Healthcare Improvement Scotland

Scottish Patient Safety Programme

Medicines in Hospital

Measurement plan

November 2026

NHS SCOTLAND

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1 How to use this measurement plan

Measurement is an essential part of improvement. It helps teams understand if the changes they are implementing are leading to better outcomes and improved care. This measurement plan provides an overview of the three types of measurement used in improvement and outlines the data that participating teams are required to submit as part of the Scottish Patient Safety Programme (SPSP) Medicines in Hospital programme. It also describes the measures associated with the SPSP Medicines in Hospital change package and provides guidance on how to collect, analyse and display data effectively.

The Readiness for change toolkit can be used alongside this plan to help teams assess whether the conditions for change are in place, understand current practice against the Essentials of Safe Care, and identify priority areas for improvement. This can support teams in selecting and implementing the changes that are most likely to have the greatest impact in their local context.

This measurement plan should be used in conjunction with the SPSP Medicines in Hospital driver diagram and change package. All measures are aligned to the relevant primary drivers within the Medicines in Hospital driver diagram.

To learn more about measurement click on the link: The Improvement Journey - Measurement (TURAS)

1.1 Why measure

This measurement plan is intended to measure the impact of key changes that you want to make.

Measurement helps you to:

- recognise the variation that exists within your system and processes
- work out whether your changes are making an improvement, and
- help tell your improvement story.

To learn more about measurement click on the link: Introduction to measurement for improvement (TURAS)

1.2 Choosing measures

An improvement project should have a small family of measures that track the progress of the project over time. These should include:

- **Outcome measures:** to tell an NHS board, site or team whether the changes it is making are helping to achieve the stated aim. For example, measuring the rate of inpatient diabetic ketoacidosis (DKA) in your hospital.
- **Process measures:** to tell the team whether things that have to be carried out to achieve the desired outcome are happening reliably. For example, the number of patients with a completed self-management assessment. Learning from these measures can help inform tests of change.
- **Balancing measures:** to understand possible unintended consequences of the work elsewhere in the system. For example, how does a new change idea impact on staff experience.

Participating NHS boards should select outcome, process and balancing measures that help them understand whether the changes they are making are leading to improvement. Boards may may choose to use measures from this plan, or develop additional measures tailored to their local context. We encourage teams to seek local quality improvement support to develop alternative measures if required.
To learn more about measures click on the link: Developing your measures (TURAS)

1.3 How to measure

When planning your data collection consider:

Collecting your data

- what data will you collect?
- who will collect the data?
- when will you collect the data?
- how will you collect and record the data?
- Any local information governance and /or clinical governance procedures you should follow.

To learn more about data collection click on the link: Data collection (TURAS)

1.4 Sampling

Measuring for improvement relies on small sample sizes, often referred to as 'just enough' data to learn from. When it is not possible to access a larger amount of data, it is suggested that a random selection of five records per week, giving twenty records per month will gather enough data.

1.5 Presenting data

Run charts are an excellent way to present your data to help you understand what is happening in your service. They are used to distinguish between random variation (variation that affects all processes, people and outcomes equally) and non-random variation, which could be due to the changes you have introduced.

To learn more about presenting your data in a run chart click on the link: Presenting data and Time Series Charts for Improvement at the QI zone.

1.6 SPSP Data submission and reporting

Baseline collection of diabetic ketoacidosis (DKA), hyperosmolar hyperglycaemic state (HHS) and severe hypoglycaemia data is encouraged where feasible to establish a baseline, understand local patterns and variation, and identify priorities for improvement. Following baseline data collection, boards may select the outcome measure(s) most relevant to their local improvement priority.

NHS boards will be encouraged to submit at least one process measure alongside their outcome measure. Additional process and balancing measures may be selected to support local improvement work.

2 Medicines in Hospital measures

Readiness for change and identifying opportunities for improvement • **Readiness for change assessment tool** • **Engagement with adverse events team and/or regular case note review to identify opportunities for improvement**	
Outcome measures	• New onset inpatient diabetic ketoacidosis (DKA) • New onset inpatient hyperglycaemic hyperosmolar state (HHS) • Severe inpatient hypoglycaemia
Process measures	**A people-led approach to the planning and delivery of safe care** • Diabetes self-management assessment • Diabetes management discussions **Effective and inclusive communication** • Diabetes passports • Diabetes safety multidisciplinary team (MDT) huddles **Leadership at all levels to support a culture of safety** • 'Think, Check, Act' training completion • Shared learning from diabetes medicines-related harm reviews **Safe clinical and care processes for safe diabetes medicines management** • Identification and risk assessment of patients with diabetes • Individualised blood glucose ranges • Timely review of out-of-range blood glucose levels • Medicines reconciliation • Blood glucose measurement before insulin administration
Balancing measures	• Patient, family and carer experience (qualitative) • Staff experience (qualitative) • Significant Adverse Event Reviews (SAERs) relating to diabetes medicines-related harm • Critical care admission rate

2.1 Outcome measures

The operational definitions for the outcome measures have been adapted from those in the NHS England National Diabetes Inpatient Safety Audit (NDISA)

Concept/measure name	What/how to measure	Data collection and reporting
Rate of new onset inpatient diabetic ketoacidosis (DKA) per 1,000 occupied bed days (OBDs) (diagnosed more than 24 hours after admission)	**Operational definition:** DKA diagnosed more than 24 hours after admission, meeting all of the following criteria: • known diabetes or blood glucose over 11.0 mmol/l • ketonaemia (blood ketones 3.0 mmol/l or more) or urine ketones 2+ or more • acidosis with venous pH less than 7.3 or bicarbonate less than 15 mmol/l For more on the definition of DKA, please refer to the JBDS 02 The Management of Diabetic Ketoacidosis in Adults on the Association of British Clinical Diabetologists website. **Numerator:** number of inpatient DKA episodes **Denominator:** total number of OBDs **Calculation:** (numerator ÷ denominator) × 1,000 **Inclusion criteria:** all inpatient DKA episodes occurring more than 24 hours after admission in adults admitted to hospital **Exclusion criteria:** • DKA present on admission • DKA diagnosed within the first 24 hours • paediatric clinical areas • outpatients and day case areas • maternity units	**Data source:** as per incident management system or local data collection tool **Reporting frequency:** monthly data points reported quarterly **Type of chart:** run chart **For rare events**: data can be visualised locally as days between

Concept/measure name	What/how to measure	Data collection and reporting
Rate of new onset inpatient hyperglycaemic hyperosmolar state (HHS) per 1,000 OBDs (diagnosed more than 24 hours after admission)	**Operational definition:** HHS diagnosed more than 24 hours after admission, with all of the following characteristic features used in diagnosis: • hypovolaemia • marked hyperglycaemia (blood glucose 30 mmol/l or more) without significant ketonaemia (blood ketones less than 3 mmol/l) or acidosis (venous pH 7.3 or more/bicarbonate 15 mmol/l or more) • osmolality usually 320 mosmol/kg or more For more on the definition of HHS please refer to the JBDS 06 The management of the hyperosmolar hyperglycaemic state (HHS) in adults with diabetes on the Association of British Clinical Diabetologists website **Numerator:** number of inpatient HHS episodes **Denominator:** total number of OBDs **Calculation:** (numerator ÷ denominator) × 1,000 **Inclusion criteria:** all inpatient HHS episodes occurring more than 24 hours after admission in adults admitted to hospital **Exclusion criteria:** • HHS present on admission • HHS diagnosed within the first 24 hours of admission • paediatric clinical areas • outpatients and day case areas • maternity units	**Data source:** as per incident management system or local data collection tool **Reporting frequency:** monthly data points reported quarterly **Type of chart:** run chart **For rare events**: data can be visualised locally as days between

Concept/measure name	What/how to measure	Data collection and reporting
Rate of severe inpatient hypoglycaemia per 1,000 OBDs (occurring more than 6 hours into an admission episode)	**Operational definition:** a blood glucose measurement of less than 2.2 mmol/l in a person with diabetes, occurring more than 6 hours into an admission episode, irrespective of treatment regimen **Numerator:** number of inpatient episodes of severe hypoglycaemia **Denominator:** total number of OBDs **Calculation:** (numerator ÷ denominator) × 1,000 **Inclusion criteria:** adults with diabetes in an inpatient setting diagnosed with severe hypoglycaemia more than 6 hours after admission. **Exclusion criteria:** • individuals with severe hypoglycaemia present on attendance to hospital or developed within the first 6 hours • maternity units • paediatric clinical areas • outpatients and day case areas **Note:** where multiple qualifying blood glucose measurements occur within a short period, these should be recorded as one episode of severe hypoglycaemia per 24-hour period Different types of harm may still be recorded within the same 24-hour period where applicable For more on the definition of severe inpatient hypoglycaemia please refer to the National Diabetes Inpatient Safety Audit	**Data source:** as per incident management system or local data collection tool **Reporting frequency:** monthly data points reported quarterly **Type of chart:** run chart **For rare events**: data can be visualised locally as days between

2.2 Process measures

A people-led approach to the planning and delivery of safe care

Concept/measure name	What/how to measure	Data collection and reporting
Diabetes self-management assessment Percentage (%) of patients with diabetes treated with insulin, with a completed self-management assessment **Goal:** process reliability at 95% or greater	Use of a self-management assessment to support people with diabetes to continue to self-administer and/or adjust insulin doses whilst in hospital where appropriate. **Numerator:** number of sampled patients with a completed self-management assessment, as per local policy **Denominator:** total number of patients with diabetes **Calculation:** (numerator ÷ denominator) × 100 **Inclusion criteria:** • adults in an inpatient setting with diabetes treated with insulin • included within the local sampling methodology **Exclusion criteria:** • patients discharged, transferred, or deceased before a self-management assessment could reasonably be completed (for example, within 24 hours of admission, depending on local policy) • patients who are unable to participate in a self-management assessment due to clinical condition or capacity considerations, where this is documented according to local policy	**Data source:** to be determined locally **Reporting frequency:** monthly sample of 20 for example, sample 5 per week **Type of chart:** run chart Include all patients if total numbers are less than 20

Concept/measure name	What/how to measure	Data collection and reporting
Diabetes management discussions Percentage (%) of patients with documented evidence of discussion regarding diabetes management **Goal:** process reliability at 95% or greater	Care planning is undertaken in partnership with the person. **Guidance:** Documentation of diabetes management discussions may include, but are not limited to: • usual meal patterns • timing and frequency of blood glucose monitoring • insulin administration • insulin dosing and adjustments • management during illness • patient preferences and self-management considerations • other factors relevant to the individual's diabetes care **Numerator:** number of sampled patients with diabetes, with documented evidence of discussion regarding diabetes management **Denominator:** total number of sampled patients with diabetes **Calculation:** (numerator ÷ denominator) × 100 **Inclusion criteria:** • adults in an inpatient setting with a confirmed diagnosis of diabetes. • included within the local sampling methodology • evidence of documented discussion on one or more aspects of diabetes management **Exclusion criteria:** patients discharged, transferred or deceased before a discussion could reasonably be completed	**Data source:** the patient's medical and nursing notes and documentation **Reporting frequency:** monthly sample of 20 for example, sample 5 per week **Type of chart:** run chart Include all patients if total numbers are less than 20

Effective and inclusive communication

Concept/measure name	What/how to measure	Data collection and reporting
Diabetes passports Percentage (%) of completed diabetes passports **Goal:** process reliability at 95% or greater	Diabetes passports can facilitate communication between patients and healthcare staff by ensuring all necessary information is shared and understood. **Numerator:** number of sampled patients with diabetes with a completed diabetes passport as locally agreed **Denominator:** total number of sampled patients with diabetes **Calculation:** (numerator ÷ denominator) × 100 **Inclusion criteria:** • adults in an inpatient setting with a confirmed diagnosis of diabetes • included within the local sampling methodology **Exclusion criteria:** patients discharged, transferred or deceased before a diabetes passport could be completed	**Data source:** to be determined locally **Reporting frequency:** monthly sample of 20 for example, sample 5 per week **Type of chart:** run chart Include all patients if total numbers are less than 20

Concept/measure name	What/how to measure	Data collection and reporting
Multidisciplinary (MDT) huddles include diabetes safety concerns Percentage (%) of MDT huddles with documented discussion of diabetes medicines-related safety concerns **Goal:** process reliability at 95% or greater	Structured MDT discussions support the early identification and management of people at risk of harm as a result of diabetes medicines management and facilitate timely escalation to specialist diabetes expertise where required. **Guidance:** documentation may include discussion of: • patients at risk of DKA, HHS or severe hypoglycaemia • complex insulin management • recurrent out-of-range blood glucose levels • requirement for diabetes specialist review • other diabetes medicines safety concerns identified by the MDT **Numerator:** number of sampled MDT huddles with documented discussion of diabetes medicines-related safety concerns **Denominator:** total number of sampled MDT huddles **Calculation:** (numerator ÷ denominator) × 100 **Inclusion criteria:** • MDT huddles undertaken within participating clinical areas • included within the local sampling methodology **Exclusion criteria:** none	**Data source:** to be determined locally **Reporting frequency:** monthly sample of 20 for example, sample 5 per week **Type of chart:** run chart Include all patients if total numbers are less than 20

Leadership at all levels to support a culture of safety

Concept/measure name	What/how to measure	Data collection and reporting
'Diabetes Think, Check, Act' training completion Percentage (%) of eligible staff completing 'Diabetes Think, Check, Act' training	Staff completion of Diabetes Think, Check, Act to support safe inpatient diabetes care through improved knowledge, communication and education. To learn more about the online learning modules click on the link: Diabetes Think, Check, Act | Turas | Learn **Numerator:** number of eligible staff who have completed 'Think, Check, Act' training **Denominator:** total number of eligible staff **Calculation:** (numerator ÷ denominator) × 100 **Inclusion criteria:** staff identified locally as requiring completion of 'Think, Check, Act' training **Exclusion criteria:** none	**Data source:** to be determined locally **Reporting frequency:** monthly **Type of chart:** monitor current position locally

Concept/measure name	What/how to measure	Data collection and reporting
Shared learning from diabetes medicines-related harm reviews Percentage (%) of completed diabetes medicines-related harm reviews with evidence of shared learning **Goal:** process reliability at 95% or greater	Supports organisational learning and the dissemination of learning from diabetes medicines-related harm events to frontline clinical teams. **Numerator:** number of completed diabetes medicines-related harm reviews with documented evidence of shared learning with frontline teams **Denominator:** total number of completed diabetes medicines-related harm reviews **Calculation:** (numerator ÷ denominator) × 100 **Inclusion criteria:** Diabetes medicines-related harm incidents that have undergone a completed review in line with local policy **Exclusion criteria:** none	**Data source:** incident reporting system, as per local policy **Reporting frequency:** monthly **Type of chart:** run chart

Safe clinical and care processes for safe diabetes medicines management

Concept/measure name	What/how to measure	Data collection and reporting
Identification and risk assessment of patients with diabetes Percentage (%) of patients with diabetes identified and risk assessment documented **Goal:** process reliability at 95% or greater	Identification of people with diabetes and those at increased risk of inpatient diabetes harm as per local policy. **Guidance:** Risk assessment may include consideration of factors associated with increased risk of inpatient diabetes harm, including: • insulin treatment • previous severe hypoglycaemia • previous DKA or HHS • cognitive impairment • frailty • reduced oral intake • people boarded out with specialty • other locally agreed risk factors **Numerator:** number of sampled patients with diabetes identified and risk assessed as per local policy **Denominator:** total number of sampled patients with diabetes **Calculation:** (numerator ÷ denominator) x 100 **Inclusion criteria:** • adults in an inpatient setting with a confirmed diagnosis of diabetes • included within the local sampling methodology **Exclusion criteria:** none	**Data source:** the patient's medical and nursing notes and documentation **Reporting frequency:** monthly **Type of chart:** run chart

Concept/measure name	What/how to measure	Data collection and reporting
Individualised blood glucose ranges Percentage (%) of patients with documented evidence of an individualised blood glucose range **Goal:** process reliability at 95% or greater	Evidence of individualised blood glucose range documented as per local policy. An individualised blood glucose range supports effective inpatient diabetes management by providing personalised treatment goals and supporting clinical decision-making. **Numerator:** number of sampled patients with diabetes with documented evidence of individualised blood glucose range **Denominator:** total number of sampled patients with diabetes **Calculation:** (numerator ÷ denominator) x 100 **Inclusion criteria:** • adults in an inpatient setting with a confirmed diagnosis of diabetes • included within the local sampling methodology **Exclusion criteria:** none	**Data source:** as per local policy **Reporting frequency:** monthly sample of 20 for example, sample 5 per week **Type of chart:** run chart Include all patients if total numbers are less than 20

Concept/measure name	What/how to measure	Data collection and reporting
Timely review of out-of-range blood glucose levels Percentage (%) patients with a timely review of out-of-range blood glucose levels **Goal:** process reliability at 95% or greater	Evidence of timely review of out-of-range blood glucose levels. The definition of out-of-range can be locally agreed or as per individualised blood glucose range. **Numerator:** number of sampled patients with diabetes with a timely review of out-of-range blood glucose levels. **Denominator:** total number of sampled patients with diabetes with out-of-range blood glucose levels **Calculation:** (numerator ÷ denominator) x 100 **Inclusion criteria:** • adults in an inpatient setting with a confirmed diagnosis of diabetes. • included within the local sampling methodology. • have one or more out-of-range blood glucose measurements. **Exclusion criteria:** none	**Data source:** the patient's medical and nursing notes and documentation **Reporting frequency:** monthly sample of 20 for example, sample 5 per week **Type of chart:** run chart Include all patients if total numbers are less than 20

Concept/measure name	What/how to measure	Data collection and reporting
Medicines reconciliation Percentage (%) compliance with medicines reconciliation **Goal:** process reliability at 95% or greater	Medicines reconciliation completed in accordance with local policy, including agreed timeframes for completion. **Numerator:** number of patients with diabetes with completed medicines reconciliation **Denominator:** total number of sampled patients with diabetes **Calculation:** (numerator ÷ denominator) x 100 **Inclusion criteria:** • adults in an inpatient setting with a confirmed diagnosis of diabetes • included within the local sampling methodology **Exclusion criteria:** none	**Data source:** to be determined locally **Reporting frequency:** monthly sample of 20 for example, sample 5 per week **Type of chart:** run chart Include all patients if total numbers are less than 20

Concept/measure name	What/how to measure	Data collection and reporting
Blood glucose measurement before insulin administration Percentage (%) compliance with blood sugars measured before insulin dose administered **Goal:** process reliability at 95% or greater	A documented blood glucose measurement should be recorded before insulin administration in accordance with local policy. **Numerator:** number of patients with blood glucose level checked before insulin administrations **Denominator:** total number of sampled patients with diabetes **Calculation:** (numerator ÷ denominator) x 100 **Inclusion criteria:** • adults in an inpatient setting with a confirmed diagnosis of diabetes • included within the local sampling methodology **Exclusion criteria:** • patients receiving continuous intravenous insulin infusions (variable rate intravenous insulin infusion (VRIII) / sliding scale insulin) • patients using continuous subcutaneous insulin infusion (insulin pump therapy), where local practice does not require blood glucose measurement immediately prior to every insulin administration	**Data source:** to be determined locally For each patient check number of blood glucose levels measured before insulin administration over the last 24-hour period. When looking at the blood sugars checked for one patient, this is an all or nothing measure. **Reporting frequency:** monthly sample of 20 for example, sample 5 per week **Type of chart:** run chart

2.3 Balancing measures

Concept/measure name	What/how to measure	Data collection and reporting
Patient, family and carer experience Qualitative measure	Use of Experience Discovery Conversations within the Care Experience Improvement Model	Conversations with people, families and carers Care opinion, local service user feedback mechanisms, informal and formal complaint processes
Staff experience Qualitative measure	Staff experience and perceptions of safety within their clinical environment Refer to SPSP Essentials of Safe Care	Local safety climate processes and tools
Significant Adverse Event Reviews (SAERs) relating to diabetes medicines-related harm Percentage (%) of SAERs where diabetes medicines-related harm was identified as a component	**Numerator:** number of SAERs with diabetes medicines-related harm identified as a component of the adverse event, using locally agreed criteria for identification. **Denominator:** total number of SAERs in the sample **Calculation:** (numerator ÷ denominator) x 100 **Inclusion criteria:** • SAERs reviewed during the reporting period • diabetes medicines-related harm identified using locally agreed review criteria **Exclusion criteria:** none	**Data source** • local adverse event management systems • SAER reports and review documentation

Concept/measure name	What/how to measure	Data collection and reporting
Critical care admission rate related to DKA/HHS/severe hypoglycaemia Critical care admission rate per 1,000 OBDs **Goal:** monitor for impact of wider system changes related to rate of admission to critical care	Critical care admission rate is a balancing measure for teams to identify the impact of changes made in different parts of their diabetes medicines safety work. Interpretation of the measure should focus on understanding any change. A change does not automatically indicate an improving or deteriorating system. **Numerator:** total emergency transfers to critical care from emergency departments (ED) and downstream wards due to DKA, HHS or severe hypoglycaemia **Denominator:** total number of OBDs **Calculation:** (numerator ÷ denominator) x 1,000 **Inclusion criteria:** all patients who were emergency admissions to Critical Care (High Dependency, Coronary Care, Intensive Care or Emergency Retrieval Service assume responsibility for management of the patient for island, remote and rural NHS boards where applicable) from ED and downstream wards due to DKA, HHS or severe hypoglycaemia **Exclusion criteria:** patients transferred from Maternity Units and Outpatients, High Dependency and Coronary Care areas to Intensive Care	**Data source:** local electronic patient management systems that track number of admissions to critical care environments, reason for admission and bed occupancy **Reporting frequency:** monthly **Type of chart:** run chart **For rare events:** data can be visualised locally as days between

Table of abbreviations

DKA	diabetic ketoacidosis
ED	emergency departments
HHS	hyperglycaemic hyperosmolar state
MDT	multidisciplinary team
OBD	occupied bed days
SAER	Significant Adverse Event Reviews
SPSP	Scottish Patient Safety Programme

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