

Improving glycaemic management in people with diabetes on maintenance haemodialysis

APEXA KUVERJI,¹ JO REED,³ HARPREET SAWHNEY,³ JUNE JAMES,² ROB GREGORY,² JAMES BURTON,¹ ANDREW FRANKEL³ ON BEHALF OF DIABETES CARE IN HAEMODIALYSIS WORKING GROUP

Abstract

The Diabetes Care in Haemodialysis (DiH) working group aims to improve the care of people with diabetes mellitus on the haemodialysis unit by supporting the implementation of the 2016 JBDS guidelines. In order to support the implementation of the guideline recommendations the DiH working group have established a set of standards, developed an audit tool to demonstrate adherence to standards, and have developed educational support for haemodialysis staff both online and delivered face-to-face.

We publish audit findings from five distinct haemodialysis units, highlighting the impact of the educational programme on the achievement of guideline standards. We also report the impact of the COVID-19 pandemic on diabetes care and quality improvement.

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Key words: audit, haemodialysis, standards, Diabetes Care in Haemodialysis, end stage kidney disease

Background

People with End Stage Kidney Disease (ESKD) caused by diabetes mellitus (DM) account for 27.8% of people on maintenance haemodialysis (MHDx). When taking into account those with ESKD and DM where DM is not the cause of renal disease, this figure rises up to 40% in some units.¹ This population are at a particularly high risk of complications such as non-traumatic lower extremity amputation,² cardiovascular events,³ and death, with overall survival on MHDx in people with diabetes being approximately half that of their non-diabetic peers (3.7 vs. 7 years).⁴

Due to the scheduling of haemodialysis and the burden of disease, people with diabetes who are on MHDx often find difficulty in accessing the care required for their diabetes, and this cohort may receive suboptimal care. Since they may be under the care of multiple disciplinary teams, this population is also at risk of receiving fragmented care. It is therefore important to integrate joint working

to ensure that care is not overlooked or duplicated. In 2016, guidelines aimed at defining good quality care for a person with diabetes on MHDx were published by the Joint British Diabetes Societies (JBDS) in conjunction with the Renal Association.⁵ These guidelines have been widely supported and have been endorsed by Diabetes UK, Kidney Care UK and the Association of British Clinical Diabetologists. However, despite this widespread support and dissemination, it is unclear whether they are being used widely to improve the care of this population.

Aims/objectives

The Diabetes care in Haemodialysis (DiH) group defines core standards of care, and provides an audit tool to identify areas of sub-standard practice. It also provides educational tools to engage haemodialysis staff and people with DM. We describe how utilising the educational programme and other outputs of the DiH can be used to improve diabetes care.

Methods

The DiH strategy is built around a defined set of standards to define care of people with DM on MHDx that align broadly to the recommendations made within the JBDS guideline document. These standards were agreed upon by relevant key stakeholders and represent the core standards for DM care:

- a) All people with DM undergoing MHDx should have a documented annual review of their diabetes which includes review of glycaemic control, dietary review and foot and eye screening
- b) All people with DM on MHDx should have a clearly defined and personalised method of assessing glycaemic control, agreed with and understood by the individual (this should include access to continuous glucose monitoring where appropriate)
- c) All people with DM and on MHDx with a HbA_{1c} <58mmol/mol who are on a hypoglycaemic treatment (insulin or a sulphonylurea) should have had an intervention to minimise the risk of hypoglycaemia
- d) All people with DM and on MHDx with a HbA_{1c} >80mmol/mol should have had access to advice from the diabetes specialist team in order to facilitate improvement in glycaemic control
- e) All units should ensure that there is a clearly defined and easy to access rapid escalation pathway for individuals with active foot complications.

Subsequently an audit tool was created to support the implementation of guidelines and to allow for measure of adherence to standards by haemodialysis staff. The tool included eleven audit

¹ John Walls Renal Unit, Leicester General Hospital, Leicester, UK.

² Leicester Diabetes Centre, Leicester General Hospital, Leicester, UK.

³ Imperial College Healthcare NHS Trust UK

Address for correspondence: Dr Apexa Kuverji

John Walls Renal Unit, Leicester General Hospital, Gwendolen Road, Leicester LE5 4PW, UK

E-mail: apexa.patel1989@gmail.com

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Table 1 Standards of care with corresponding JBDS guideline recommendations⁵

Standards	JBDS Guidelines ⁵	Description
1a	1.4	100% of people with diabetes on haemodialysis are under a named Doctor/Nurse to support the delivery of their diabetes care (GP, Consultant, DSN)
1b	1.4	100% of people with diabetes on haemodialysis have had a documented annual review of their glycaemic control by a diabetes specialist or DSN.
1c	5.1	100% of people with diabetes on haemodialysis have had a documented dietary review of their diabetes by a Renal Dietitian in the last 12 months
1d	1.1	100% of people with diabetes on haemodialysis should have documented annual eye screening
2	2.5	100% of all people on insulin and/or sulphonylureas should be undertaking a personalised method of assessing glycaemic control
3a	2.1; 2.3	100% of people with diabetes on haemodialysis should have an HbA _{1c} done every 4 months
3b	3.1	0% of people on insulin therapy or a sulphonylurea should have HbA _{1c} <58 mmol/mol – (indicates high risk of hypoglycaemia)
3c	5.15	100% of all people on insulin and/or sulphonylurea have capillary blood glucose measured immediately before and after haemodialysis
4	3.1; 3.2	100% of people with HbA _{1c} >80 mmol/mol must have had access to Diabetes team in the preceding 4 months
5a	6.5	100% of people with diabetes on haemodialysis receive regular weekly foot inspections on the haemodialysis unit
5b	6.6	100% of people with diabetes on haemodialysis have had an annual foot risk assessment documented

JBDS=Joint British Diabetes Societies; GP=general practitioner; DSN=diabetes specialist nurse; HbA_{1c}=glycated haemoglobin

standards and measures, exclusion criteria and an audit question corresponding to each standard. The audit standards of care, with the corresponding JBDS recommendations, are highlighted in Table 1.

An important aspect of this strategy has been to engage the multiprofessional haemodialysis staff and people with DM. A face-to-face educational programme for haemodialysis staff was piloted in February 2019 in two renal networks (Imperial College London and Leicester) to ensure that the programme was fit for purpose and meeting the learning needs. An e-Learning module is currently under development to ensure learning is consolidated and resources for learning are provided to haemodialysis units.

Any programme aimed at improving care for people with long-term conditions must also include elements that facilitate patient activation and self-care. In order to support this, a patient charter was created in conjunction with Kidney Care UK and published in Kidney Matters Magazine and on the Kidney Care UK website in February 2020.⁶ This document is designed to raise awareness and to empower people with DM to be involved in their diabetes care and to understand what to expect in relation to this care once upon a haemodialysis unit.

Results

Education session feedback

Two pilot study days were carried out sequentially for haemodialysis unit staff, first in Leicester and then at Imperial College London, in February 2019. The topics covered are listed below:

- What is diabetes – the basics
- Diabetes in a person on haemodialysis – the implications
- Nutrition and hypoglycaemia
- Foot care on the dialysis unit
- Diabetes complications
- Managing glycaemia safely on the dialysis unit and interactive case studies
- End of life care

The feedback evaluation from both groups (with 14 haemodialysis staff from each group) was extremely positive, as shown in Figure 1 and Figure 2. Feedback from the first session (Figure 1) was carefully evaluated and the second session was adjusted in response to this, resulting in an improvement in feedback (Figure 2).

Qualitative feedback from both groups included quotes such as:

- *“The training will help me to progress and I can share this with my colleagues”*
- *“Excellent that there is now a course linking diabetes and haemodialysis”*
- *“A very useful day – great to have a training programme for people with diabetes on HD”*
- *“Going forward – I will ask my patients more in-depth about their diabetes treatments”*

Baseline results from haemodialysis units

The audit tool was initially piloted at three haemodialysis units:

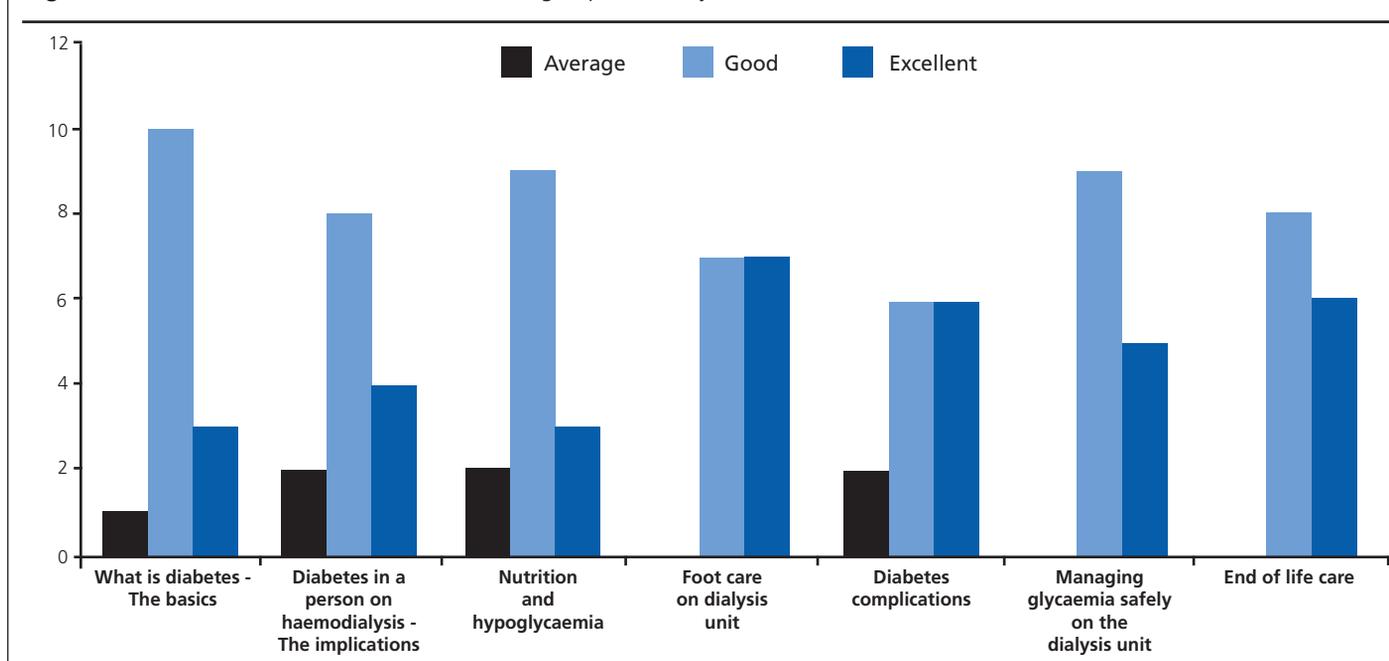
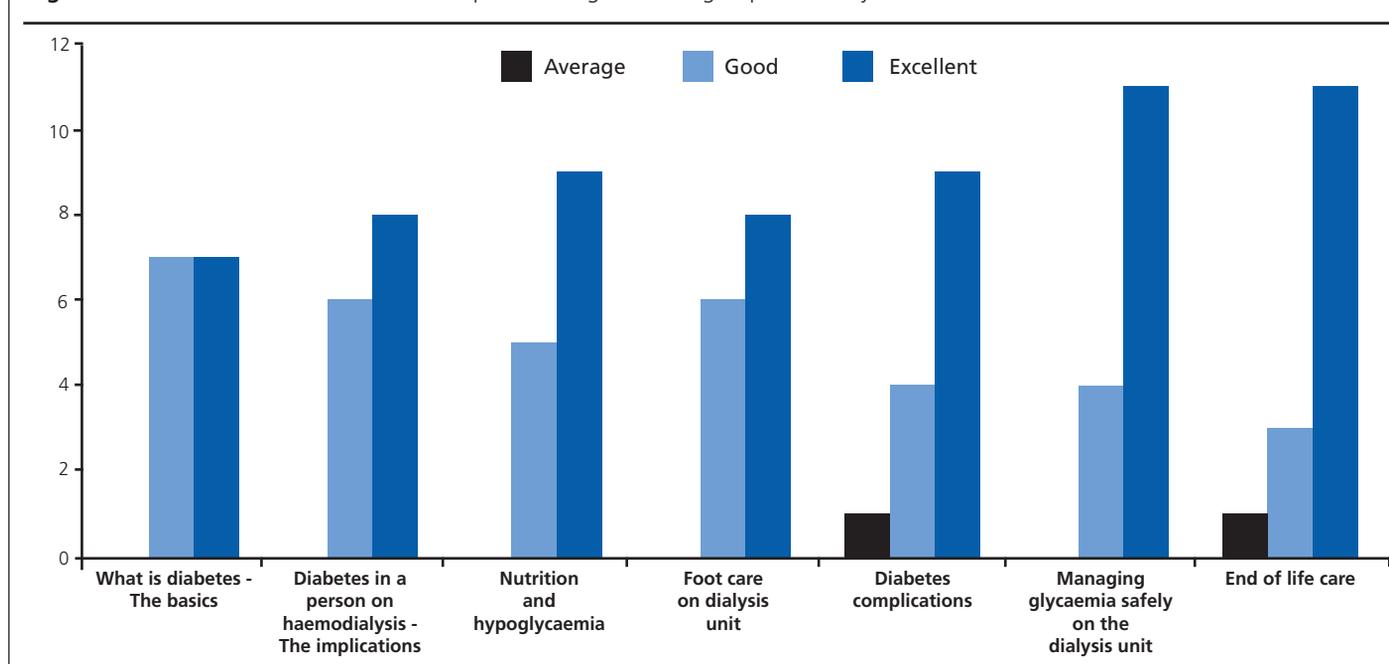
- Unit 1 – a London satellite unit (59 people with DM)
- Unit 2 – a London hospital-based unit (28 people with DM)
- Unit 4 – a Leicestershire hospital-based unit (70 people with DM)

The pilot was then extended to include three further units:

- Unit 3 – a Hertfordshire hospital-based unit (12 people with DM)
- Unit 5 – a Leicestershire satellite unit (31 people with DM)
- Unit 6 – a Leicestershire satellite non-NHS unit (49 people with DM)

A total of 249 people with DM were included in the audit. The pilot questionnaire was distributed for the individuals and dialysis nurses to fill out. The results for each standard at each haemodialysis unit are shown in Table 2.

Changes were made to the data collection tool after gathering the initial data and user feedback from all haemodialysis units. The final data collection tool was approved taking the feedback into consideration.

Figure 1. Feedback evaluation from the Leicester group - February 2019**Figure 2.** Feedback evaluation from the Imperial College London group - February 2019

Improvement in a region

Three haemodialysis units were re-audited after implementation of DiH-sponsored interventions. The results are highlighted in Table 3. The interventions included:

- 1) Presentation of guidelines and audit findings to renal dietitians to increase their awareness and engagement. Signposting educational resources for diabetes advice and creating a pathway for escalation of dietetic concerns.
- 2) Introduction of virtual diabetes-haemodialysis multi-disciplinary team (MDT) meetings to discuss each individual's glycaemic control. An allocated member of the team relayed outcomes from the meetings to the individual, including any relevant changes to glucose management.
- 3) Using Gold & Clarke scores in addition to the questionnaires to assess the risk of hypoglycaemia for those individuals with HbA_{1c} <58 mmol/mol

Table 2 Results of the haemodialysis units corresponding with each standard

	UNIT1 Satellite London NHS Unit		UNIT2 Hospital-based London NHS unit		UNIT3 Hospital-based Hertfordshire NHS unit		UNIT4 Hospital-based Leicestershire NHS unit		UNIT5 Satellite Leicestershire NHS unit		UNIT6 Satellite Leicestershire Non-NHS unit	
Stds	Aug-19		May-19		Nov-19		May-19		Aug-19		Aug-19	
1a	▶ 78.0%	46/59	▶ 75.0%	21/28	▶ 83.3%	10/12	▶ 78.6%	55/70	▶ 35.5%	11/31	▶ 73.5%	36/49
1b	▶ 40.7%	24/59	▶ 35.7%	10/28	▶ 41.7%	5/12	▶ 44.3%	31/70	▶ 19.4%	6/31	▶ 28.6%	14/49
1c	▶ 22.0%	13/59	▶ 60.7%	17/28	▶ 75.0%	9/12	▶ 14.3%	10/70	▶ 54.8%	17/31	▶ 44.9%	22/49
1d	▶ 83.1%	49/59	▶ 89.3%	25/28	▶ 91.7%	11/12	▶ 73.9%	51/69	▶ 74.2%	23/31	▶ 79.6%	39/49
2	▶ 81.4%	35/43	▶ 80.0%	20/25	▶ 88.9%	8/9	▶ 85.5%	47/55	▶ 90.5%	19/21	▶ 90.3%	28/31
3a	▶ 91.5%	54/59	▶ 78.6%	22/28	▶ 100.0%	12/12	▶ 87.1%	61/70	▶ 100.0%	31/31	▶ 49.0%	24/49
3b	▶ 74.4%	32/43	▶ 60.7%	17/28	▶ 55.6%	5/9	▶ 40.4%	19/47	▶ 47.6%	10/21	▶ 48.4%	15/31
3c	▶ 7.0%	3/43	▶ 0.0%	0/25	▶ 77.8%	7/9	▶ 97.9%	46/47	▶ 100.0%	21/21	▶ 96.8%	30/31
4	▶ 40.0%	2/5	▶ 0.0%	0/3	▶ 100.0%	0/0	▶ 0.0%	0/1	▶ 50.0%	2/4	▶ 100.0%	1/1
5a	▶ 28.8%	17/59	▶ 25.0%	7/28	▶ 66.7%	8/12	▶ 66.7%	38/57	▶ 100.0%	30/30	▶ 0.0%	0/49
5b	▶ 36.0%	18/50	▶ 34.8%	8/23	▶ 75.0%	9/12	▶ 21.1%	12/57	▶ 77.8%	14/18	▶ 20.0%	7/35

Legend: ▶ 90%+ ▶ 50%-90% ▶ <50%

- 4) Referral to primary or secondary care services for specialist diabetes input
- 5) Revision of education sessions for dialysis nurses – designed and delivered by DiH. Signposting podiatry services and creating escalation pathways for diabetic foot concerns.
- 6) Standardisation of foot care documentation across all dialysis units

Discussion

Audit tool

There was a difference in the manner in which the audit tool was completed across all the dialysis units. Unit 1 questionnaires were filled in by a DSN and renal doctor; Unit 2 asked the dialysis nurses to fill in the questionnaire; Unit 3 asked the individuals with DM to fill in the questionnaire; and at Unit 4, 5 and 6 the dialysis nurses and a renal doctor completed the questionnaire in conjunction with the individuals.

One of the problems encountered when collecting the data was the lack of documentation by the user; many of the boxes were left blank on the questionnaires that were given to dialysis nurses or individuals with DM to fill in (at Unit 1, 2 and 3). The data from these units may have been influenced by patient recall or limited access of the user to medical records. There were missing data from Unit 3: 30 questionnaires in total were handed out to people with DM on MHDx and only 12 were returned with responses. This suggests that input or oversight from a healthcare professional may lead to better completion of the audit questionnaire. This was confirmed by improved completion of the audit from Units 4, 5 and 6, where the data collected from individuals with DM were cross-checked by a healthcare professional with

documented data collected from various IT systems and medical records.

By piloting the audit questionnaire with different users, valuable feedback was gained that enabled adaptation of the questionnaire to make it more practical and fit for use. The questionnaire was adapted in the following ways:

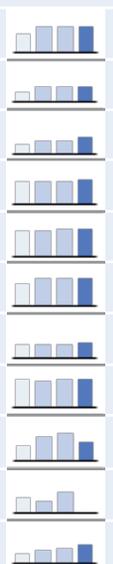
- Instructions on the questionnaires were modified and made easier to follow
- Closed questions were included to reduce the number of unanswered questions
- Sections were split and it was specified whether they were to be answered by individuals with DM or dialysis nurses

To address the variations in audit user, an audit tool pack, with instructions for use, was developed and distributed to dialysis units to ensure that data were collected and recorded as fully and accurately as possible. The pack was also uploaded to the DiH website for other renal networks to access.⁷

The improvement of care

Simple interventions improved compliance with most of the care standards measured. Referral to secondary care services for diabetes review resulted in Standard 1a (named diabetes healthcare professional) improving from 68% to 93.8% and Standard 1b (annual diabetes specialist review) improving from 34% to 54.7%. Dietary advice (Standard 1c) improved from 32.7% to 58.8% after presenting the initial findings to the renal dietitians and engaging them into the project. Virtual diabetes-dialysis MDT meetings were conducted to identify those at risk of hypoglycaemia. These improved the compliance to Standard 3b (hypoglycaemia risk) from 44.4% to 51.9%. The educational sessions and foot care pathway

Table 3 Total results of re-audit at three haemodialysis units in a region

Stds	Aug-19		Nov-19		Feb-20		Jul-20		
	Compliance	Numerator/Denominator	Compliance	Numerator/Denominator	Compliance	Numerator/Denominator	Compliance	Numerator/Denominator	
1a	68.0%	102/150	91.2%	135/148	92.8%	142/153	93.2%	138/148	
1b	34.0%	51/150	49.3%	73/148	51.6%	79/153	54.7%	81/148	
1c	32.7%	49/150	47.3%	70/148	46.4%	71/153	58.8%	87/148	
1d	75.8%	113/149	79.7%	118/148	79.7%	122/153	82.4%	122/148	
2	87.9%	94/107	93.3%	97/104	94.6%	105/111	96.3%	104/108	
3a	77.3%	116/150	94.6%	140/148	98.7%	151/153	97.3%	144/148	
3b	44.4%	44/99	44.7%	46/103	44.1%	49/111	51.9%	56/108	
3c	98.0%	97/99	88.3%	91/103	95.5%	106/111	97.2%	105/108	
4	50.0%	3/6	81.8%	9/11	100.0%	11/11	66.7%	4/6	
5a	50.0%	68/136	42.2%	62/147	68.6%	105/153	N/A	Unable	
5b	30.0%	33/110	48.5%	65/134	54.9%	84/153	62.2%	92/148	

Standard 5a was not measured in July 2020 due to limited access to the dialysis units at the time as a consequence of a COVID-19 outbreak.

empowered the nurses to identify foot problems early and improved compliance to Standard 5a (weekly foot inspections) from 50% to 68.6%.

There was significant variation in degree of improvement between the three units, particularly for standards relating to nursing care. Two of the units showed significant improvement within the first few months, however there was a delayed improvement shown from one of the units. This was attributed to a number of factors, including a change in service provider, inadequate training, and low level of staff confidence in recognising foot complications.

The impact of COVID-19 on diabetes care

The COVID-19 pandemic has affected many usual care processes in the NHS. It has also had an impact on service improvement. Provision of opportunistic diabetic eye screening at the dialysis unit was put on hold due to infection control measures during the COVID-19 pandemic. The compliance to Standard 1d (annual eye screening) therefore remained relatively stable throughout the year.

Regional outpatient care was initially cancelled to support inpatient services, and subsequently restarted in virtual format to reduce the risk of infection transmission. Compliance to Standard 4 (review in preceding 3 months if HbA_{1c} >80 mmol/mol) dropped from 100% to 66.7% during this period of the COVID-19 pandemic. An explanation for this may be the temporary suspension of outpatient care. Further re-audits may show that the compliance to the standard resumes once usual care processes resume.

Future DiH work

Current care has been evaluated based on the standards above,



Key messages

- Audit findings from five haemodialysis units show that compliance to care standards relating to JBDS guidelines are mostly below 90%.
- Simple interventions including the DiH educational programme has resulted in improvement in diabetes care on the haemodialysis units.
- The compliance to some standards has been affected by competing demands driven by the COVID-19 pandemic, and further re-audits are necessary to assess the long-term effects of this.

but the 2021 updated guidance from JBDS may prompt adaptation of the standards. In particular, Standard 3b may be modified to state that, "All people on insulin or a sulphonylurea should have assessment by blood glucose monitoring/continuous glucose monitoring to determine if they require a reduction in dose." This will take into consideration cases where HbA_{1c} may be falsely low due to altered red cell turnover and reduce the risk of treatment being automatically reduced inappropriately.

Summary

The DiH audit tool has been developed to collect information about the standards of diabetes care on haemodialysis units. The tool is easy to use but pilot studies revealed that in order to improve completion of the audit questionnaire, encouragement

and input from healthcare professionals is critical. The educational programme has received positive feedback and has resulted in improvement in compliance to standards on re-assessment. The compliance to some standards has been affected by competing demands driven by the COVID-19 pandemic, and further re-audits are necessary to assess the long-term effects of this. Future work from DiH includes releasing e-learning materials for haemodialysis staff, adapting standards based on the future JBDS guideline updates and sharing areas of good practice.

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