Te Tāhū Hauora
Health Quality & Safety Commission

Sepsis quality improvement programme scoping summary

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Te Kāwanatanga o Aotearoa
New Zealand Government

Purpose

This paper outlines the findings from the preliminary scoping exercise including opportunities for improvement, and the benefits of doing this programme including the financial benefits.

Acknowledgements

Te Tāhū Hauora Health Quality & Safety Commission acknowledges the significant work and feedback from everyone who has been involved in the information gathering phase to inform scoping of a sepsis initiative.

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- Paul Huggan who is an infectious disease doctor and founding member of the Sepsis Trust NZ for providing the clinical leadership to this programme
- Cam Howard for providing the expertise as a sepsis clinical nurse specialist
- colleges, professional bodies, health agencies and various councils for sharing their experience related to sepsis
- Bennett who is our consumer with lived experience and Pepa as his whānau.

Executive summary

Sepsis is a condition of “life-threatening organ failure caused by a dysregulated host response to infection.” Sepsis is a leading cause of hospital deaths in the developed world (Fleischmann et al 2016). Each year 15,000 patients in Australia and New Zealand are admitted to intensive care with sepsis (Finfer et al 2004).

In 2018, the Sepsis Trust NZ and Accident Compensation Corporation (ACC) facilitated a national consultation exercise, supplemented by a multi-stakeholder meeting, which led to publication of a National Sepsis Action Plan in 2021.

In 2022, Te Tāhū Hauora published a stocktake of sepsis management in secondary care across Aotearoa New Zealand (Health Quality & Safety Commission 2022). The report highlighted significant variations in the way sepsis was managed and monitored in Aotearoa and made several recommendations for action.

Building on the insights gained from the stocktake, Te Tāhū Hauora initiated the scoping of a national sepsis programme focused on early identification, timely treatment, and post-sepsis care. Literature review, data analysis, interviews and discussion with stakeholders nationally and internationally were completed to inform the scoping.

Findings from stakeholder engagement

Scoping discovered that there are opportunities to improve the early identification and timely treatment of sepsis in health care settings across the continuum of care from the community to the hospital. In terms of the governance, currently, there are no national governance structures to support sepsis work in Aotearoa. The Sepsis Trust NZ has provided the leadership in this space including providing relevant tools, templates, and other materials to support sepsis through their ‘Raise the Flag: Could it be sepsis?’ programme. Governance of

sepsis at a hospital level is provided mainly through the patient deterioration or patient safety groups however feedback shows variation in the effectiveness of governance.

There is low public awareness of sepsis and the current systems in hospitals are not optimally designed to improve the knowledge and awareness of sepsis. There appears to be variation in the knowledge, awareness, and skills of the health workforce as well.

Scoping identified that most people with sepsis present via the Emergency Department (ED). Within the hospital setting, there are two key areas where there is opportunity to recognise sepsis early: the ED and inpatient wards. There is significant variation around the system used to recognise sepsis in the ED. It was identified that in many cases patients deteriorated while waiting in ED. In some cases, the condition of the patient was masked by the medical intervention given prior to ED presentation. Sub-optimal communication between various health settings exacerbates the issue further.

Scoping highlights the opportunity for early detection of infection and sepsis in pre-hospital settings, including urgent care and ambulance, using a standardised screening tool.

An independent literature review was completed to identify the most effective national and international quality improvement initiatives implemented in various health care settings since 2015 that have addressed the early recognition, diagnosis, and timely management of sepsis and post-sepsis care across all populations. This review identified the necessity of a coordinated national approach and the importance of leadership and adequate resource allocation in sepsis quality improvement initiatives. It also showed a notable gap in the implementation or evaluation of sepsis quality improvement initiatives in the pre-hospital or ambulatory settings. The review identified an evidence gap in community, primary care, and long-term settings which present opportunities for future research and policy formulation.

To understand sepsis in the New Zealand context, local data sources were identified and analysed. This includes adverse events, ACC, Health and Disability Commission (HDC), and initial analysis of National Minimum Data Set (NMDS).

Preliminary analysis of 150 sepsis-related adverse events (SAC 1 and SAC 2) indicates that on average, two adverse events occur in public hospitals every month. Delayed recognition or treatment was identified as the most common reason for an adverse event to be reported. A search for sepsis-related decisions on the HDC website reveals 427 reports which include 184 decisions and 243 other sepsis-related reports. To understand the occurrence of sepsis in public hospitals, sepsis-related diagnostic codes were identified for ICD-10 AM/ACHI/ACS 8th edition. A preliminary analysis was completed using these codes.

Sepsis implementation was explored in two public hospitals (Waikato and Taranaki) in Aotearoa. A recently published paper highlights the reduction in standardised mortality rate after the implementation of ‘Raise the Flag” sepsis programme in Waikato (Huggan et al 2024). Despite the published outcome, effectiveness of the programme beyond the improvement phase needs further review, as sustaining the interventions appears to be a challenge with change in governance, leadership, changing priorities, and the people driving the initiative locally.

Information on value for money for a national initiative on sepsis showed early recognition and treatment may lead to less ICU utilisation, length of stay, mortality, health resource utilisation and ongoing resource requirement for post-sepsis care. Improving the discharge process will potentially reduce the readmission with sepsis, especially people discharged

from hospital with a medical device (eg, central venous catheters). Focusing on post-surgery sepsis will further reduce the overall events of sepsis.

A study funded by ACC using a restrictive definition of sepsis in discharge coding submitted in 2016 shows the average length of hospital stay was 8.1 days (range 1–86, median 6, IQR 3–10). The average reimbursement per discharge was $11,552 (range $717–$181,988, median $10,381, IQR $6,177–$10,964) (Huggan et al 2021).

Safer Care Victoria has reported the cost-effectiveness of state-wide implementation (across 23 hospitals) of a whole of hospital sepsis pathway. Their programme cost $1.8 million to implement over one year. Outcomes included a 2.9-day reduction in length of stay, a 5 percent average reduction in hospital mortality, and an AUD$7,900 reduction in cost per patient, proving that a well-resourced sepsis initiative can save lives and markedly reduce the health service cost per admission (Brusco et al 2023).

There is a need to implement a standardised recognition and treatment system in various health settings that will facilitate early recognition and timely treatment based on best practice. This can be achieved through a national quality improvement initiative that will focus on areas such as national and local governance, data collection and monitoring, improving knowledge and awareness, and standardised sepsis recognition and treatment system.

Introduction

Background

Sepsis is a leading cause of hospital deaths in the developed world (Fleischmann et al 2016). Each year 15,000 patients in Australia and New Zealand are admitted to intensive care with sepsis (Finfer et al 2004).

Sepsis is a condition of “life-threatening organ failure caused by a dysregulated host response to infection” (Singer et al 2016). Research indicates that Māori and Pacific communities in Aotearoa experience sepsis at significantly higher rates than non-Māori and non-Pacific populations, amplifying health disparities in this country (Huggan et al 2017).

In 2017, the World Health Assembly and the World Health Organization made sepsis a global health priority by adopting Resolution WHA70.7 to improve, prevent, diagnose, and manage sepsis (World Health Organization 2017). The resolution urges the 194 United Nation Member States to implement appropriate measures to reduce the human and health economic burden of sepsis.

In 2018, the Sepsis Trust NZ and ACC facilitated a national consultation exercise, supplemented by a multi-stakeholder meeting, which led to publication of a National Sepsis Action Plan in 2021.

In 2022, Te Tāhū Hauora published a stocktake of sepsis management in secondary care across Aotearoa (Health Quality & Safety Commission 2022). This evaluated protocols and guidelines used across acute and secondary care settings, relating to the recognition of risk, diagnosis, management and follow up for sepsis patients. The report highlighted significant variations in the way sepsis was managed and monitored in Aotearoa and made several recommendations for action. These recommendations focused on keeping patients at the centre of sepsis planning, from prevention to post-discharge support. Other

recommendations include standardising approaches to the prevention, recognition, and treatment of sepsis; collecting and monitoring data at a national and organisational level; developing education and training for health professionals; improving resources for consumers; and increasing support for patients and whānau after hospital discharge.

Initial scoping work

Building on the insights gained from the stocktake, Te Tāhū Hauora completed the scoping of a national sepsis programme focused on early identification, timely treatment, and post-sepsis care. This work was undertaken with members from the Sepsis Trust NZ and placed strong emphasis on integrating Te Tiriti o Waitangi principles, addressing inequities, improving treatment, and incorporating consumer lived experience.

The focus of scoping was to gather information from local and international sources about:

- management of sepsis in hospitals and other health settings
- the current evidence related to sepsis care
- gaps in the current system
- governance and leadership for sepsis in New Zealand
- availability of qualitative and quantitative data to support improvement initiative
- readiness of the sector for a sepsis related national quality improvement initiative
- value for money
- establishing a quality improvement approach to improving early identification, timely treatment, and post-sepsis care in New Zealand.

Method of gathering information

Literature review: a review was completed to identify the most effective national and international quality improvement initiatives implemented in various health care settings since 2015 that have addressed the early recognition, diagnosis, early management, and post-sepsis care of sepsis across all populations.

Data: data from diverse datasets were explored including the National Minimum Data Set (NMDS), ACC claims, complaints made to HDC, and adverse events reported to Te Tāhū Hauora.

International initiatives: Reports and information published by similar initiatives completed internationally.

Interview and discussions: information (qualitative data) was gathered through site visits, interviews, and discussions with stakeholders. Taking a systems approach and focusing on the patient journey, a range of stakeholders were involved in this process from primary care to secondary care. The leads of groups, professional organisations, and colleges were consulted during this process. A systematic approach using semi-structured interviews was used where predetermined questions were shared with stakeholders in advance and each question was discussed in the interview. A list of stakeholders who were consulted is available in Appendix 1.

Findings from stakeholder engagement

Sepsis in different health care settings

Scoping discovered that there are opportunities to improve the early identification and timely treatment of sepsis in health care settings across the continuum of care from the community to the hospital. There is unwarranted variation in the way sepsis is identified and treated in these health settings. A sepsis screening tool is available from the Sepsis Trust NZ for pre-hospital and in-hospital care. However, the usage of this tool appears low and remains a challenge. Post-sepsis care was also identified as a key area requiring attention.

Seven clinical focus areas were identified in the sepsis continuum of care:

1. Hospital level care
2. Care during transport (ambulance)
3. Urgent care: A&E
4. Primary care: GP practices
5. Community care: health services in community settings
6. Public health: health literacy
7. Post-sepsis care: rehabilitation and ongoing care

National and local governance

Governance is vital for the implementation and sustainability of any quality improvement initiative. This includes governance at the local and national level. Currently, there are no national governance structures to support sepsis work in Aotearoa. The Sepsis Trust NZ has provided the leadership in this space including providing relevant tools, templates, and other materials to support sepsis through their 'Raise the Flag' sepsis programme available on their website (https://www.sepsis.org.nz/). As sepsis does not fall under a specific disease group there is no professional clinical group to support ongoing work to improve sepsis management. There is currently no national consensus document for best practice in the management of sepsis in New Zealand.

Governance of sepsis at a hospital level is provided mainly through the patient deterioration or patient safety groups. Feedback received from hospital teams indicates that there is variation in the effectiveness of governance provided through these groups. Some teams have reported weakening of the governance structures and less attention on sepsis. This challenge is exacerbated by the lack of clarity around who owns sepsis within hospitals. Usually, it is incorporated into infection prevention and control groups, but it can be included in ICU, ED, and infectious diseases as well.

These findings highlight the gap in the governance and leadership for sepsis in our public hospitals. There was very limited information available around governance for sepsis out of hospital settings. Overall, there is a lack of unified governance and leadership for sepsis across various health settings.

Knowledge, awareness, and skills

Discussions with senior clinicians provided an insight into knowledge gaps around sepsis recognition and treatment. There appears to be variation in the knowledge, awareness, and

skills of the health workforce around sepsis. There are inconsistencies around who provides the education to staff on sepsis and how often it is provided. There is also variation in the approach to recognition and treatment of sepsis. The early signs of sepsis can be non-specific so clinicians may not think about sepsis as a potential diagnosis. It was also identified that there are very few skilled sepsis educators and specialists. Some of these challenges are also identified in the New Zealand Sepsis Action Plan (Sepsis Trust 2021).

Lack of education opportunities and standardised materials related to sepsis for patients and whānau is also identified as an improvement opportunity. There is low public awareness of sepsis and the current systems in hospitals are not optimally designed to improve the knowledge and awareness of sepsis. Feedback from multiple stakeholders highlights the lack of public awareness around sepsis.

Process and practices

Scoping identified that most people with sepsis present via the ED. This aligns with international literature which states that approximately 80 percent of sepsis is community acquired (Yealy et al 2021).

In 2018, BPAC published a sepsis guideline which contextualised the NG 51 NICE guidelines to the New Zealand health care environment. The Sepsis Trust NZ used the NICE and BPAC guidelines to develop a sepsis risk stratification tool for pre- and in-hospital settings and for different patient groups such as maternity, adult and paediatrics. These tools are available on the Sepsis Trust NZ website; however, it was learned during the interviews with urgent care and Sepsis Trust NZ members that the utilisation of these tools appears low, especially outside hospitals.

Feedback from hospitals showed that there are different systems in use for sepsis. Within the hospital setting, there are two key areas where there is opportunity to recognise sepsis early: the ED and inpatient wards. There is significant variation around the system used in ED to recognise sepsis. It was identified that in many cases patients deteriorated while waiting in ED. In some cases, the condition of the patient is masked to the medical intervention given prior to ED presentation.

Nationally standardised vital sign charts with early warning scores are used in New Zealand hospitals to recognise acute deterioration and prompt clinicians to respond. While an elevated early warning score can alert clinicians that a person is more likely to deteriorate, it does not provide information as to the cause of this deterioration. Stakeholders' feedback suggests that when responding to an elevated early warning score, clinicians do not always consider sepsis and are not prompted to complete sepsis screening.

Multiple reports and stakeholder feedback highlighted the issue of sub-optimal communication between various health settings. This includes ED to other clinical areas where sepsis is not clearly communicated to inpatient wards and communication to patient and whānau as well. The issue around documenting the relevant information related to sepsis was also highlighted.

It was identified that patients understanding on post-sepsis care is limited. Scoping identified an opportunity to strengthen the discharge process with appropriate handover to GP and ensure patient education and information on post-sepsis care.

It was learned that people with sepsis often deteriorate rapidly, meaning they often either call an ambulance, present to urgent care or the hospital ED rather than visiting their GP. There is lack of information around the use of a sepsis screening tool in GP clinics and community-based clinics. Scoping highlights the opportunity for early detection of infection and sepsis in these settings using a screening tool.

Findings from literature review

As part of the scoping phase an independent literature review was completed to identify the most effective national and international quality improvement initiatives implemented in various healthcare settings since 2015 (Attwell 2023). This focused on initiatives that have addressed the early recognition, diagnosis, early management of sepsis and post-sepsis care across all populations.

Data were extracted from 186 sepsis quality improvement publications. These included 24 guidelines, 2 meta-analyses, 10 systematic reviews, 73 quality improvement initiative evaluations, 58 sepsis quality improvement-related research studies, and 17 literature reviews. The settings encompassed around 20 in pre-hospital primary settings such as maternity, general practice, community, etc, and 142 in hospital settings, which included about 28 in emergency departments, 23 in intensive care units, 11 in neonatal intensive care units, 11 in paediatrics, and 7 in ambulance settings.

Key findings:

- The review also highlighted the complexity in sepsis definition and guidelines, the potential, and limitations of new technology in sepsis management, the multifaceted factors influencing disparities in sepsis outcomes, and the need to build the right teams and navigate roadblocks for successful implementation.
- The "Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3)" was published in 2017. This provided revised definitions and clinical criteria. By utilising the Sequential [Sepsis-related] Organ Failure Assessment (SOFA) score and quickSOFA (qSOFA) score, the guidelines aimed to streamline diagnostic processes and facilitate earlier recognition and management, thus enhancing patient outcomes (Singer et al 2016).
- This review identified the necessity of a coordinated national approach and the importance of leadership and adequate resource allocation in sepsis quality improvement initiatives.
- The literature reviewed from 2015 to 2023 showed a notable gap in the implementation or evaluation of sepsis quality improvement initiatives in the pre-hospital or ambulatory settings. The review identified an evidence gap in community, primary care, and long-term settings which present opportunities for future research and policy formulation.

Findings from data exploration

To understand sepsis in the New Zealand context, local data sources were identified and analysed. This includes ACC, HDC, and initial analysis of NMDS.

ACC

Te Tāhū Hauora worked with the ACC team to understand the breakdown of accepted treatment injury claims. In total, 929 treatment injury claims mentioned sepsis in the injury fields between 1 January 2018 and 30 October 2023, with total costs of $19,489,714. Of these, 656 (71 percent) of claims were from a treatment facility coded as a district health board (ie, public hospitals). The distribution of overall cost is $10,692,874 for compensation, $4,032,422 for rehabilitation and $4,764,418 for treatment.

Adverse events:

An analysis of the sepsis-related adverse events (SAC 1 and SAC 2) reported to Te Tāhū Hauora over the five years from 2017 to 2022 was completed to understand the size of the problem (Te Tāhū Hauora 2024). Adverse events are given a severity assessment code (SAC) of between 1 and 4 based on the severity of the outcome. SAC 1 and SAC 2 events are those that result in death or severe loss of function.

A total of 150 adverse events were reported between 2017 to 2022. Preliminary analysis indicates that on average, two adverse events occur in public hospitals every month.

To better understand the findings and recommendations of the subsequent adverse event reviews, a thematic analysis of the findings and recommendations from sepsis-related adverse events (SAC 1 and SAC 2) was completed. A total of 77 adverse events reported from 2015 to 2022 were included in the analysis.

Delayed recognition or treatment was identified as the most common reason for an adverse event to be reported (Table 1). Adverse events were also commonly reported when people developed medical device-related or surgical site infections that led to sepsis, or surgery-related events that resulted in the person developing sepsis.

Table 1: Primary reasons adverse events were reported by sepsis cohort

Adverse events	Total	Adult	Paediatric or neonatal	Maternity
Delayed recognition or treatment of sepsis	29	16	6	7
Medical device related	19	17	2	0
Surgery related	11	9	0	2
Surgical site infection	7	7	0	0
Pressure injury	2	2	0	0
Premature rupture of membranes	2	0	0	2
Medication error	2	1	0	1
Other	5	2	2	1
Total	**77**	**54**	**10**	**13**

HDC

Data received from HDC for the financial year 2018/19 to year 2022/23, indicated a total of 164 complaints involving sepsis. Some complaints involved more than one service provider or facility. This means 197 services were complained about.

Table 2: Top service types in complaints involving sepsis

Service type	Number of complaints
Aged care	41
Surgery	27
Accident and Emergency	24
General practice	24
Maternity	13
General medicine	11
Disability - Supported living	9
Intensive care/critical care	6
Total	**197**

Most of the complaints involving sepsis relate to Health New Zealand | Te Whatu Ora (61%), followed by aged residential care and primary care. The research article by Mowat et al published in 2023 also points sepsis as one of the leading causes of complaints relating to acute deterioration (Mowat et al 2023).

A search for sepsis-related decisions on the HDC website reveals a total of 427 reports which include 184 decisions and 243 other sepsis-related reports.

National Minimum Dataset (NMDS)

The NMDS is a national collection of public and private hospital discharge information, including clinical information, for same day and multi day inpatients. Additional information on NMDS is available on the Health New Zealand Te Whatu Ora website (https://www.tewhatuora.govt.nz). The NMDS is used for policy formation, performance monitoring, research, and review. It provides statistical information, reports, and analyses about the trends in the delivery of hospital inpatient and day-patient health services both nationally and on a provider basis.

To understand the occurrence of sepsis in public hospitals, sepsis-related diagnostic codes were identified for ICD-10 AM best Eleventh Edition. A preliminary analysis was completed using these codes. While identifying the codes it was apparent that the current analysis may not be a true reflection of the prevalence of sepsis as there is a lack of common definition of sepsis. A definition needs to be agreed and more exploratory work is required before the true prevalence can be ascertained.

A similar exercise was carried out in Waikato, where codes and metrics were identified to support the improvement which is captured in the article published by Huggan et al 2021. As the codes used were from ICD-10 AM best Eighth Edition, the methodology needs to be refined based on updated codes and definitions to understand the sepsis in public hospitals.

Hospitals which implemented sepsis interventions

Members of the sepsis working group explored the implementation approach, outcome, and sustainability of sepsis-focused quality improvement programmes in two public hospitals (Waikato and Taranaki) in Aotearoa. In terms of the outcome, a recently published paper highlights the reduction in standardised mortality rate after the implementation of ‘Raise the Flag’ programme in Waikato (Huggan et al 2024).

One distinguishing factor in Health New Zealand - Te Whatu Ora Waikato was the presence of a sepsis clinical nurse specialist who drives the sepsis-related education, governance, post-sepsis clinic and facilitates best practices across all wards, services and various clinical settings including outpatients.

Discussion with a senior medical officer (SMO) in Waikato ED highlighted some barriers and opportunity for a successful implementation of intervention related to sepsis. This includes clinician resistance to change, clinician change over, nursing staff turnover, resistance to complete paperwork compared to providing care. It was also identified that for a successful implementation, creating buy-in is a critical factor and interventions such as involving SMOs in decision making, having champions, a no-blame attitude, involving other specialities and the flexibility to make clinical decisions worked well in Waikato.

Despite the published outcome, effectiveness of the programme beyond the improvement phase needs further review, as sustaining the interventions appears to be a challenge with change in governance, leadership, changing priorities, and the people driving the initiative locally.

Feedback from other hospitals

A proposed national programme was shared with hospitals through the quality and risk managers’ national meeting. Since then, the sepsis working group has connected with several hospitals to understand their work on sepsis. At least six hospitals readily expressed their interest to participate in the national programme. Discussion with these hospitals has revealed a sense of urgency to address this issue due to recent adverse events. Hospitals in the central region have come together to address sepsis and have escalated sepsis as a clinical risk. Hospitals are keen to progress this work and have started activities including education, testing the current sepsis screening tool, and forming governance and working groups to tackle this challenge.

Hospital teams continue to connect with the national working group to learn about the upcoming changes to sepsis recognition and treatment approaches.

Value for money

A national programme could have a significant impact on both consumer outcomes and the health care system. A national or multi-regional roll-out of the ‘Raise the Flag’ sepsis programme is expected to lead to reductions in mortality, health care use and costs. Early recognition and treatment may lead to less ICU utilisation, length of stay, mortality, health resource utilisation and ongoing resource requirement for post-sepsis care. Improving the discharge process will potentially reduce the readmission with sepsis, especially people

discharged from hospital with a medical device (eg, central venous catheters). Focusing on post-surgery sepsis will further reduce the overall events of sepsis. Early identification and timely treatment may prevent people from deteriorating with sepsis and could improve the quality of life of the patient and whānau.

Te Tāhū Hauora worked with the ACC team to understand the breakdown of the accepted claims. There were 996 treatment injury claims that mentioned sepsis in the injury fields between 1 January 2018 and 30 September 2023 with total cost of $19,489,713. Of these claims, 929 were accepted for cover. Out of these 656 (71 percent) are claims from the treatment facility group that is coded as DHB (public hospitals). The distribution of overall cost is $10,692,873 for compensation, $4,032,421 for rehabilitation and $4,764,418 for treatment.

A system-wide approach to sepsis means that there is potential to prevent sepsis, which in turn may result in a reduction of sepsis-related spending for ACC. Our confidence in the gains is backed by many of the international studies that reflects the return on investment. Also, depending on funding, we wish to undertake a full economic evaluation from an external agency to ascertain the true cost saving.

Sepsis incurs high costs, estimated at over US$32,000 per patient on average in hospital settings (Arefian et al 2017). In 2018/19 an official information request release stated there were 4,183 publicly funded case-mix hospital discharges with a primary diagnosis of sepsis reported by the Ministry of Health. These events had an average length of stay of 6.2 days, and a total estimated cost of NZD$39,71,006.29 with the average estimated cost per event for these hospitalisations is NZD$10,423.28.

In a study, funded by ACC and using a restrictive definition of sepsis in discharge coding submitted in 2016, 1,868 admissions were identified as having sepsis. The average length of hospital stay was 8.1 days (range 1–86, median 6, IQR 3–10). The average reimbursement per discharge was $11,552 (range $717–$181,988, median $10,381, IQR $6,177–$10,964).

Safer Care Victoria have reported the cost-effectiveness of state-wide implementation (across 23 hospitals) of a whole of hospital sepsis pathway. Their programme cost $1.8 million to implement over one year. Outcomes included a 2.9-day reduction in length of stay, a 5 percent average reduction in hospital mortality, and an AUD$7,900 reduction in cost per patient, proving that a well-resourced sepsis initiative can save lives and markedly reduce the health service cost per admission (Brusco et al 2023).

The British Columbia Sepsis Network (BCSN) performed a return-on-investment analysis that compared their financial investment with the savings from the prevention and mitigation of nosocomial (hospital-acquired) sepsis. They estimated 981 sepsis cases, and 172 deaths were averted in the post-BCSN period (2014-2018). An investment of CAN$449,962 returned net cost savings of CAN$50.6 million by 2018, translating to a return of CAN $112.50 for every dollar invested (Khowaja et al 2022).

A 2019 initiative implementing a sepsis care quality improvement programme across a 547-bed tertiary academic health system in Illinois, USA in adults with suspected infection led to decreased mortality and length of stay and substantial cost-savings (Afshar et al 2019).

Health economics and outcomes research data indicate that sepsis quality improvement initiatives, when efficiently implemented, may not only enhance clinical outcomes but also provide significant economic benefits.

Based on the cost-benefit analyses highlighted above, we can assume that implementing an effective sepsis quality improvement programme in Aotearoa will lead to significant savings in the health system and improve patient outcomes.

Conclusion and key considerations

Sepsis is a leading cause of hospital deaths in the developed world (Fleischmann et al 2016). Each year 15,000 patients in Australia and New Zealand are admitted to intensive care with sepsis (Finfer et al 2004). Contributing factors to prevent this are very clear through multiple sources including, adverse event reports, HDC reports, international evidence, and feedback from clinicians.

There is a need to implement a standardised recognition and treatment system in various health settings that will facilitate early recognition and timely treatment based on best practice. To achieve this, other elements of the system also need to be addressed at the same time, otherwise any improvements made will not be lasting. The following elements should be strengthened:

- Governance and leadership: Local and national governance and leadership plays a pivotal role in the success of any project and initiative without which the outcomes achieved will not be sustained.
- Data collection and monitoring: Better capturing of sepsis in clinical notes and coding of the same is vital. The available data can be utilised for ongoing monitoring of the progress.
- Knowledge and skills: Increase knowledge and skills of current clinical workforce through agreed and suitable mechanisms. Targeted education needs to be included for migrant clinical workforce and new graduates. While designing the strategies, ongoing education also needs to be incorporated to accommodate standardisation and best practice.

A national approach to implement a best practise-based system for timely recognition and treatment of sepsis will help to achieve the goal and improve the outcomes for consumers and their whānau.

During scoping, the majority of information gathered around management of sepsis occurred in secondary care and further exploration is required to understand the opportunities in primary and community care.

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Appendix One: List of stakeholders engaged as part of scoping

No.	Organisation	Type of meeting
1	Waikato sepsis team	District site
2	Taranaki	District site
3	Waitemata	Key agency stakeholder
4	Mortality Review Committee	Key agency stakeholder
5	Canterbury District	District site
6	HDC	Key agency stakeholder
7	Northland District	District site
8	Blood Cultures	Key agency stakeholder
9	Southern Cross	District site
10	Waikato Emergency Department	District site
11	NZ Private surgical hospital association	Key agency stakeholder
12	Hato Hone St John	Key agency stakeholder
13	Quality leads forum	Key agency stakeholder
14	Capital and Coast District	District site
15	Northland District	District site
16	Australian Commission on Safety and Quality in Health Care	International
17	NZ Nurses Organisation	Key agency stakeholder
18	RNZCGP	Key agency stakeholder
19	UK Sepsis Trust	International
20	Capital and Coast District	District site
21	Health Quality British Columbia	International
22	Antimicrobial Stewardship	Key agency stakeholder
23	George Institute Australia	International
24	Surviving Sepsis Campaign USA	International
25	Wellington Free Ambulance	National
26	Primary Care Clinical Leads	Key agency stakeholder