Scottish Patient Safety Programme

Deteriorating Patient and Sepsis

Measurement framework

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1. How to use this Measurement Framework

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 framework 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 SPSP Deteriorating Patient programme. It also describes the measures associated with the SPSP Deteriorating Patient change package and provides guidance on how to collect, analyse and display data effectively.

The readiness for change toolkit can be used alongside this framework 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 framework should be used in conjunction with the SPSP Deteriorating Patient and SPSP Sepsis driver diagrams and change packages. Measures are aligned to the relevant secondary drivers within the Essentials of Safe Care.

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

1.1 Why measure

This measurement framework 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, please see Measurement at the QI Zone on 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 cardiopulmonary resuscitation per 1000 discharges and deaths in your hospital.
- **Process measures:** to help the team understand whether key actions needed to achieve their local improvement aim are happening reliably. For example, the number of patients with a completed treatment escalation plan. 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 medical emergency calls.

Outcome measures are routinely collected through the SPSP Adults in Hospital programme for national reporting.

Participating teams are expected to submit outcome data on cardio pulmonary resuscitation and medical emergency calls with preceding deterioration quarterly. From January 2027, NHS boards will be encouraged to submit at least one process measure alongside their outcome measures.

Participating NHS boards should select process and balancing measures that help them understand whether the changes they are making are leading to improvement. Boards may choose to use measures from this framework, 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:

- 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 5 records per week, giving 20 records per month will gather enough data.

1.5 Presenting data

Run charts are an excellent way to present your data to help you to 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.

The SPSP Adults in Hospital Team will issue a toolkit for outcome measures and process measures to NHS boards participating in the SPSP Adults in Hospital programme.

To learn more about presenting your data, please see Presenting data and Time Series Charts for Improvement at the QI zone on TURAS.

2 Deteriorating Patient Measures

Participating NHS boards should select a small family of measures that support their local improvement work. **One outcome measure** is routinely submitted through the SPSP Adults in Hospital national reporting process alongside narrative progress reporting. **From January 2027**, 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 priorities.

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2.1 Outcome measures

Concept / Measure Name	What / How to measure	Data collection and reporting
Rate of Cardiopulmonary Resuscitation (CPR) per 1,000 discharges and deaths	**Operational definition:** All individuals in eligible clinical areas receiving chest compressions and/or defibrillation and attended by the hospital-based resuscitation team (or equivalent) in response to the 2222 call. **Numerator:** The total number of patients receiving CPR in the hospital site / NHS board for the month **Denominator:** The total number of discharges plus deaths in the hospital site / NHS board for the month **Calculation:** (numerator ÷ denominator) x 1000, reported as CPR events per 1,000 discharges and deaths. **Exclusion criteria:** patients within Emergency Departments, Coronary Care Units, Intensive Care Units, Paediatric clinical areas, Maternity Units, Outpatients and Day Case procedures.	**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
Percentage of Medical emergency calls with preceding deterioration	This measure supports understanding of whether patients experiencing a medical emergency demonstrated signs of deterioration in the preceding 24 hours. Monitoring this measure can support teams identify opportunities to improve the recognition, escalation and response to deterioration before a medical emergency occurs. **Operational definition:** Medical emergency events (2222 calls) in where evidence of deterioration was present within the previous 24 hours, including documented NEWS2 score ≥5, NEWS2 score of 3 in a single parameter, lactate ≥4 mmol/L, or documented concerns raised by staff, patients, families or carers. **Numerator:** The number of medical emergency events preceded by documented clinical deterioration within the previous 24 hours **Denominator:** The total number of medical emergency events in the sample **Calculation:** (numerator ÷ denominator) x 100 **Exclusion criteria:** Emergency Departments, Patients admitted less than 24 hours prior to the medical emergency event, Coronary Care Units, Intensive Care Units, Maternity Units, Outpatients and Day Case procedures.	**Data source:** As per incident management system or local data collection tool. **Reporting frequency:** Monthly sample of 20 e.g. sample 5 per week. **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
Patient, family and carer views and concerns are consistently sought and recorded Percentage patients with patient, family or carer views and concern recorded **Goal:** Process reliability at 95% or greater	The views and concerns of patients, their families or carers, including concerns about deterioration, are reliably sought and recorded within 24hrs of admission and at least daily thereafter. For example: '*How are you feeling compared to the last time we asked you (or since you came into hospital*)?' Any concerns raised and actions taken are documented in the patient's medical and nursing notes **Numerator:** Number of patients with documented evidence that patient, family or carer views and concerns were sought and recorded within 24 hours of admission and reviewed at least daily thereafter. **Denominator:** The total number of patients in the sample. **Calculation:** (numerator ÷ denominator) × 100 **Inclusion criteria:** All adult inpatients admitted for at least 24 hours.	**Collection method:** To be determined locally. **Data source:** The patient's medical and nursing notes. **Reporting frequency:** Monthly sample of 20 e.g. sample 5 per week. Include all patients if total numbers are less than 20. **Type of chart:** Run chart

Concept / Measure Name	What / How to measure	Data collection and reporting
Recorded patient, family and carer views and concerns inform care delivery Percentage of patients where their recorded concerns have informed care delivery **Goal**: Process reliability at 95% or greater	The views and concerns of patients, families or carers inform the person-centred care plan and subsequent care delivery. **Numerator:** The number of patients where their recorded concerns have informed documented approach to care delivery. **Denominator:** The total number of patients with documented concerns recorded. **Percentage:** (numerator ÷ denominator) x 100 **Inclusion criteria:** All adult inpatients with documented views and concerns recorded.	**Primary data source:** The patient's medical and nursing notes. **Reporting frequency:** Monthly sample of 20 e.g. sample 5 per week. Include all patients if total numbers are less than 20. **Type of chart:** Run chart.

Concept / Measure Name	What / How to measure	Data collection and reporting
Patients with a completed Treatment Escalation Plan Percentage of patients with a completed NHS Scotland Do Not Attempt Cardiopulmonary Resuscitation (DNACPR) form and a Treatment Escalation Plan **Goal:** Process reliability at 95% or greater	Where patients have a resuscitation decision documented there is a corresponding Treatment Escalation Plan in place. Treatment Escalation Plans are a communication tool that summarises treatment goals, including resuscitation status. **Numerator:** The number of patients with a completed Treatment Escalation Plan within the sample. **Denominator:** The total number of patients with a completed NHS Scotland DNACPR or ReSPECT form. **Calculation:** (numerator ÷ denominator) × 100 **Inclusion criteria:** All adult inpatients.	**Collection method:** to be determined locally. **Data source:** The patient's medical and nursing notes. **Reporting frequency:** Monthly sample of 20 e.g. sample 5 per week. Include all patients if total numbers are less than 20. **Type of chart:** Run chart.

Concept / Measure Name	What / How to measure	Data collection and reporting
Patients receiving CPR with a DNACPR in place Percentage of patients receiving CPR with a DNACPR in place	The occurrence of CPR being initiated in patients who had a documented DNACPR decision in place at the time of the cardiac arrest. **Numerator:** The number of patients who received CPR following an in-hospital cardiac arrest and had a documented DNACPR decision in place at the time of the event. **Denominator:** The total number of patients who received CPR following an in-hopsital cardiac arrest. **Percentage compliance:** (numerator ÷ denominator) x 100 **Inclusion criteria:** All patients who receive CPR following an in-hospital cardiac arrest. **Note:** Cardiac arrest reviews may help identify opportunities to improve future care planning, including timely consideration and documentation of DNACPR decisions and Treatment Escalation Plans where appropriate.	**Collection method:** to be determined locally. **Primary data source:** Cardiac arrest review documentation, clinical notes. Include all cardiac arrest reviews. **Reporting frequency:** Monthly **Type of chart:** Run chart

Effective and inclusive communication

Concept / Measure Name	What / How to measure	Data collection and reporting
Complete structured response Percentage compliance with structured response to deterioration **Goal:** Process reliability at 95% or greater	A structured process for responding to patient physiological deterioration includes Recognition, Response, Review and Reassessment. Boards can locally define what constitutes a complete structured response. **Numerator:** The number of patients with complete structured response within the sample. **Denominator:** The total number of patients in the sample. **Calculation:** (numerator ÷ denominator) × 100 **Inclusion criteria:** Patients who meet local criteria for a structured response to deterioration, including a NEWS2 score of ≥5 (or 3 in a single parameter), a lactate ≥4 mmol/L, or concerns raised by staff, patients, families or carers.	**Collection method:** to be determined locally. **Data source** The patient's medical and nursing notes and documentation, including NEWS2. **Reporting frequency:** Sample five patients weekly per ward/department with a NEWS2 score of ≥5 or include all patients if numbers less than 20/month. **Type of chart:** Run chart.

Leadership at all levels to support a culture of safety

Concept / Measure Name	What / How to measure	Data collection and reporting
Multidisciplinary cardiac arrest reviews Percentage of Cardiac Arrests with a multidisciplinary review **Goal:** Process reliability at 95% or greater	Multidisciplinary review of inpatient cardiac arrests. **Numerator:** Number of patients who received a completed multidisciplinary review following an inpatient cardiac arrest, using a locally agreed review process, with documented learning and/or improvement actions identified. **Denominator:** The total number of inpatient cardiac arrest events during the reporting period. **Calculation:** (numerator ÷ denominator) × 100 **Inclusion criteria:** All patients who experienced an inpatient cardiac arrest during the reporting period. **Exclusions:** Maternity and Outpatient Depts. Local teams should consider reviewing cardiac arrests in their emergency departments and critical care areas to enable learning from across the system. **Note:** Cardiac arrest reviews should be undertaken using a locally agreed review tool. Findings from reviews can be used to identify themes, inform improvement priorities, and monitor learning and improvement actions over time.	**Collection method:** to be determined locally. **Data source** incident reporting system, 2222 review process documents as per local policy. **Reporting frequency:** Monthly: report all in-patient cardiac arrest events that were recorded through the local incident reporting system, Datix, 2222 call review process, or equivalent local review process during the reporting period. **Type of chart:** Run chart

Safe clinical and care processes for reliable recognition of deterioration and standardised structured response

Concept / Measure Name	What / How to measure	Data collection and reporting
NEWS2 Frequency Percentage compliance with correct frequency of observations using NEWS2 **Goal:** Process reliability at 95% or greater	The National Early Warning Score (NEWS) 2 augments clinical judgement in the identification of acutely ill and deteriorating patients. **Numerator:** The number of patients with NEWS2 observations performed at the correct frequency as per local policy. **Denominator:** The total number of patients in sample. **Calculation:** (numerator ÷ denominator) × 100 **Inclusion criteria:** All in-patient wards managed through NEWS2. **Exlusion criteria:** Clinical areas not using NEWS2.	**Collection method:** to be determined locally. **Data source:** NEWS2 chart Check frequency of observations per patient, using a random sample of 20 patients per month per unit (sample 5 patients per week). When looking at all six observations for one patient, this is an all or nothing measure. **Reporting frequency:** Monthly **Type of chart:** Run chart

Concept / Measure Name	What / How to measure	Data collection and reporting
Delirium screening Percentage compliance with 4AT screening **Goal:** Process reliability at 95% or greater	A new onset delirium or confusion is a clinical condition that can indicate that a patient has deteriorated and is unwell. Delirium is a medical emergency. The 4AT tool is designed to be used by any health professional at first contact with the patient, and at other times when delirium is suspected. **Numerator:** Total number of patients with a completed 4AT score as per locally defined delirium screening criteria. **Denominator:** The total number of patients in the who meet locally defined delirium screening criteria. **Percentage compliance:** (numerator ÷ denominator) x 100 **Inclusion criteria:** All patients who meet the locally defined delirium screening criteria.	**Primary data source:** Local agreed documentation for 4AT, medical or nursing notes. Sample five patients weekly per ward/department who meet the locally defined delirium screening criteria or include all patients if numbers less than 20/month. **Reporting frequency:** Monthly **Type of chart:** Run chart

Concept / Measure Name	What / How to measure	Data collection and reporting
Delirium response Percentage compliance with TIME bundle implementation within 2 hours for patients with 4AT score of ≥ 4 **Goal:** Process reliability at 95% or greater	All patients identified as experiencing delirium with should have the TIME bundle for delirium management implemented within 2 hours of 4AT score of ≥ 4. • **T**hink, exclude and treat possible triggers • **I**nvestigate and intervene for possible underlying causes • **M**anagement plan initiated • **E**ngage and explore in discussion with the family **Numerator:** The total number of patients with a 4AT score of ≥ 4 who have evidence of the 4 elements of the TIME bundle documented within 2 hours of the trigger score **Denominator:** The total number of patients in the sample. **Percentage compliance:** (numerator ÷ denominator) x 100 **Inclusion criteria:** Patients with a new confusion, who have been screened and have 4AT score of ≥4.	**Primary data source:** The patient's medical and nursing notes including NEWS2 and 4AT/TIME chart as per local documentation. Sample five patients weekly per ward/department with a 4AT score of ≥4 or include all patients if numbers less than 20/month. **Reporting frequency:** Monthly **Type of chart:** Run chart

2.3 Balancing measures

Concept / Measure Name	What / How to measure	Data collection and reporting
Critical care admission rate (per 1,000 occupied bed days) **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 deteriorating patient 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 and downstream wards. **Denominator:** Total occupied bed days. **Rate:** (numerator ÷ denominator) x 1000 **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 downstream wards. **Exclusions:** Patients transferred from Maternity Units and Outpatients, High Dependency and Coronary Care areas to Intensive Care.	**Primary data source:** Local electronic patient management systems may track number of admissions to critical care environments and bed occupancy. **Reporting frequency:** Monthly **Type of chart:** Run chart **For rare events:** data can be visualised locally as days between.

Concept / Measure Name	What / How to measure	Data source
Hospital Standardised Mortality Ratio (HSMR)	Monitor for impact of wider system changes related to HSMR.	PHS Discovery
Patient, family and carer experience Qualitative measure	Use of 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 deterioration. Rate ofSAERS with deterioration as a component	**Numerator:** Total SAERs with deterioration identified as a component of the adverse event, using locally agreed criteria for identification. **Denominator:** Total number of SAERs in the sample. **Rate:** (numerator ÷ denominator) x 100	Local systems.

3 Sepsis specific measures

The following table outlines sepsis-specific measures for teams undertaking focused improvement work on sepsis as a subset of their deteriorating patient work. Teams undertaking sepsis improvement work can select their small set of measures from either the sepsis specific measures or the deteriorating patient measures depending on the focus of their work.

Outcome Measures	• Infection related mortality (proxy for suspicion of sepsis)
Process Measures	• Sepsis 6 performed within 3 hours for patients with NEWS2 ≥5 or 6 (or 3 in single parameter) with documented suspicion of infection • Patients with NEWS2 ≥7 and suspicion of infection who receive the first dose of IV antibiotics within 1 hour
Balancing Measures	• Patterns of antimicrobial resistance • Hospital Acquired Infection rates

3.1 Outcome measures

Concept / Measure Name	What / How to measure	Data collection and reporting
Infection related mortality % infection related mortality	Percentage of people with a Suspicion of Sepsis ICD-10 code in the first diagnostic position who die within 30 days of hospital admission. **Numerator:** The total number of people with a Suspicion of Sepsis ICD-10 code who died within 30 days of hospital admission. **Denominator:** The total number of people with a Suspicion of Sepsis ICD-10 code in the first diagnostic position. **Percentage**: (numerator ÷ denominator) x 100 **Exclusions:** (numerator and denominator): people younger than 16 years old.	**Primary data source:** PHS Discovery **Reporting frequency:** Monthly data points reported quarterly. **Type of chart:** Run chart. **For rare events:** data can be visualised locally as days between.

3.2 Process measures

Concept / Measure Name	What / How to measure	Data collection and reporting
Percentage of patients with NEWS2 5 or 6 (or 3 in a single parameter) with documented suspicion of infection with Sepsis Six performed within 3 hours of time zero **Goal:**Process reliability at 95% or greater	**Numerator:** The total number of patients with NEWS2 5 or 6 (or 3 in a single parameter) with a documented suspicion of infection who have **all** elements of Sepsis Six as locally agreed, completed within 3 hours of time zero. **Denominator:** The total number of patients in the sample. **Percentage compliance:** (numerator ÷ denominator) x 100 **Inclusion Criteria:** Patients who score 5 or 6 (or 3 in a single parameter) on NEWS2 with a documented suspicion of infection. **Time Zero:** Front Door – triage time. In-patient area – time of meeting inclusion criteria.	**Primary data source:** The patient's clinical notes, medication record, NEWS2 chart, and fluid balance chart. Sample five patients weekly per ward/department or include all patients if numbers less than 20/month. In specialty ward areas it might be helpful to batch similar wards together to provide a denominator of >10. **Reporting frequency:** Monthly **Type of chart:** Run chart

Concept / Measure Name	What / How to measure	Data collection and reporting
Percentage of patients with NEWS2 7 or more (or 3 in a single parameter) with documented suspicion of infection commenced on IV antibiotics within 1 hour. **Goal:** Process reliability at 95% or greater	**Definition:** Timely response to deterioration where sepsis is the suspected or confirmed cause. **Numerator:** The total number of patients with NEWS2 of 7 or more (or 3 in a single parameter) with documented suspicion of infection who receive first dose of IV antibiotics within 1 hour of time zero. **Denominator:** The total number of patients in the sample. **Compliance:** (numerator ÷ denominator) x 100 **Inclusion Criteria:** Patients who score 7 or more (or 3 in a single parameter) on NEWS2 (or locally defined trigger) with a documented suspicion of infection. **Time Zero:** Front Door – triage time. In-patient area – time of meeting inclusion criteria.	**Primary data source:** The patient's clinical notes, medication record, NEWS2 chart, and fluid balance chart. Sample five patients weekly per ward/department or include all patients if numbers less than 20/month. In specialty ward areas it might be helpful to batch similar wards together to provide a denominator of >10. **Reporting frequency:** Monthly. **Type of chart:** Run chart.

3.3 Balancing measures

Concept / Measure Name	Data Source
Patterns of antimicrobial resistance	PHS Discovery Antimicrobial Resistance and Healthcare Associated Infection (ARHAI) Indicators. Local Antimicrobial Resistance (AMR) data where available.
Hospital Acquired Infection (HAI) rates	PHS Discovery ARHAI Indicators: HAI Surveillance.

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