materials

The judges' core assessment of your initiative will be based on this entry form. However, we do recommend that you ***support your entry*** with relevant materials, as these will be made available to the judges and are often the deciding factor in shortlisting the finalists.

Supporting materials could include IT-based programmes, pamphlets, booklets, audits, events, reports, journal articles, evaluation documentation, websites etc.

Supporting materials along with your entry form should be submitted by email to christine.jones@nnuh.nhs.uk.

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Closing date 28th February 2022

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The winners of the Rowan Hillson Inpatient Safety Award 2022: **The best interventions: Redesigning, rebuilding and maintaining safe inpatient diabetes care during COVID w**ill be published on the Association of British Clinical Diabetologists (ABCD) and Diabetes UK website and will appear and be referred to in future journal articles. By submitting your entry, you will be consenting to your initiative being used for these purposes. By submitting your entry you will also be consenting to your innovation being used and adapted by other Trusts in the country.