SYNERGIA

Stocktake of sepsis management in Aotearoa New Zealand

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Acknowledgements

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1. EXECUTIVE SUMMARY

Sepsis is one of the leading causes of death amongst hospitalised patients in the developed world and is associated with high morbidity, high treatment costs, high readmission rates, and long-term disability resulting in additional burden to whānau and carers.

The Health Quality & Safety Commission (the Commission) worked with Synergia to undertake a stocktake of the current management of sepsis in Aotearoa New Zealand. The aim of this stocktake is to understand current clinical practices, protocols and guidance across the patient pathway, including the recognition of risk, diagnosis, treatment, management and follow up for sepsis patients in acute and secondary care settings.

Approach

A national sepsis survey was developed collaboratively with the Commission. The survey was piloted with several clinicians and experts in the sector, to ensure it was fit for purpose in different health contexts. The survey had 119 completed responses from District Health Board (DHB) hospitals, private surgical hospitals, ambulance providers and urgent care clinics. This stocktake also involved a series of interviews with a variety of private and public hospital roles and ambulance services.

Limitations

The sepsis stocktake was carried out during the Omicron surge of the COVID-19 pandemic in Aotearoa New Zealand. This stocktake was designed to build a foundation for understanding sepsis management in Aotearoa New Zealand. It is not intended to be an exhaustive review and does not represent a complete picture of sepsis activity in Aotearoa New Zealand.

Key findings

Equity

From an equity perspective, there are pockets of work being done to reflect the varying needs of different ethnic groups. There is acknowledgement that more work is required around protocols and guidelines to reflect the needs of different ethnicities, cultures, and support responsiveness to these groups.

Sepsis governance and leadership

There is significant variation in sepsis governance structures and processes within organisations related to sepsis. There are differences in how organisations collect and report on sepsis data, with common barriers to collecting data reported as time, workforce resources, and funding. Many organisations have a lead person responsible for overseeing sepsis programmes and activities but there is variation in what the role includes. There was no consistent ‘home’ for the oversight and governance of sepsis.

Sepsis prevention

Survey respondents reported various guidelines, bundles, and programmes in use across their organisations and departments, but these were most commonly related to general infection prevention as opposed to being sepsis specific.

Clinicians expressed a desire to have more focused efforts and awareness of sepsis prevention activities, drawing more attention to the potential severity of outcomes if protocols and guidance are not followed consistently.

Sepsis recognition

The predominant recognition tool in use across the country were early warning scores. Nearly half (47%) of all respondents indicated that sepsis recognition training is included as a part of the training for their role, however many of these were one-off or irregular training opportunities. Respondents noted that more regular, routine training and refreshers related to recognising sepsis would be desirable to ensure they were up to date with best practice protocols and processes to support sepsis patients.

Sepsis treatment and management

Participants from the survey and interviews commented that there was no single overarching protocol across Aotearoa New Zealand and within DHB environments.

The protocols and guidelines in use included:

- Variations of the early warning scoring system
- Best Practice Advocacy Centre (BPAC)
- Sepsis Six
- Internally developed tools (varied from within DHBs, across services and departments, private hospitals and urgent care centres).

Consistent messaging for patients and whānau who are either at risk of developing sepsis, or have experienced it, is an important part of improving the patient experience.

Recommendations

This report outlines 22 recommendations for action to better support a cohesive, equitable response to sepsis for patients and their whānau based on the findings of the stocktake. Key recommendations were based across the following areas:

1. **Governance**
    - This encompasses strategies nationally and within organisations and includes a national steering group and agreed sepsis definitions.
2. **Preventing sepsis**
    - Developing a standardised way to identify and mitigate underlying risk factors for sepsis.
    - Developing health-literate and culturally-appropriate patient information that covers the risk of sepsis and how to reduce the risk

3. **Recognising sepsis**
    - Providing training and education to first responders, primary care and emergency department staff to enable early recognition of sepsis
    - Improving the integration and use of sepsis recognition tools within electronic patient management systems.
    - Ensuring ‘sepsis recognition tools’ have an equity focus
4. **Appropriate treatment of sepsis**
    - Developing a standard national set of guidance documents including national antimicrobial sepsis guidelines that can be tailored for different populations.
    - Standardising specialist referral and escalation pathways.
    - Ensuring the use of compatible health information systems.
5. **Appropriate follow-up care**
    - Standardised step-down approaches within hospitals.
    - Developing resources to ensure patients and whānau receive appropriate information after a sepsis event.
    - Improving post-discharge follow-up for patients and better engagement with primary care.

2. INTRODUCTION

The Health Quality & Safety Commission (the Commission) has worked with Synergia to undertake a stocktake of the current management of sepsis in New Zealand. Sepsis is a life-threatening organ dysfunction caused by a dysregulated response to infection. Sepsis is one of the leading causes of death amongst hospitalised patients in the developed world and is associated with high morbidity, high treatment costs, high readmission rates, and long-term disability resulting in additional burden to whānau and carers. Sepsis causes a large financial burden on the health system with the average cost of an admission with sepsis in Aotearoa New Zealand being $11,000.[1] From 2015-2020, the number of accepted Accident Compensation Corporation (ACC) treatment injury claims for sepsis were 1,250 with a total cost of $5,969,268.[2]

Sepsis is caused by infection and the best estimates available suggest that sepsis affects up to 1% of people in Aotearoa New Zealand each year[1]. Approximately 15,000 people in Aotearoa New Zealand and Australia are admitted to a hospital intensive care unit each year with sepsis.[3] Complications from sepsis can be mitigated when health practitioners understand and identify the early warning signs.[4]

Individuals with risk factors for infection are also at risk of sepsis. Having multiple chronic diseases and the effects of socio-economic deprivation contribute to an increased infection risk. Māori and Pacific experience sepsis at least twice as often as non-Māori and non-Pacific people, this difference is notably seen in children[1]. Higher rates of sepsis for Māori and Pacific people can be partially explained by higher rates of chronic disease and the increased likelihood of living in areas of high deprivation.[5] It is likely that access to healthcare and the quality of care are also contributors.

Currently, it is suspected there is significant variation in the management of sepsis in Aotearoa New Zealand, and information is lacking about how health services manage sepsis. The aim of this stocktake is to understand current clinical practices, guidance, and the environment where treatment is provided for patients with sepsis, including the recognition of risk, diagnosis, treatment/management and follow up of sepsis in acute and secondary care settings. A baseline assessment and understanding of current sepsis practices is critical to be able to support the progression of the National Sepsis Action Plan[6], released in November 2021, and inform future quality improvement activity related to sepsis at a local and national level. The Commission partnered with the Sepsis Trust NZ for this stocktake. Consistent guidance for identifying and managing sepsis will support an improved, equitable response to sepsis. This document is an important foundational step on this journey.

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[1] https://www.sepsis.org.nz/
[2] https://www.acc.co.nz/assets/oia-responses/claims-data-for-sepsis-related-treatment-injuries-gov-007020-response.pdf
[3] https://bpac.org.nz/guidelines/4/#introduction
[4] https://www.acc.co.nz/newsroom/stories/working-together-to-treat-and-prevent-sepsis/
[5] https://www.sepsis.org.nz/wpcontent/uploads/Technical_and_Consensus_Report_P2.pdf
[6] https://www.sepsis.org.nz/wp-content/uploads/Aotearoa-National-Sepsis-Action-Plan-The-Way-Forward.pdf

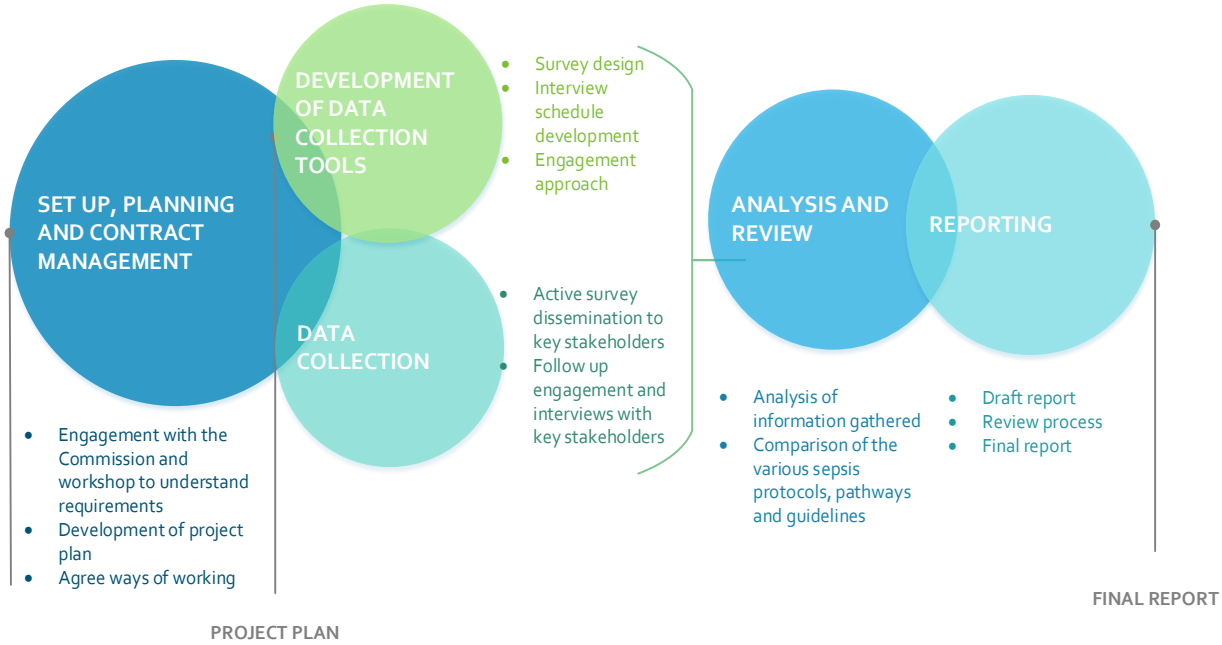
3. METHODOLOGY

The Commission undertook a stocktake of current sepsis management in DHB hospitals, private surgical hospitals, ambulance services, and urgent care centres in Aotearoa New Zealand. Other primary and community care was out of scope for this stocktake but should be considered in the future.

Synergia worked with the project team from the Commission to refine the stocktake process. The project went through four key phases; project set up and planning, data collection, analysis and reporting. The planning phase involved designing and developing the stocktake survey and a follow up interview guide. Data collection then took place, before the analysis and review.

The overall process and methodology are presented in the following graphic and outlined in more detail below:

Figure 1: Process graphic



3.1. Survey

A national sepsis survey was developed collaboratively with the Commission project team. This involved drawing on the initial scoping completed by the Commission and drafting an online survey based on input from the Commission staff, ACC, and Sepsis Trust NZ. The survey was piloted with several clinicians and experts in the sector, to ensure it was fit for purpose. Piloting the survey included those working in:

- A DHB intensive care unit (ICU)
- A DHB anaesthetic department
- A DHB emergency department
- A private surgical hospital
- Ambulance services
- Urgent care.

Feedback from those who reviewed the survey resulted in refinement to ensure its practicability in the relevant clinical environments. Consideration was given to the breadth and depth of the survey and adjustments were made to its length and complexity to maximize the response rate.

3.1.1. Survey dissemination

The survey was disseminated via an email invitation from the Commission to the following groups:

- Quality and Risk managers at each DHB
    - Quality and Risk managers were asked to forward the survey to Clinical Directors from the following services within their DHB:
        - Emergency department
        - Intensive care unit
        - Maternity services
        - General medicine
        - Haematology and oncology
        - Infectious diseases
        - Surgery
        - Paediatrics
        - Mental health.
- Key contacts at MercyAscot hospitals and Southern Cross Healthcare national office.
- Quality and Risk managers (or equivalent) at a selection of independent private surgical hospitals, as identified by the Commission.
- Medical directors at a selection of urgent care clinics.
- Medical directors at St John Ambulance and Wellington Free Ambulance.

The survey was open from 11th April to 27th May 2022 and was also promoted on the Commission's and Sepsis Trust NZ websites. Prospective participants yet to respond were contacted twice during the open period of the survey, to maximise the response rate and improve the breadth of insight captured.

3.1.2. Responses

The survey had 119 completed responses. The highest proportion of respondents were from DHB hospitals. Table 1 outlines the number of respondents within each setting.

Table 1: Respondents per setting

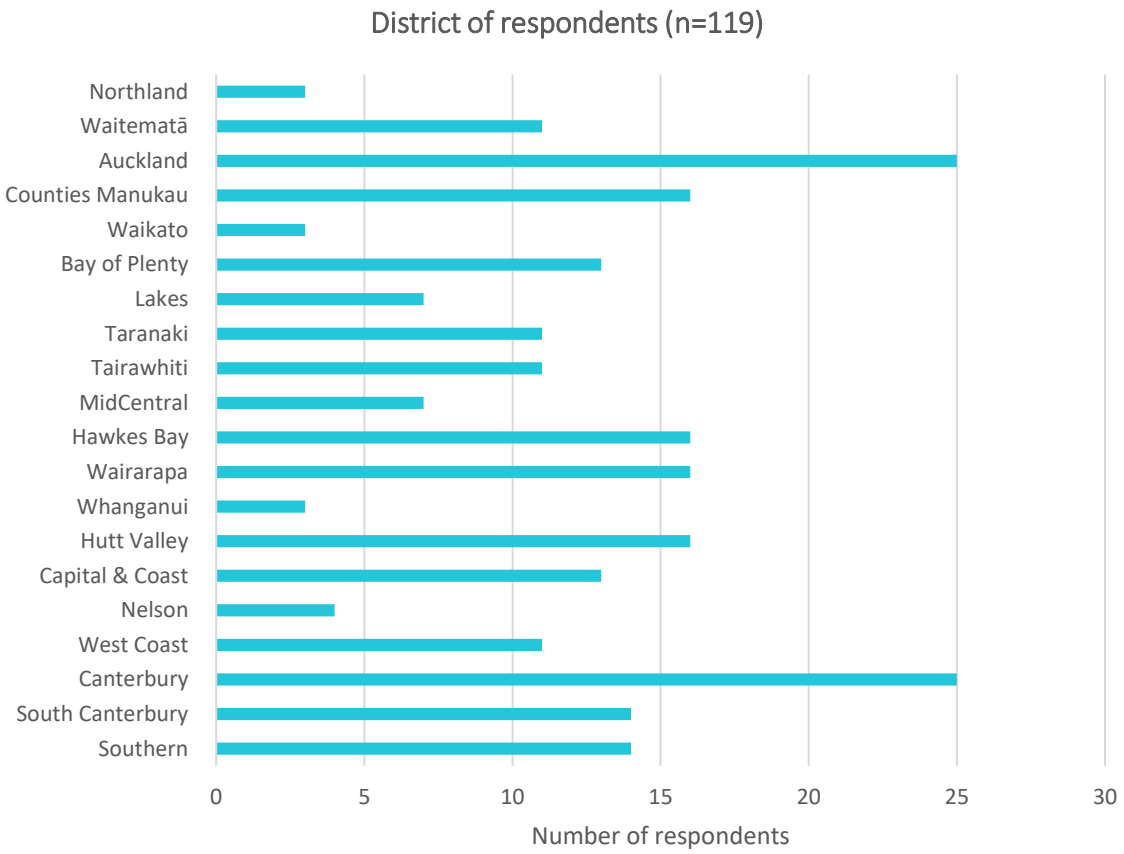
Setting	Number of respondents
DHB hospital	96
Private hospital	15
Ambulance	3
Urgent care clinic	5

Survey respondents represented a broad range of roles within their respective organisations. Self-reported roles included:

- Director of nursing
- Registered nurse
- Nurse practitioner
- Nurse educator
- Clinical resource nurse
- Clinical nurse specialist (CNS)
- Patient at risk nurse
- Midwife
- Certified nurse-midwife
- Clinical director
- Medical director
- House officer
- Senior medical officer (SMO)
- Anaesthetist
- Intensivist
- Quality and risk
- Management and governance
- Infection prevention and control coordinator
- Maternity quality and safety programme coordinator
- Safety quality and capability manager
- Paramedics/ambulance officer.

There were participants from every district, Figure 2.

Figure 2: District of respondents (n=119)



3.2. Interviews

This stocktake involved 10 interviews from a variety of private and public hospital roles and ambulance services.

Key stakeholders were identified through the Commission and Synergia networks to provide insight in interviews. Potential participants were invited by email explaining the aim of the interview and what was required.

The interviews, conducted virtually, were semi structured and took approximately 30-45 minutes. The aim of the interviews was to:

- Understand sepsis management across the country
- Gain depth of insight into a cross-section of organisations
- Supplement survey responses to understand various elements of sepsis management, including:
    - Current clinical practice
    - The use and content of sepsis guidelines and protocols

    - Sepsis data collection practices and methods
    - Governance and resourcing
- Build an understanding of what could be done to effectively support sepsis management at a regional and/or national level.

3.3. Limitations

The sepsis stocktake was carried out during the Omicron surge of COVID-19 pandemic in Aotearoa New Zealand. During this time, there were significant additional pressures on the health system and its workforce. A number of those invited to participate in the stocktake were unable to respond within the given timeframe.

This stocktake was designed to build a foundation for understanding sepsis management in Aotearoa New Zealand. It is not intended to be an exhaustive review and does not represent a complete picture of sepsis activity in Aotearoa New Zealand. It does provide a foundation for insight into activity within a DHB environment, some insight into private surgical hospital practices regarding sepsis management, as well as ambulance and urgent care settings.

A further limitation of this stocktake was that the scope of the work was limited to the settings mentioned above. Primary and community care settings (outside of urgent care) were out of scope, and therefore these findings are not representative of the whole health system.

It is recommended that these findings are built upon, with further consultation with leaders in sepsis across the sector for implementing future planning.

4. KEY FINDINGS

The following section identifies the key findings of the sepsis stocktake. The key findings are related to five key areas:

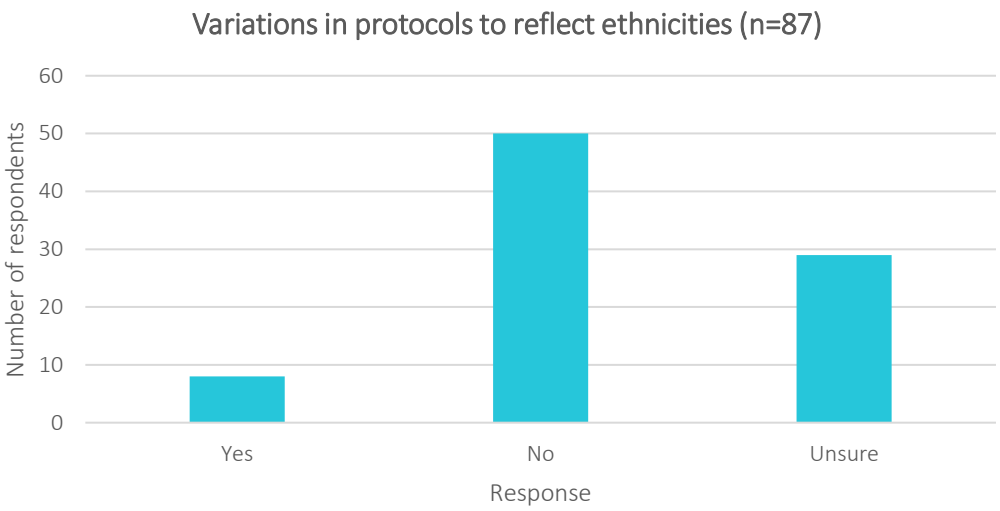
- Equity
- Sepsis governance and leadership
- Sepsis prevention
- Sepsis recognition
- Sepsis treatment and management.

4.1. Response to equity

From an equity perspective, there are pockets of work being done to reflect the varying needs of different ethnic groups. It is known that there are biopsychosocial factors that result in Māori and Pacific populations being at greater risk of developing infections, and therefore sepsis.

Few (9%) respondents reported that there were variations in their protocols and guidelines to reflect varying needs of different ethnicities, and support responsiveness to these groups (Figure 3).

Figure 3: Variation in protocols to reflect ethnicities (n=87)



The Sepsis Trust NZ screening tool[7] consists of red flag and amber flag criteria. A red flag predicts if the patient is at higher risk of severe sepsis or septic shock. The amber flag identifies a patient at risk of deterioration. The Sepsis Trust NZ tool recognises Māori and Pacific as an 'Amber flag' criterion. Within hospitals, respondents from two DHBs had similar criteria where Māori and Pacific people were recognised as higher risk for potentially developing sepsis and are therefore triaged faster.

Several respondents reported that their organisations were looking into processes to improve the response of these tools to equity, such as understanding the needs of different ethnic groups and responding to these through their use of the tools. Equity was not commonly considered at governance and leadership levels. Interviewees were generally unaware of any documentation around equity initiatives relating to sepsis processes, and specifically no distinct pathways for Māori or Pacific populations.

4.2. Sepsis governance and leadership

There is significant variation in the governance structures of organisations, and processes related to sepsis. There was no consistent 'home' for the oversight and governance of sepsis within any of the organisations included in this stocktake, and ownership varies from organisation to organisation.

This section discusses the varied organisational oversight of sepsis, sepsis as a management priority, and the use of data to support sepsis management along the patient pathway.

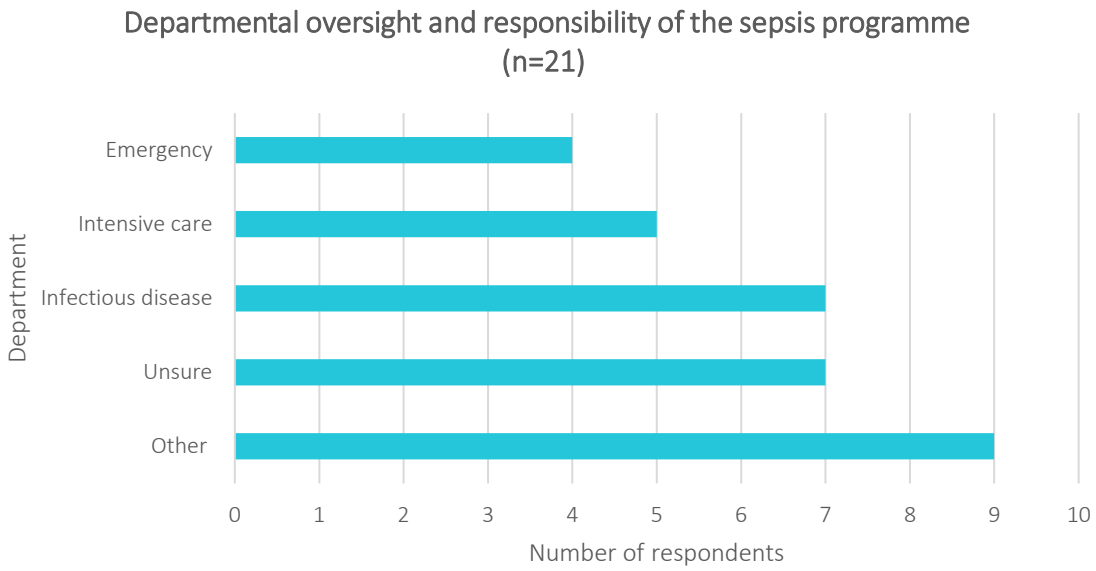
4.2.1. Organisational oversight of sepsis

Quality and Risk managers were asked whether there were particular departments or services within their organisation that have responsibility or oversight of sepsis programmes. 43% of respondents to this question indicated that they were aware of a lead responsible for overseeing sepsis programmes within their organisation. In terms of departments within the hospital environment, responsibility and oversight of sepsis varied significantly. There was variation between responsibility lying with intensive care, infectious disease and emergency medicine (Figure 4).

> ***"We have a sepsis governance group that has representatives from most departments within the hospital, including paediatrics and maternity. This group has oversight of sepsis activity within the organisation."***
>
> ***Survey respondent***

[7] https://www.sepsis.org.nz/clinical-tools/

*Figure 4: Departments with oversight of sepsis (n=21) **



**Note: This was a question only answered by those who identified their role as Quality and Risk management. Respondents could identify more than one department.*

For those who responded other, respondents commonly cited patient safety teams as the group with organisational oversight of sepsis. Multidisciplinary approaches were also referenced by several respondents, who commented that representatives from most hospital departments were included in these groups. Respondents noted that most sepsis governance groups included representatives from paediatrics and maternity.

In the ambulance sector, there is a national working group that develops clinical procedures and guidelines for the ambulance services. This group has overall responsibility to provide sepsis guidance across the emergency response providers. Within the ambulance setting, the national clinical director has responsibility for the oversight of sepsis governance and introduction of any programmes, pathways, or protocols. Individual paramedics take ownership within their own roles to action appropriate protocols.

4.2.2. Sepsis as a management priority

The majority of participants in this stocktake, from both the survey and the interviews, were of the view that sepsis was not always a priority at the management level. This was a more common response from those who worked in public hospital settings.

Interviewees reported that sepsis primarily comes up on the agenda at a governance level associated with severe mortality and/or morbidity outcomes, rather than as routine monitoring or part of regular quality improvement practices. In the public sector, there are many competing priorities, with limited resource to invest in activities

beyond conditions with Ministry of Health targets. Sepsis is not a mandated priority, with no current national health targets, and it was felt that sepsis receiving little direct attention at a management level could be a consequence of this. One DHB hospital staff member interviewed indicated that their quality and risk team have many competing priorities and do not have the capacity to own work in this space.

> ***"In the quality and risk team no one has taken this up as a priority… they are already too busy and at capacity to do so."***
>
> ***Interview respondent***

In private hospital settings, it was reported that infection and sepsis are considered important outcome measures and are monitored following surgical procedures. Private hospitals carry out high volumes of surgical work and operate in a somewhat more competitive environment than public hospitals. Within this stocktake, private hospital settings reported a proactiveness in developing nursing programmes to prevent sepsis as well as improve early recognition and treatment of sepsis.

Due to how private hospital teams are structured, participants noted there may be variation between surgeons and anaesthetists in terms of prophylactic antibiotic use and which agents are used to treat infections, but it was felt this variation had decreased in recent years. It was reported that guidelines are in place but not always known about by senior members of surgical teams.

Recognition of post-surgical sepsis can occur after discharge from the private setting, and therefore an accurate understanding of the prevalence of sepsis originating in these settings is difficult to quantify. Sepsis may only be recognised when patients present to primary care or public emergency departments. There is no formal process for communicating back to the private hospital from general practice and public hospital settings, although patients may contact their surgical care provider if there is an issue.

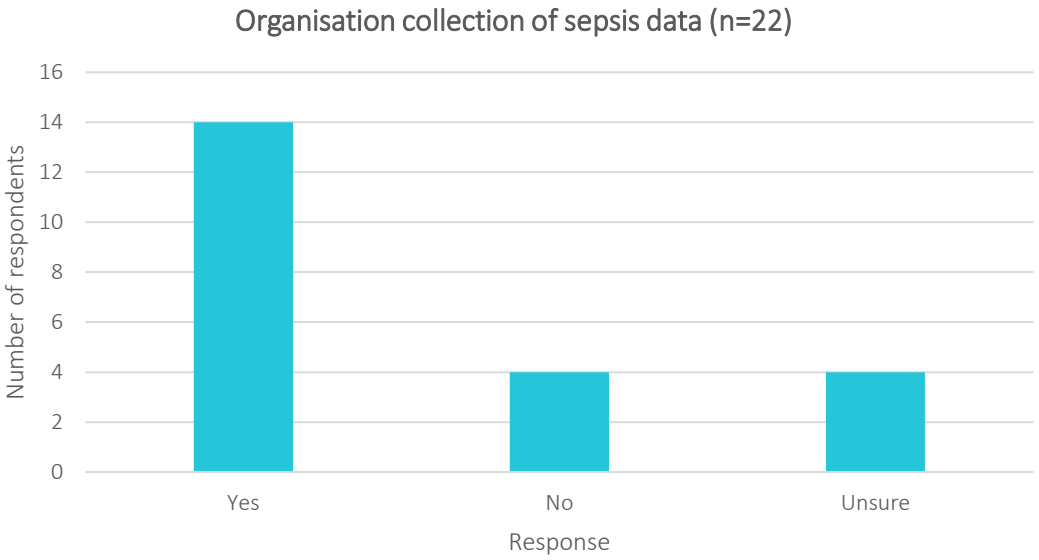
4.2.3. Sepsis data management and quality improvement

Consistent capture of data is important to inform practice and quality improvement initiatives within an organisation. Examples of sepsis data include sepsis rates, time to antibiotics after sepsis diagnosis, early warning scores and infection rates. Across the survey respondents, there was significant variation in how sepsis data is captured, who it is reported to and what it is used for.

Note: The questions within the survey that addressed data management and quality improvement activities were only asked of those who identified themselves as having a role related to Quality and Risk (n=22). This means that less people responded to

these questions than the general survey questions. Additional information in this section is supplemented by interview data.

Figure 5: Collection of sepsis data within organisations (n=22)



63% of Quality and Risk respondents to this question identified that they do collect data specifically on sepsis (Figure 5). Respondents commented that common barriers to collecting sepsis data were time, workforce resources, and funding. There was significant variation as to how this data was collected and the mechanisms in place to support the data collection process. Six respondents said that data was collected automatically through laboratory blood culture results and surveillance programmes, which requires little manual time and effort to keep up to date.

Four respondents said data was collected through ICNet or another electronic portal, that did require time and resource to collect. Three respondents (one from a private hospital, two from DHB hospitals) said data was collected through the ANZICS (Australian and New Zealand Intensive Care Society) database on a quarterly basis.

Quality improvement

50% of respondents to this question noted that their organisations have recent, current, or planned quality improvement initiatives around the management of sepsis. Most respondents from the urgent care setting noted that they did not have any quality improvement initiatives related to sepsis planned. These respondents indicated that the nature of their environment results in limited capacity to run planned or routine quality improvement activities.

Some examples of quality improvement initiatives within DHBs included:

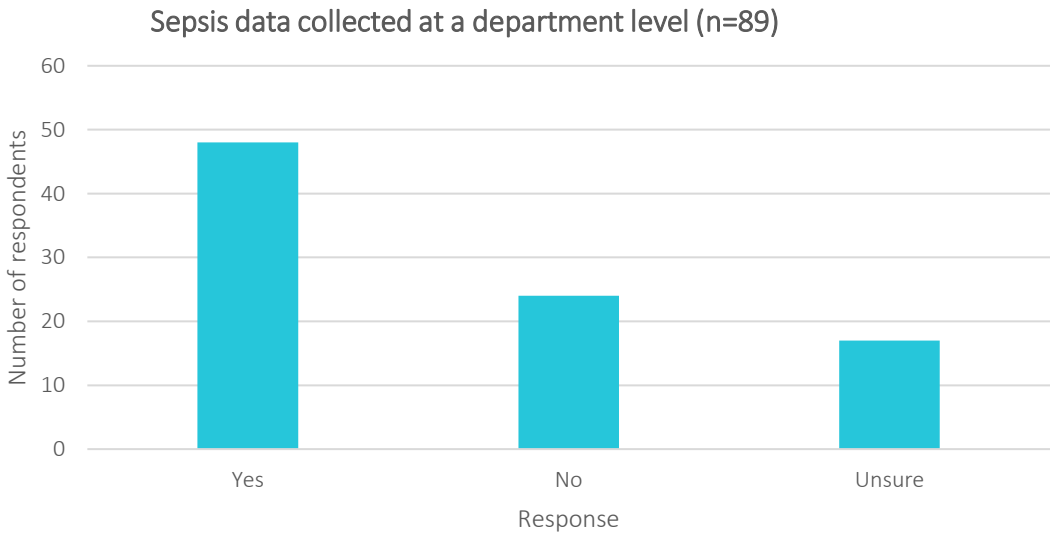
- Rolling out a sepsis programme through the Antimicrobial Stewardship Group to support organisation-wide improvement in sepsis treatment.
- Junior doctor audit, with a focus on sepsis to better understand the prevalence and incidence of sepsis within the hospital
- Updating the current guidelines to reflect best practice
- Rolling out mandatory education sessions for staff to ensure they are up to date with best practice protocols
- Applying an equity view to the current programme as per the new Health and Disability standards, to better understand the equity impact of current practice
- Evaluation and implementation of the Sepsis Trust NZ Adult Sepsis Screening and Action Tool.

4.2.4. The use of data

There is significant variation in how data is used by public and private hospitals and ambulance services. Health Round Table was referenced by several DHB respondents. Clinicians reported that differences in coding and recording of sepsis, is likely to result in inaccuracies in these types of sepsis datasets. The main concern was that there may be underreporting of sepsis incidence.

One of the most important enablers identified to use data effectively was Information Technology (IT) support and linked data platforms. Being able to have laboratory data, Early Warning System (EWS) data and prescribing data accessible in one place would allow for better oversight and audit of sepsis management, as well as enable comparative functions across and within services, departments, and even hospitals.

Figure 6: Data collection within departments (n=89)

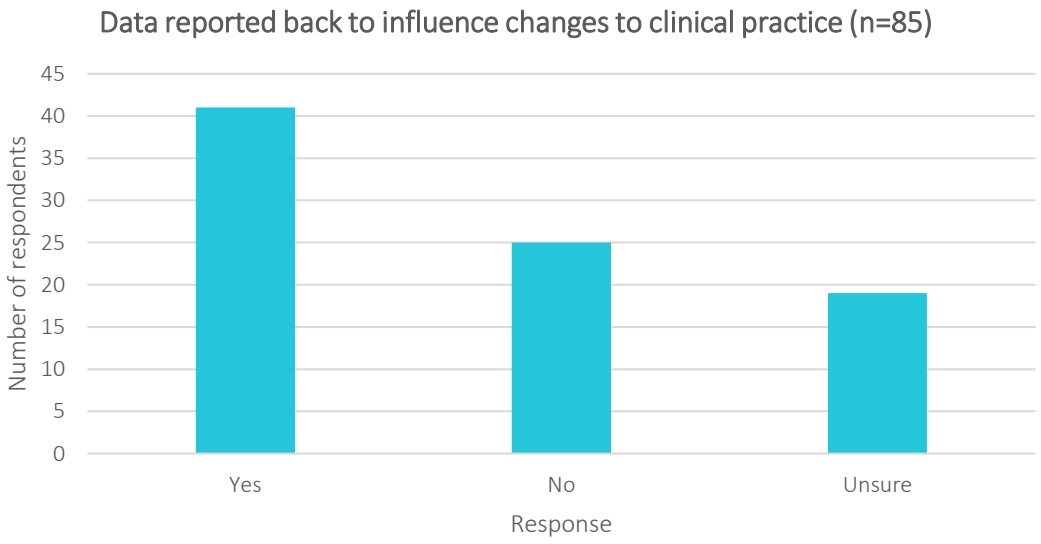


54% collected sepsis data (Figure 6). Of those who do collect sepsis data, eight respondents said they collected data manually, 11 respondents reported electronic data collection. Within those who collect data, only four respondents reported that they were aware of the data being recorded against ethnicity.

Some respondents stated that as an organisation they audit sepsis outcomes, but it is not a regular activity. One DHB stated that their organisation had previously conducted wider data collection, but this is not possible with current workloads due to their COVID-19 response. A SMO within another DHB said that they are working on collecting organisational sepsis data on their own and noted how difficult it can be to accurately capture data.

> ***"I have been working on this [data collection] individually and it is very difficult to identify children with sepsis from our records."***
>
> ***Survey respondent***

Figure 7: Reporting of data (n=85)



48% of survey respondents were certain that data was reported back to influence changes to clinical practice (Figure 7). Examples of this include:

- Data being fed back quarterly through the ANZICS Core portal which would influence change if outcomes were poor, for example, mortality events would trigger response and action
- Case based weekly quality meetings
- Sepsis outcomes reported to department heads leading to quality

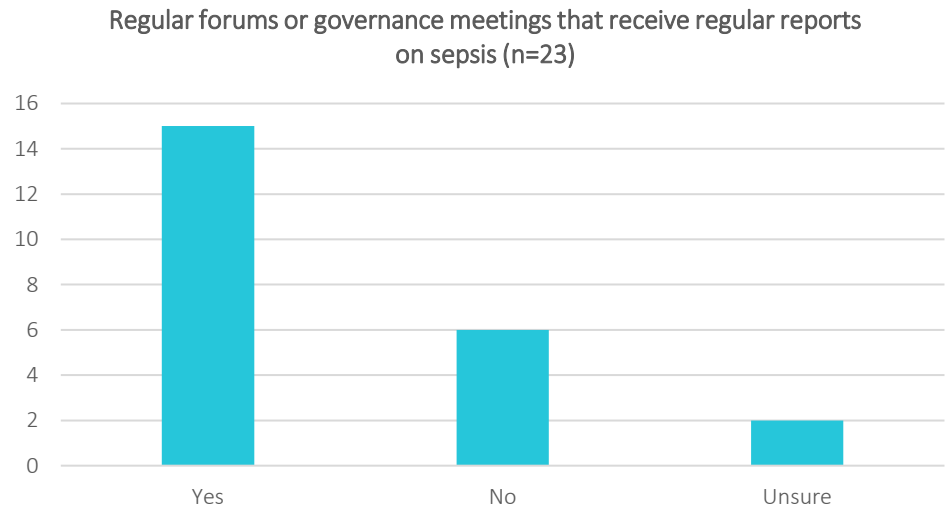
improvement projects
- Cases discussed at peer review and education drives
- Review of sepsis guidelines and implementation of sepsis bundles in all maternity and gynaecology areas following their last audit.

It was reported that most commonly, infection prevention and control teams, individual teams and quality and risk teams are responsible for reporting and presenting data back to clinical teams and up to senior management.

At a clinical team level, 43% of survey respondents were certain that data was reported back to their team to influence changes to clinical practice. Influencing changes to clinical practice at a team level included a nurse and/or a sepsis lead communicating at team meetings to share areas of improvement, audit reports, and potential development opportunities based on available data.

Most respondents (65%) reported that there are regular forums or governance meetings that receive regular reports on sepsis. (Figure 8). These typically took the form of senior leadership meetings, or sepsis governance groups that data is reported to on a regular basis.

Figure 8: Regular governance forums that receive reports on sepsis (n=23)



4.2.5. Sepsis auditing

In DHB hospitals, there were varying degrees of auditing practices taking place. DHB audits involved:

- Antimicrobial stewardship reviews
- Morbidity and mortality meetings
- Audits of all sepsis patients reported to ACC on a regular basis
- Excel sheet audit tool to look at sepsis patient's time of arrival and time to antibiotic retrospectively
- Pharmacists ensuring antibiotic use for sepsis was in the correct dose, form, route, and type and compliant with Sepsis Six.

Private hospital audits involved:

- Quarterly meetings to discuss and review patients who left hospital and developed sepsis or become unwell due to infection
- Regular audits completed, with ten charts selected at random, and the EWS score of those patients reviewed to identify whether the appropriate pathways were initiated. This process linked into a broader quality improvement process.

Audit in the ambulance setting involved:

- Collecting data on time of arrival to ED and time to antibiotics for patients identified as having developed sepsis.
- Two-yearly cycle review of their protocols based on audit data.

4.3. Sepsis prevention

The survey respondents reported various sepsis prevention strategies in use across their organisations and departments. Some activities were described as broad infection prevention activities, with some specific to sepsis. The most common activities mentioned were:

- Antimicrobial guidelines
- Anti-staphylococcal bundle for surgical site infection prevention
- Multi-drug resistant organism monitoring to guide empirical antibiotic use
- Central line-associated bloodstream infections bundle
- Hand hygiene programmes
- Safety schemes in procurement toolkit
- Pressure injury prevention
- Citrix Virtual Apps and Desktop monitoring
- Fit for surgery programme
- Health Quality & Safety Commission pamphlet for preventing infections
- Wound care

- Intravenous catheter care
- Opportunistic immunisations/vaccinations
- Sepsis educational boards within hospital settings with posters and pamphlets.

General infection prevention and control activities such as hand hygiene, surgical prophylaxis, vaccination drives, and sepsis awareness activities were commonly reported across those interviewed.

Examples of sepsis awareness activities by a DHB sepsis project lead and sepsis clinical nurse include:

- Connecting with GP liaisons to share messages on sepsis care
- Onsite meetings with ambulance officers and working with them to identify successful processes for sepsis care
- Sepsis lanyards with the addition of maternity Sepsis Six+2 guidelines
- World Sepsis Day staff education, grand round presentations (medical education by presenting medical problems and treatment of sepsis cases, and presenting audit results
- Attending agricultural field days and delivering education to the community.

Broadly, targeted sepsis prevention activities were associated with specific patient groups who were identified at higher risk of developing sepsis based on their existing conditions, although this was not always standardised. Clinicians spoke of a desire to have more focused efforts and awareness of sepsis prevention activities, drawing more attention to the potential severity of outcomes if protocols and guidance were not followed consistently.

4.3.1. Risk stratification

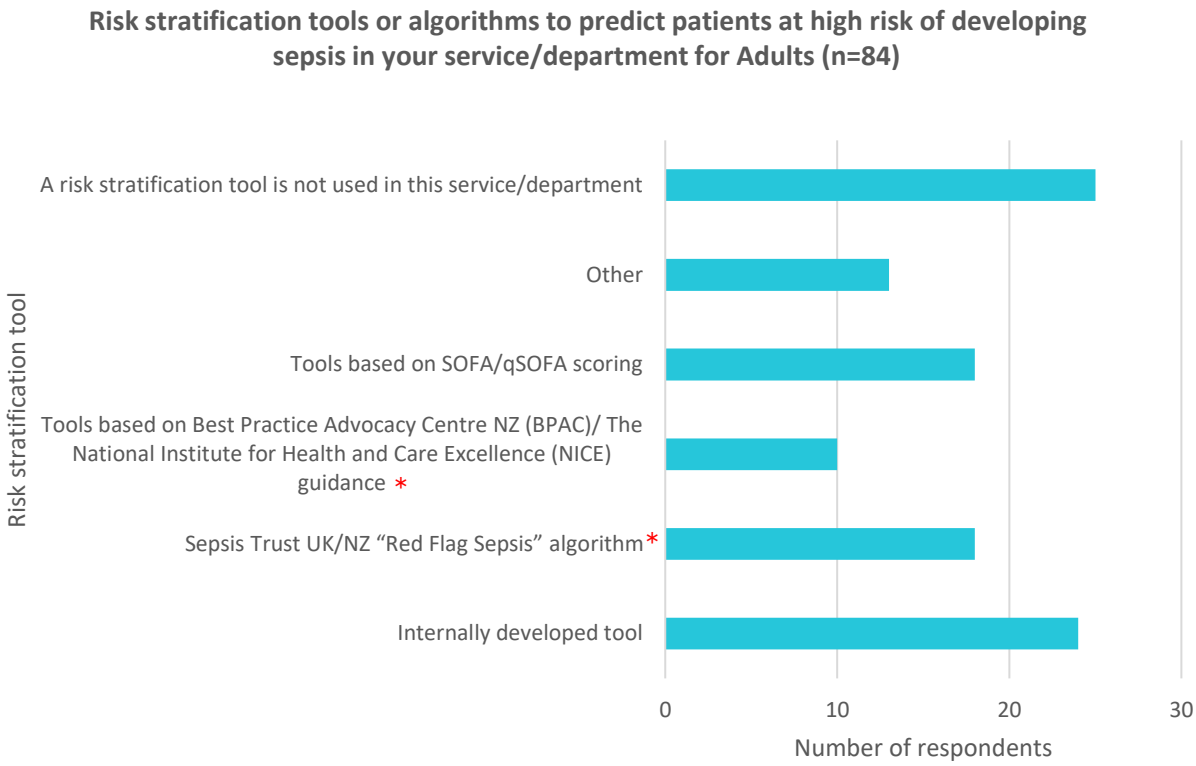
The stocktake survey specifically asked respondents about tools and algorithms used within their context to predict adults at high risk of developing sepsis. Commonly used tools are the quick Sepsis Related Organ Failure Assessment (qSOFA) which identifies high-risk inpatients outside the ICU,[8] the Sepsis Trust NZ Red Flag Sepsis algorithm tool for pre-hospital screening and action for adults and paediatric populations[9], and tools adapted from National Institute for Health & Care Excellence (NICE).[10]

Most commonly, it was reported that risk stratification tools were not routinely in use, and if they were, they were identified as being developed internally (Figure 9). Internally developed tools, which were felt to be more usefully tailored to the specific context of the organisation and local populations, result in increased variation. Many of these tools, however, were based on existing tools developed by the Sepsis Trust NZ or qSOFA.

[8] https://qsofa.org/what.php
[9] https://www.sepsis.org.nz/clinical-tools/
[10] https://bpac.org.nz/guidelines/4/

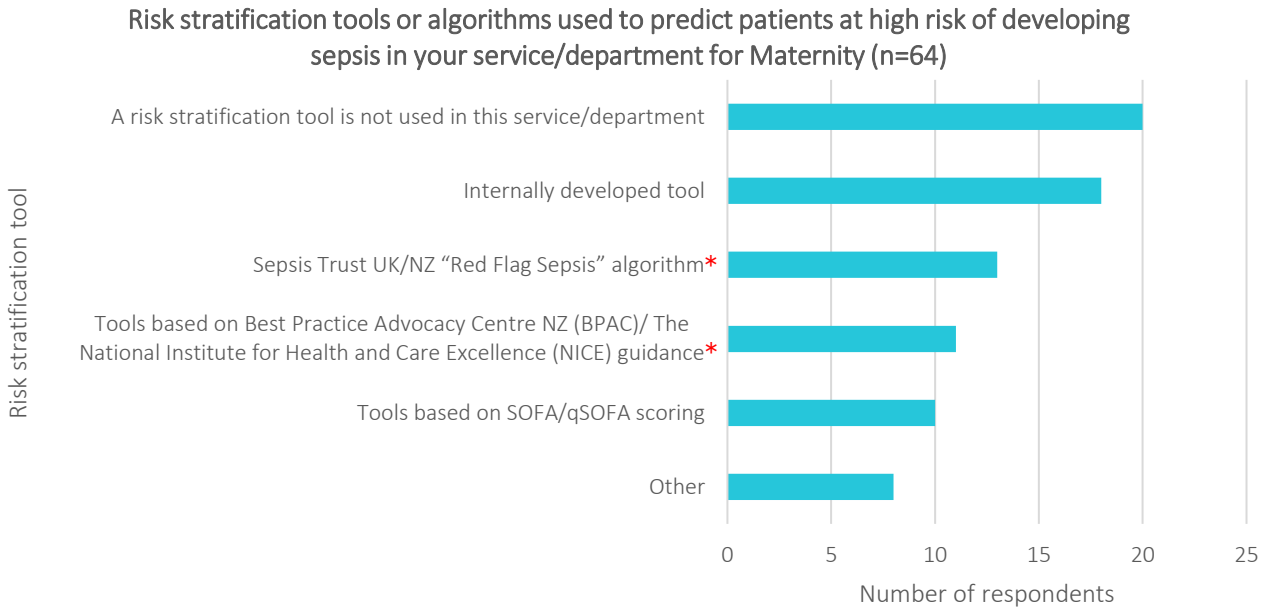
It should be noted that for the following graphs, the two options noted as "Tools based on BPAC/NICE guidance" and "Sepsis Trust UK/NZ 'Red Flag Sepsis' algorithm" are both aligned to, and derived from, a single guideline – the NICE Guideline 51. These two options are marked with a red asterisk (*). Therefore, when interpreting the following graphs, it is important to note that in most cases, the NICE Guideline 51-derived approaches are the most commonly used.

Figure 9: Adult risk stratification tools (n=84)



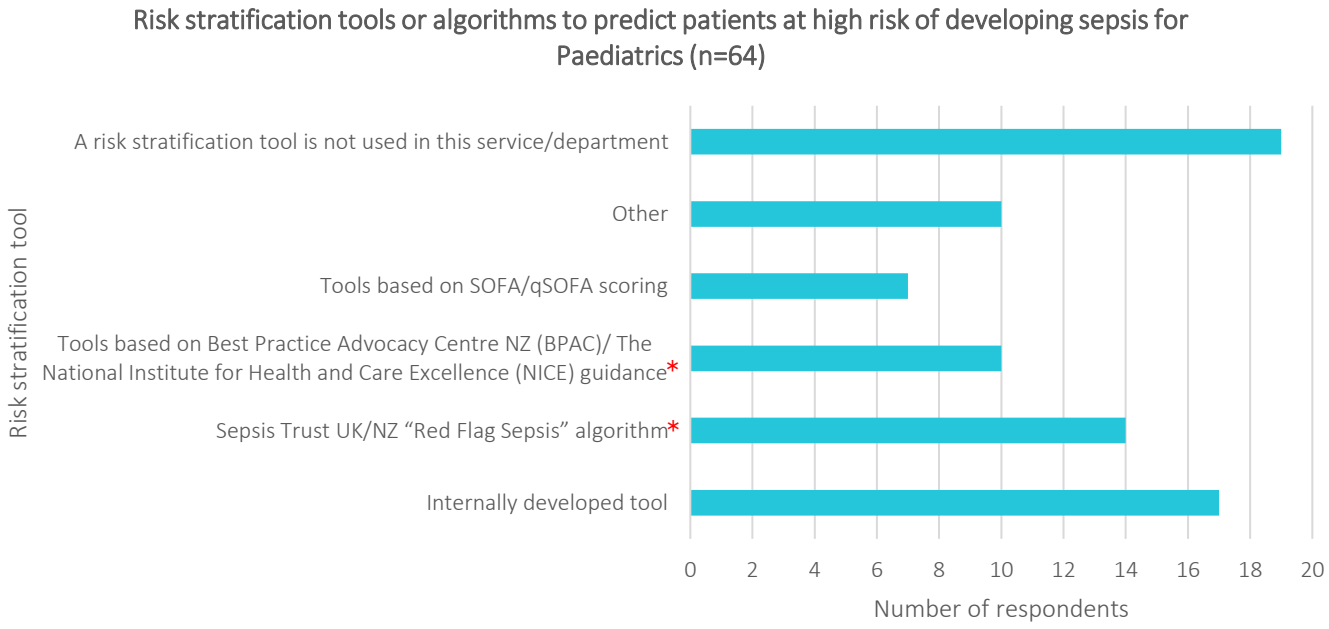
A similar response was recorded when looking at risk stratification tools for maternity patients. 31% of respondents to this question did not use a risk stratification tool for maternity patients (Figure 10). Of those that did, most commonly these were developed internally. The Sepsis Trust NZ Red Flag Sepsis algorithm was used by 20% of respondents in the maternity setting. Those who used other tools identified Maternal Early Warning Scores (MEWS) to support risk management.

Figure 10: Maternity risk stratification tools (n=64)



For Paediatric risk stratification tools, the most common response was that they were not used (60%) (Figure 11). Some queried the lack of use of specific paediatric tools in their departments, signalling that standard tools and processes can be applied when it comes to risk stratification in paediatric patients.

Figure 11: Risk stratification tools for paediatric patients (n=64)



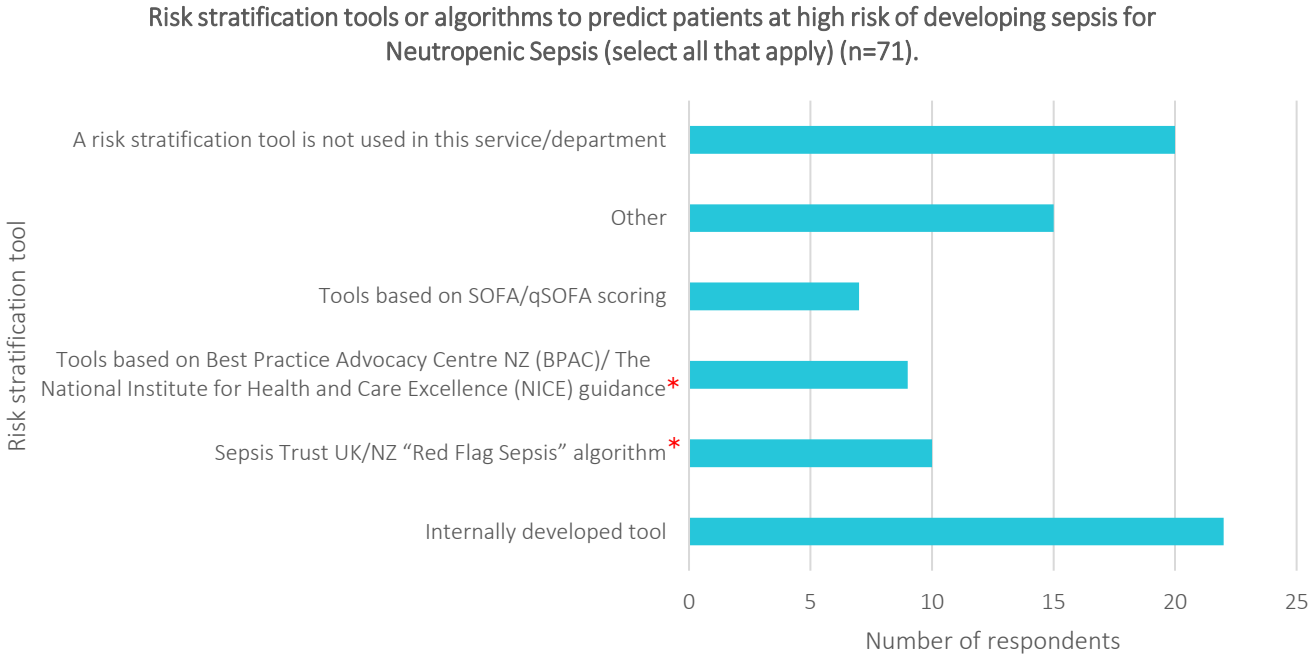
Other paediatric tools identified by survey respondents included:

- Paediatric Early Warning Systems (PEWS)[11] to support risk management, although it was noted that the purpose of this tool is not to support risk identification. However, some guidance exists within this system
- Starship Children's Hospital guidelines and protocols to support identification and management of patients at high risk
- Hospital HealthPathways Sepsis in Children clinical guidelines to support identification of risk – although again it was noted that this is not the primary purpose of this document.

For neutropenic sepsis, most used risk stratification tools that were internally developed (24%) (Figure 12). Other tools identified by survey respondents included:

- Early warning score (EWS)
- Specific individualised support from oncology areas
- Drug company guidelines for neutropenia
- Starship Children's Hospital guidelines.

Figure 12: Risk stratification tools for neutropenic patients (n=71)



Other comments suggested that neutropenic sepsis is relatively uncommon and is immediately treated or referred without the use of a tool.

[11] https://starship.org.nz/guidelines/observation-and-monitoring-of-an-infant-child-or-young-person/

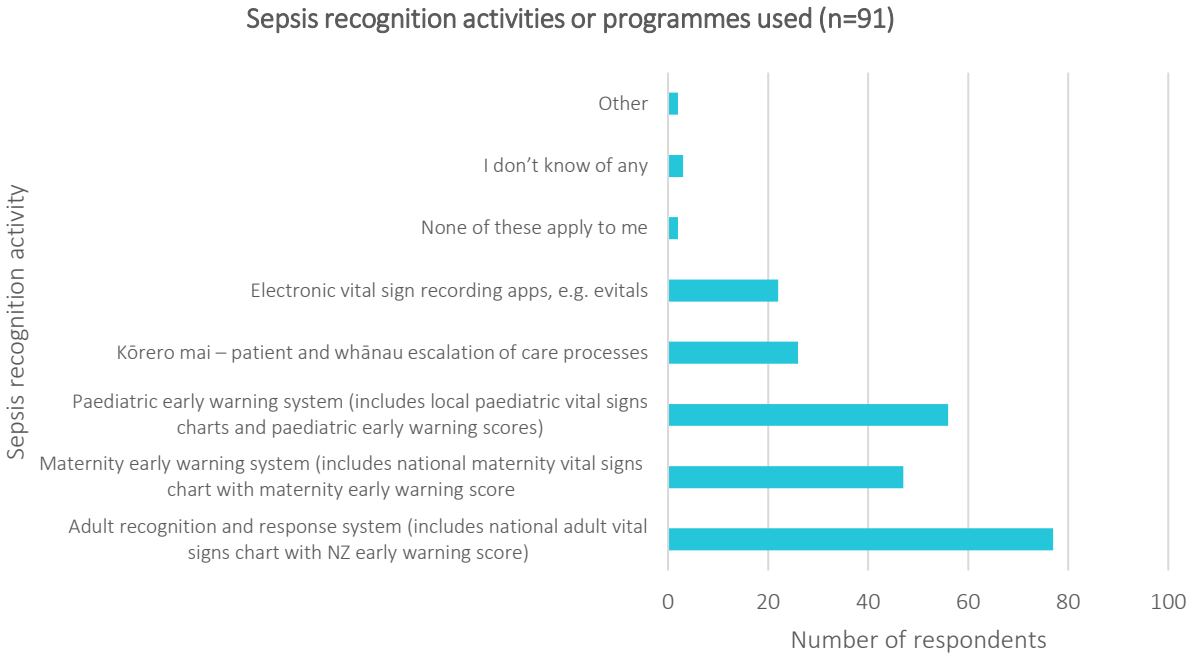
4.4. Sepsis recognition

The predominant recognition tools in use across the country were EWS systems. Most respondents use their respective adult, maternity, and paediatric EWS (Figure 13). The next most used tool was the Kōrero mai patient, family and whānau escalation system where patient, family and whānau are encouraged to escalate any clinical concerns to staff. [12]

Other recognition activities used by respondents include:

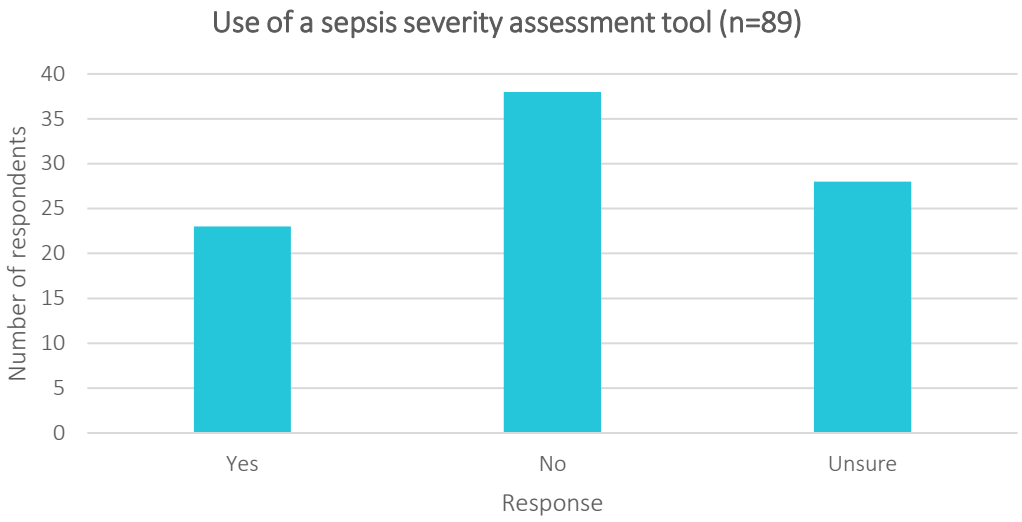
- Other EWS (e.g., NEWS2, UK)[13]
- Patientrak – real time patient monitoring and risk screening tool. Patientrak records vital signs and includes an automated calculation of EWS[14]
- 'Trakcare' - a healthcare information system and electronic medical records tool, that does not include EWS at present[15]
- Raise the flag (Sepsis Trust NZ version).
- Referrals to Sepsis CNS or other specialist to review.

Figure 13: Sepsis recognition activities or programmes used by respondents (n=91)



[12] https://www.hqsc.govt.nz/our-work/improved-service-delivery/patient-deterioration/workstreams/patient-family-and-whanau-escalation/
[13] https://www.rcplondon.ac.uk/projects/outputs/national-early-warning-score-news-2
[14] https://www.alcidion.com/products/patientrack/#:~:text=Patientrack%20is%20the%20solution%20that,to%20inform%20monitoring%20and%20management.
[15] https://www.intersystems.com/trakcare

Figure 14: Sepsis severity assessment tool (n=89)



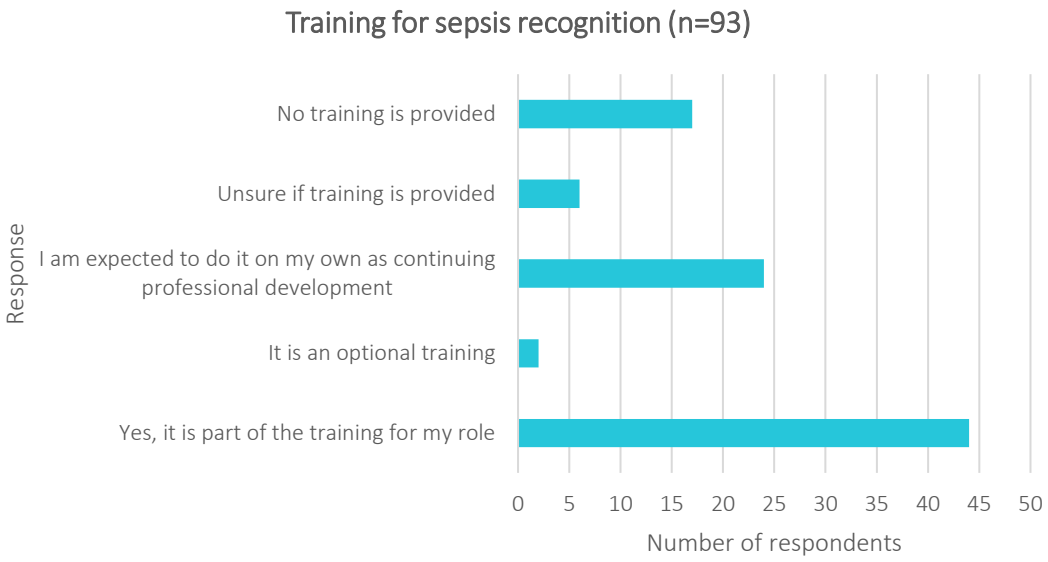
43% of respondents said they did not use a sepsis severity tool (Figure 14). Of those 26% who did use a severity assessment tool, these included:

- EWS protocols
- Internally developed tools as part of an ED or urgent care assessments
- qSOFA, with some respondents noting that it had been internally modified
- Red and Amber flags from the Sepsis Trust NZ.

4.4.1. Clinical training and education for sepsis recognition

Nearly half (47%) of all respondents indicated that sepsis recognition training is included as a part of the training for their role (Figure 15). However, many of these were one-off or irregular training opportunities. There were comments from respondents that more regular, routine training and refreshers would be desirable to ensure they kept up to date with best practice protocols and processes to support sepsis patients.

Figure 15: Sepsis recognition training (n=93)



> ***"All new paediatric registrars have sepsis training and unwell child training... Ongoing challenge is keeping people educated."***
>
> ***Interview respondent***

Other respondents reported that they received training to recognise sepsis during their qualifications, however, there are limited opportunities to keep up to date with the latest information.

> ***"Training to recognise sepsis was a part of my training to become a nurse, however we don't often get opportunities to review the latest information as a part of professional development unless it's something you choose to do"***
>
> ***Survey respondent***

4.5. Sepsis treatment and management

Participants from the survey and interviews commented there was no single overarching protocol across the country and within DHB environments. Appendix 1 outlines which tools each DHB, private hospital and ambulance organisation use, and if internally developed, what tools they are based on. The most used protocols and guidelines included:

- BPAC[16]
- Sepsis Six (using the Sepsis Trust UK/NZ tool) [16]
- Variations of the EWS
- Internally developed tools (varied from within DHBs, across services and departments, private hospitals and urgent care centres).

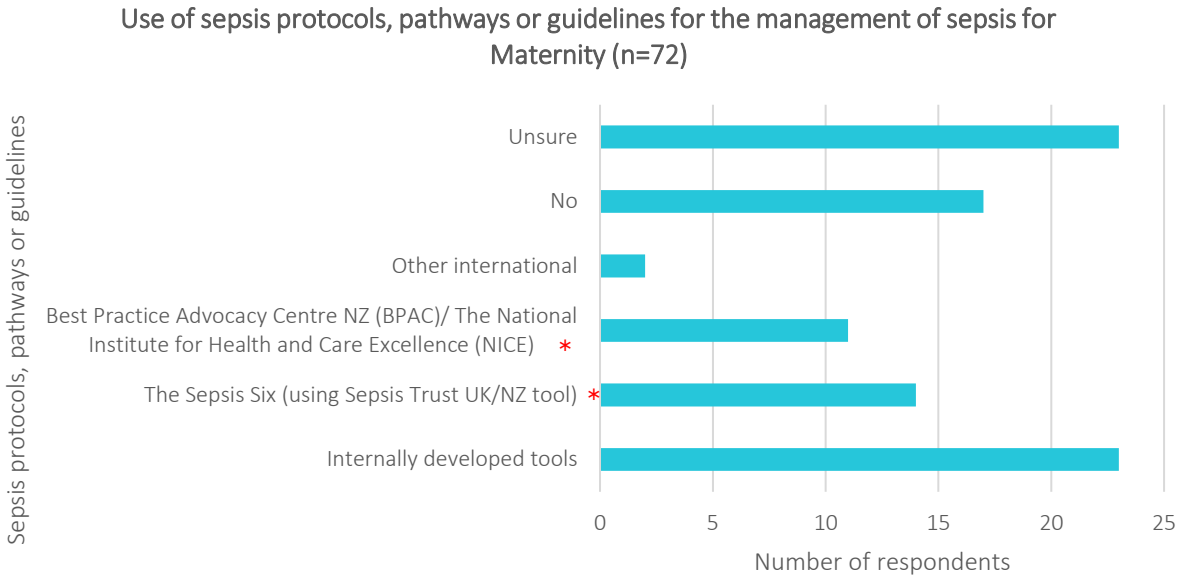
For **adult sepsis management**, most respondents reported that their organisations used internally developed tools (31%, Figure 16). The second most common tool for adults was the Sepsis Six tools (20%, Figure 17). Some respondents use BPAC guidelines (13%), and 12% of respondents do not have an agreed protocol in place. A DHB SMO reported that in ICU, vigilance for sepsis is constant. All patients would constantly score high on all available scoring systems, thus making the use of such tools redundant. Respondents who used other international tools identified the use of the Australian Sepsis Network and British Columbia Sepsis tools.

Figure 16: Adult sepsis protocols, pathways, or guidelines (n=82)

[16] *It should be noted that for, the two options, "Tools based on BPAC/NICE guidance" and "Sepsis 6, using the Sepsis Trust UK/NZ tool", are both aligned to and derived from a single guideline – the NICE Guideline 51. These two options are marked with a red asterisk (*). Therefore, when interpreting the following graphs, it is important to note that in most cases, the NICE Guideline 51-derived approaches are the most commonly used.*

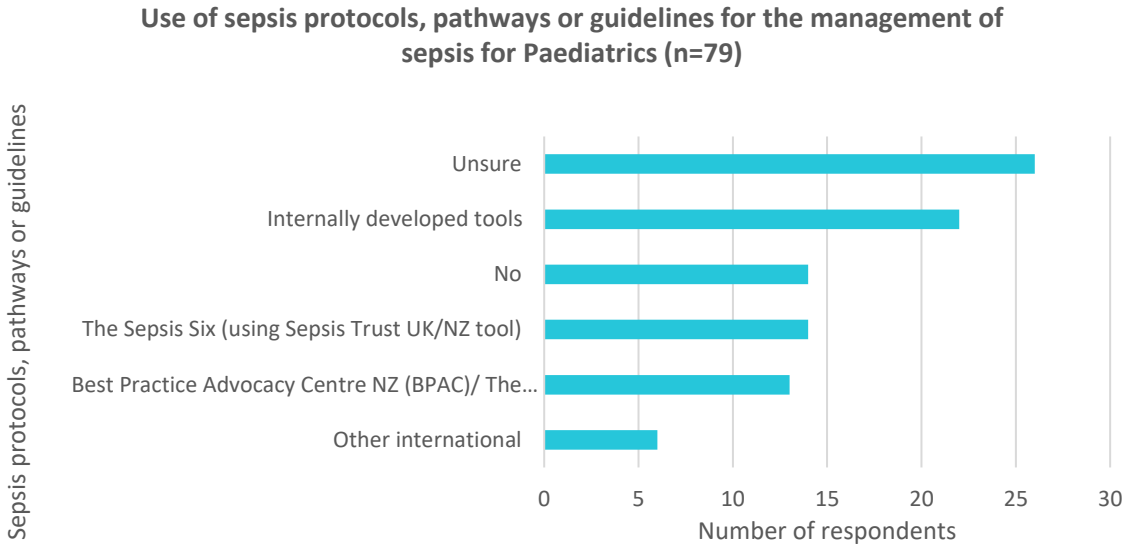
For **maternity sepsis management**, 25% of respondents were unsure if their service or department used any sepsis protocols, pathways, or guidelines (Figure 17). If respondents commented, they were unsure – it was generally followed with a comment that it was not applicable to their department. 19% responded that a risk stratification tool was not used in their service. One DHB responded that they had a working group to inform their maternal sepsis guidelines.

Figure 17: Maternity sepsis protocols, pathways, or guidelines (n=72)



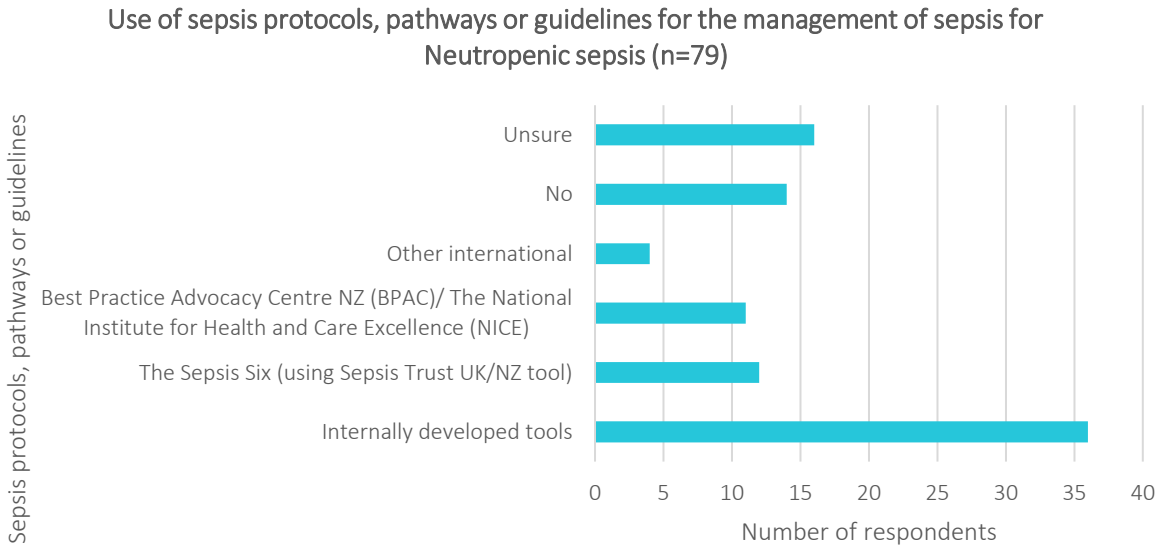
For **paediatric sepsis**, the most common response was that respondents were unsure if sepsis protocols, pathways or guidelines were used (Figure 18). 27% of respondents were unsure if their service or department used any sepsis protocols, pathways, or guidelines. Ten respondents commented that their organisation uses the Starship Children's Hospital Sepsis Clinical Guidelines. International guidelines identified by respondents were from the Children's Oncology Group and Melbourne Royal Children's Hospital.

Figure 18: Paediatric sepsis protocols, pathways, or guidelines (n=79)



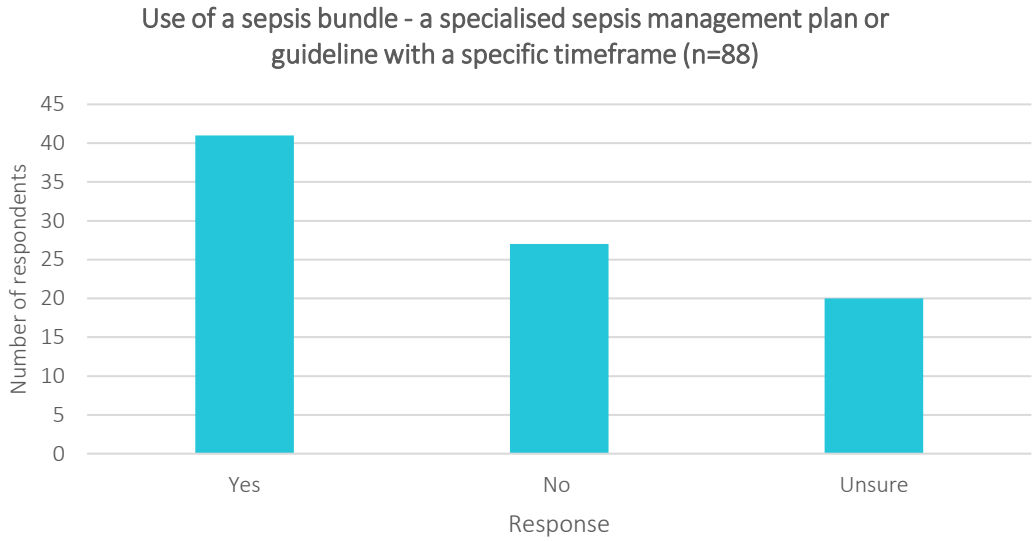
Respondents commented that **neutropenic sepsis** was far less common within all organisation settings. 39% of respondents had an internally developed tool for their service or department dealing with neutropenic sepsis (Figure 19). Survey comments stated that these were either taken from another DHB, and for paediatrics, most commonly Starship Children's Hospital. Other responses referred to their organisational immunosuppressed pathway, referrals to the lead oncology area, or consult with haematologist for neutropenia.

Figure 19: Neutropenic sepsis protocols, pathways, or guidelines (n=79)



47% of respondents said their organisation used a sepsis bundle (Figure 20).

Figure 20: Use of sepsis bundle (n=88)



Of those who responded yes, the following were examples of the bundles used:

- Sepsis Six
- Adult Sepsis Screening performa
- Internally developed bundle
- Golden hour

Respondents also reported anti-staphylococcal bundles and antibiotic therapy as bundles used.

4.5.1. Antibiotics as sepsis treatment

Participants in the stocktake spoke with some concern about lack of consistent national guidance for empiric antimicrobial use for sepsis. It was thought that antibiotic cover for suspected cases was a regular practice and noted that without clear guidance, there may be adverse effects of this in terms of longer-term antimicrobial resistance efforts. This also reflects the lack of standardisation in choice of antibiotics across the sector.

> ***"We need to balance overcalling sepsis and using broad spectrum antibiotics and really focus on the subtle features of sepsis before prescribing."***
>
> ***Interview respondent***

Ambulance services called for a national approach to standardising antibiotic treatment of sepsis. There is currently significant variation across DHB regions as to which antibiotics are used to treat sepsis out of hospital and when it is administered. This can cause confusion for staff and has the potential to increase the likelihood of treatment errors.

One view expressed was that different patient populations in the different DHBs make it difficult to have the same first line antibiotics available. It was expressed that this variation can potentially be harmful, and the sector should look to standardise these practices and protocols as much as possible.

> ***"In my view, I'd want to change the timeline of giving antibiotics to 45 minutes and simplify the out of hospital treatment pathway to just ceftriaxone."***
>
> ***Interview respondent (Ambulance)***

It was also noted that internal organisation audit activities, such as identifying inappropriate antibiotic use, is currently variable across the country. This is compounded by the lack of electronic infrastructure which means audits are largely desktop based manual processes which are unable to be replicated regularly. Clear, consistent sepsis guidance and protocols were identified as a way to standardise treatment, along with clarity around antimicrobial stewardship responsibilities within different organisations. Updated, nationally consistent antibiotic guidelines were acknowledged as a mechanism for improving care and outcomes.

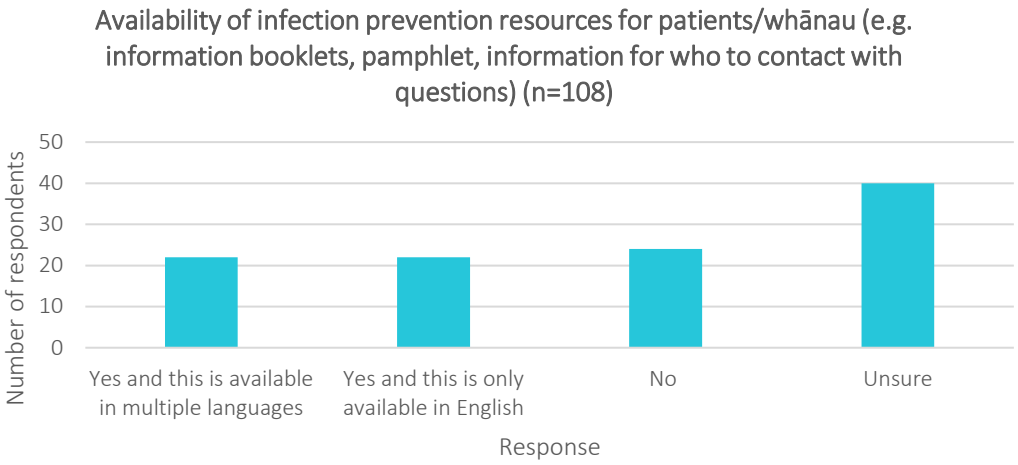
4.5.2. Resources for patients and whānau

Consistent messaging for patients and whānau who are either at risk of developing sepsis, or have experienced it, is an important part of improving the patient experience.

Having accurate, informative, and accessible resources to share with patients can help them understand and mitigate any risk factors, prompt early recognition by patients or whānau, empower them to seek help and early treatment, and support their recovery.

37% of respondents were unsure about whether their organisation had any **prevention and recognition resources** available for patients and whānau (Figure 21). Of those who were aware of generic infection prevention and control resources for patients and whānau within their organisation, half reported that they were only available in English.

Figure 21: Infection prevention resources available for patients and whānau (n=108)



Of those with resources available, there were a variety of different resources in use. These included:

- Kōrero mai information booklets, pamphlets, posters
- Hand hygiene sheets
- Sepsis Trust NZ patient and whānau information books
- Internally developed information sheets related to infection prevention using simple language
- Wound care booklets for post-surgical patients
- Referring patients to the Health Navigator website.

Respondents referenced the need to access international resources to cater for the different languages of patients and ensure accessibility of the resources they were supplying. Some respondents indicated that within the DHB hospital setting, some information was available in te reo Māori as well as English, with no other languages routinely available.

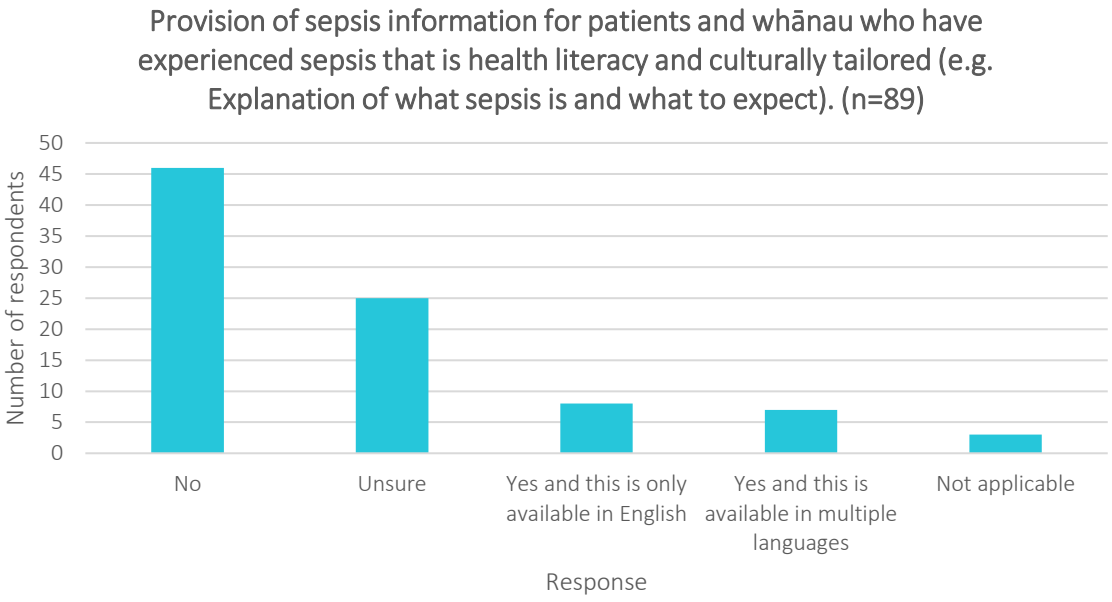
> ***"We use international resources for other languages beyond the Pacific region, e.g. Spanish, Mandarin, etc. we don't have those easily accessible as locally developed resources."***
>
> ***Survey respondent***

There were limited resources provided **for people who have experienced sepsis** at the right level of health literacy and culturally tailored (Figure 22).

More than half, (51%) of respondents said there was no information for patients and whānau on sepsis, for example, descriptions of what sepsis is and what to expect. 51% of

respondents said their organisation does not have information for patients and whānau that is health literacy and culturally tailored. A very small number (8%) said there is information for patients and whānau available only in English and 7% said there is information available in multiple languages. One DHB SMO said that Infectious Diseases Service provides verbal advice to family and whānau, but no written materials.

Figure 22: Sepsis information resources available for patients and whānau (n=89)

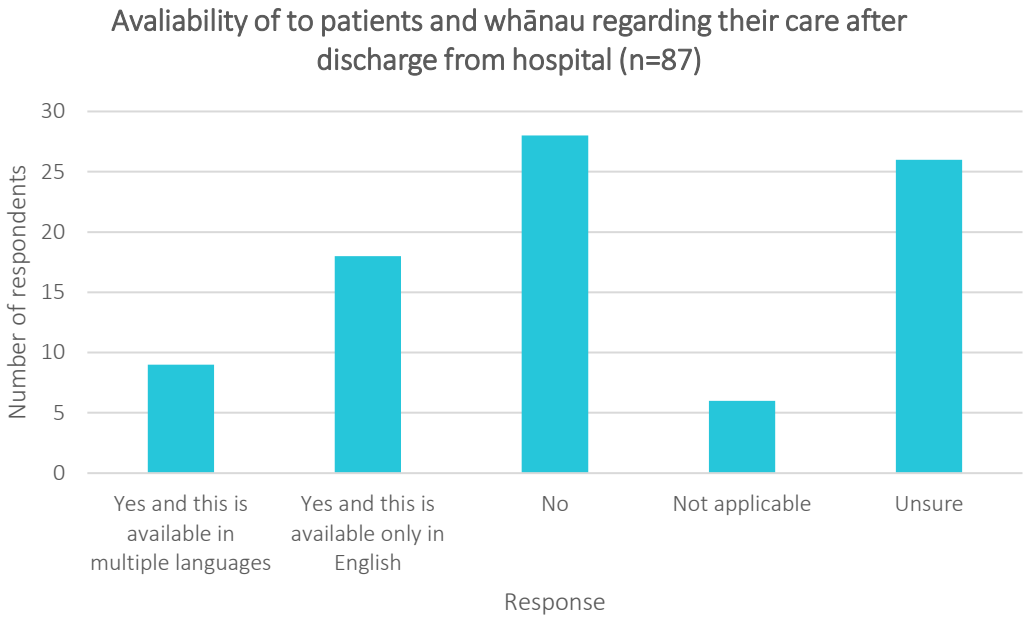


After discharge there were few resources available for patients and whānau. 32% of respondents were aware of resources to support patients post-discharge, with just 10% of total respondents aware of these in multiple languages (Figure 23). Most commonly, this information was included within discharge summaries, which are often delayed or patients and whānau are not able to engage with. Two respondents noted that post-discharge care information would regularly be verbally explained to patients and whānau, but there was no consistent guidance outlined to support these conversations.

There was a high proportion of respondents who were unsure whether patient resources were available (30%), with some commenting that this was something they were going to follow up on within their organisation.

> ***"I'm not sure what sepsis resources we have for patients after discharge, but I will look into this as it would be great to have them."***
>
> ***Survey respondent***

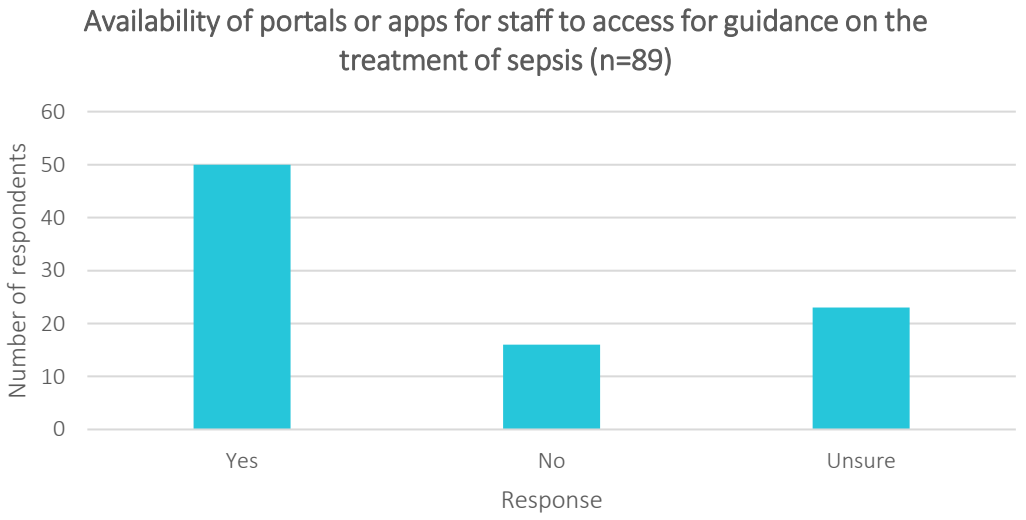
Figure 23: Resources for patients and whānau after discharge from hospital (n=85)



4.5.3. Electronic tools to support sepsis treatment

The availability of electronic tools to support sepsis treatment was noted to be a considerable enabler for providing optimal care. Approximately 60% of respondents to this question were able to access some form of electronic portal or application (app) to support their treatment decision making (Figure 24).

Figure 24: Portals and applications available for guidance on treatment of sepsis (n=89)



Examples currently in use across the organisations include:

- HealthPathways – feedback from the survey and interviews inferred that this was the most used tool within the DHB hospital environment
- Antibiotic treatment applications available on mobile devices:
    - Internally developed antibiotic selection app
    - Empiric app
    - Microguide app
    - MedApp
    - Script App
- Infectious Diseases protocols/guidelines/policies on the organisation's intranet
- Lippincott resources
- Starship Children's Hospital Emergency Drug Dose calculator.

4.5.4. Post-discharge management

There is considerable variety in post-discharge management back to the community across the organisations. On discharge from ICU/critical care, very few respondents (13%) reported clear step-down protocols for managing patients on the ward (Figure 25). For organisations that did have these, it was noted that there were outreach teams to monitor transfer out of ICU. It would then be the responsibility of these teams to manage sepsis patients. Some respondents identified surgical services as responsible for following the step-down protocols for surgical patients. Other organisations commented that the type of step-down pathway can be tailored to the individual patient.

Figure 25: Step-down protocols for managing sepsis patients' post-ICU (n=88)

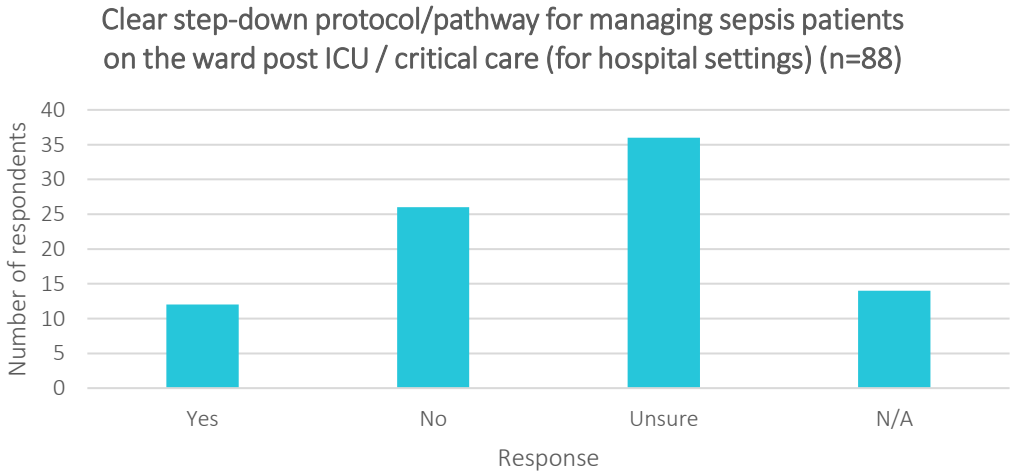
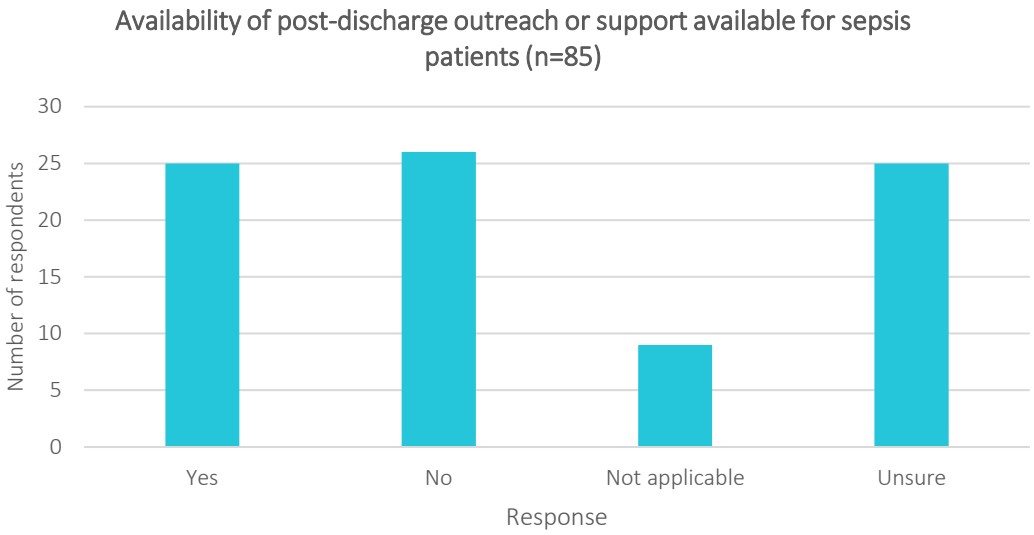


Figure 26: Post-discharge outreach or support for sepsis patients (n=85)

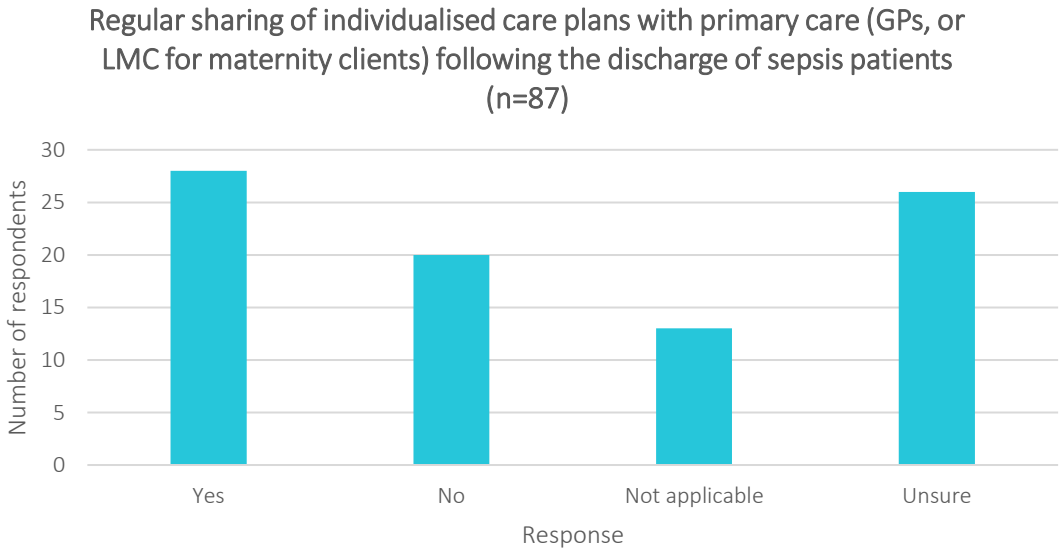


The availability of post-discharge outreach or support for sepsis patients was split between no resources for patients (30%) and available resources (29%) (Figure 26). Many respondents were not sure if there were resources available (29%).

4.5.5. Primary care information sharing

The transfer of individualised care plans to primary care following discharge was varied. 32% of respondents to this question regularly share these plans, although 23% and 30% of respondents respectively either did not, or were unsure whether their organisation regularly shared care plans with primary care (Figure 27).

Figure 27: Sharing of individualised care plans (n=87)



Information sharing was primarily done through discharge summary letters. Where sepsis is recognised and treated within an emergency department environment (i.e., the patient is not admitted), this information is rarely shared back to primary care.

Where required, some private hospitals noted that they can make phone calls to the patient's general practitioner or other community workers. However similar to DHB hospitals, most information is transferred to primary care via a discharge summary or an electronic written assessment.

> ***"This is mostly done through standard discharge summaries, which are transferred electronically to the patient's GP. Sometimes if it is needed, we will call the GP."***
>
> ***Survey respondent***

5. RECOMMENDATIONS

This stocktake has highlighted the significant variation in sepsis management across acute and secondary care environments in Aotearoa New Zealand. Based on the findings included in this report, the following high-level recommendations for action will support a cohesive, equitable response to sepsis for patients and their whānau.

It is also important that work is undertaken across primary and community care and other out-of-hospital settings to understand sepsis governance, prevention, recognition, management and follow up in these settings.

Governance

Nationally

1. A national steering group should be established, with multi-disciplinary representation, to progress the Aotearoa New Zealand National Sepsis Action Plan.
2. This group should develop an agreed set of definitions for sepsis so consistent data can be captured.
3. Outcome of sepsis events should be monitored, and key learning shared to support improvement. Existing programmes such as Learning from Adverse Events may support this process.
4. In line with Te Whatu Ora Health New Zealand, Te Aka Whai Ora Māori Health Authority, and the Public Health Agency (Ministry of Health) structures, sepsis data should be presented to decision makers at a national and district level.

Within organisations

5. Each organisation should ensure that management of sepsis sits within their clinical governance framework and areas for improvement are identified and prioritised.
6. Data should be presented for the following populations by age, ethnicity and clinical specialty, with a clear understanding of where sepsis developed (for example, in the community or in hospital):

    - Paediatrics
    - Adults
    - Maternity.

7. Each organisation should establish clinical roles tasked with improving sepsis management and outcomes. The resource required should be determined by the complexity and size of the organisation. The resource provided will:

    a. Facilitate monitoring and feedback of the sepsis management pathway for priority groups

b. Provide clinical leadership
c. Establish local champions to support education, disseminate findings and share insights e.g. nurse educators
d. Ensure consumer engagement
e. Ensure Māori and Pacifica engagement

Preventing sepsis

8. Develop a set of standardised tools to identify individuals at high risk of developing sepsis. Promote this tool kit to both community and hospital-based clinicians via relevant pathways.
9. Develop patient information that aligns with the health literacy and language requirements for patients and whānau to cover the risk of sepsis and how to reduce the risk in the following settings:

    - Surgery
    - Maternity
    - Paediatrics
    - Those at high risk, e.g. with compromised immunity such as cancer and diabetes.

Recognising sepsis

10. Work with first responders and community-based health care providers to increase their understanding of sepsis including the early recognition of sepsis.
11. Develop effective educational strategies for clinical staff in urgent care and emergency departments so that the risks for sepsis can be identified at presentation and appropriately triaged.
12. Aim to integrate electronic patient management systems with population appropriate Early Warning Systems (EWS) and other automated sepsis recognition tools or algorithms (and look at use of AI or algorithms and flags).
13. Ensure that 'Sepsis recognition tools' have an equity focus, are culturally safe and can be monitored by ethnicity. The development of such tools should embed the principles of Te Tiriti o Waitangi.
14. Ensure that appropriate diagnostic testing is performed at presentation to facilitate diagnosis and to support the appropriate choice of antimicrobials.
15. Recommend early referral to intensive care services.

Appropriate treatment of sepsis

16. A standard national set of guidance documents should be developed, including

national antimicrobial treatment guidance for sepsis. Existing pathways for sharing of such guidance should be utilised. Guidance should be tailored to different healthcare provider and patient groups including but not limited to:

- Primary care and out of hospital (e.g. birthing units and ambulance)
- 24-hour accident and emergency centres and urgent care centres
- Emergency departments
- Adult based wards
- Paediatrics
- Maternity
- Cancer/immunocompromised.

17. Standardise the requirement for specialist referral and escalation pathways to ensure patients that deteriorate are identified and managed appropriately. Ensure that infectious diseases/clinical microbiology expertise is provided at secondary care level.
18. Ensure compatible electronic patient information systems are available and used to guide treatment e.g. laboratory results or e-prescribing for antibiotic choice.

Appropriate follow up care

19. Develop standardised step-down approaches within hospital.
20. Develop processes to ensure that patients and whānau receive information after a sepsis event that is appropriate for them and that is delivered in a culturally appropriate manner.
21. Standardise discharge summaries and foster processes for active engagement with primary care.
22. Identify those patients at high risk of recurrence, or poor outcomes, and work with the patient, their whānau and primary care team to develop a response plan to mitigate further sepsis events.

6. CONCLUDING COMMENTS

This stocktake sought to understand how sepsis is prevented, recognised, and treated in public hospitals, private hospitals, ambulance services and urgent care clinics. There is substantial variation across and within these healthcare settings for these activities. There are pockets of good work occurring, with unique organisation-led initiatives supporting the response to sepsis, but these are often not implemented widely, or systematically.

The current health reforms provide an opportunity to standardise and streamline the response to sepsis regionally, and nationally where appropriate, with national guidance and facilitation of these efforts representing a good starting place.

This stocktake should be used as a foundation for understanding how to support action within existing systems. To this end further work needs to be done to understand the response to sepsis in primary and community settings.

This report highlights a set of key recommendations that would improve understanding and management of sepsis in Aotearoa New Zealand. Agreement and consistency around data collection and reporting would be a significant step forward, allowing Te Whatu Ora, Te Aka Whai Ora, and health agencies to accurately monitor sepsis prevalence and outcomes.

Other recommendations relate to workforce and training, as well as better connectedness with primary care to support the patient on their journey. These are key to enhancing system responsiveness to sepsis and improving recovery following hospital discharge.

This report's recommendations are not new and appear to align with previous work. Specifically, the New Zealand Sepsis Trust supported the development of a collaborative national sepsis action plan, which reached similar conclusions to those presented here. The only thing left to do now, is act.

7. APPENDIX: SEPSIS GUIDELINES

Following the survey and interview, we asked respondents to send their sepsis organisational protocols and guidelines. We received protocols and guidelines from 20 DHBs. The most common adult guidelines are the 'Sepsis Six' by The UK Sepsis Trust and qSOFA. For maternity settings, maternal early warning scores and Sepsis Six+2 were most commonly used. Society of Obstetric Medicine of Australia and New Zealand (SOMANZ) and Sepsis Trust NZ paediatric tool were used most in paediatric settings. No specific guidelines were provided for neutropenic sepsis. HealthPathways were used across all adults, maternity, paediatric and neutropenic patients.

None provided means that we either did not receive these guidelines from the organisation or they do not exist.

Followed up, no response means that we received no response from the organisation.

DHB Hospital/ Service	Adults	Maternity	Paediatric	Neutropenic
Northland	*Followed up, no response*	*Followed up, no response*	*Followed up, no response*	*Followed up, no response*
Waitematā	Internally developed guideline qSOFA	Internally developed guideline Sepsis Six+2	*None provided*	*None provided*
Auckland	*None provided*	Internally developed guideline MEWS scores	*None provided*	*None provided*
Counties Manukau	*None provided*	*None provided*	Internally developed guideline NEWS scores SOMANZ scores	*None provided*
Waikato	Sepsis Six	*None provided*	*None provided*	*None provided*
Bay of Plenty	*None provided*	*None provided*	Internally developed guideline HealthPathways	Internally developed guideline
Taranaki	Internally developed guideline Sepsis Six	Internally developed guideline Sepsis Six MEWS scores	*None provided*	*None provided*
Lakes	Internally developed guideline	*None provided*	*None provided*	*None provided*

DHB Hospital/ Service	Adults	Maternity	Paediatric	Neutropenic
	qSOFA British Columbia ED Sepsis Guidelines			
Tairāwhiti	*None provided*	*None provided*	Internally developed guideline	*None provided*
Whanganui	Sepsis Six	Sepsis Six+2	*None provided*	HealthPathways
MidCentral	*None provided*	*None provided*	Internally developed guideline	*None provided*
Hawke's Bay	*Followed up, no response*	*Followed up, no response*	*Followed up, no response*	*Followed up, no response*
Capital and Coast	*None provided*	Internally developed guideline Soon to be aligned with Sepsis Trust	Internally developed guideline Soon to be aligned with Sepsis Trust	Internally developed guideline Soon to be aligned with Sepsis Trust
Hutt Valley	*None provided*	Internally developing a sepsis maternal bundle	*None provided*	*None provided*
Wairarapa	*Followed up, no response*	*Followed up, no response*	*Followed up, no response*	*Followed up, no response*
Nelson Marlborough	*Followed up, no response*	*Followed up, no response*	*Followed up, no response*	*Followed up, no response*
West Coast	Internally developed guideline Sepsis Six	Internally developed guideline Sepsis Six	*None provided*	*None provided*
Canterbury	*None provided*	Internally developed guideline MEWS scores	Internally developed guideline HealthPathways	*None provided*
South Canterbury	*Followed up, no response*	*Followed up, no response*	*Followed up, no response*	*Followed up, no response*
Southern	Sepsis Trust Guidelines	Sepsis Trust Guidelines	Sepsis Trust Guidelines	*None provided*
Gillies Hospital	Sepsis Trust Adult Sepsis screening action tool BPAC sepsis	*None provided*	Sepsis trust Paediatric screening action tool	*None provided*

DHB Hospital/ Service	Adults	Maternity	Paediatric	Neutropenic
	tools			
Starship	*None provided*	*None provided*	Internally developed guideline Health Pathways	*None provided*
Wellington Free Ambulance	Internally developed guideline	Internally developed guideline	Internally developed guideline	*None provided*
St John	Internally developed guideline	Internally developed guideline	Internally developed guideline	*None provided*
Number who supplied Guideline	42%	46%	46%	13%