SEPSIS

A Decade of Change

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Executive Summary

Sepsis is a life threatening condition which has been given priority nationally and internationally. The diagnostic and treatment guidance is fluid and responsive to changing best practice. This can cause issues with implementation of guidance and ensuring patients receive appropriate treatment.

This Advancing Quality (AQ) report is designed to provide a clear summary of the progress that has been made in the North West over the last decade in the timely diagnosis and treatment of people with sepsis as well as improvement in outcomes for participating providers. The report is also intended to outline the variation and shortfalls that still exist for patients with sepsis.

Sepsis is a life-threatening organ dysfunction caused by a dysregulated host response to infection. It triggers an overwhelming systemic response to infection in which the immune system mediates a potentially damaging inflammatory response. It is difficult to diagnose definitively as the symptoms can mimic a number of other conditions. Successful management requires prompt recognition, appropriate intervention and appropriate escalation for decisive medical management.

Sepsis has high mortality and evidence suggests that incidence is increasing. There are about 240,000 sepsis admissions in England per year. This has increased due to both better recognition of the condition and also published coding guidance which has resulted in greater coding of the condition.

AQ is a North West quality improvement programme that supports healthcare organisations by gaining clinical consensus to establish evidence-based pathways for good care. The AQ measure sets use comparative analysis of audit information to identify opportunities to improve the delivery of patient care. Following the AQ pathway demonstrates an increase in the timely diagnosis and delivery of treatment for sepsis patients. Some measures are correlated with reductions in in-hospital mortality, long stays, and readmissions.

National guidance for the detection and timely treatment of sepsis patients in secondary care has stabilised. There is more work to be done to improve the detection and management of sepsis in out of hospital care settings.

Publicity & Awareness

Sepsis can develop rapidly and lead to serious illness and death. If the diagnosis is missed and treatment isn't given swiftly, the consequences can be dramatic. About 48,000 patients lose their lives to sepsis in the UK every year (1).

An important part of raising awareness has been seeing sepsis in headline news. While it has been reported that up to 1 in 4 sepsis deaths are preventable (2), recent research indicates that this figure is more like 1 in 20 (3). Timely diagnosis and treatment are important because patients who survive sepsis can be left with the dramatic and life-changing impact of limbs lost or severe organ damage (4). Recovery is a long and challenging journey which can leave patients with chronic conditions to manage (5). There is less public awareness about the long term health impact of a sepsis diagnosis.

Policy and Guidance

The failure of the healthcare systems to detect and treat sepsis has been recognised. The diagnostic toolsets and terminologies have evolved significantly in the last decade.

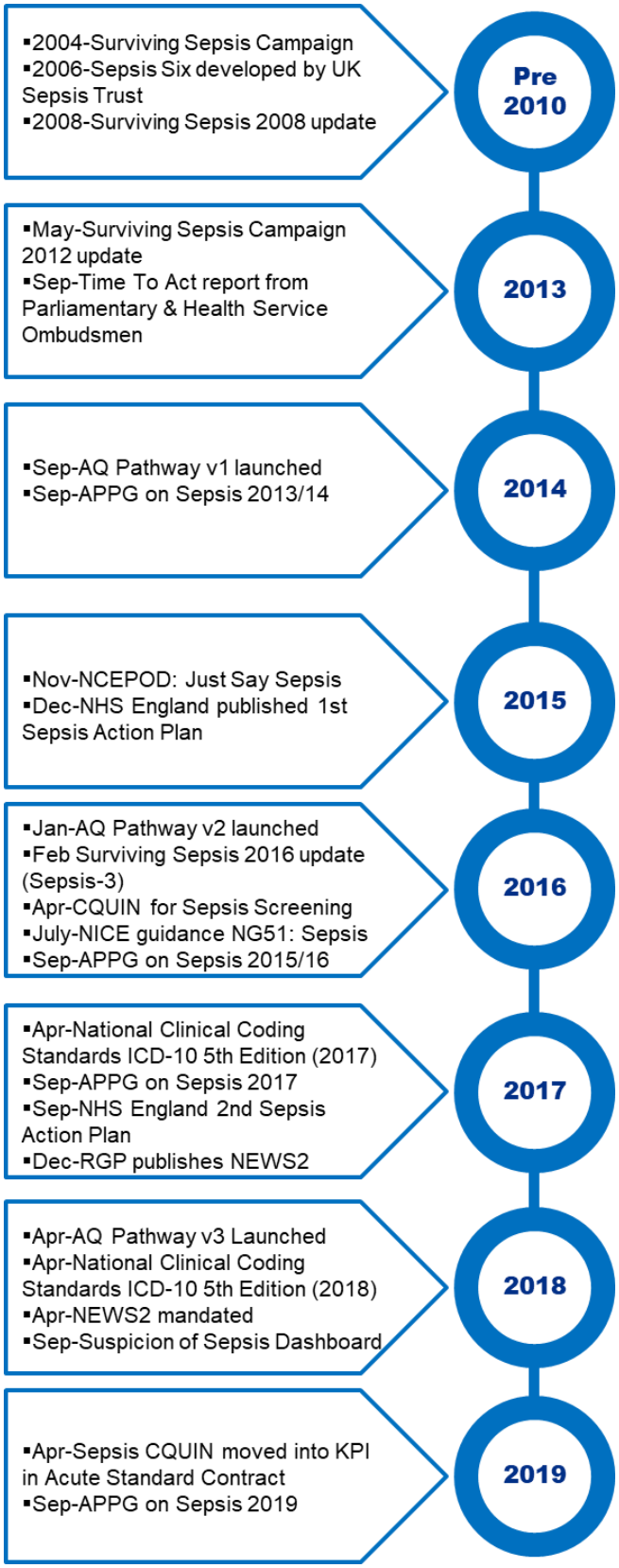

Fig. 1 Policy and Guidance Timeline

The foundation for improved sepsis awareness and treatment was the 2004 Surviving Sepsis Campaign. An international group of critical care and infectious disease experts reviewed the evidence and agreed management guidelines for severe sepsis and septic shock (6).

In 2013 the *'Time to Act'* parliamentary report documented failures in sepsis care and declared "rapid diagnosis and treatment saves lives" (2).

Recognising the need for clinically driven improvement, the AQ programme launched their sepsis pathway in 2014.

The UK Sepsis Trust produced the Sepsis Six bundle (7); broken down into 3 diagnostic and 3 therapeutic steps to be delivered within 1 hour of sepsis diagnosis. The bundle is proven to reduce mortality (8). The AQ programme revised sepsis measures to incorporate the Sepsis Six and to deliver on the Sepsis Action Plan.

In 2016 sepsis screening was added to the Commissioning for Quality and Innovation (CQUIN) financial incentive. Participating AQ providers had already been delivering the required audit locally for 2 years. After the 2017 publication of NEWS2 and 2018 requirement mandating its use, the AQ programme updated the sepsis measure set and ran a collaborative series designed to support organisations to adopt and embed. Throughout the period AQ has always acted quickly to synthesise the guidance and evidence into a complete package,

helped providers to identify appropriate patients, audited the care delivery and provided detailed reports and data that could be used to identify gaps in care and target improvements.

Diagnosis Toolsets

Sepsis is difficult to diagnose, but there are a number of tools available to aid in the diagnosis. Though the tools cannot definitively diagnose sepsis, they are a method of taking parameters that are already measured in secondary care and fitting them into a framework to evaluate a combined picture of severity. The challenge has been to find a tool that allows accurate and timely sepsis identification and to get agreement on which tool delivers the best performance.

Several methods are in use. Two or more Systemic Inflammatory Response Syndrome (SIRS) plus infection indicated a sepsis diagnosis. SIRS has a long history, first being introduced in the 1980s and adopted formally in 1992. The UK Sepsis Trust and NHS England developed the sepsis Red Flags for their 2014 toolkit. These were meant to build upon the SIRS and lend additional specificity to identify patients undergoing organ failure. The red flags can be used in a number of ways such as 2 SIRS plus 1 red flag or presumed infection plus 1 red flag. The quick Sequential Organ Failure Assessment (qSOFA) was developed as a bedside tool to rapidly identify adult patients with infection who are more likely to have poor outcomes. It was recommended by Sepsis-3 in 2016 (3). qSOFA is considered to be positive if the patient has at least 2 of the clinical criteria. NEWS2 was launched by the RCP in 2017 and mandated in 2018. A NEWS2 score of 5 or above is tied in with an encouragement to ‘think sepsis’.

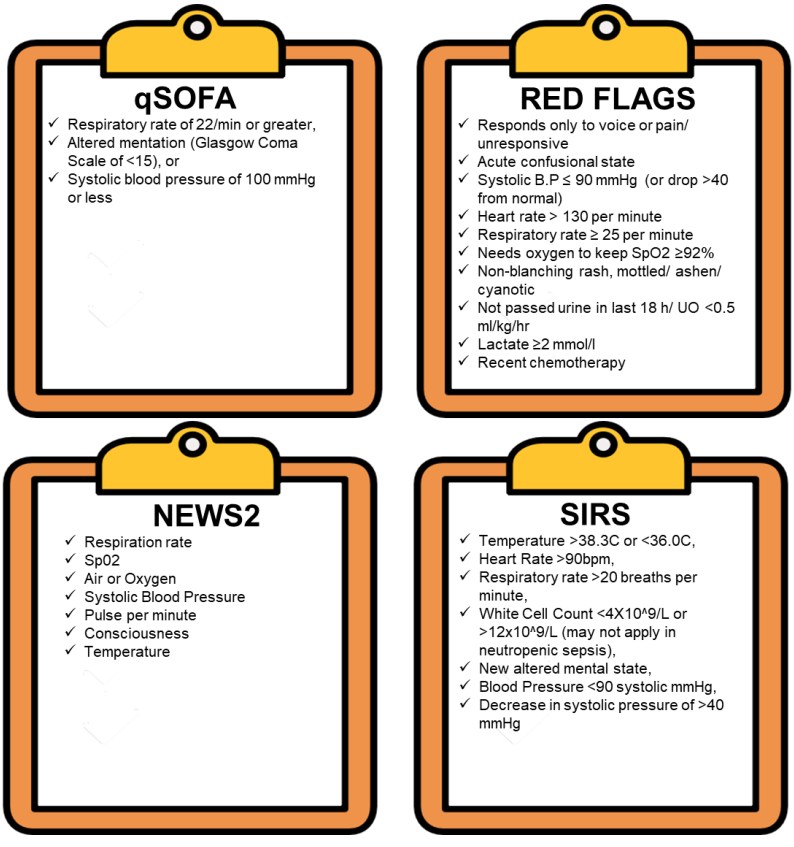

Fig. 2 Diagnosis Toolsets

Patient Experience

It cannot be overlooked that the numbers in this report reflect real people. All the analysis depicts patient activity. It is important to keep the patient in mind and ensure that the work improves the patient experience of diagnosis and treatment.

Patient stories of sepsis are an important component in understanding the real human cost of the disease. Patients are experts in their own health and treatment. An emotive patient story can serve as a retrospective to gaps in the pathway. AQ incorporates the lived experience perspective and focusses on the common themes they report.

Common issues in patient narratives are:

1. Disjointed treatment delaying sepsis diagnosis (4).
2. The speed at which patients with sepsis can deteriorate (5) (6).
3. Lack of knowledge of the aftereffects of sepsis (7) (8).

Measuring Sepsis

CODING

Sepsis is difficult to diagnose and is often seen alongside common conditions such as pneumonia or cancer. Diagnosis depends on a collection of symptoms that can mimic other conditions. The accuracy of hospital sepsis data is dependent on the contents of patient notes produced by clinical staff. Clinical coders follow published guidance to code diagnoses in patient notes against the International Classification of Diseases v10. The hospital sends an extract of the coded patient data to NHS Digital for SUS.

The coding guidance for the 2017 fiscal year gave new instructions that where sepsis was recorded in the patient notes, it must always be coded (9). This resulted in a dramatic increase in the number of sepsis codes recorded. When the coding volume increases it has an effect on every aspect of sepsis reporting as new populations look different from previously. This could cause increases or decreases in key measures when measuring trends from before and after the change. There was an adjustment in guidance the following year to clarify

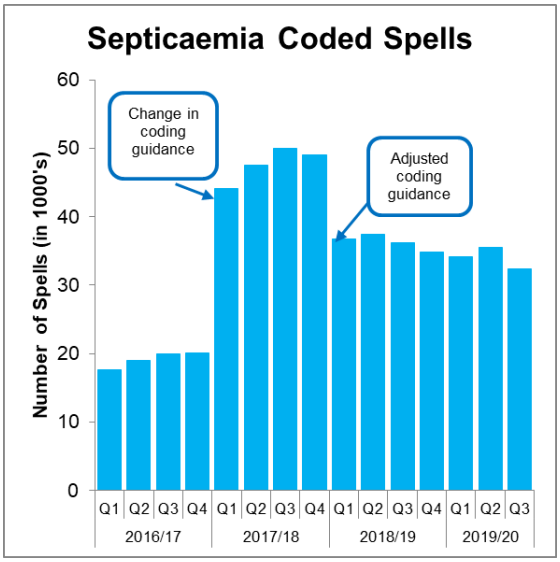

Fig. 4 Sepsis Coding Volumes Source: HED

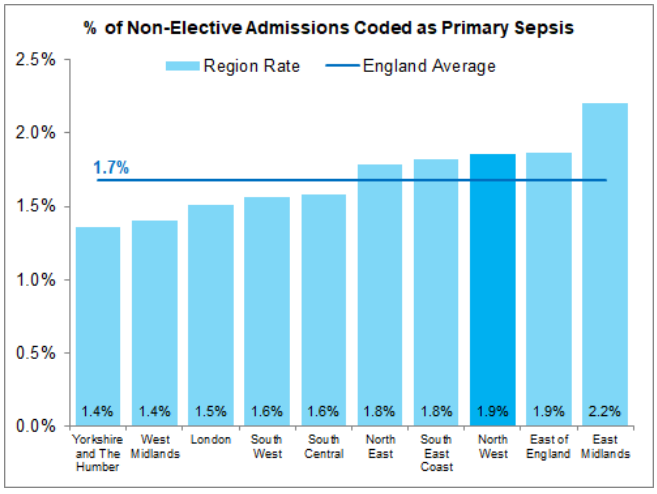

Fig. 3 NEL Admission Rates Source: HED

when to appropriately code sepsis (10), but 2017 heralded a step-change in the volume of sepsis coding (Fig. 4).

Analysis of patients admitted with a primary sepsis diagnosis indicates that most admissions are non-elective (96.5%). The North West region has the 3rd highest proportion of emergency spells coded as sepsis when compared to most other England regions. This could reflect a higher incidence of sepsis or higher levels of recording (Fig. 3).

Age and Gender Breakdowns

The risk of being diagnosed with sepsis increases with age, with the exception of an increased risk in the under 4s. Patients aged 70 and above account for 58% of septicaemia spells (Fig. 5).

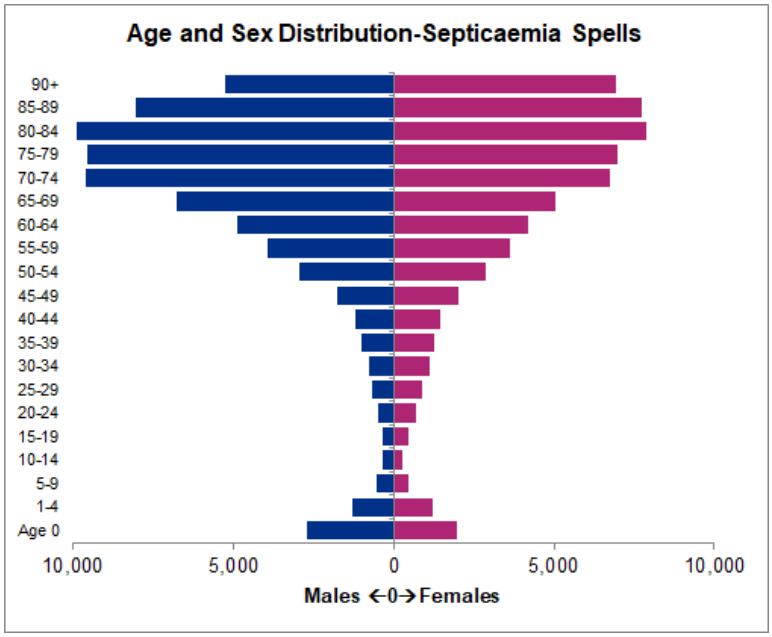

Fig. 5 Sepsis Spells by Age & Gender Source: HED

Sepsis is relatively evenly split between genders, with males making up 53% of admitted hospital spells in 2019. The age 90+ cohort has a greater proportion of female patients, but that reflects the longer life expectancy of women.

The overall Office of National Statistics (ONS) 2018 mortality shows that men have a slightly higher rate of deaths from Sepsis. The overall death rate was 4.76/per 100,000 in 2018. The death rate for the past 5 years has been relatively consistent (Fig. 6).

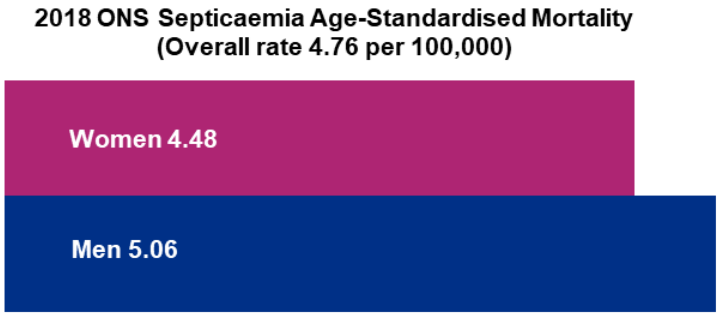

Fig. 6 ONS Mortality by Gender

The mean average length of stay (LoS) is 10.4 days. However, this is heavily correlated with age, ranging from a 3 day average for the youngest group up to an 11 day average for the 75-89 age groups (Fig. 7). The risk of dying in hospital increases with age and reaches 30% for those over 90 (Fig. 8). Readmission rates do not have the same profile, but are higher for the 50-79 age groups.

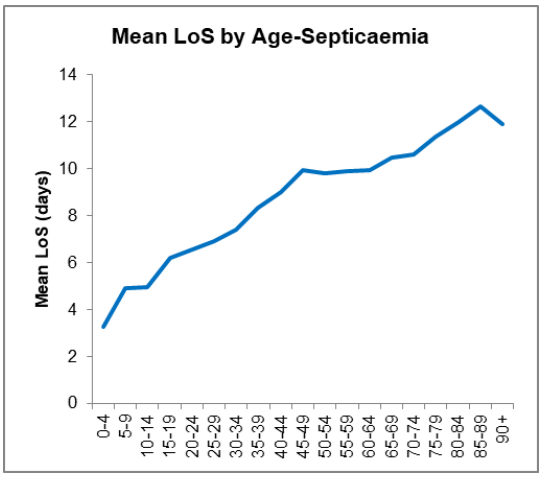

Fig. 7 LoS by Age Source: HED

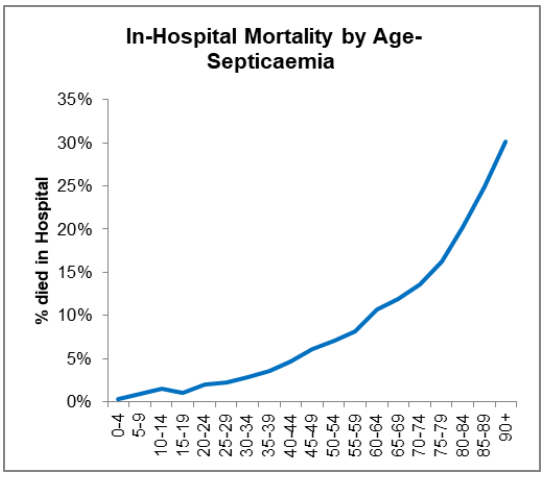

Fig. 8 In-Hospital Mortality by Age Source: HED

Comparing the North West

AQ was originally a North West Programme and still mainly supports providers in that area.

SHMI Mortality

The Summary Hospital-level Mortality Indicator (SHMI) is the ratio between the actual number of patients who die following hospitalisation at the trust and the number that would be expected to die on the basis of average England figures, given the characteristics of the patients treated there (11).

The overall SHMI for the North West region is on par with the England average (Fig.9).

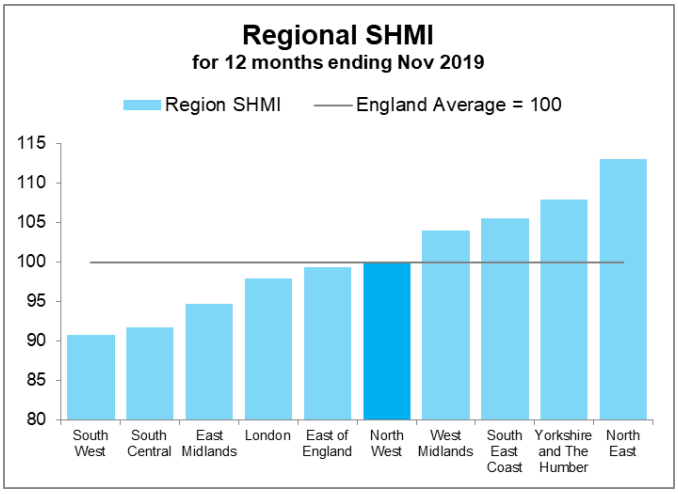

Fig.9 Regional SHMI Source: HED

However, the summary average disguises variation among trusts. There are 20 acute trusts in the North West and 3 of them have a Septicaemia SHMI that is statistically higher than expected (above the 95% Upper Control Limit on the funnel plot) (Fig. 10). The North West has 15% of trusts identified as high outliers. Only 1 other region in England has a similarly high proportion. This variation indicates that, while performance is unexceptional overall, opportunity for improvement still appears in the detail.The North West has the highest average length of stay of any region in England. At 11.1 days, it is ¾ day higher than the overall average of 10.4 days (Fig. 10).

The 30 day non-elective readmission rate is only slightly higher than average. However, septicaemia has a very high rate of readmission. The England septicaemia readmission rate is 16.7% which is almost double the overall readmission rate of 8.7%. The overall

readmission rate specific to the North West is 8.2% (slightly lower than the England rate). However, the North West septicaemia rate is 16.9% which is higher than the England Rate (Fig. 10).

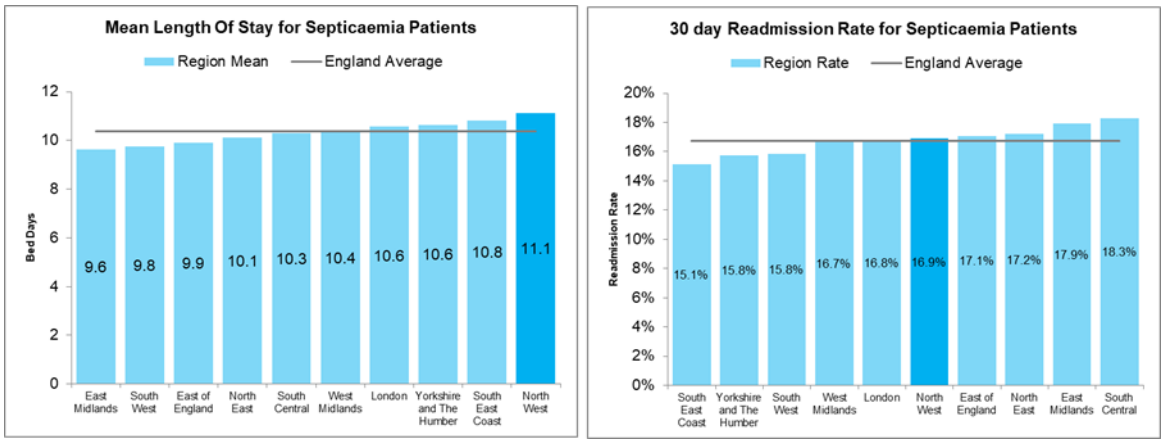

Fig. 10 Regional Length of Stay & Readmission Rate Source: HED

Advancing Quality Programme

In 2014, AQ added sepsis to their portfolio.

ADVANCING QUALITY SEPSIS MEASURES TRANSITION OVER TIME

	PHASE 1 - Sep 14 to Jun 16	PHASE 2 - Jul 16 to Aug 19	PHASE 3 - Apr 18 onwards
SCREENING	SEPS-01 Early Warning Score recorded within 60 minutes of hospital arrival		SEPSIS-11 National early warning score (NEWS2) recorded within 1 hour of hospital arrival
	SEPS-02 Evidence of 2 or more SIRS and documentation of suspected sepsis source within 2 hours of hospital arrival	SEPSIS-02 Evidence of screening for infection within 2 hours of hospital arrival	
TREATMENT	SEPS-03 Blood cultures taken within 3 hours of hospital arrival		SEPSIS-12 Blood cultures taken within 1 hour of sepsis diagnosis
	SEPS-04 Antibiotics administered within 3 hours of hospital arrival		SEPSIS-13 Antibiotics administered within 1 hour of sepsis diagnosis
	SEPS-05 Serum lactate taken within 3 hours of hospital arrival		SEPSIS-14 Serum lactate taken within 1 hour of sepsis diagnosis
	SEPS-06 Second litre of IV fluids commenced within 4 hours of hospital arrival		SEPSIS-15 IV fluids commenced within 1 hour of sepsis diagnosis
	SEPS-07 Oxygen therapy administered within 4 hours of hospital arrival		
	SEPS-08 Fluid Balance Chart commenced within 4 hours of hospital arrival		
	SEPS-09 Senior Review or assessment by Critical Care within 4 hours of hospital arrival		SEPSIS-16 Senior review within 2 hours of sepsis diagnosis
DATA COLLECTION	SEPS-10 Severity of sepsis documented (Data Collection Only)		
	SEPS-11 Antibiotic review within 72 hours of therapy commencing (Data Collection Only)		
		SEPSIS-09 Critical Care Admission within 48 hours of hospital arrival (data collection only)	
		SEPSIS-10 qSOFA score recorded (data collection only)	
			SEPSIS-17 Care pathway commenced following sepsis diagnosis

Fig.11 AQ Sepsis Phases & Measures

In the period from 2014 to 2020, the sepsis measure set has gone through 3 complete revisions. This reflects the rapid change in guidance over that time period.

The AQ measure set is specifically targeted at identifying and treating adult patients arriving at hospital with non-maternity sepsis.

The measure set has evolved over time - described here in Phases 1, 2 and 3 – and covers screening for sepsis, treatment and a data collection element (Fig.11).

Screening

The screening measures validate whether a patient who has an ICD-10 code for sepsis is eligible to receive the care outlined in the AQ measures. The first challenge with sepsis is diagnosis as it mimics other conditions that cause deterioration. The diagnosis method is multi-factored (Fig.12). More specific guidance led to a change for Phase 3, though audit of the collected data showed that there were still multiple methods being recorded for identification.

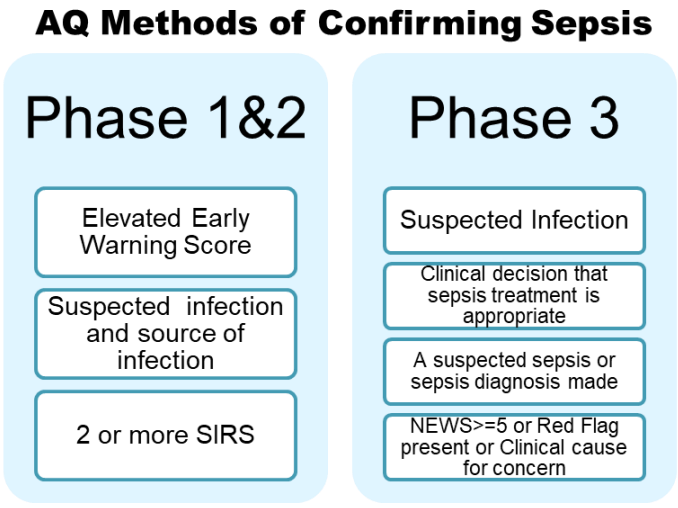

Fig.12 AQ Methods of Confirming Sepsis

Only the confirmed sepsis patients would be considered to have sepsis on arrival and go on to be audited for the remaining treatment measures of Blood Cultures, Antibiotics, IV fluids, Oxygen, Fluid Balance Chart and Senior Review.

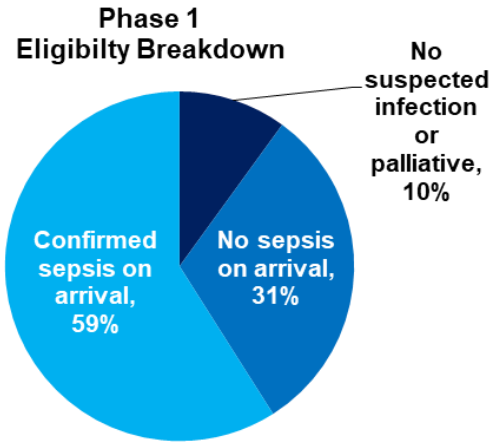

Fig. 13 AQ Pathway Eligibility

A surprising result of the Phase 1 (2014-2016) audit was the percentage of patients excluded from the treatment measures. Large numbers of patients were coded, but only about 6/10 were confirmed as having had sepsis on arrival for the AQ measures, despite being coded with sepsis (Fig. 13) The population definitions and algorithms were changed slightly for Phases 2 and 3, but the number of confirmed sepsis patients remains consistently between 50-70%, indicating that the specificity of diagnostic coding has not improved much. Sepsis remains difficult to identify and diagnose, even with increased scrutiny.

Treatment

The initial AQ treatment measures were similar to the UK Sepsis Trust's Sepsis Six (12), launched by the UK Sepsis Trust in 2006. The main differences between that and the AQ programme was around the designation of the time zero and time targets. The sepsis six are intended to be done within 1 hour of sepsis diagnosis (Fig. 14)

At that time an AQ survey showed 13/19 (68%) of trusts used a sepsis screening tool. Without a standard screening tool to trigger the time of sepsis diagnosis, there was no way to assure that a time of diagnosis was recorded in the patient notes. For the Phase 1 launch, the state of sepsis treatment in North West hospitals did not support the Sepsis Six one hour target. AQ used arrival time as a proxy time zero and extended the time allowed for the interventions to 3 hours. The additional time was to allow for the recognition and diagnoses of sepsis. Once the audit data was collected, it showed that there was large variation in the recording of an explicit sepsis diagnosis in the patient notes. The average was 40%, but the range was 25-98% (across 16 hospitals).

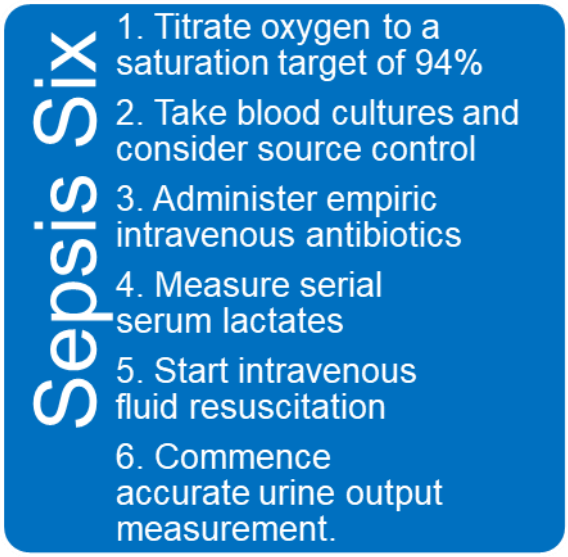

Fig. 14 Sepsis Six Source: UK Sepsis Trust

The changes between Phase 1 and Phase 2 were driven by Sepsis-3 (3) and the results of the analysis of Phase 1.

Phase 3 was initiated due to the patient safety alert mandating the use of NEWS2 (13) in acute hospitals and ambulance services and an AQ project in collaboration with Cheshire & Mersey Health and Care Partnership to support the implementation. This also drove a phased approach to the shift of hospitals between Phase 2 and Phase 3. Hospitals were only moved over to the new measures once they had implemented NEWS2 in their A&E departments. The full transition took from April 2018 to August 2019.

Data Collection

For the detection and treatment measures it is essential that we have comparative and reliable data based on the best available evidence. However, there are a number of useful measures that don't reach this threshold because:

1. There isn't sufficient evidence-basis or guidance to mandate the measure
2. Varying policy means that hospitals are limited in their ability to deliver
3. It allows information of interest to be collected for analysis, even if that isn't strictly necessary to monitor the pathway

Some data collection measures can be made permanent in future phases, but this has not happened with the sepsis measures.

The Phase 1 Severity of Sepsis measure demonstrated that severity was not uniformly recorded, but by Phase 2 the 'severe sepsis' and 'septic shock' designations were falling out of usage. The antibiotic review was also being collected in the new Sepsis CQUIN measure (14) so was removed to reduce data collection duplication. The Phase 2 qSOFA measure was implemented due to the Sepsis-3 guidance, but qSOFA never achieved popularity at NHS hospitals with only 1 participating trust implementing it. It was replaced by the NEWS2 mandate. The sepsis care pathway measure was added to Phase 3 for data collection only

as it is not mandated by guidance. Thus far, audit indicates that despite all hospitals having a care bundle, its usage is inconsistent for sepsis patients.

Measure Performance

This analysis covers the Phase 3 measure performance for providers using NEWS2 (from April 18 onwards).

The AQ measure sets are designed to drive improvement. By agreeing and standardising a set of measures of evidence based interventions, providers in the North West have the opportunity to better understand how well they are detecting, diagnosing and treating patients with sepsis and the outcomes for their patients

The AQ measures are not appropriate for every patient. They are specifically targeted to improve outcomes by facilitating fast identification and treatment of patients presenting with sepsis. For the current AQ Sepsis measure set (Phase 3) around half of patients identified through coding are excluded from the measures. Exclusion rates for individual measures range from 31% to 76% (Fig. 15)

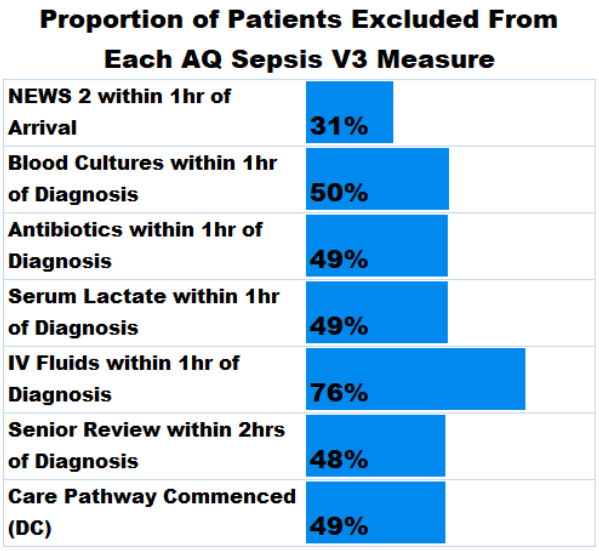

Fig. 15 AQ Sepsis Phase 3 Exclusions

In general, about 50% of the patients identified through coding are confirmed as having sepsis and are eligible for the measures.

Some measures are more reliably delivered. Almost 95% of patients have NEWS2 captured within an hour, but only around half have a senior review or a care pathway started (Fig. 16).

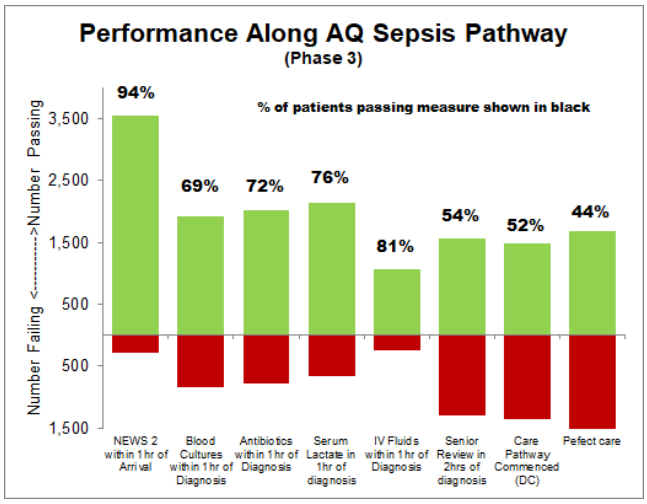

Fig. 16 Pass-Fail Breakdown by AQ Measure

The Sepsis Six evidence has clearly focused the attention of Trusts on the measures which need to be delivered within the first hour. These measures are appropriate for suspicion of sepsis as well as confirmed diagnosis. Most patients are receiving these measures; performance across these measures is in the 70-80% range. The later measures on the pathway perform more poorly indicating that the immediate treatment is better than the follow-up process.

The AQ programme has devised an 'Appropriate Care Score' to measure the proportion of patients that received all of the measures they were eligible for. We call this 'Perfect Care' and this currently applies to only 44% of sepsis patients. Less than half of all sepsis patients are receiving all the measures that evidence indicates is most likely to improve outcomes; there remains significant opportunities for trusts across the North West to improve the care delivered to sepsis patients.

The reason the Perfect Care measure is 10% lower than the lowest regular measure is due to inconsistent delivery of measures. The measures are all being delivered shortly after arrival in hospital, usually in the Emergency Department (ED). Delays in ED could cause delays in delivery of the appropriate sepsis measures.

IMPROVEMENT OVER TIME

There is a regular trend to the AQ audit performance. The initial year benchmarks performance. As the providers review and use the data, they are able to implement quality programmes to address gaps in service. This is evidenced by an increase in scores across the participating providers and also a contracting in the spread of scores, a reduction in treatment variation across the region.

When a change is made to the programme, a new baseline is captured, which may look like a drop in performance, but simply reflects a change in what is being measured. The improvement cycle then re-starts. The 'Compression Chart' captures that trend showing both the increase in performance scores and the reduction in variation (Fig.17).

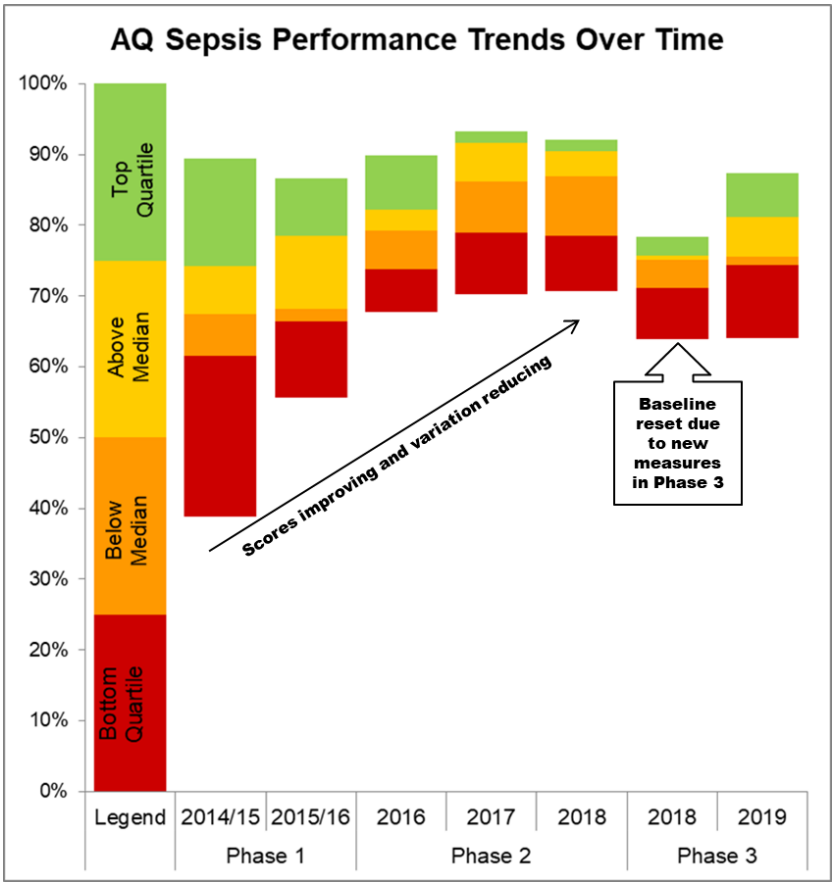

Fig.17 AQ Sepsis Compression Chart

Regional Quality Improvement

The trusts that participate in the AQ programme all:

- sign up to a clinically-supported evidence-based process in line with national policy
- collect patient-level data using a standardised approach and definitions
- agree to use the results to deliver improvement

The trusts benefit from the expertise and broad clinical consensus that underpins the programme, robust and comparable data to support analysis and understanding and QI support and expertise from the AQ programme to deliver improvement. AQ measures are specifically designed to be used for QI and we use specific techniques to drive a systematic approach to improvement (18).

AQ uses patient-level data to deep-dive into where a hospital is not delivering the standard of care expected. Some of the data collected is detailed enough to identify the specific issue. The AQ Improvement Advisors work with the trusts to support a structured quality improvement methodology and improve capability within the trust to support future improvements. There follows three case study examples of how AQ drives improvement.

AQ Case Study 1: Royal Liverpool

Royal Liverpool and Broadgreen NHS Trust identified an issue with the delivery of the AQ Sepsis measure for Serum Lactate Taken Within1 hour. Evidence suggests that the sickest sepsis patients have high levels of serum lactate. Timely measurement of serum lactate levels in patient pathways can improve early diagnosis. The trust identified the key drivers of poor performance for the measure and tested and implemented solutions to those challenges.

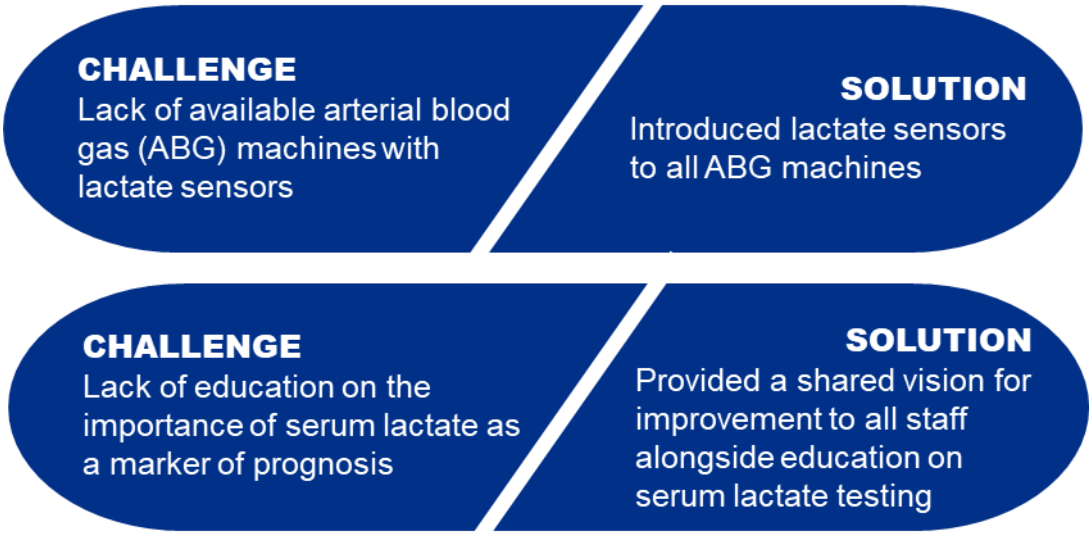

Fig. 18 RLB Challenges and Solutions

RLBUHT have successfully implemented a process to improve identification of the sickest sepsis patients which will lead to early identification and treatment and improved outcomes (15).

AQ Case Study 2: Pennine Acute

Pennine Acute is a large multi-site hospital with 3 separate A&E departments. They used the AQ data as part of a broad programme of improvement across trust sites that accompanied implementing the NEWS2 mandate within the trust.

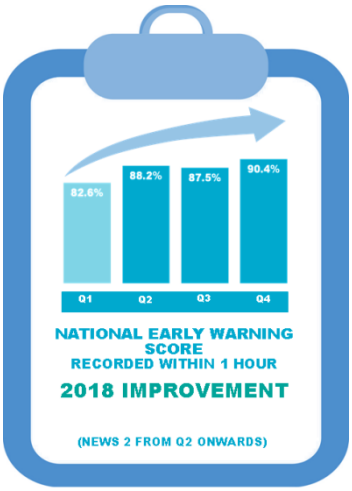

Fig. 19 PAT NEWS Improvement

They had multiple aims including

- To successfully implement NEWS2 across 4 acute sites without seeing a reduction in performance.
- To improve the proportion of patients having an early warning score recorded within 60 minutes of arrival at hospital.
- To improve the proportion of patients receiving antibiotics within 1 hour of sepsis diagnosis

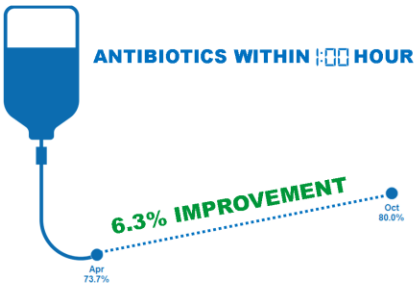

Fig. 20 PAT Antibiotic Delivery Improvement

Each site had a designated clinical lead that identified staff for a sepsis improvement team. Those teams reported to trust board and also to the CCG with their improvement initiatives. The trust used the AQ data to identify where to improve and monitored trends in performance using Plan, Do, Study, Act (PDSA) cycles to test changes for improvement. Using the AQ audit data as a baseline, they were able to achieve the stated aims of their QI project and demonstrate the improvements achieved. The trust improved performance for the proportion of patients having a recorded early warning score within 60 minutes of hospital arrival. Prior to the implementation of NEWS2, 83% of patients met this standard; by October 2018 this was over 90%. They also improved the proportion of patients receiving antibiotics within 1 hour of sepsis diagnosis. Rates improved from 74% in April 2018 to 80% in October 2018 (16).

AQ Case Study 3: Primary Care 24

The AQ QI methodology and support is not just available to secondary care providers. Primary Care 24 (PC24) provides urgent care services across the North West. In September 2016 PC24 started an improvement project with the aim to ensure that '75% of all adult patients being admitted to hospital with suspected sepsis from primary care would have a full set of documented observations.' Included in the definition of full set of observations were temperature, respiratory rate, blood pressure, pulse, level of consciousness and oxygen saturations. The trigger for this project was the result of the unexpected death from sepsis of a 37 year old normally fit and well patient.

The patient group included in this project were those who had a face-to-face consultation with a GP prior to being transferred to secondary care.

PC24 put together an action team that implemented a 4-pronged strategy:

- Action One: Establish an Improvement Team
- Action Two: Increasing Education and Awareness
- Action Three: Using Data to Improve
- Action Four: Collaborative Working

The initial baseline was 12% of patients receiving full observations. The 75% target was hit by month 12 of the initiative and was maintained for at least 12 additional months at last reporting. The organisation recognised that feedback on case outcomes and shared understanding of hospital processes motivated the out of hours GPs to consistently record full sets of observations and pre-alert secondary care clinicians for suspected sepsis admissions (17).

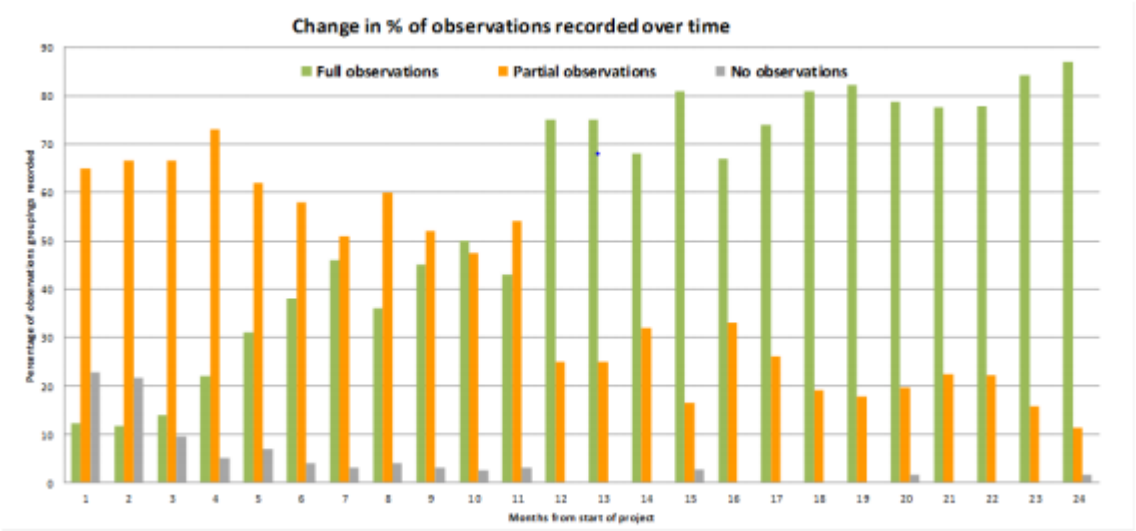

Fig. 21 PC24 Observations Recorded Improvement

Outcomes

The purpose of improving the processes for the diagnosis and treatment of patients with sepsis is to deliver improved outcomes. Outcomes can be difficult to measure for pathway and quality interventions. The AQ programme uses standard hospital activity data to identify populations. That standard dataset contains information about in-hospital mortality, length of stay and unplanned readmissions within 30 days.

A recent prospective observational cohort study (21) used univariable and multivariable logistic regression on Phase 1 & 2 AQ results. Results were adjusted for age, comorbidity and lactate levels. Results were reported using odds ratios (OR) and 95% confidence intervals.

An OR of less than 1 means something is less likely to occur, greater than 1 means more likely. A reduction in mortality, readmissions or long stays is an improvement (OR < 1).

This analysis showed that participation in the programme resulted in reduced length of stay in hospital and a reduced likelihood of readmission for sepsis patients.

- a reduction in readmissions within 30 days (OR 0.81 (0.69–0.95))
- a reduction in long hospital stays of over 10 days (OR 0.69 (0.60–0.78))

The participating trusts did not have a statistically significant reduction in mortality. However, specific measure analysis did indicate that the timely delivery of some measures had an effect on mortality, as well as the other outcomes.

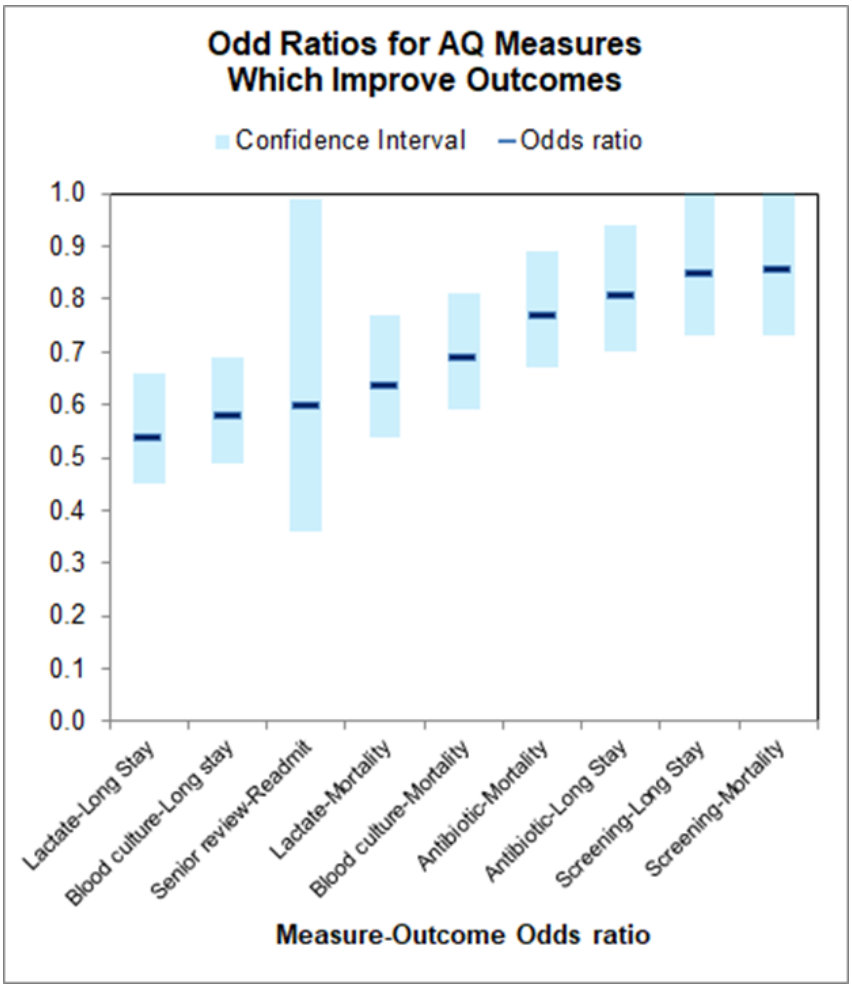

Fig. 22 Odds Ratios for Outcome Improvement

Reduced mortality and a reduction in long hospital stays were associated with meeting the Serum Lactate, Blood Culture, Screening and Antibiotic measures. Reduced readmissions were associated with patient having a timely senior review (Fig. 22).

Future of Sepsis

While there have been significant and measurable improvements in the delivery of sepsis diagnosis and treatment and in the outcomes for the providers participating in the AQ programme, perfection has not been attained. There is more opportunity to deliver improvements for participating providers in individual measures and in reducing variation in comparison to peer trusts. In addition, non-participating providers have an opportunity to join the programme and evidence and compare their level of delivery.

Following on the mandated use of NEWS2 in acute trusts and ambulance services, there has been a benefit seen for the use of a ‘common language’. The NEWS2 score gives a standard threshold for escalation, a simple method of tracking changes in the patient’s condition and a way to communicate that across different areas. The PC24 case study shows one way patient diagnosis can be improved.

The NEWS2 score is not mandated or validated for use in primary care or care homes. However, as a NEWS2 >= 5 is a sign that urgent clinical review may be needed, it may be

useful within those areas for a standard trigger for escalation to secondary care. It “does not replace clinical judgement but can be used as an adjunct to patient assessment in general practice (18)”. Some progress has been made in this area. The RESTORE2™ tool is a physical deterioration and escalation tool for care/nursing homes based on nationally recognised methodologies including early recognition (Soft Signs), the national early warning score (NEWS2) and structured communications (SBARD) (19) (20).

As patients in care may already be frail and have a NEWS2 > 0, they may benefit from having a baseline NEWS2 recorded (21). In that way changes to the baseline can indicate new deterioration and inform escalation.

Work is on-going to continue to spread good sepsis practice beyond acute care and increase awareness in primary and community care.

However, the NEWS2 score alone is not a complete solution to the difficulties in diagnosing sepsis. The use of biomarkers to identify sepsis is currently being studied. Biomarkers can be used to identify (or rule out) sepsis and also guide appropriate treatment. Some North West Hospitals are participating in the PRONTO trial which is testing for procalcitonin (PCT) plus NEWS compared to current standard of care using NEWS alone (22).

The challenge of sepsis will continue to impact health care and new research and solutions are always being published in this dynamic subject.

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Appendix

SEPSIS CODING AND ANALYSIS

There is no universally-agreed definitive list of ICD-10 codes that define sepsis. Most sepsis is coded using a few common codes; however there is a long additional list of codes that are occasionally used. For the analysis in this paper there were consistent codes used for specific data sources. All groups exclude maternal sepsis.

Comparison of ICD10 Coded Activity Between SHMI Septicaemia (CCS2) and AQ Sepsis

Subgroup	Code	SHMI Septicaemia (CCS 2)	AQ Sepsis	Number coded in 12 months ending Nov 19	% of coded sepsis terms
A02 - OTHER SALMONELLA INFECTIONS	A021 - SALMONELLA SEPTICAEMIA	✓		94	0.1%
A20 - PLAGUE	A207 - SEPTICAEMIC PLAGUE	✓		-	
A22 - ANTHRAX	A227 - ANTHRAX SEPTICAEMIA	✓		-	
A26 - ERYSIPELOID	A267 - ERYSIPELOTHRIX SEPTICAEMIA	✓		-	
A32 - LISTERIOSIS	A327 - LISTERIAL SEPTICAEMIA	✓	✓	23	0.0%
A39 - MENINGOCOCCAL INFECTION	A392 - ACUTE MENINGOCOCCAEMIA	✓		19	0.0%
	A393 - CHRONIC MENINGOCOCCAEMIA	✓		-	
	A394 - MENINGOCOCCAEMIA, UNSPECIFIED	✓		311	0.2%
A40 - STREPTOCOCCAL SEPTICAEMIA	A400 - SEPTICAEMIA DUE TO STREPTOCOCCUS, GROUP A	✓	✓	696	0.5%
	A401 - SEPTICAEMIA DUE TO STREPTOCOCCUS, GROUP B	✓	✓	597	0.4%
	A402 - SEPTICAEMIA DUE TO STREPTOCOCCUS, GROUP D	✓	✓	310	0.2%
	A403 - SEPTICAEMIA DUE TO STREPTOCOCCUS PNEUMONIAE	✓	✓	906	0.6%
	A408 - OTHER STREPTOCOCCAL SEPTICAEMIA	✓	✓	1,574	1.1%
	A409 - STREPTOCOCCAL SEPTICAEMIA, UNSPECIFIED	✓	✓	447	0.3%
	A40X - STREPTOCOCCAL SEPTICAEMIA		✓	-	
A41 - OTHER SEPTICAEMIA	A410 - SEPTICAEMIA DUE TO STAPHYLOCOCCUS AUREUS	✓	✓	3,066	2.1%
	A411 - SEPTICAEMIA DUE TO OTHER SPECIFIED STAPHYLOCOCCUS	✓	✓	1,521	1.1%
	A412 - SEPTICAEMIA DUE TO UNSPECIFIED STAPHYLOCOCCUS	✓	✓	385	0.3%
	A413 - SEPTICAEMIA DUE TO HAEMOPHILUS INFLUENZAE	✓	✓	78	0.1%
	A414 - SEPTICAEMIA DUE TO ANAEROBES	✓	✓	291	0.2%
	A415 - SEPTICAEMIA DUE TO OTHER GRAM-NEGATIVE ORGANISMS	✓	✓	18,755	13.1%
	A418 - OTHER SPECIFIED SEPTICAEMIA	✓	✓	2,322	1.6%
	A419 - SEPTICAEMIA, UNSPECIFIED	✓	✓	111,266	77.9%
	A41X - OTHER SEPTICAEMIA		✓	-	
A42 - ACTINOMYCOSIS	A427 - ACTINOMYCOTIC SEPTICAEMIA	✓	✓	6	0.0%
B00 - HERPESVIRAL [HERPES SIMPLEX] INFECTIONS	B007 - DISSEMINATED HERPESVIRAL DISEASE	✓		12	0.0%
B37 - CANDIDIASIS	B377 - CANDIDAL SEPTICAEMIA		✓	102	0.1%
R57 - SHOCK, NOT ELSEWHERE CLASSIFIED	R572 - SEPTIC SHOCK	✓	✓	24	0.0%
R65 - SYSTEMIC INFLAMMATORY RESPONSE SYNDROME [SIRS]	R650 - SYSTEMIC INFLAMMATORY RESPONSE SYNDROME OF INFECTIOUS ORIGIN	✓	✓	-	
	R651 - SYSTEMIC INFLAMMATORY RESPONSE SYNDROME OF INFECTIOUS ORIGIN	✓	✓	-	
U80 - AGENT RESISTANT TO PENICILLIN AND RELATED ANTIBIOTICS	U800 - PENICILLIN RESISTANT AGENT	✓		-	
	U801 - METHICILLIN RESISTANT AGENT	✓		-	
	U808 - AGENT RESISTANT TO OTHER PENICILLIN-RELATED ANTIBIOTIC	✓		-	
U81 - AGENT RESISTANT TO VANCOMYCIN AND RELATED ANTIBIOTICS	U810 - VANCOMYCIN RESISTANT AGENT	✓		-	
	U818 - AGENT RESISTANT TO OTHER VANCOMYCIN-RELATED ANTIBIOTIC	✓		-	
U82 - RESISTANCE TO BETALACTAM ANTIBIOTICS	U820 - RESISTANCE TO PENICILLIN	✓		-	
	U821 - RESISTANCE TO METHICILLIN	✓		-	
	U822 - EXTENDED SPECTRUM BETALACTAMASE (ESBL) RESISTANCE	✓		-	
	U828 - RESISTANCE TO OTHER BETALACTAM ANTIBIOTICS	✓		-	
	U829 - RESISTANCE TO BETALACTAM ANTIBIOTICS, UNSPECIFIED	✓		-	
U83 - RESISTANCE TO OTHER ANTIBIOTICS	U830 - RESISTANCE TO VANCOMYCIN	✓		-	
	U831 - RESISTANCE TO OTHER VANCOMYCIN RELATED ANTIBIOTICS	✓		-	
	U832 - RESISTANCE TO QUINOLONES	✓		-	
	U837 - RESISTANCE TO MULTIPLE ANTIBIOTICS	✓		-	
	U838 - RESISTANCE TO OTHER SINGLE SPECIFIED ANTIBIOTIC	✓		-	
	U839 - RESISTANCE TO UNSPECIFIED ANTIBIOTIC	✓		-	
U84 - RESISTANCE TO OTHER ANTIMICROBIAL DRUGS	U840 - RESISTANCE TO ANTIPARASITIC DRUG(S)	✓		-	
	U841 - RESISTANCE TO ANTIFUNGAL DRUG(S)	✓		-	
	U842 - RESISTANCE TO ANTIVIRAL DRUG(S)	✓		-	
	U843 - RESISTANCE TO TUBERCULOSTATIC DRUG(S)	✓		-	
	U847 - RESISTANCE TO MULTIPLE ANTIMICROBIAL DRUGS	✓		-	
	U848 - RESISTANCE TO OTHER SPECIFIED ANTIMICROBIAL DRUG	✓		-	
	U849 - RESISTANCE TO UNSPECIFIED ANTIMICROBIAL DRUGS	✓		-	
U85 - RESISTANCE TO ANTINEOPLASTIC DRUGS	U85X - RESISTANCE TO ANTINEOPLASTIC DRUGS	✓		-	
U88 - AGENT RESISTANT TO MULTIPLE ANTIBIOTICS	U88X - AGENT RESISTANT TO MULTIPLE ANTIBIOTICS	✓		-	
U89 - AGENT RESISTANT TO OTHER AND UNSPECIFIED ANTIBIOTICS	U898 - AGENT RESISTANT TO OTHER SINGLE SPECIFIED ANTIBIOTIC	✓		-	
	U899 - AGENT RESISTANT TO UNSPECIFIED ANTIBIOTIC	✓		-	
			Total Coded spells	**142,805**	**100.0%**

All data sourced from HED used the Clinical Classification System (CCS) diagnostic grouping 2 titled Septicaemia (except in labour). The HED data was for the 12 month period from February 2019 to January 2020.

All data sourced from AQ Audit used a list of sepsis codes agreed by an advisory Clinical Expert Group. (23). The AQ data covered the period from January 2019 to December 2019.

Although the CCS Septicaemia group contains 54 ICD10 codes and the AQ Sepsis group contains 19 codes, many of the codes not used in AQ have little or no activity coded. The 19 codes that the two groups have in common cover 99.6% of coded activity, which is within the range to use the two groups comparably.