Aged Residential Care

Manaaki Kaumātua i ngā Whare Kaumātua

Deterioration Early Warning System (DEWS)

Pūnaha Whakatūpato Moata

Feasibility study

Aromatawai whaihua

Te Tāhū Hauora Health Quality & Safety Commission

University of Auckland Waipapa Taumata Rau New Zealand

Ageing Well | Kia eke kairangi ki te taikaumātuatanga | National Science Challenges

Te Kāwanatanga o Aotearoa New Zealand Government

Published May 2025 by Te Tāhū Hauora Health Quality & Safety Commission, PO Box 25496, Wellington, 6146.

ISBN 978-1-991122-28-5 (online)

Available online at www.hqsc.govt.nz

Enquiries to: info@hqsc.govt.nz

REPORT CITATION:

Daltrey J, Boyd M, Robinson J, Hutchings K, Pola R. 2025. Aged residential care Deterioration Early Warning System (DEWS) feasibility study. Te Tāhū Hauora Health Quality & Safety Commission. Wellington: New Zealand.

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Acknowledgements
He kupu whakamihi

Ehara taku toa i te toa takitahi, engari he toa takitini

Success is not the work of an individual, but the work of many.

Te Tāhū Hauora Health Quality & Safety Commission (Te Tāhū Hauora) acknowledges the significant work and feedback from everyone who has been involved in the development and testing of the Deterioration Early Warning System (DEWS). In particular, the DEWS project team at Te Tāhū Hauora would like to thank the following people.

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Acknowledgements

- Residential aged care participants who made this possible both in the feasibility study and development of the DEWS
- Nikki Grae, project sponsor
- Rachael Spooner, project coordination
- Mahashweta Mistry, project management
- Linda Shepherd, project management
- Te Tāhū Hauora Māori Health team for cultural support
- Members of the DEWS feasibility study Expert Advisory Group
- Members of the Aged Residential Care Quality Leads Group

Funders

- Te Tāhū Hauora for the DEWS feasibility study
- Ageing Well National Science Challenge, Ministry of Business, Innovation and Employment, New Zealand for the Development of the Deterioration Early Warning System (project 3720418).

Foreword
Kōrero takamua

I am pleased to present the Deterioration Early Warning System (DEWS) feasibility study report. This report highlights the clinical expertise and experience that brought together the successful design, planning, testing and reporting of a system created to support, not replace, clinical decision-making. DEWS was designed by doctoral candidate Julie Daltrey and Associate Professor Dr Michal Boyd.

Evidence shows that older adults living with frailty often experience atypical patterns of acute deterioration that are not well captured by vital-sign based early warning tools. DEWS uses the observation of population specific clinical indicators to identify changes that may be acute deterioration. Then provides a structured framework for resident assessment, combining clinical indicators of acute deterioration with vital sign measurement to assess clinical urgency and respond using an aged residential care (ARC) appropriate standardised escalation pathway.

In 2024, five ARC facilities participated in a feasibility study to test DEWS. Each facility took part in structured preparation activities, that included their governance structures signing off localised escalation pathways attending education sessions, participating in site visits and establishing staff training plans.

The testing phase included implementation of the three main DEWS tools:

- Quick-DEWS (for health care assistants to identify early changes)
- DEWS-RN assessment tool (to guide structured clinical assessment and escalation)
- SBARR-DEWS communication and critical thinking tool (to standardise handover to primary or secondary care).

This report highlights the method, interventions and evaluation findings from the study. It also includes recommendations for future development provided by the ARC facility staff who participated in the study. Overall, DEWS has been well received and favoured by the ARC sector.

Nikki Grae
Senior Manager, Quality Systems
Te Tāhū Hauora Health Quality & Safety Commission

Executive Summary
Kupu whakarāpopoto matua

This report details the feasibility research study undertaken between January and October 2024. The study examined whether the Deterioration Early Warning System (DEWS) could be implemented in age-related residential care (ARC) in Aotearoa New Zealand and, more importantly, whether it should be implemented in ARC.

Background

DEWS is a unique evidence-based track and trigger system designed to support health care staff who are working in ARC to identify and respond to acute deterioration in the people living in care. It was developed and designed by Daltrey and Boyd (2022)[1] with support from Ageing Well National Science Challenge, Ministry of Business, Innovation and Employment, New Zealand (project 3720418). DEWS was designed and developed over three phases using New Zealand-specific ARC data, interviews and co-design processes. The co-design phase coincided with the COVID-19 pandemic, which limited the breadth and depth of DEWS testing. This study was designed to fully test both DEWS and the quality improvement processes required to implement such a system. It combined expertise from Te Tāhū Hauora Health Quality & Safety Commission Improved Service Delivery team and DEWS designers from the University of Auckland.

Nationally and internationally, vital-sign based track and trigger early warning systems (EWS) have been shown to improve patient safety, reducing both in-hospital mortality and the need for intensive care admissions. Such tools have been trialled in ARC (internationally). However, research shows that they are being used to confirm acute deterioration after a change in condition has been noted, rather than being used to identify acute deterioration.

The primary theory to explain this lack of efficacy is that older people, particularly those with age-related disability and/or frailty syndrome, have physiological changes that affect the presentation of acute deterioration. Presenting symptoms may be subtle, atypical or seemingly unrelated to the underlying condition. The significant clinical risk associated the level of urgency being unrecognised when older adults present to emergency departments with non-specific complaints has led to calls for them to be considered 'red flag' or emergency presentations.

DEWS overcomes these issues by requiring health care assistants (HCAs) to track resident wellbeing during routine day-to-day activities using a set of evidence-based clinical indicators significantly associated with acute deterioration (Quick-DEWS tool). The presence of one or more indicators triggers a more in-depth assessment by the registered nurse (RN) using a tool (DEWS-RN) that combines non-specific indicators and the measurement of vital signs. The urgency score derived from this assessment results in an escalation response commensurate with the presenting issue. The escalation is supported by a communication and critical thinking tool (SBARR-DEWS) that encourages the RN to analyse the presenting situation in the context of the person living in care.

1 The DEWS tools and supporting documents belong to Daltrey and Boyd (2022). The tools are licenced under Creative Commons BY-NC-ND 4.0, Attribution-NonComerical-NoDeriviatives 4.0 International (https://creativecommons.org/licenses/by-nc-nd/4.0/).

Method

The efficacy of DEWS and the implementation process were tested using a type 2 hybrid effectiveness-implementation study grounded in the Reach, Effectiveness, Adoption, Implementation and Maintenance (RE-AIM) framework. This framework has been used for more than two decades to assess population health interventions. The study was supported by key stakeholders. An expert advisory group established specifically for the feasibility study provided consumer, cultural, clinical and regulatory expertise. The ARC Quality Leads Forum, an established group of national quality improvement leaders, also provided input throughout the DEWS design and feasibility studies.

Intervention

ARC providers that expressed interest in participating were selected for their diversity in representing the ARC sector. Each ARC team was required to set up a leadership group (including leaders, managers and DEWS tool users) to run the DEWS implementation at their site. The leadership groups were provided with a project implementation guide, DEWS tools, education and user guide, and data collection tools. In the study preparation phase, a 'how-to' workshop was held that detailed the project. During the study period, weekly implementation audits and fortnightly support meetings were held. The implementation was organised into four phases: plan, prepare, test and evaluate. The preparation phase lasted four months and DEWS tools were tested over a five-month period.

Results

Five ARC facilities took part in the study, representing rural and urban areas and small and large providers from publicly listed and privately owned businesses. All levels of care were represented, and one facility was selected for its integration of Māori tikanga. Overall, leadership groups, RN and HCA tool user groups reported that, not only could DEWS be implemented into ARC, it should be implemented across the ARC sector.

> 'Good practise, good evidence, and tools that make it easy to do, would just transform our capacity to deliver good care'...'I hope that most aged care facilities in New Zealand embrace it with open arms' (project leadership group).

This recommendation was for several reasons. Most importantly, DEWS was effective in supporting health care staff to identify and respond to acute deterioration. HCAs felt it helped them to both identify significant indicators of acute deterioration and to promptly escalate important changes to the RN. The RNs reported it supported their assessment of acute deterioration, reducing the second guessing that sometimes occurs. Importantly, it also engaged RNs in the critical thinking process improving the communication of their analysis with both families and the primary care provider. Leadership groups identified the potential for DEWS to support communication across health boundaries and reduce complaints about communication and acute deterioration detection and increase engagement of HCAs in clinical (rather than care only) practices. Furthermore, they were enthusiastic about the potential for DEWS to support staff new to ARC, such as newly qualified staff and those with English as a second language.

The quality improvement (QI) tools used to support DEWS implementation were generally well received. This is unsurprising because they had been tested during the in-hospital patient deterioration programme and other QI projects run by Te Tāhū Hauora. Of particular importance were the weekly implementation audits that enabled leadership teams to identify and correct any emerging issues.

Three major recommendations

The study makes three major recommendations.

1. DEWS tools (which were tested as paper documents) need to be converted to a digital medium so they can be integrated into patient management systems used in the ARC sector.
2. The education package supporting DEWS implementation should be concise and targeted to the audience with teaching modules no longer than 15 minutes duration, to fit naturally into ARC routines.
3. National implementation of DEWS in the ARC sector would require project support similar to that provided during the feasibility study (including project tools but, importantly, a dedicated role to facilitate implementation).

Limitations

This was a feasibility study conducted with ARC participants expressing an interest in participation. This sets up the potential for bias towards a positive outcome. Testing occurred in five ARC facilities over a relatively short period, longer testing may have seen reduced motivation for the project.

Areas for further study

One participating ARC facility had a significant reduction in falls during DEWS testing. This surprised the research team but could be a result of earlier detection of acute deterioration (falls occur as a result of acute ill-health). This is an area that would require further study. Quantitative efficacy measures need further development. Measurement of acute primary care consultations was only possible in some ARC facilities. It is possible, with a longer intervention period, that changes may be seen with the interRAI long-term facility assessment tool. This would, however, require a comparative analysis research methodology that was beyond the scope of this study.

Conclusion

The use of DEWS was recommended by ARC participants for the ARC sector. It was found to be effective in supporting the timely identification of and response to acute deterioration. Importantly, it supports critical thinking, effective communication and clinical accountability. Participants strongly recommended that DEWS be digitised, to enable integration into existing patient management systems throughout the ARC sector.

Abbreviations

ARC	aged residential care
DEWS	Deterioration Early Warning System
EWS	early warning scores
GP	general practitioner
HCA	health care assistant
HDC	Health and Disability Commissioner
Health New Zealand	Health New Zealand | Te Whatu Ora
NP	nurse practitioner
PLG	project leadership group
PRN	Pro re nata (“when required,” or “as needed”)
QI	quality improvement
RE-AIM	Reach, Effectiveness, Adoption, Implementation and Maintenance
RN	registered nurse
STCP	short-term care plan
Te Tāhū Hauora	Te Tāhū Hauora Health Quality & Safety Commission

Introduction
Kupu whakataki

The timely identification of acute deterioration in people living in aged residential care (residents) is critical for accessing the right treatment, in the right place, at the right time to meet their needs (Daltrey et al 2022; Laging et al 2018). Up to 75 percent of residents live with advanced frailty (Liau et al 2021), a condition of decreased physiological reserve (Morley et al 2013) that results in vulnerability to catastrophic health deterioration from relatively minor stressors (Kojima 2015). In the event of acute deterioration, people living with frailty are more likely to die than their non-frail counterparts (Clegg et al 2013; Kojima et al 2018; Stow et al 2018).

The identification of acute deterioration in this population is not straight forward because frailty-related physiological changes often result in unusual or non-specific presentations of acute illness (Chambers et al 2023; Hodge et al 2023; Simon et al 2022). This is understood to contribute to health professionals not fully recognising patient acuity (Bingisser and Nickel 2019; Karakoumis et al 2015; Limpawattana et al 2016; Samaras et al 2010; Wachelder et al 2017) and has featured as an important component of adverse events both nationally (Mowat et al 2023; Wall 2016) and internationally (Andersson et al 2018).

The Deterioration Early Warning System (DEWS) is an age-related residential care (ARC) specific track and trigger early warning tool, designed to support health care teams with the timely identification of and response to acute deterioration. DEWS development and design was completed in 2020. However, the iterative design and development process coincided with the COVID-19 pandemic, which curtailed the project. Larger scale testing was required before a recommendation could be made about the role of DEWS in ARC in and Aotearoa New Zealand context. This report describes that testing process.

Background
Kōrero o mua

The 670 ARC facilities in New Zealand provide homes for around 35,000 of the country's oldest and most frail people (Reid et al 2024). The ARC sector is large and complex, comprising multiple non-affiliated providers. Forty-eight percent of facilities are operated by individuals or small groups (36% private, 12% charitable) and the remainder are operated by major groups (24% publicly listed, 20% private company, 8% charitable) (Reid et al 2024).

Services delivered by ARC are governed by a national contractual agreement with Health New Zealand | Te Whatu Ora (Health New Zealand), which is on its website,[2] and must meet the Ngā Paerewa Health and Disability Services Standard (NZS 8134:2021).[3] The national contract directs minimum staffing and clinical practice requirements. It requires registered nurse (RN) and health care assistant (HCA) employment as well as general practitioner (GP) or nurse practitioner engagement for routine and on-call emergency medical services. Clinically, it requires RNs to assess and refer (as required) residents in the event of a change in health status. Around 8,000 HCAs and 2,000 RNs (Reid et al 2024) work in ARC. Nearly 40 percent of RNs are internationally qualified (Jenkins and Annette 2016), because most are from India and the Philippines, and English is a second language.

Early warning scores

Early warning scores (EWS) based on tracking vital sign parameters were introduced to hospital practice more than two decades ago (Morgan et al 1997). They have been shown to improve patient safety in national (Mohan et al 2023) and international (Lee et al 2020) studies. However, they are not a panacea. Evidence shows that EWS may not be as sensitive to acute deterioration in frail older people (Rønningen et al 2023), and some critique indicates that they reduce critical thinking among nurses (Downey et al 2017). However, the concept of tracking a person's health status and triggering a commensurate response in the event of change is sound and this has led to a trial of hospital EWS in ARC. Although EWS have been found to improve staff confidence and clinical communication, their efficacy in detecting acute deterioration remains unproven (Barker et al 2019; Russell et al 2020; Stocker et al 2021). Some early warning tools have been developed in ARC. The most well-known internationally is the 'Stop and Watch' tool has been implemented as part of large multifactorial quality improvement (QI) studies so has never been separately validated (Kane et al 2017). Other ARC-developed tools include a proprietary tool developed in Canada (ElBestawi and Kohm 2018) and an infection detection tool from Scandinavia (Tingström et al 2015). None of these tools provide a clear systematic track and trigger system that support both the HCA and RN to identify and respond to acute deterioration in the ARC population (Chambers et al 2023; Daltrey et al 2022; Hodge et al 2023). DEWS was developed to fill this gap.

2 For more information, see Health New Zealand | Te Whatu Ora Aged Residential Care Provider Agreements (www.tewhatuora.govt.nz/for-health-providers/aged-residential-care/te-whatu-ora-aged-residential-care-provider-agreements).

3 Standards New Zealand Ngā paerewa health and disability services standard (https://www.standards.govt.nz/shop/nzs-81342021).

Deterioration Early Warning System

The Deterioration Early Warning System (DEWS)[4], [5] is a set of three connecting clinical tools (Quick-DEWS, DEWS-RN, SBARR-DEWS) that screen for, confirm and respond to acute deterioration (see Table 1). Tool use is supported by an associated education package and user guide. DEWS is an evidence-based approach that was co-designed with representatives of the ARC sector. It incorporates established industry practices, uses gerontology specialty knowledge, encourages decision-making and values a team approach. All are elements that have been identified as enablers of deterioration detection in ARC (Chambers et al 2023; Hodge et al 2023; MacAndrew et al 2025).

Quick-DEWS requires HCAs to screen resident status every shift. It uses a set of clinical indicators that can be unobtrusively observed and are commonly present when people living in ARC experience acute deterioration (Chambers et al 2023; Daltrey et al 2022, 2025; ElBestawi and Kohm 2018; Ouslander et al 2016a, 2016b). A positive Quick-DEWS triggers an internal referral to the RN for further assessment with the DEWS-RN, which guides assessment and provides an aggregate score that estimates clinical urgency. Each urgency level corresponds to a mandatory escalation pathway. ARC providers are required to develop the detail of the escalation pathway. This ensures that the escalation pathway aligns with interconnecting ARC policy and procedure and that associated referrals are made to the correct service for that locality. Importantly, as a mandatory process, it clearly identifies expectations of and support for RN assessment and referral.

The communication and critical thinking tool, SBARR-DEWS, supports RN escalation. It is a combination of the internationally recognised briefing tool (Situation, Background, Assessment, Recommendation, Response) and a summary of the DEWS indicators (Shahid and Thomas 2018).

Most people residing in ARC are living their last years of life and will have recorded an advance decision for care and treatment options (such as 'shared goals of care' or resuscitation status). Regardless of such documents, DEWS is applied to all people (except those who are diagnosed as dying). This is because the timely identification of acute deterioration provides an opportunity for clinical conversations with residents, family and whānau (or delegated decision-makers) and sound decision-making related to the presenting issue. Figure 1 shows the application of DEWS tools.

Table 1: Deterioration Early Warning System (DEWS) tools overview

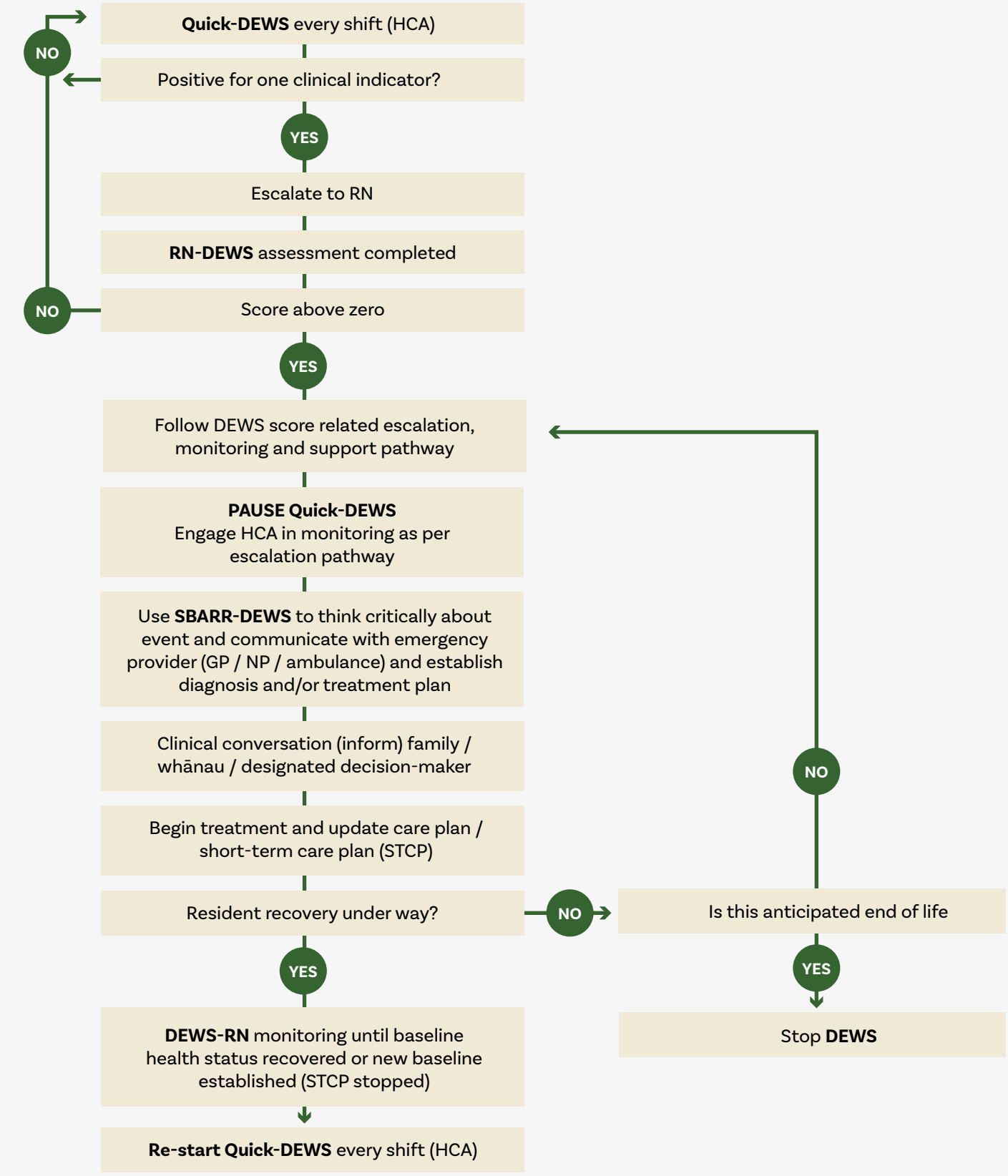
Tool	User	Purpose
Quick-DEWS	HCA	• Screen for changes that may indicate acute deterioration • Trigger referral to RN for further assessment
DEWS-RN	RN	• Guide a structured clinical assessment to confirm deterioration • Estimate clinical urgency • Provide an ARC facility standardised intervention and escalation pathway
SBARR-DEWS	RN	• Support RN critical thinking • Communicate DEWS assessment to next provider • Record plan of action (response) to evolving situation

Note: ARC = aged residential care; HCA = health care assistant; RN = registered nurse.

4 The DEWS tools copyright belongs to Daltrey and Boyd (2022). The tools are licenced under Creative Commons BY-NC-ND 4.0, Attribution-NonComerical-NoDeriviatives 4.0 International (https://creativecommons.org/licenses/by-nc-nd/4.0/).

5 The development of DEWS was funded by Ageing Well National Science Challenge, Ministry of Business, Innovation and Employment, New Zealand (project 3720418).

Figure 1: Deterioration Early Warning System (DEWS) flow chart



Note: GP = general practitioner; HCA = health care assistant; RN = registered nurse.

Te Tāhū Hauora Health Quality & Safety Commission and early warning systems

Introduction of EWS to New Zealand hospitals began around 15 years ago. Each health region developed its own tool and, by 2016, this national variation was identified as a critical risk for health consumers. Te Tāhū Hauora Health Quality & Safety Commission (Te Tāhū Hauora) started leading the process to standardise EWS across New Zealand. Through this experience, Te Tāhū Hauora developed expertise and a series of specific QI tools to support the implementation of EWS.

The developers of DEWS (Daltrey and Boyd) and the Improved Service Delivery team from Te Tāhū Hauora saw an opportunity to collaborate to conduct a feasibility study of DEWS in the ARC sector. Feasibility studies offer a proof of concept and provide an opportunity to test and revise without having to commit to practice changes (Pearson et al 2020).

Grounding framework

The Reach, Effectiveness, Adoption, Implementation and Maintenance (RE-AIM) framework was used to support planning and evaluation of the feasibility study. RE-AIM has been used in clinical, community and corporate settings, across multiple countries and cultures since its development more than two decades ago (Glasgow et al 1999, 2019). It is a flexible framework that does not need to be used in its entirety and can be used iteratively during a study to ensure elements of the implementation remain 'empirically robust and practically meaningful' (Glasgow et al 2019, p 5). Traditionally, RE-AIM measures have been quantitative, however, mixed evaluation methods are now recommended (Holtrop et al 2018). The dimensions of the framework are shown in Table 2.

Table 2: Reach, Effectiveness, Adoption, Implementation and Maintenance (RE-AIM) framework

Dimension	Evaluates
Reach	• Who is intended to benefit and who participates?
Effectiveness	• What are the most important benefits? • How do we know if that is achieved?
Adoption	• What organisational support is required?
Implementation	• How do we ensure intervention is delivered properly? • How consistently was intervention applied?
Maintenance	• Is intervention recommended to become operational? • How can the intervention be incorporated into practice and delivered long term?

The aims of the feasibility study were to:

1. test effectiveness of DEWS in supporting ARC staff with the timely identification and response to acute deterioration of people in their care
2. test the feasibility of introducing DEWS to the ARC sector
3. test the QI implementation tools supporting the introduction of DEWS to the ARC sector
4. obtain a stakeholder view of the value of DEWS to the ARC sector.

Method
Tukanga

The feasibility study used QI methodology to facilitate the implementation and testing of DEWS in ARC over 11 months (December 2023 to November 2024). This was a type 2 hybrid effectiveness-implementation feasibility study, evaluating the intervention (DEWS) and the implementation process simultaneously (Curran et al 2012, 2022). Feasibility studies are a crucial step to understanding the potential of an intervention to translate to real-world settings (Pearson et al 2020). The combination of RE-AIM and hybrid effectiveness-implementation is an accepted approach for such studies (Harden et al 2024). Mixed-methods data collection was used to evaluate the RE-AIM domains.

Participants

Participants in the feasibility study were therefore considered to be ARC provider facilities. This was a health care staff practice change study and staff could not opt out of using DEWS because the identification of acute deterioration is a core practice expectation. To be eligible for the study, ARC providers had to be accredited to deliver long-term care under the New Zealand national age-related residential care services agreement. The minimum facility size was 50 beds (a parameter set to ensure sufficient RN users in the study). ARC facilities had to have a primary care service that had been in place for a minimum of one year. Consent to conduct the study in ARC was provided by the Chief Executive (or equivalent) of the facility who had to agree to provide sufficient human resources to meet the needs of the project and to protect DEWS copyright (to avoid multiple variations of DEWS entering the sector). Staff participation in study evaluation interviews was not compulsory, this was by fully informed consent.

Table 3: Parameters of Deterioration Early Warning System feasibility study test facilities

Size	Location	Level of care	Business model	Staff population
50–70 beds (small)	Urban	Private hospital	Individual / minor group private	≥ 20% Māori staff*
≥ 70 beds (large)	Rural	Rest home	Individual / minor group charitable	
		Dementia	Major group – private	
		Psychogeriatric	Major group publicly listed	
			Major group – private chartable	

Note: * In 2020, the percentage of Māori working as personal care assistants was 17 percent (in home-based support services and aged residential care combined) and 9 percent were registered nurses (Informatics and Te Rau Ora 2022).

Recruitment and sample

Recruitment material (inviting an expression of interest) was distributed electronically via Te Tāhū Hauora networks. Interested providers were given more detailed information (a participant information sheet) and screened for inclusion criteria. Maximum variation purposive sampling was used to select from ARC providers who expressed interest in participating. The aim was to recruit between three and five ARC facilities, a number that balanced sampling needs and research team capacity. Sample variation parameters are detailed in Table 3.

Ethics

The study did not enrol health consumers, nor did it collect identifiable consumer data. Consideration was given to the possibility that DEWS could overestimate or underestimate clinical acuity. It was anticipated that identification of acute deterioration with DEWS would be non-inferior to standard processes. The DEWS tools did not replace clinical judgement. To ensure clinical safety, health care staff were instructed to raise concerns regardless of DEWS. The study protocol was endorsed by the Māori Health team (Ahuahu Kaunuku) from Te Tāhū Hauora, and Māori leadership was included in the Expert Advisory Group. DEWS development included Māori, as is expected of tauiwi (non-Māori) under the Treaty of Waitangi. Ethical approval was granted by the Auckland Health Research Ethics Committee (approval AH26938) on 15 December 2023. This trial protocol was published and registered with the Australian New Zealand Clinical Trials Registry on 13 March 2024 (ANZCTR number 12624000244505).

Figure 2: Deterioration Early Warning System (DEWS) feasibility study project stakeholder groups

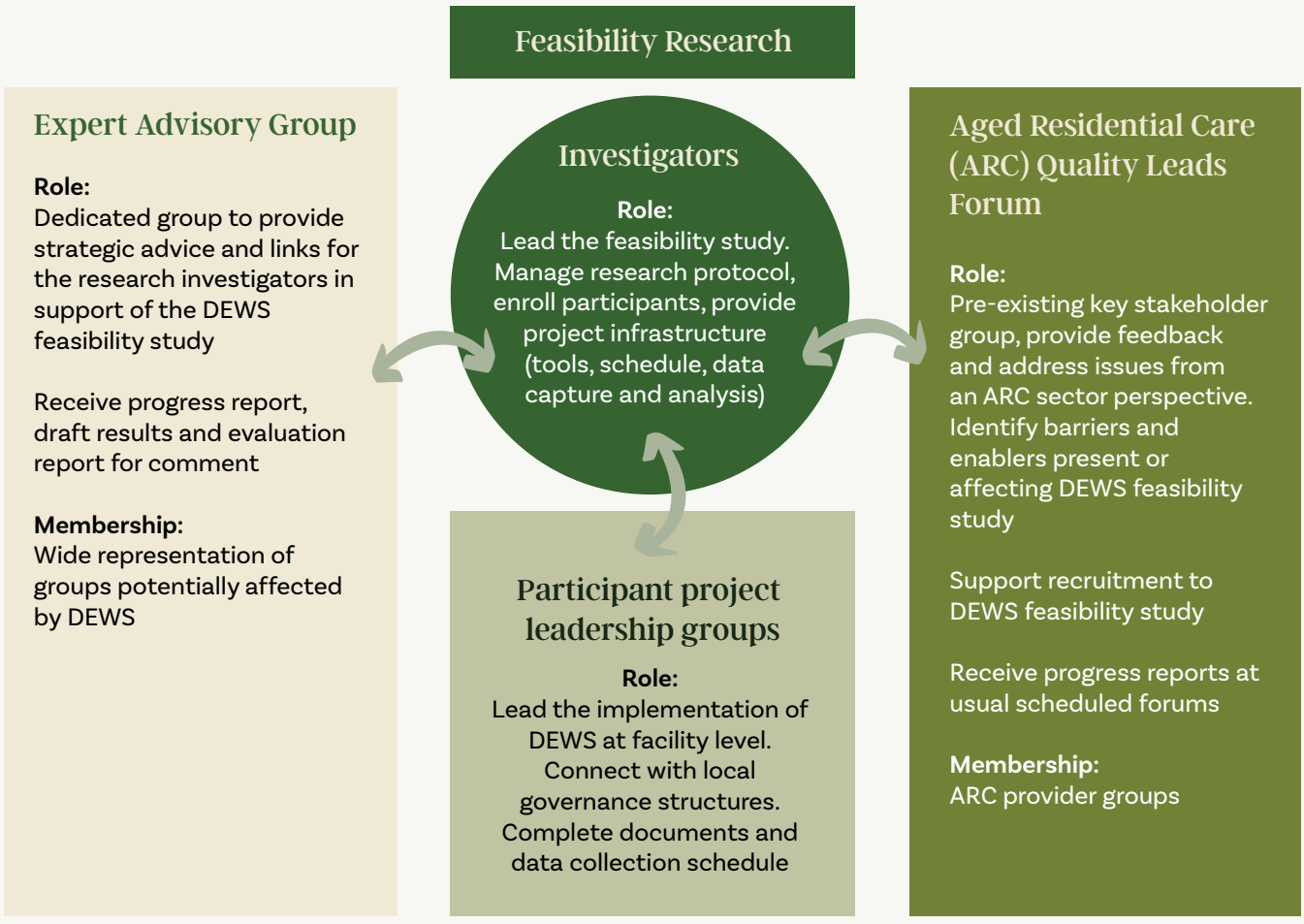
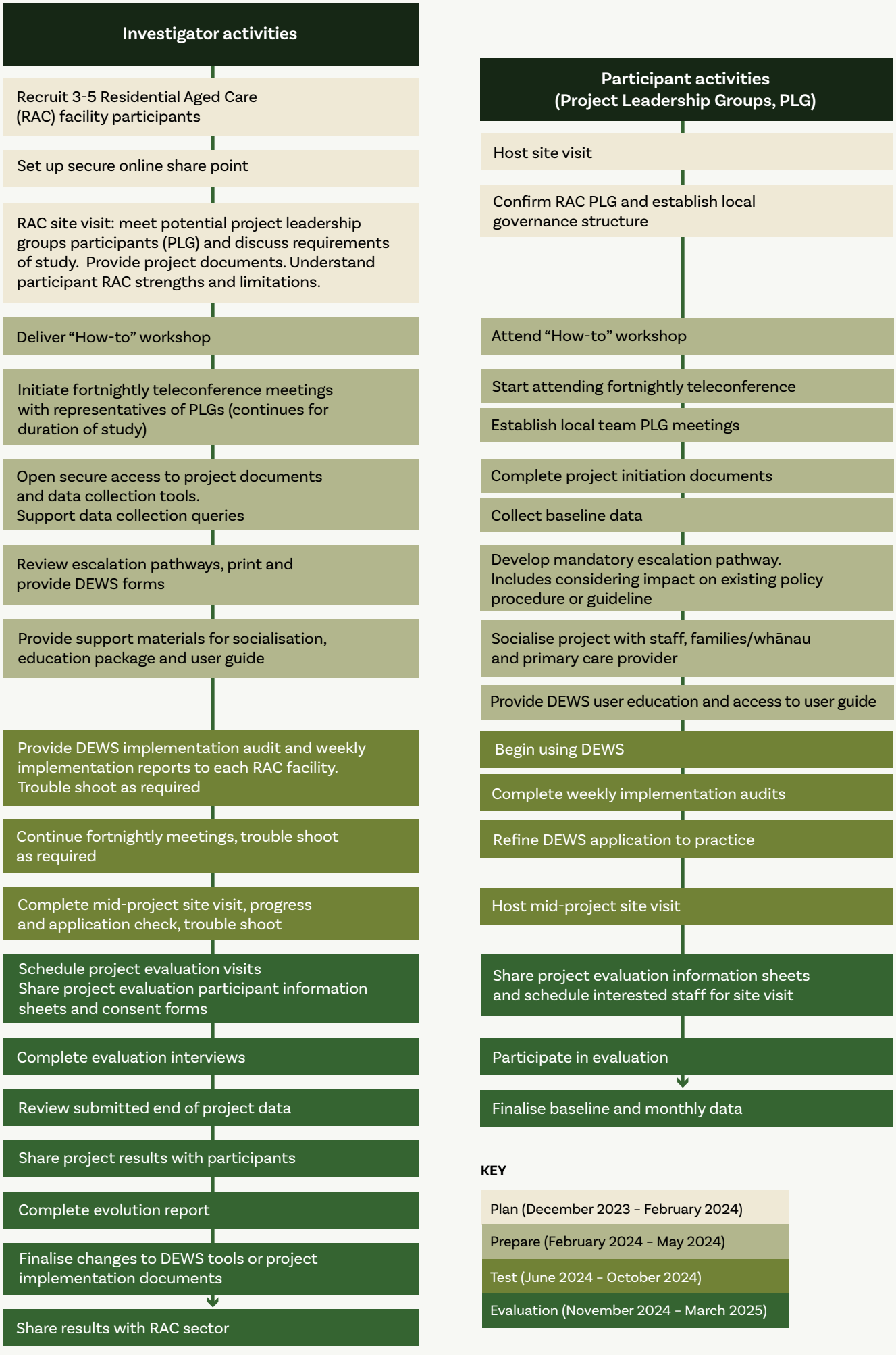


Figure 3: Deterioration Early Warning System (DEWS) feasibility study four phases of testing



Intervention

The feasibility study was organised into four phases: plan, prepare, test and evaluate. These phases supported the establishment of a project leadership group (PLG) in ARC to drive implementation of DEWS in the clinical environment as well as activities effectiveness reporting. The study was supported by an expert advisory group and key stakeholder group. Recruitment advertising began in November 2023 and final reporting was completed April 2025.

Feasibility project structure

The research project had two pillars of support, an expert advisory group established specifically for the feasibility study and the ARC Quality Leads Forum an established group of national QI leaders (see Figure 2).

The Quality Leads Forum has been a key stakeholder group since the beginning of the development of DEWS, it is a senior group of QI leaders from the ARC sector. The Expert Advisory Group had a wide range of representatives from groups potentially affected by or otherwise connected to DEWS implementation (see Appendix 1 for terms of reference).

Feasibility study procedures and timeline

The implementation of DEWS was directed and supported by the research team. Day-to-day implementation activities were conducted by multidisciplinary PLGs formed in each participating ARC facility. Implementation and testing activities were scheduled in four phases of plan, prepare, test and evaluate (Figure 3).

Table 4: Deterioration Early Warning System feasibility study intervention tools and processes tested

	Purpose		
Tools	DEWS tools	Reference	Q I tools
Deterioration Early Warning System (DEWS) tools			
Quick-DEWS	✓		
DEWS-RN	✓		
SBARR-DEW	✓		
Education presentations		✓	
DEWS user guide		✓	
Escalation mapping tool			✓
Quality improvement implementation processes, tools and measures			
Preparation and implementation guide		✓	
Project charter			✓
Current system assessment template			✓
Measurement guidance		✓	
Data collection plan template			✓
Implementation audit tool			✓
Case review tool			✓

Phased activities

During the planning phase, researchers focused on engaging ARC participants to form the PLGs and ensure groups understood the commitments of the study. This included providing project QI documents and completing a site visit by the research team. During the preparation phase, a 'how-to' workshop was delivered, detailing DEWS tools and working through QI documents and measures. Fortnightly support teleconferences with PLG representatives began in this phase and continued until the end of the study. Teleconferences encouraged completion of QI documents and, during testing, supported ongoing implementation measurement, provided an opportunity for troubleshooting and maintained project momentum. One site visit was conducted during the testing phase, to assess adherence to project and tool parameters and encourage continued participation. The evaluation phase included interviews with PLGs and tool user groups (RNs and HCAs) and the review of collected datasets.

Participant phased activities

During the planning phase, ARC participants formed PLGs, established internal governance structures and hosted a visit from the research team. They attended the workshop, completed project documents, collected baseline data, socialised the project and delivered education during the preparation phase. Testing introduced DEWS to RN and HCA daily practice, while PLGs supported their teams and completed implementation audits. During the evaluation phase, PLGs finalised data collection, participated in evaluation interviews and shared invitations to participate in evaluation interviews with health care staff.

Data collection and analysis

Table 4 provides a list of the intervention tools and processes that were tested.

Table 5 identifies data sources to answer questions. Qualitative data underwent descriptive thematic analysis, and descriptive statistics explored quantitative data.

Table 5: Overview of evaluation data sources related to each Reach, Effectiveness, Adoption, Implementation and Maintenance (RE-AIM) dimension

RE-AIM dimension	Participant facilities	Workshop evaluation	QI document completion	DEWS implementation audit	Check completed DEWS tools	Semi-structured group interviews (HCA, PLG, RN)	Tool user survey	Acute event rate
Reach	✓							
Effectiveness				✓	✓	✓	✓	✓
Adoption		✓	✓			✓		
Implementation				✓	✓	✓	✓	
Maintenance			✓			✓		✓

Note: DEWS = Deterioration Early Warning System; HCA = health care assistant; PLG = project leadership group; RN = registered nurse; QI = quality improvement.

Results
Ngā hua

Results are structured using the RE-AIM themes and split into two primary sections. Section one reports on DEWS effectiveness evidence and relates to aims 1, 2 and 4. Section two is mostly concerned with QI implementation tools and processes and relates to the third research aim. Data sources are reported consecutively under each theme. This was a real-world hybrid effectiveness-implementation study and inevitably data may contribute to more than one research aim. Participating ARC facility information is reported once before the sections are introduced.

Participating ARC facilities

Ten ARC facilities responded to recruitment material. Applications were assessed according to eligibility and sample criteria. Four were excluded from the study, two did not meet eligibility criteria and a further two were multiple applications from the same major group ARC provider. Six ARC facilities were enrolled in the study, one facility discontinued in the planning phase for human resources reasons (see Figure 4). The characteristics of the participant ARC facility final sample are in Table 6.

Figure 4: Aged residential care facility participant flow chart

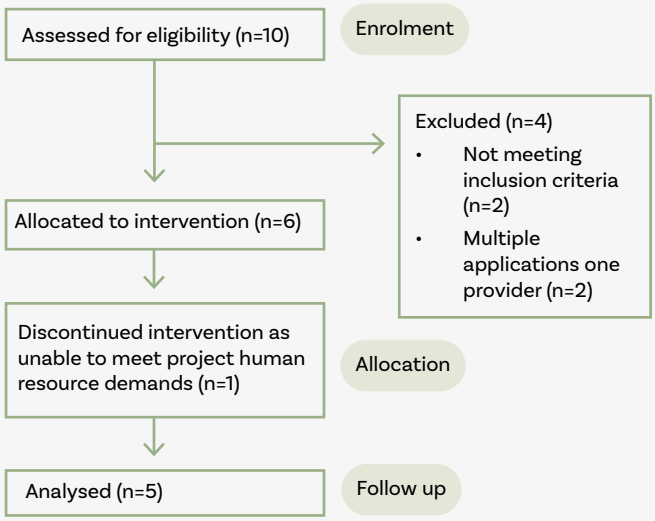


Table 6: Characteristics of aged residential care facility participants

Size (beds)	Location	Māori representation	Business model	Level of care			
				Rest home	Hospital	Dementia	Psychogeriatric
66	Rural		Individual / minor group private	✓	✓		
57	Major urban	✓	Major group – private	✓	✓	✓	
70	Large urban		Major group – publicly listed	✓	✓		
130	Major urban		Major group – publicly listed	✓	✓	✓	
103	Major urban		Major group – private	✓	✓		✓

Effectiveness
Te manatū

This section begins with results from semi-structured group interviews of project leadership and tool user groups. It then reports the results of user surveys, implementation audit results and the researcher review of DEWS tools.

Semi-structured group interviews

Each participating ARC facility was required to establish a multidisciplinary PLG, to drive the implementation of DEWS in day-to-day practice. All PLGs had an organisational executive sponsor. The composition of each PLG is outlined in Table 7.

One group interview was conducted with each PLG. Separate group interviews were conducted with RN users of DEWS and HCA tool users. Only one primary care provider was available to be interviewed, with 22 interviews conducted (Table 8). Interview questions can be found in Appendix 2.

To be effective, DEWS needed to support the clinical proficiency of the health care teams in ARC facilities while also being responsive to the environment. These are the two overarching themes for assessing effectiveness in the interview data.

Table 7: Project leadership group membership per aged residential care facility participant

Aged residential care facility	National leader	Regional leader	Facility manager	Clinical leader	Unit coordinator	Registered nurse	Enrolled nurse	Health care assistant
V			✓	✓		✓		✓
W		✓		✓		✓		✓
X	✓			✓	✓	✓	✓	
Y	✓	✓		✓	✓	✓		✓
Z	✓	✓		✓	✓	✓		✓

Table 8: Evaluation interviews

Interview group	Number of interviews	Number of aged residential care facilities represented
Project leadership group	5	5
Registered nurse (tool user)	8	5
Health care assistant (tool user)	8	5
Primary care provider	1	1

Supporting clinical proficiency

Clinical proficiency means taking a skilled holistic approach to evolving situations. It includes the identification of acute deterioration, the application of critical thinking to formulate a timely, clinically appropriate response, clinical communication, and remaining accountable for practice. DEWS supported all components of clinical proficiency.

Identifying acute deterioration

Project leadership group participants reported that DEWS had improved both the RNs' and HCAs' ability to identify and respond to acute deterioration. One PLG group summed it up by stating:

> 'The surprising thing with this tool is that the residents actually were triaged and sent [for help] quicker than they probably would have been before. So, the skill that it gave the registered nurses was the ability to do the rapid assessment and to make a decision' (PLG).

Most RN participants supported this observation explaining, 'You really couldn't miss a deteriorating patient from that form at all'. They went on to explain how, 'Sometimes we thought that somebody was unwell, and you'd start doing DEWS on them and it highlighted that they really are sick' (RN). This was also the case for HCAs interviewed, who said, 'We became very alert in our shift to identify those residents who need to be assessed by the RN right away' (HCA).

Supporting critical thinking

Critical thinking is the process of determining a reasonable and appropriate response to acute deterioration. This includes taking account of medical and social history, clinical urgency, expressed preferences for care as well as availability of local services. The PLGs agreed that DEWS supported critical thinking. Most RNs agreed with this observation and described that, following notification from the HCA:

> 'We promptly do our RN DEWS, we are able to easily identify [acute deterioration] and it will lead us to a diagnosis, that uses a lot of our critical thinking skills… so, by the time we alert the doctor you already know what we're gonna do' (RN).

Although not generally considered part of their role, HCA accounts also portrayed critical thinking. They described, for example, analysing the reason for a fall, 'Is that because they've not been drinking much? Or is it because their mobility is going down? So it sort of tricks you to do a bit of thinking' (HCA).

This change in practice was also observed by RNs who described, 'The caregivers are more focusing on the clinical side of things as well, like, even though you know, all of our caregivers, they don't have clinical backgrounds. So this one [DEWS] really helps' (RN).

Communication

PLG participants and RNs agreed that SBARR-DEWS had a positive impact on clinical communication both externally, with primary care providers and families, and internally between RN and HCA teams. Using SBARR-DEWS encouraged RNs to express their clinical assessment. One PLG concluded, 'Definitely I can say that all my nurses here now are confident in ringing the GP because of the SBARR and DEWS' (PLG). RN participants reported it was the combination of DEWS tools that supported their communication, 'Because we are assessing during the deteriorating condition of the resident, it makes it really easy to communicate with the GP' (RN). They felt that 'doctors actually like it [SBARR-DEWS] too, because it's quite detailed. So, they can see [for] themselves what's going on' (RN).

Communication with families was also positively affected, as one RN explained,

> 'Sometimes we have trouble communicating with the family of what's happening, because it's very difficult, especially if the resident decline[s] suddenly. So, with the tool, we can we say that all this was done, and, as per our observation, this was not there yesterday… So, it's easier because we have that process. So, the family, they are more confident that their loved one is well looked after' (RN).

One PLG noted that when the RNs were ringing families they were no longer asking them what to do, rather they were having clinical conversations and discussion options, 'Now it's a different story, it's really more critical thinking… rather than [just] asking the family what do you want to do' (PLG).

The impact on communication was not limited to the SBARR-DEWS tool. Health care assistants explained, 'Since we have this kind of tool, then it's easier for us to describe what had happened to our resident' (HCA).

Accountability

Clinical accountability was important to all participants. PLGs reported that escalation pathways helped staff feel supported in their decision-making, 'Giv[ing] them permission to not wake the manager up, or ring the doctor in the middle of the night. They can just send them [to hospital] and [think] I won't get into trouble for it' (PLG). RNs were concerned about their day-to-day professional risk and advised that DEWS:

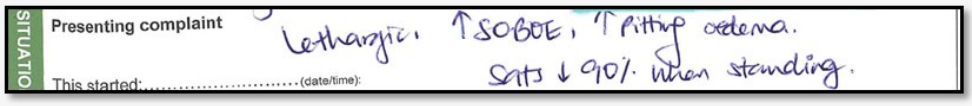
> '... safeguards your practise, it safeguards the facility, it safeguards the residents... the resident gets really good care and early intervention, if required. And it safeguards the nurse that, you know, she can see she's done absolutely everything she could do, and it safeguards the facility [showing] that we are taking care of the residents properly' (RN).

HCAs felt the Quick-DEWS process validated their knowledge and supported their escalation to the RN, 'We know when there's a difference [in the resident], and they [RNs] don't know when there's a difference... I feel like the issues that I brought up got taken further' (HCA). Although, this was not as simple as transferring accountability, HCAs 'Would cross check with other caregiver[s]... they'd go in together to actually have a look at the resident together' (PLG) before escalating to the RN.

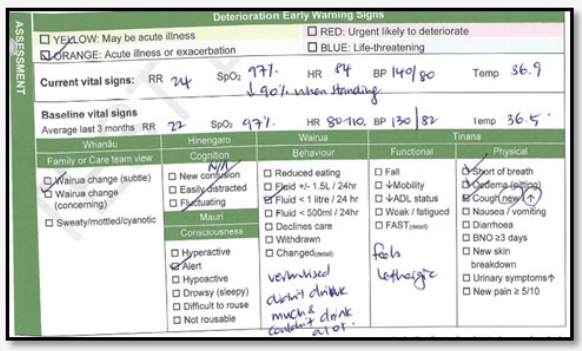
Figure 5 illustrates the components of clinical proficiency. It includes the identification of acute deterioration, application of critical thinking and communication of a clinical response that is appropriate, timely and professionally accountable.

Figure 5: Illustration of clinical proficiency components

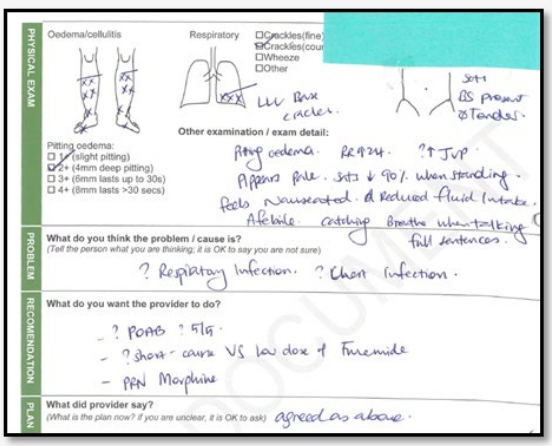
Presenting complaint



DEWS Assessment



Clinical reasoning



Responding to the aged care environment

This theme, responding to the aged care environment, had dual components. It recognised the unique clinical characteristics of the population during acute deterioration and was cognisant of the sector skill mix and workload.

Population characteristics

Participants identified that people living in ARC present differently from other populations when unwell and so 'That's why this DEWS project is amazing because we didn't take something directly from hospitals and, you know, just plop it in' (PLG). 'You can actually see it's something that's actually for aged care, not for the average adult' (PLG).

Skill mix and maximising potential

Most PLGs saw a change in the HCA practice because DEWS gave them a more formalised role in identifying acute deterioration and escalating it to the RN. One PLG reflected, 'I think that teaches us, that actually, we don't give our caregivers enough training. We need to really empower them because we're so reliant on them' (PLG). Most RNs appreciated the improved information they got from HCAs, however, they also appreciated the connectedness of the system that came with DEWS:

> 'Usually if something happened to the resident, the nurse is the one who is doing assessment and everything. But here, the caregivers are also doing their part. They are first one to infer what's happening… then the RN doing the assessment… then we are contacting [the] GP… So overall we are everyone taking care of the residents' (RN).

Support for new staff

DEWS was considered useful for staff new to gerontology, 'I think this is incredibly useful to orientate new staff to aged care, to give them that framework and tools so that they can pin their knowledge and learning onto that' (PLG). This comment applied to new employees as well as internationally qualified nurses, a view endorsed by an internationally qualified nurse participant:

> 'I'm going to be only one year here. So, I'm not aware of lots of things, but there are more things that I need to take care of while checking of a resident… There are lots of things which will help the DEWS for me to understand' (RN).

Although one experienced RN pointed out that, 'On night shift, if you've got somebody deteriorating and you start DEWS, well… there's no second guessing' (RN). Similarly, HCAs recognised the tools as, 'Great for the new people, only here maybe, six months, three months. It's really good tool for them to sort of follow through' (HCA).

Workload and time effectiveness

Most PLGs viewed DEWS as a time-effective tool that, 'Was quite useful to actually understand what is going on in the whole village' and to guide follow up, 'Like there's a "cross" there [on the DEWS form] and I'm like, "oh let me see what's wrong with this person" [and I] go through what the nurses did' (PLG).

Most leadership groups also reported a reduction in workload for the on-call nurse, 'The nurses, hasn't really been ringing the clinical manager for support because we're quite confident following the DEWS' (PLG). Leadership group participants also reported an impact on RN workload through 'Building that teamwork, so that the time that the RN spends is incredibly useful and effective, because they're getting the information more clearly and in a more meaningful way' (PLG).

This theme of time effectiveness was also reflected in RN and HCA participant interviews. HCAs reported, 'We could identify the problems quicker than before you know, and we reported to the RN' (HCA). Consequently, RNs reported, 'Things were picked up on in a good, timely manner that stopped that patient from becoming a lot worse than they could have' (RN). One RN provided a clinical exemplar that illustrates this point:

> 'I did have a resident who had an aspiration. So, the thing is, it was actually escalated straight away. I think the DEWS help a lot. So, the caregiver alerted the RN. So then obviously I did the DEWS-RN, my assessment, and then informed the doctor, and then antibiotics started straight away. So, I believe that there was a very prompt intervention which has helped the resident recover from the aspiration' (RN).

Workload estimates

Impact on workload is an important consideration when introducing a new tool. Most RN participants felt DEWS requires little additional time, compared with usual care, 'When they are sick, we take ages with them anyway' (RN). Generally, they found the assessment tool, 'Very straight forward... like the RN-DEWS, you just have to tick which one applies' (RN). HCA participants were initially concerned about the impact on their workload, 'I was kind of thinking, where's the time to do this? And then it was good to pick up if there's a change in them [residents] and it didn't take long" (HCA). This was at least in part because it was 'Easy to remember and easy to apply' (HCA).

DEWS user group surveys

Staff DEWS user groups completed individual surveys assessing DEWS tools (see Appendix 3). Across all five participant ARC facilities, 17 RNs and 43 HCAs completed the DEWS survey, a response rate of 27 percent and 17 percent, respectively. Most survey participants were of Asian ethnicity (RNs, 88% n=15; HCAs, 63% n=27) and nearly half had between one and five years of experience in ARC (see Table 9).

Survey results were consistent with the clinical proficiency theme. Respondents reported on the ability of DEWS to support the identification of acute deterioration, increase confidence with clinical reasoning and empower them in their work with minimal impact on workload.

Table 9: Demographics of health care assistants and registered nurses who completed individual surveys

	Health care assistants (N=43) n (%)	Registered nurses (N=17) n (%)
Gender		
Male	4 (9)	3 (18)
Female	38 (88)	14 (82)
Not stated	1 (3)	0 (0)
Age		
18–24	1 (3)	0 (0)
25–34	11 (26)	8 (47)
35–44	11 (26)	8 (47)
45–54	7 (16)	0 (0)
55–64	8 (17)	1 (6)
65–74	4 (9)	0 (0)
Ethnicity		
NZ European	8 (18.6)	1 (5.9)
Māori	1 (2.3)	0 (0)
Pacific peoples	7 (16.3)	1 (5.9)
Asian	27 (62.8)	15 (88.2)
Other		
Years in aged care		
< 1	2 (4.7)	2 (11.8)
1–5	21 (48.8)	9 (52.9)
5–10	8 (18.6)	6 (35.3)
10 plus	12 (27.9)	0 (0)

Identifying acute deterioration and supporting critical thinking

Seventy-five percent of RN respondents (n=12) and 67 percent (n=29) of HCAs felt the DEWS tools helped them recognise and respond to acute deterioration, 'quite a lot' or 'a lot'. This increased RN confidence with clinical reasoning (65%, n=11, 'quite a lot' or 'a lot') and empowered them to work better (65%, n=11, 'quite a lot' or 'a lot'). Similarly, HCA confidence in identifying acute deterioration increased (72%, n=31 'a lot' or 'quite a lot') and they felt empowered do their job (77% n=33, 'a lot' or 'quite a lot').

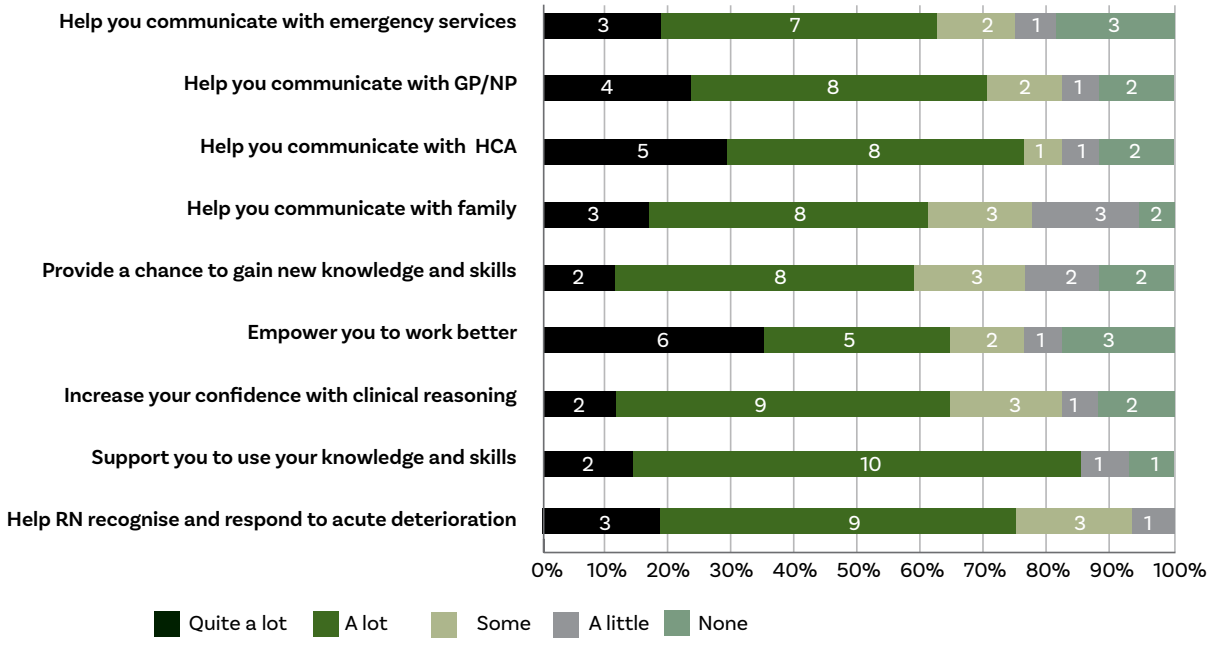
Communication

A positive impact on internal and external communication was also evident in the surveys. RN and HCA respondents reported a positive impact on communication with each other, and RNs noted an effect on their communication with primary care providers (see Figure 6 and Figure 7).

Workload and time effectiveness

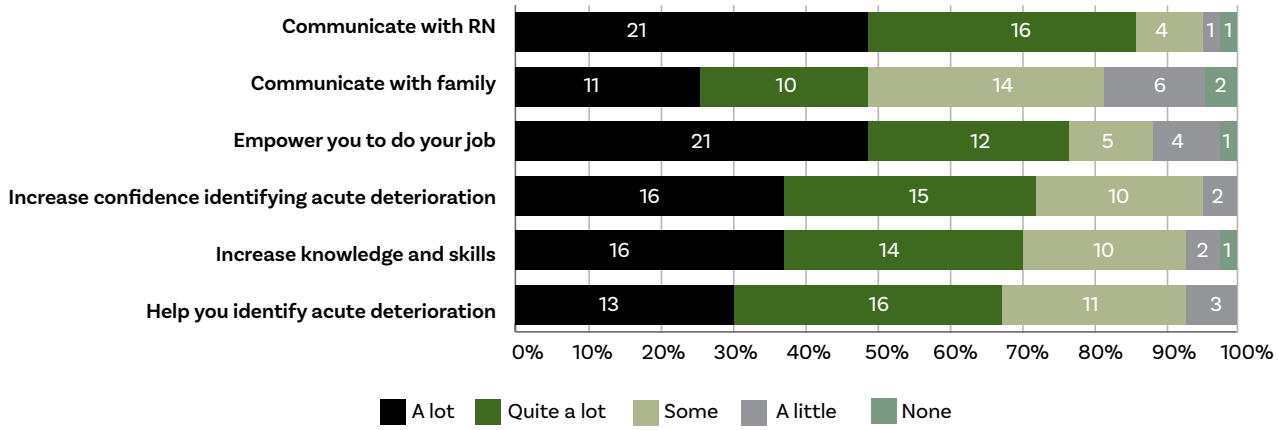
The evaluation interview results and workload surveys indicated that 71 percent (n=12) of RNs and 98 percent (n=42) of HCAs felt that completing the DEWS tool took 'no more' to 'a little more' time than usual care (Figure 8). Overall, 77 percent (n=33) of HCAs estimated that Quick-DEWS took 60 seconds or less to complete and 59 percent (n=10) of RNs estimated DEWS-RN and SBARR-DEWS took up to 10 minutes each (see Table 10).

Figure 6: Registered nurse tool user survey results



Note: GP = general practitioner; HCA = health care assistant; NP = nurse practitioner; RN = registered nurse.

Figure 7: Health care assistant tool user survey results



Note: RN = registered nurse.

Figure 8: Time to complete Deterioration Early Warning System (DEWS) tools, compared with usual care

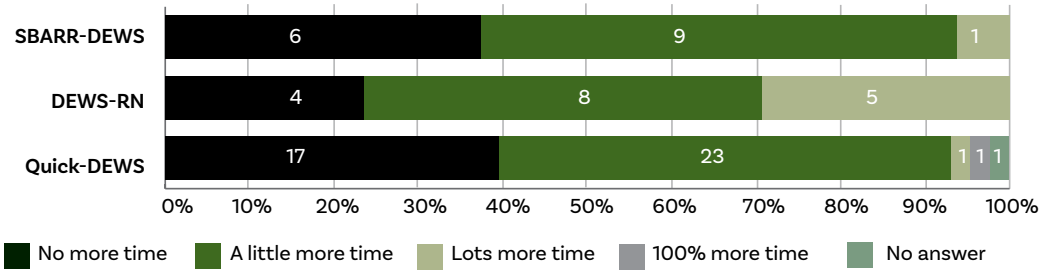


Table 10: Estimated time to complete the Deterioration Early Warning System (DEWS) tools

Quick-DEWS		DEWS-RN		SBARR-DEWS	
Time (seconds)	Number (%)	Time (minutes)	Number (%)	Time (minutes)	Number (%)
<10	7 (16)	≤5	6 (35)	≤5	6 (35)
10 to 30	17 (40)	6 to 10	9 (53)	6 to 10	4 (24)
31 to 60	9 (21)	≥ 10	1 (6)	11 to 15	2 (12)
> 60	10 (23)			≥ 15	2 (12)
		Did not answer	1 (6)	Did not answer	3 (18)

DEWS implementation audit

The number of occupied bed days totalled 135,327 across four facilities during the testing period of the study (occupied bed day data were missing for one ARC provider). For Quick-DEWS, 1,351 screening tools were audited during the study, a sub-set of 202 were positive for potential acute deterioration. Population characteristics of the total and sub-set groups were similar. The population was largely New Zealand Europeans who had lived in ARC for more than one year (see Table 11 and Table 12).

Identifying acute deterioration

Most (70%, n=141) cases of acute deterioration were identified with a single Quick-DEWS clinical indicator. Indicators 'walks less or falls' (55%, n=77) and a 'difference in wairua or different to usual' (23%, n=33) were triggered most frequently. In 30 percent (n=61) of cases more than one Quick-DEWS indicator was positive. 'Walks less or falls' and a 'difference in wairua or different to usual' triggered at similar rates (n=91, 32% and n=81, 28%), see Table 13.

Table 13: Triggered Quick-DEWS indicators of potential acute deterioration

Positive Quick-DEWS clinical indicators	Total triggers 285 n (%)
Walks less or falls	91 (31.8)
Difference in wairua or different to usual	81 (28.3)
Sleeps more	27 (9.4)
Eats less	25 (8.7)
Sudden or severe pain	18 (6.3)
Easily distracted or confused	16 (5.6)
Short of breath	15 (5.2)
Swelling	12 (4.2)

Table 11: Population characteristics total sample

Population	Total 1,351 n (%)
Ethnicity	
NZ European	1,212 (89.7)
Māori	45 (3.3)
Pacific peoples	36 (2.7)
Asian	44 (3.2)
Other	14 (1.0)
Time in aged residential care	
Less than 6 months	222 (16.4)
Six to 12 months	194 (14.4)
More than 12 months	935 (69.2)

Table 12: Population characteristics of Quick-DEWS positive sub-set

Population	Total 202 n (%)
Ethnicity	
NZ European	187 (92.6)
Māori	7 (3.5)
Asian	4 (2.0)
Other	2 (1.0)
Not recorded	2 (1.0)
Time in aged residential care	
Less than 6 months	52 (25.7)
Six to 12 months	35 (17.3)
More than 12 months	115 (56.9)

Ninety percent (n=181) of the positive Quick-DEWS led to the completion of a DEWS-RN assessment. All levels of urgency were represented in that sample, most (81%, n=146) were for the lowest level of urgency (see Table 14).

Outcome data show 90 percent of acute events identified were managed in ARC, with RN only or RN and primary care intervention, and less than 10 percent required transfer to hospital (see Table 15). The addition of outcome data to the implementation audit occurred during the study, so data are available for only 142 of the 181 DEWS-RN assessments.

Table 14: DEWS-RN clinical urgency assessments

Score	Urgency description	n (%)
1 to 9	May be acute illness	146 (80.6)
10 to 15	Acute illness or exacerbation	26 (14.4)
16 to 20	Urgent likely to deteriorate	6 (4.0)
21+	Life threatening	3 (2.0)

Table 15: Outcomes of DEWS-RN assessments

Outcome	n (%)
Registered nurse management only	47 (33.1)
Primary care advice only (no treatment)	37 (26.1)
Primary care treatment	38 (26.8)
End-of-life pathway	6 (4.2)
Transferred to hospital	14 (9.8)

Various underlying conditions were recorded as associated with acute deterioration, however, falls (37%, n=48) and respiratory complaints (11%, n=20) were the most common (Table 16).

Table 16: Underlying cause of acute deterioration

Final diagnosis or problem	Total 141 n (%)
Trauma	
Fall	44 (31.21)
Fracture following fall	1 (0.71)
Falls and pulled out urinary catheter	2 (1.42)
Fall with laceration	1 (0.71)
Cardio-respiratory	
Respiratory infection	15 (10.63)
Covid-19	3 (2.13)
Rhinitis	1 (0.71)
Chest infection and heart failure	1 (0.71)
Heart failure exacerbation	3 (2.13)
Heart failure and urinary infection	1 (0.71)
Gastrointestinal	
Hernia exacerbation	1 (0.71)
Diarrhoea	3 (2.13)
Nausea	1 (0.71)
Vomiting	2 (1.42)
Neurological	
Stroke or TIA	1 (0.71)
Dementia-related behaviour change	1 (0.71)
Other	
Leg pain	1 (0.71)
Blood loss	1 (0.71)
Registered nurse observation only	16 (11.35)
Seen by primary care no abnormality found	9 (6.38)
Medication changes required	3 (2.13)
Higher level of care	1 (0.71)
Hospitalised (admitted)	6 (4.26)
Unknown	23 (16.31)

Note: TIA = transient ischaemic attack.

Acute event rate results

Data representing acute events were collected for five months before DEWS implementation (January to May 2024) and five months with DEWS in place (June to October 2024). Data were compared for evidence of changes. Some data were missing, due to collection issues. Measurement of the rate of acute primary care consultations was possible for facilities with fee for service arrangements and virtually impossible without this arrangement. Ambulance attendance rates rather than ambulance transfer rates were felt to be representative of ARC identification of acute deterioration, because not all attendances resulted in resident transfer. Measurement of unanticipated death was a measure used by some ARC facilities and the definition of 'unanticipated' was based on clinical judgement.

Acute event rates

- Acute primary care consultations: monthly data were provided by three ARC facilities (data missing for two ARC facilities). The mean acute primary care consultation rate across three facilities before DEWS was 12.96 per 1,000 bed days (95% CI, 2.57, 65.45), this decreased to 8.25 per 1,000 bed days (95% CI 1.63, 41.67) with DEWS, a statistically significant reduction (p=0.009).
- Ambulance attendance rates: monthly data were provided by four facilities (data missing for one ARC facility). The mean ambulance attend rate before DEWS was 1.88 per 1,000 bed days (95% CI, 1.01, 2.75), this increased slightly to 1.98 per 1,000 bed days (95% CI 1.10, 2.85) with DEWS, a non-statistically significant difference (p=0.76).
- Unanticipated deaths: monthly data were provided by three ARC facilities, two unanticipated deaths occurred before DEWS and one after, data were insufficient for a useful calculation.

Adoption
Te whakaae

The theme of adoption asks what organisation support is required to deliver the intervention. In this study, sub-themes of organisation motivation and leadership were important drivers of adoption. Data are drawn from interviews only.

Organisational motivation and leadership

All participant organisations were motivated to implement DEWS. Overall, they were driven by the desire to provide the best possible evidence-based service for their populations, in line with their philosophies of care and a sense of corporate citizenship, 'Strategically, we want to make sure that we are contributing to the sector. The other thing is, we didn't want to be involved in just anything. Like we had to put our time into something that would change the sector' (PLG).

All teams recognised the clinical challenge of identifying acute deterioration, 'Picking up that recognition of the deterioration is a common theme for us, it's something we've grappled with. Like often you know, you do a piece of training, and it just falls short. It's just not the whole package' (PLG).

While one team also saw the opportunity to give, 'The staff something interesting, because aged care can be a bit Groundhog Day, you know. Every day you make a difference to people's lives, but you don't always get to step out of your comfort zone' (PLG).

The PLG described their inclusive leadership styles that prioritised clinical and non-clinical staff understanding, 'What was going on, why we were doing it and what it was for' (PLG). Many of the PLGs used family analogies to describe their teams. One went so far as to explain how they select for characteristics that would blend with their ARC family, 'We have a lot of labour force from the Philippines or India and when we choose them, we choose them for their heart and their passion, rather than just these skills' (PLG).

The inclusive leadership style was also applied to each other during the DEWS project, 'We set up a regular weekly meeting on a Friday and we would talk about the DEWS. We talk about anything from the DEWS meeting that that have been held fortnightly' (PLG). Interestingly, the PLGs working with low turnover workforces believed it was 'Easy to get started because the team here is actually very stable' (PLG). However, one new PLG with a new team saw the study as an opportunity for development, 'Most of the staff as well, like they are new. So, I think it's quite a good start for us to be challenged... like it can be a bit of a team building as well' (PLG).

DEWS escalation pathway development

All PLGs produced escalation pathways for DEWS-RN (an example can be seen in Figure 9). Mostly, they found this straightforward because they simply applied existing processes for managing and escalating residents to DEWS-RN urgency categories 'All we have to do is categorise those systems... I didn't really find it difficult' (PLG). This ability to tailor the details of the escalation in response to clinical urgency was considered an important part of the process. Some PLGs found they had escalation information, 'Scattered in other places' (PLG) and the feasibility study became a prompt to consider the impact of a new tool on other systems. Some challenges were involved with first draft escalation pathways, which forced PLG to consider, 'Where do you draw the line because you want it to be easy for them [staff] to follow and read, but then we don't want to miss out anything vital' (PLG). In most cases, PLG leaders included the RNs in the escalation pathway development, 'To get this part right because there's no point doing the rest of this tool unless you know what to do with the information' (PLG).

MANDATORY escalation pathway	
May indicate acute illness	**DEWS 1–9 Escalate** • Consider nursing intervention for 24 hours, in discussion with unit coordinator / clinical manager • Book into this week's GP round • Discuss with designated contact and family* **Watch** • DEWS-RN twice a day • Call GP if deteriorates / no improvement in 24 hours (or as directed) • Add 'resident of concern' alert and DEWS-RN status to clinical handover **Support** • Provide fluids, aim for 1.5L/24 hours (unless fluid restricted) • Aim for consumption of 75% usual diet • Give prescribed PRNs, as clinically indicated
Acute illness or worsening chronic condition	**DEWS 10–15 Escalate** • Call GP and email SBARR-DEWS within 4 hours of assessment • If no contact made with primary GP within 30 minutes, contact alternative GP with support from RN duty lead • Discuss with designated contact and family* **Watch** • DEWS each shift / 8 hours • Call GP if deterioration / no improvement in 24 hours (or as directed) • Add 'resident of concern' alert and DEWS-RN status to clinical handover **Support** • Start prescribed treatment within 4 hours • Encourage food and fluids • Aim for consumption of 75% of easily digestible food • Aim for consumption of 1.5L/24 hours (unless fluid restricted)
Likely to get worse rapidly	**DEWS 16–20 or ANY RED Escalate** • Immediately discuss with RN duty lead (and escalate to on-call clinical manager, if required) • Call GP within 1 hour and email SBARR-DEWS • Consider hospital admission, if no GP review in 1 hour • Discuss with designated contact and family* **Watch** • DEWS 2 x per shift / 4 hours • Call GP if deterioration / no improvement in 24 hours (or as directed) • Add 'resident of concern' alert and DEWS-RN status to clinical handover **Support** • Start treatment in less than 4 hours • Provide support with food and fluids • Aim for consumption of 75% easily digestible food and 1.5L/24 hours (unless fluid restricted)
Life threatening	**DEWS 10–15 Escalate** **DEWS 21+ ANY BLUE Escalate** • Call GP immediately and email SBARR-DEWS • Discuss with designated contact and family* **Watch** **Anticipated end of life** • Stop DEWS – follow last day of life pathway **Or ARC-based treatment chosen** • DEWS-RN 4 hourly or as directed • Call GP if deterioration / no improvement in 24 hours (or as directed) • Add 'resident of concern' alert and DEWS-RN status to clinical handover **Support** • Begin supportive treatment in 1 hour • Food and fluid support as clinically indicated

Note: ARC = aged residential care; DEWS = Deterioration Early Warning System; GP = general practitioner; PRNs = Pro re nata ("when required" or "as needed"); RN = registered nurse.

Implementation
Te whakatinanatanga

The implementation theme considers the practical strategies required to ensure the intervention is delivered correctly. It includes education of how and when to use DEWS tools, checking (audit) of correct tool application and an outline of the clinical challenges that occurred during the implementation process. This theme draws on interview data only.

Education: DEWS tools

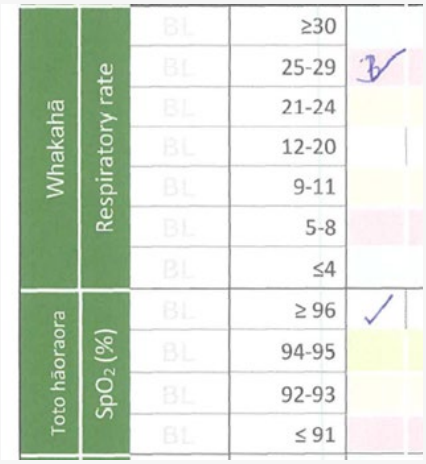
DEWS educational materials (PowerPoint presentations and DEWS user guides) were provided to PLGs. All PLGs reported adapting the resources provided. The main driver for this was that, '[Time] for education is limited, so we are looking at bite size pieces of education as opposed to you know like an hour education session' (PLG). PLGs reasoned they could, 'Pick [out] things that we think is relevant, then you can go back and explain if there are problems' (PLG). Despite having short time slots for education, all PLGs made sure all staff were educated, '[Name] came in at some ungodly hour to do a session with you know, night staff on consecutive days' (PLG). Follow-up education did occur early in the testing phase, 'The second day someone was triggering the DEWS and it turned out they were just for palliative care' (PLG). More education occurred, 'After we do an audit, most of the time, we send out memo handovers, like if we miss out something' (PLG) and in this way complete DEWS education occurred over a few weeks.

However, gaps in the education delivered seemed to occur because HCA user group interviews revealed HCAs were tempted to create their own escalation rules due to a lack of clarity about when to stop and start Quick-DEWS. For example, 'Like eating less, they could just be having a bad day like and just didn't feel like their lunch that day. So do we need to tick that eating less, or do we just need to give them a couple of days of them eating less before reporting?' (HCA). As well, what if a person, 'Tripped over a vacuum cleaner, do we need to record that as them having falls more? Because they're not really having falls more it's just one isolated incident... So I think if it's over about two or three weeks or if it was like falling all the time' (HCA). The driver for this was the desire to recreate the DEWS 'rules' to protect RN colleagues because, 'We're under the impression that every DEWS we do gives the RN more paperwork and they have to do heaps of stuff, so like, we try and not overload the nurses' (HCA).

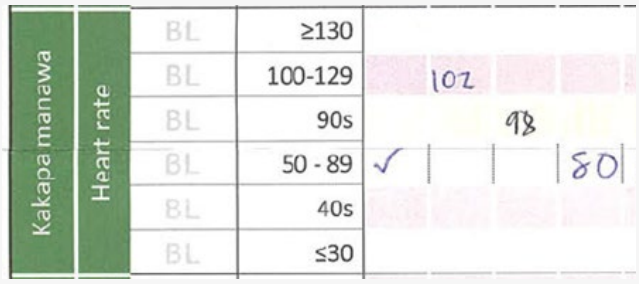
Mid-project site visits provided an opportunity for the research team to examine completed DEWS tools selected by the PLG where it became evident that two important variations were occurring in DEWS-RN tool completion. Baseline vital sign recording was lacking, information from which to judge clinical change and urgency, and vital sign measure detail was missing. RNs simply ticked a range and this does not allow the clinician to accurately follow psychological change. To help resolve this, one PLG suggested, 'A completed one [tool examples] would have been useful for the registered nurses, you don't want them to copy it, but I think just a visual that would be great' (PLG). PLGs worked with their teams to quickly address these implementation issues (see Figure 10).

Figure 10: Example of DEWS-RN tool completion before mid-project site visit

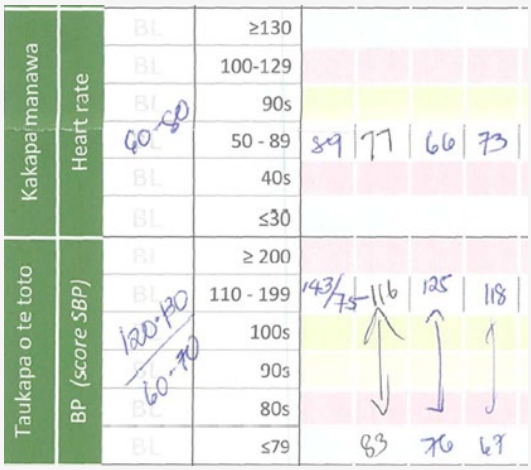
Ticking vital sign instead of recording measurement
No baseline (BL) recorded



No baseline (BL) recorded



After issue was identified



Clinical practice challenges

Rest home level care requires an RN to be available at all times, but not always on-site. This challenges the completion of the DEWS-RN following a Quick-DEWS trigger. One PLG solved this by providing reassigning tasks, 'So if the nurse is busy with the DEWS or [has gone from hospital to the] rest home because of DEWS, then they [HCA] can jump in and do the medication, or jump in and help with the other stuff' (PLG). Teamwork and practice boundaries were clearly thought through by this team who concluded the, 'Interpretation and the action as a result of whatever that [DEWS] shows is RN scope of practice' (PLG). However, asking the HCA to complete tasks for the DEWS assessment, 'Is a real positive, because sometimes within villages you'll get a little bit of segregation between caregivers and RNs and you've got to have them working together' (PLG).

Maintenance
Te tiaki

The maintenance part of the RE-AIM framework focuses on recommendations for the future. It presents the voices of participants regarding the feasibility and efficacy of DEWS in the ARC sector and outlines revisions for DEWS tools. This section draws on interview data and a participant-supplied sample of completed DEWS forms. Overall project leadership groups, registered nurse and health care assistant user groups recommended the implementation of DEWS in the residential aged care sector.

Project leadership groups

Overall, implementation of DEWS in ARC was recommended by PLGs. This was both due to the impact observed on the participating ARC facility and the anticipated benefits for other ARC facilities in their provider groups. Importantly, those using DEWS in day-to-day clinical practice (RNs and HCAs) also recommended DEWS implementation (see Appendix 4, Table A1 and Table A2).

Summing up, one PLG states simply that, 'Good practise, good evidence, and tools that make it easy to do, would just transform our capacity to deliver good care' (PLG). 'I hope that most aged care facilities in New Zealand embrace it with open arms' (PLG). One PLG said that, 'DEWS came and it's showing us the good things we have in place already', so they felt it was not needed at that facility, but they could still see the benefit of DEWS for other facilities in their provider group.

Benefits of DEWS

PLGs recognised the potential of DEWS to moderate communication across health boundaries, if the, 'Whole hospital team and everyone's quite aware, maybe it will be easier for us to communicate with the paramedics to actually explain the state of the resident, because it's a constant battle' (PLG). As well as sharing an understanding of the unique clinical characteristics of the population, 'If we all go to the same standard nationalised tool, we can see that we are not unnecessarily transferring residents to hospital' (PLG).

Some saw the potential for DEWS to impact on complaints, 'It would just stop that happening. So, it would make our lives a lot easier, you know, not having to spend hours and weeks doing HDC [Health and Disability Commissioner] complaints and things' (PLG). Many referred to the ability of DEWS to support clinical practice of the ARC workforce, 'Given the large number of international nurses and the change from working in their environments in their own countries to coming here. Aged care is a unique setting and to have that support it's huge' (PLG).

Registered nurse user group

Most RN participants supported the implementation of DEWS and suggested to, 'Tell the other places that are going to use it, that don't be afraid of it, to embrace it wholeheartedly, that it's the easy tool to use, once you actually use it more than once' (RN). RNs liked the tools for their ability to help them by, 'Sort of narrowing your focus to the people that need you' (RN). They valued the impact on clinical safety, 'So, it benefits them [residents] because if there is this, and [they] usually [have] this, we can act fast... we can refer promptly' (RN). As well as evidence of doing the right thing, 'It's better to use DEWS-RN, even though it's causing little more task to us, at least we have proof, like it's our registration... our licence is saved' (RN). A few RNs felt that existing patient management systems worked well so DEWS did not need to be added in their current workplaces. Overall, 94 percent (n=16) of RNs surveyed would recommend implementation of DEWS to other facilities.

Health care assistant user group

Most HCA participants recommended DEWS. Their reasons included, 'Everyone on the team is on one page, because everyone can see the DEWS' (HCA). As well as the rapid response that a positive Quick-DEWS elicited from the RN, 'I reckon it helped us quite a bit with, like, getting action done as well' (HCA). Overall, 86 percent (n=36) of HCA survey respondents would recommend DEWS to other facilities.

Digitisation and electronic records (improving feasibility)

Four of the five participating facilities had a digital patient management system in place, and a strong recommendation was made for the digitisation and integration of DEWS tools into those systems. Benefits of digitisation included multiple user access to DEWS tools, accuracy, and time-efficiency of self-populating data fields, 'So you did not have to input data two or three times to two or three different places' (PLG). As well as the visibility of developing clinical situations, including automatic alerts and handover, 'There's actually, like, a tick box that says, "include in the handover report", so when you click that one... it will actually automatically go to the nurses' (HCA). This impacted on clinical accountability, as an HCA explained, 'They [RN] also have to do something about it because, everyone... clinical manager or manager they can see all the notes' (HCA). The participating ARC facility with paper records, however, endorsed the DEWS documents because they were 'Right there, right on our nurse's desk, so you could even have a look before, you get handover and you've got a really good picture' (RN).

Revision of DEWS user education and user guide

Most participants reported that the education resources for DEWS tools had sufficient content but did not meet their needs in terms of responding to the limited time available to run education sessions. It was suggested that the DEWS user guide be broken into small sections so that, 'You can open the book and just refer to this particular section and it will guide you. It is a 10-minute read' (PLG). No specific recommendations were made on the content of the DEWS education, however, a strong recommendation was made for bite-size education modules.

Revisions of DEWS tools

Variation identified in the completion of DEWS tools during mid-study site visits, and a review of a sample of DEWS tools selected for sharing by PLGs, has resulted in changes to DEWS tools being completed in anticipation of future DEWS implementation (see Figure 11 and Figure 12).

Figure 11: SBARR-DEWS changes

SBARR-DEWS urgency category (during study)

Deterioration Early Warning Signs	
☐ YELLOW: May be acute illness	☐ RED: Urgent likely to deteriorate
☐ ORANGE: Acute illness or exacerbation	☐ BLUE: Life-threatening

SBARR-DEWS urgency category (revision)

Deterioration Early Warning Signs	
☐ May be acute illness (DEWS 1 – 9)	☐ Acute illness or exacerbation (DEWS 10 – 15)
☐ Urgent likely to deteriorate (DEWS 16 – 20) **or ANY RED zone indicator**	☐ Life-threatening (DEWS 21+) **or ANY BLUE zone indicator**

Figure 12: DEWS-RN changes

Tested: no example and baseline (BL) unclear

Whakahā	Respiratory rate	BL	≥30		
		BL	25-29		
		BL	21-24		
		BL	12-20		
		BL	9-11		
		BL	5-8		
		BL	≤4		
Toto hāorapora	SpO_2 (%)	BL	≥ 96		
		BL	94-95		
		BL	92-93		
		BL	≤ 91		
Kakapa manawa	Heart rate	BL	≥130		
		BL	100-129		
		BL	90s		
		BL	50 - 89		
		BL	40s		
		BL	≤30		
Taukapa o te toto	BP *(score SBP)*	BL	≥ 200		
		BL	110 - 199		
		BL	100s		
		BL	90s		
		BL	80s		
		BL	≤79		

Updated: example column provided

Tīmana	Function		Fall (today)	
			↓Mobility	
			↓ ADL status	
			Newly weak / fatigued	
			Stroke (FAST)	
	Physical		↑Short of breath	
			Oedema (pitting)	E
			New or ↑Cough	X
			Nausea /vomiting	A
			Diarrhoea	M
			BNO ≥3 days	P
			New skin breakdown	L
			↑Urinary symptoms	E
			New pain (≥5/10)	
Whakahā	Respiratory rate		≥30	
		W	25-29	
		R	21-24	23
		I	12-20	
		T	9-11	
		E	5-8	

Updated: baseline instructions clarified

Whakahā	Respiratory rate		≥30	
		W	25-29	
		R	21-24	23
		I	12-20	
		T	9-11	
		E	5-8	
			≤4	
Toto hāorapora	SpO_2 (%)	B	≥ 96	
		A	94-95	94
		S	92-93	
		E	≤ 91	
Kakapa manawa	Heart rate	L	≥130	
		I	100-129	
		N	90s	98
		E	50 - 89	
			40s	
			≤30	
Taukapa o te toto	BP *(score SBP)*	N	≥ 200	
		U	110 - 199	120
		M	100s	I
		B	90s	I
		E	80s	80
		R	≤79	

Tested: temperature range

Pāmahana	Temperature °C		≥ 38s	
		H	37s	37.2
		E	36s	
		R	35s	
		E	≤ 34s	

Updated: temperature range

Pāmahana	Temperature°C		≥38°C	
		H	37.3 - 37.9	
		E	36 - 37.2	36.1
		R	35 - 35.9	
		E	≤34.9°C	

Quality improvement and DEWS implementation *Whanake kounga me te whakatinana i a DEWS*

This section considers the QI tools and processes used to support the implementation of DEWS and addresses the third aim of the feasibility study. The theme of adoption asks what organisation support is required to deliver the intervention. This study set the requirements designed to ensure a successful completion. Project parameters included creating PLGs, having enough human resources to commit to a project schedule, completing QI project documents and attending a 'how-to' workshop.

Project leadership group membership

The feasibility study structure required ARC facilities to form representative multidisciplinary PLGs to lead the day-to-day implementation of DEWS. This process ensured each PLG had people with QI experience who could translate terminology because, 'People on the ground have never heard those things' (PLG). It also supported data collection processes and links to organisational clinical governance structures, and ensured members of staff (RNs and HCAs) who were influential with their peers were involved and helped lead the implementation of DEWS.

Quality improvement documents

Initiating the project at the local level required the completion of QI tools (project implementation plan, project charter, measures, current state assessment tools). Having these tools pre-developed was, 'Really useful, it helped us out and saved time' (PLG), with the caveat that, 'Perhaps having like more of an example because we weren't quite sure how to fill out some of this stuff' (PLG). All PLGs completed project charters and data collection templates, but completion of other documents was variable (Table 17).

Table 17: Quality improvement tools completed by project leadership groups (PLGs)

Quality improvement tools offered for completion	Number of PLGs completing documents n (%)
Escalation mapping tool	3 (60)
Project charter	5 100)
Current system assessment template	2 (40)
Data collection plan template	5 (100)
Case review tool	1 (20)

Scheduling

The feasibility study was deliberately scheduled to start after and finish before the summer season, which is a particularly busy time for ARC providers. The three-month planning and preparation phase was appreciated, 'It went very smoothly… because we were given enough time to really plan ahead and discuss things' (PLG).

Teleconference support

PLGs were expected to commit to having representation at fortnightly teleconference meetings with the research team throughout the study. PLGs reported these helped, 'To just remember to do the things that you haven't done in a busy work environment' (PLG). They also provided reassurance and connection to the other teams, 'If we were having issues some others were too, so it was sort of you're not alone' (PLG). Most teleconference participants felt the one-hour meeting 'Clipped along well' (PLG), however, one participant suggested 40 minutes would be preferable. The regular contact between the PLGs and research team helped ARC teams feel supported to complete the study, for example, 'Really appreciate the support that we've had as well, from the DEWS lead team always being available when we have a bit of a curly question that we need to answering' (PLG). All participant groups began using DEWS tools on 2 June 2024 and finished on 31 October 2024.

'How-to' workshop

A 'how-to' workshop was provided, to ensure PLGs could gain an in-depth understanding of DEWS and the QI implementation process. It was attended by 25 representative members of the PLGs (see Table 18). A presentation was also given by the office of the Aged Care Commissioner exploring the potential of DEWS as a patient safety mechanism.

During the semi-structured interviews, PLGs advised they valued the workshop for providing 'Time to reflect and sort out how we're gonna do it' (PLG). However, the workshop also generated an emotional response. One PLG recalled, 'I'm an excited [about DEWS research], at the same time it's quite challenging. You know when after the workshops like, oh, we've said yes to this project and it's bigger [than we thought]' (PLG).

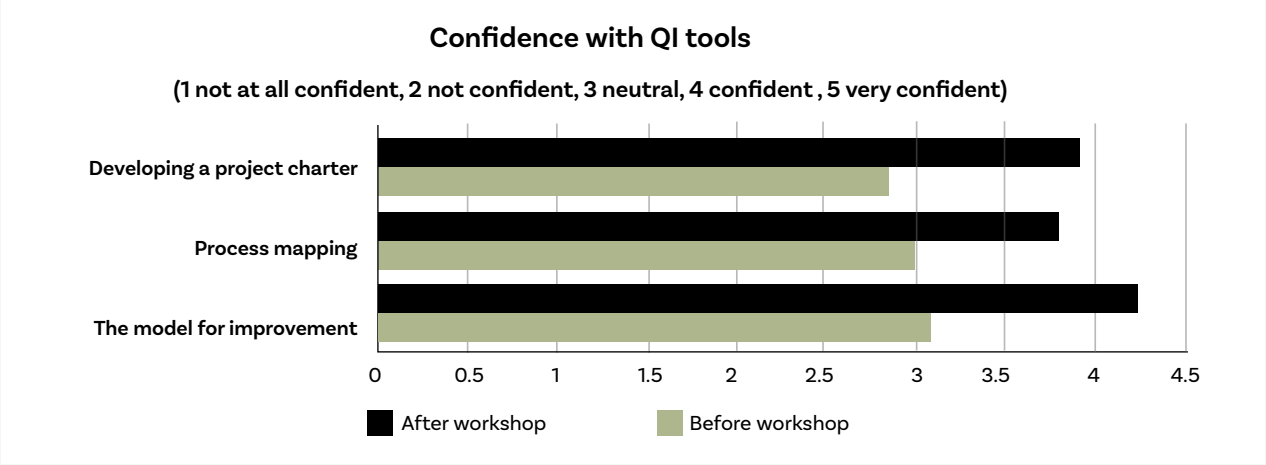
The workshop evaluation survey (80% response rate) showed an increased confidence with QI tools (Figure 13). Asked to report three learnings from the day, participants identified: understanding the DEWS tools and QI project documents, the importance of a substantial project planning phase, and a representative PLG to lead the implementation.

The most important QI tool used to ensure DEWS implementation was the weekly audit submitted to the research team via a secure online platform. PLGs were asked to audit DEWS tools for 10 residents per week. This was considered a reasonable time commitment, 'Takes like 30 minutes to an hour' (PLG) and issues identified were followed up with ARC tool user groups. It provided PLGs with a mechanism to

Table 18: 'How-to' workshop attendees

Facility	National leader	Regional leader	Facility manager	Clinical leader	Unit coordinator	Registered nurse	Enrolled nurse	Health care assistant
V			✓	✓		✓		
W		✓		✓		✓		✓
X	✓			✓	✓	✓	✓	
Y				✓	✓	✓		✓
Z	✓	✓		✓	✓			✓

Figure 13: 'How-to' workshop evaluation survey results



Note: QI = quality improvement.

manage their implementation, and they reported if the audit showed something was, 'Not happening, then OK, we go back again, remind them [RNs and HCAs], so it's constant reminding everyone until they embrace it' (PLG).

The research team also asked for rates of acute events per month, as a measure of project impact. These measures had mixed success because not all providers had mechanisms to capture the data requested. One PLG suggested, 'A bit more sitting alongside us as we interpret what the question wants would probably have meant that we would have given you better information' (PLG). Also, because data were collected at the end of the study, the research team was unable to make iterative changes to these measures.

Interestingly, one PLG noted a marked reduction in falls during the DEWS feasibility study, 'We can see that huge impact in reducing our falls. So it's drastically make, like half, nearly halved of our incident events. So we're quite good in falls prevention now because of the DEWS' (PLG). This was an unanticipated outcome that represents an interesting potential measure for any future evaluation.

Quality improvement tools

A few suggestions were made for improvement regarding the QI implementation process. One was for simplification of language, '[Be]cause the [research team] talks about quality improvement and improvement science... actually people on the ground have never heard those things and don't quite know what that lingo means' (PLG). The secure online platform proved a challenge for some PLGs, with access issues related to organisational firewalls and user familiarity.

Future support mechanisms

As PLGs recommended implementation of DEWS for the wider ARC sector they started to explore how this would work. Those who were part of larger groups felt they would be able to, 'Support our local care homes within [organisation name] with rolling it out' (PLG). However, they were concerned that, without the feasibility study experience, it would be more difficult for an ARC facility to implement and recommended a, 'Help desk, a person, or a process, or a portal or somewhere where you can just chuck your questions' (PLG) or a 'bit of drop-in session' (PLG). They felt that having, 'A champion on each site' (PLG) would be really useful.

Group ARC provider participants ensured they selected facilities for participation with robust primary care services, to support the study. However, primary care engagement was not considered essential for the implementation of DEWS because it was seen as an internal nursing process suggesting, 'Even if the GP doesn't come on board, I think it will still support the nurses. So the [GP] can choose to come on board or not, but this [DEWS] is what we [ARC] do' (PLG).

Discussion
Te matapaki

This study has established that the implementation of DEWS in ARC is not only feasible but is also recommended by participants of ARC sector, for the ARC sector. It has presented compelling reasons for implementation. Most importantly, DEWS is effective in supporting the timely identification of and response to acute deterioration. This study has also tested and identified areas for improvement of (or iteratively developed) DEWS tools and supporting QI documents and processes. These improvements could be delivered as part of a future implementation roll out and/or definitive DEWS trials. Strategically, participants with senior leadership appreciated the improved clinical safety and risk reduction benefits of DEWS. RN participants articulated the effect of DEWS on their clinical proficiency. The positive impact on the HCA workforce was the surprise finding. Importantly, results show support for DEWS implementation was spread equally amongst strategic and clinical leaders as well as direct care providers.

Identification and response to acute deterioration

The identification of acute deterioration is the crucial first step to establishing a commensurate treatment or care pathway for people living in ARC. The Quick-DEWS put screening for a change in condition in the hands of HCAs, who are the health care workers with the most clinical contact time. This increased the likelihood that a change in a residents' condition would be detected. Quick-DEWS helped the HCA convert a sense of 'knowing something is wrong' to a clinical action.

The importance of supporting the HCA to articulate the sense that something is wrong with the resident is consistent with other studies (Barker et al 2019; Boockvar et al 2000; Chambers et al 2023; Hodgson et al 2022; MacAndrew et al 2025; Russell et al 2020; Stocker et al 2021; Tingström et al 2015). In addition, this study's results indicate that both RNs and HCAs value the clarity of the clinical conversations that occur when using the tool to identify change, a result also reported in other research (Hodgson et al 2022; Russell et al 2020). The escalation pathway in DEWS mandates an RN response to an HCA notification, and the results of this study indicate this helps avoid treatment delays. This is an important finding because studies indicate that delays in escalation are one of the root causes of adverse events in care (Andersson et al 2018; Wall 2016).

Critical thinking

Critical thinking is a complex mental process of synthesising, analysing and evaluating collected information, it is associated with high-quality care (Papathanasiou et al 2014; Van Nguyen and Liu 2021).

Results from this study showed that DEWS encourages and supports RNs and HCAs to apply critical thinking. This is an interesting and exciting result because critique of EWS tools has suggested they prevent or hinder critical reasoning in the nursing workforce (Downey et al 2017). This may, in part, be due to DEWS resembling EWS tools that combine nursing knowledge, non-specific clinical indicators (Kemp et al 2020; Simon et al 2022) and vital sign measures (Douw et al 2017; Haegdorens et al 2024). Interestingly, survey results indicated that DEWS empowered RNs to apply their existing knowledge rather than providing them with new information.

The empowerment of RNs through early warning systems is consistent with other studies (McGaughey et al 2017). Most (88 percent) RN participants in this study were internationally qualified nurses. This

raises questions about the difference in socialisation of nurses to the profession between New Zealand and other countries. It is reasonable to suggest that internationally qualified nurses (and possibly RNs new to aged care) are managing confidence issues, rather than knowledge or critical thinking deficits. Results of this study demonstrate that the guided reasoning process outlined in DEWS provided nurses with a sense of organisational support for and obligation to apply critical thinking skills. The RN narrative results of this study indicating the value of DEWS in 'safeguarding' or 'protecting' their registration suggests RNs in ARC feel vulnerable and this presents an area of further study.

Escalation pathway

Results of this study show that the ability to tailor the escalation pathway response to acute deterioration is critical to the implementation of DEWS. This is an approach that is consistent with the New Zealand national EWS process. The DEWS escalation pathways developed in this study differed from acute care pathways because no emergency medical services are on-site at ARC facilities and internal emergency response personnel were limited. Furthermore, results escalation parameters are sensitive to the primary care environment.

Engagement of HCA workforce

The engagement of HCAs with DEWS was the surprise result of this study. RN participants in this study expressed enthusiasm for the change in HCA practice, and PLG participants questioned whether they had underused this workforce in maintaining clinical safety. In a clinical environment, with a large HCA workforce and relatively small RN workforce, this is an important finding. Overseas, some ARC facilities are staffed entirely by HCAs and EWS had been trialled with varying success (Hodge et al 2023). The question of whether health consumers or their family and whānau could use Quick-DEWS to raise the alarm was beyond the scope of this study but is an area of further investigation.

Barriers and enablers

The biggest barrier and, conversely, enabler to future DEWS implementation identified in the results of this study was the digitisation of the ARC sector. Large group ARC providers (around half of the ARC sector) have digital patient management systems, as do an unknown proportion of smaller organisations. Results of this study indicate that integration of DEWS into digital systems would act as a significant implementation enabler, 'piggybacking' DEWS onto existing alerts and secure communication processes. It was beyond the scope of this research to unpack how digitisation of DEWS could progress, however, this is an important area of further study.

Areas for improvement

Results of this study show some important areas for improvement for the DEWS package. An significant result was that the education presentations provided were too long. This forced participants to be selective about teaching elements of DEWS and, in the first half of the study, resulted in variation in tool application. To manage this risk in any future application of DEWS, short (15 minute) modules need to be developed. Essential topics for education modules identified in these results include the importance of baseline vital signs, knowing when Quick-DEWS should start and stop, being clear about scope of practice, and how DEWS connects to end-of-life processes and advanced care decisions such as shared goals of care.

Quality improvement process and outcome measures

Results of this study demonstrate that some QI processes were valued and used while others were redundant. The most important implementation support processes were the 'how-to' workshop, fortnightly teleconference meetings, mid-project site visits and the implementation audit. It was clear from the results of this study that motivation and leadership were more important than facility size, staff stability and organisational infrastructure for the implementation of DEWS.

Standard quantitative outcome measures were difficult to set for this study, as evidenced by the gaps in outcome data. Hospitalisation, an outcome measure used in other studies (Ouslander et al 2011, 2016a), was not used in this study because it is difficult to interpret. It could be argued that timely identification of acute deterioration would result in reduced hospitalisation, conversely, DEWS may improve the identification of acute deterioration requiring hospital intervention and increase hospitalisation. Furthermore, just as hospital EWS impact is measured with hospital outcomes (death in hospital, intensive care admission) (Mohan et al 2023), it is the author's view that the impact of DEWS in ARC should be measured with ARC outcomes (primary care). However, collecting ARC case information, along with numbers of hospital transfers, may offer a more nuanced measurement of DEWS outcomes, and this is an approach used in other studies (Ouslander et al 2016b, 2016c).

Unexpectedly, one PLG presented their reduction in falls rates during the feasibility study as an impact of DEWS. Falls are often indicators of acute deterioration in frail older people (Daltrey et al 2022) so a reduction in falls rates could be argued to be a marker of the earlier identification of acute deterioration. This outcome measure has been used in other studies (Little et al 2019). The international resident assessment instrument long-term care facility tool (interRAI-LTCF) is the consistently available data source across the New Zealand ARC sector and, in the event of long-term implementation of DEWS, may provide outcomes measures. However, determining what those measures would be is an area for further study.

Strengths and limitations

This is the first study in New Zealand to review the effectiveness of an early warning system in ARC and, as such, has provided valuable contextual information. However, as a real-world feasibility study, it has potential sources of bias. The call for expressions of interest to participate ensured that only those with an interest and the capacity to be involved were recruited to the project. This may have led to overly optimistic and positive DEWS results. However, ARC providers expressing an interest did so at least in part so they could influence what happens in their sector. Had participants not supported DEWS, they were in a prime position to make a recommendation not to implement. Furthermore, DEWS tool users (RNs and HCAs) were not given a choice about participating, and resentment could have resulted in negative feedback during evaluation interviews. The testing period of DEWS was finite and a relatively short 5 months.

Testing deliberately avoided summer peak service pressures. A longer testing period and continuation over the summer may have reduced participant motivation and affected DEWS implementation. The short timeframe resulted in a lack of quantitative results to balance against interview data. However, collecting qualitative data from participants meant DEWS was judged by subject matter experts. Research design gaps exist, this was a health care worker study only, therefore, no data are available from the health consumer perspective. Feasibility studies are not designed for generalisability. The sample included in this study was biased toward large group ARC providers. No matched control or comparison groups were established with which to judge DEWS effectiveness.

Conclusion
Te kupu whakatepe

Participants in this study wholeheartedly recommended use of the DEWS tools to the ARC sector. DEWS was found to be effective in supporting the timely identification of and response to acute deterioration. Importantly, it supported critical thinking, effective communication and clinical accountability, as well as increasing staff confidence in those skills. The regular formal screening of the residents' condition by the HCA followed by the mandated response of the RN contributed to the timeliness of the process. Participants strongly recommended that DEWS be digitised, to enable integration into existing patient management systems. They also advised that future implementation of DEWS would require QI infrastructure similar to that delivered during the feasibility study.

Appendix 1:

Aged residential care quality leads forum and DEWS expert advisory group terms of reference

Āpitihanga 1:

He wānanga whakahaere manaaki kounga o me ngā paearu mahi mā te rōpū mātanga o DEWS

Terms of reference for the Aged Residential Care Quality Leads Forum

February 2025

Te Tāhū Hauora
Health Quality & Safety Commission

Aim and Purpose

Te Tāhū Hauora Health Quality & Safety Commission (Te Tāhū Hauora) aims to support quality improvement activity across the aged residential care (ARC) sector. This will be achieved through partnering with ARC sector stakeholders in a way that is engaging, innovative, and builds strong alliances and partnerships.

The key purpose of the ARC Quality Leads Forum (QLF) is to provide an opportunity for Te Tāhū Hauora Health Quality & Safety Commission (Te Tāhū Hauora) to identify priority areas of improvement and projects that are underway within the sector.

The ARC QLF will provide sector insights and strategic feedback on the national resources that will be used by Te Tāhū Hauora's project team. This will influence the ARC sector and contribute to developing strategies to improve ARC services to positively impact on residents' experience of care.

Additionally, the ARC QLF will:

a. provide an opportunity for **open and free dialogue** that proactively support effective **relationships** between the ARC sector and Te Tāhū Hauora

b. share information that supports a national approach, thus fostering an integrated approach to improving the quality and safety of health and disability services with relevant Te Tāhū Hauora programmes

c. provide **strategic insight** to ensure Te Tāhū Hauora's approach is aligned with other ARC sector priorities

d. develop a repository for **sharing** tools, resources and best practice across the ARC sector

e. support implementation **of equity-focused initiatives** and give effect to the responsibilities of Te Tāhū Hauora under Te Tiriti o Waitangi by ensuring its recommendations contribute to achieving **equitable outcomes for Māori.**

Membership and appointment

The Chair will be appointed by Te Tāhū Hauora.

The membership will comprise representatives from a range of large ARC service providers, ideally the organisation's national quality director or manager, or the equivalent. There is no set number of members. The membership and structure may be reviewed to reflect the developing nature of Te Tāhū Hauora's work programme.

Te Tāhū Hauora is committed to undertaking a variety of engagements across the sector to support a sustainable approach to continuous quality improvement.

Due to manageability of group size, we cannot have all provider voices directly represented on this group. Therefore, our approach will be to ensure all providers have opportunities to inform and engage in the work

through a range of networks, for example via the NZACA nursing leadership group.

Terms and conditions of appointment

Members will either be invited to join the group or appointed following an "Expressions of Interest" process. Nominations may also be sought from organisations and professional bodies across Aotearoa New Zealand health sector. Where expressions of interest are sought, applications will be reviewed by a selection panel with recommendations for appointment made to Te Tāhū Hauora and endorsed by the Chair. and endorsed by the Chair.

Terms of appointment will be for two years with the ability to re-appoint for additional terms. As members come up for renewal each will be considered on their merits, and informed by the needs of the programme, knowledge continuity and expertise required on the group. Any member may at any time resign by advising the Chair in writing.

It is expected that representatives' organisations will cover their time and travel expenses to attend these meetings.

The continued purpose of the group will be subject to the ongoing programme planning for Te Tāhū Hauora's Safety and Quality group. The terms of reference for the group will be reviewed and updated on a two-yearly cycle or sooner if required.

Responsibilities

The ARC QLF is obliged to conduct its activities in an open and ethical manner. Members are expected to work in partnership with Te Tāhū Hauora, and to:

a. work strategically contributing to a sustainable system of improvement

b. work collaboratively, respecting the views of others with a focus on improving health outcomes and overall system performance as well as improving the experience for health care consumers, whānau and family

c. act, as a collective group, in the best interests of quality and safety initiatives locally, regionally and nationally

d. make every effort to attend all meetings and devote sufficient time to become familiar with the priorities of the group and the wider environment within which it operates. When a member is unable to attend, a delegate with similar job responsibilities is able to attend the meeting as long as notice is provided to the Te Tāhū Hauora team

e. identify and declare any conflicts of interests and proactively manage any conflicts

f. refer requests for media comments to the Chair of the group who will then ensure Te Tāhū Hauora's relevant executives are informed.

Meetings and decision-making

Recommendations to Te Tāhū Hauora will be made at the group meetings and ratified through the Chair. Decisions will be made by consensus.

a. The group will meet as required by videoconference or face to face.

b. A quorum will be a minimum of five members, plus the Chair.

c. All members will contribute to substantive decisions or recommendations.

Secretariat

Te Tāhū Hauora will provide a secretariat to the QLF, responsibilities of which will include:

a. prepare and distribute the agenda and associated papers at least 5 days before meetings

b. record and circulate the minutes no later than 2 weeks after the meeting date

c. manage the organisational arrangements for meetings, including provision of rooms, audio-visual equipment and virtual meeting requirements.

Reporting and communication

Key messages for public dissemination from the QLF will be communicated via Te Tāhū Hauora's communication networks and mechanisms such as the website and e-digest newsletter.

Te Tāhū Hauora
Health Quality & Safety Commission

Terms of reference for the Deterioration Early Warning System feasibility study, expert advisory group

November 2023

Background

The deterioration early warning system (DEWS) is being tested within age-related residential care (ARC) facilities in Aotearoa New Zealand. DEWS is a system designed to support ARC staff to recognise and respond to the acute deterioration of residents in their care. This work will build on research undertaken by Julie Daltrey, our clinical lead, and Dr Michal Boyd.

Purpose

The purpose of the DEWS feasibility study expert advisory group (EAG) is to provide expertise, advice, ethical guidance and support to the research project team at Te Tāhū Hauora Health Quality & Safety Commission (Te Tāhū Hauora), which is leading the testing of DEWS within ARC facilities.

The DEWS pilot EAG will:

- provide **strategic advice** in the approach and testing of the DEWS tools within ARC facilities to determine whether the DEWS system is effective in supporting teams to recognise and respond to the acute deterioration of people living in care
- **make recommendations** that are informed by evidence and international, national and local knowledge, and focused on improving outcomes for people living in care
- focus on **improving equity**, particularly for Māori.

Membership

Te Tāhū Hauora will appoint the EAG chair.

The EAG membership will comprise respected leaders who are experts in their fields and/or who are actively engaged in the community or group/s they represent.

There is no set number of members. Membership will include, but is not limited to representatives from the following organisations and groups:

- Health and Disability Commissioner – Aged Care
- New Zealand Aged Care Association - Nursing Leadership Group
- New Zealand Council of Christian Social Services
- ARC Quality Leads group
- HealthCERT
- Nurse Practitioner/s
- Royal New Zealand College of General Practitioners
- Ambulance services
- Emergency Department services
- Advance Care Planning
- consumers with experience of ARC facilities, either through personal lived experience or as whānau members or friends of individuals who have lived in ARC
- a senior leader from Te Tāhū Hauora
- experts in advancing Māori health and with wider cultural expertise
- DEWS feasibility study leads
- Te Tāhū Hauora staff who are part of the DEWS project working group (project management and coordination, quality improvement advisor and senior manager)

The group may seek advice from key specialists as required.

Responsibilities

The EAG will conduct its activities in an open and ethical manner. Members will work in partnership with Te Tāhū Hauora and:

- champion the project within their networks and represent the consensus of the group
- work cooperatively, respecting the views of others with a focus on improving health outcomes and overall system performance as well as improving the experience for consumers and whānau
- act, as a collective group, in the best interests of this quality and safety initiative locally, regionally and nationally

- make every effort to attend all meetings and devote sufficient time to becoming familiar with the priorities of the group and the wider environment within which it operates
- identify and declare any conflicts of interests and proactively manage any conflicts
- refer requests for media comments to the DEWS clinical lead and the director of communications at Te Tāhū Hauora.

Meetings and decisions

The EAG will be in place until December 2024, then reviewed.

Recommendations and advice for Te Tāhū Hauora will be communicated at EAG meetings or by follow-up email if agreed at meetings and ratified through the chair.

The EAG will meet a minimum of quarterly; meetings may be more frequent depending on the needs of the project.

Meetings will mostly be held via Zoom; in-person meetings will be agreed in advance by members.

A quorum will be a minimum of 50 percent of the group membership at the time of the meeting.

Where substantive decisions or recommendations need to be made, all members will be encouraged to contribute via email.

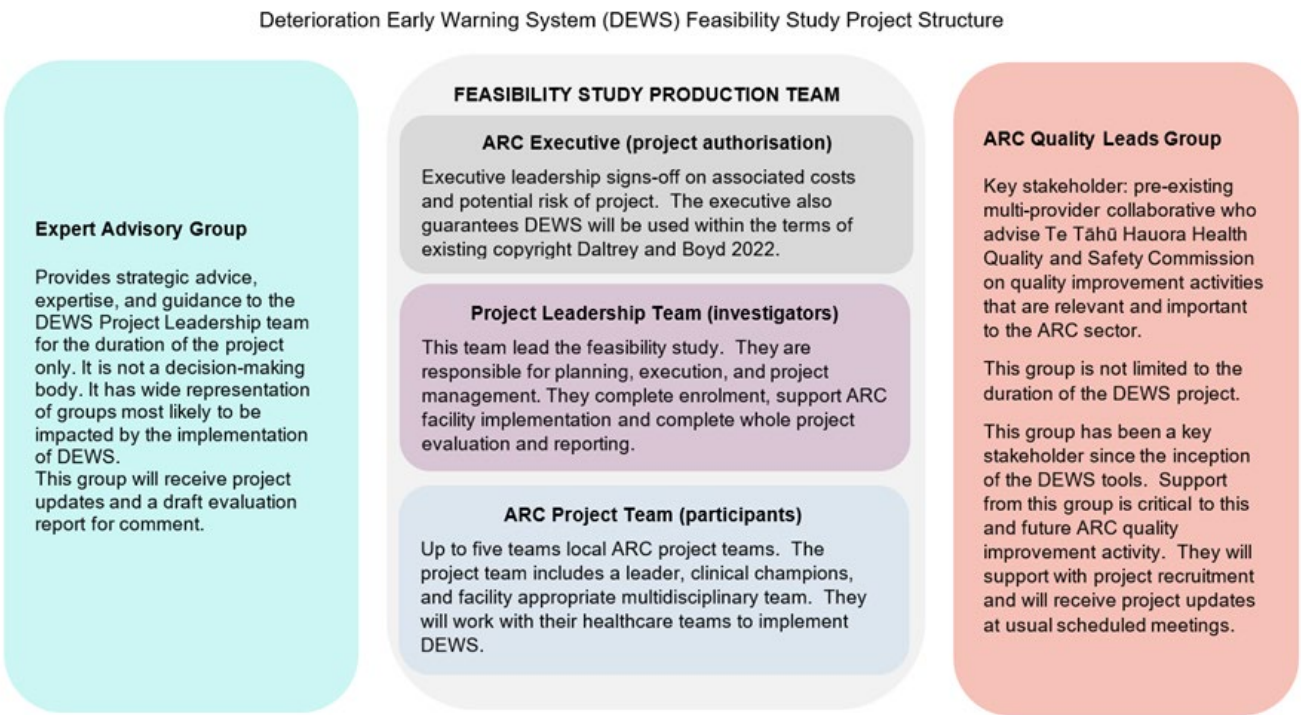
Secretariat

Te Tāhū Hauora will provide the EAG with a secretariat.

The responsibilities of the secretariat include:

- preparing and distributing the agenda and associated papers at least 3 days before meetings
- distributing relevant documentation and coordinating a central register for decision-making
- recording and circulating the minutes no later than a fortnight after the meeting date
- managing the organisational arrangements for meetings, including flight bookings and the provision of rooms and audio-visual equipment.

EAG alignment and DEWS feasibility study project structure



Membership and appointment

Members will be invited to join the DEWS EAG. Members may resign at any time by advising the chair in writing.

Fees

Members who are staff of a New Zealand public sector organisation, including public service departments, state-owned enterprises or crown entities, are not permitted to claim a fee to attend the AAG meetings. Te Tāhū Hauora has a fees framework that applies to members who are not included in the above groupings or attend EAG meetings within their own time.

Other members are eligible for fees in accordance with Public Service Commission guidelines and will be paid within the CO (22) 2 Group 4, Level 2 band. In most cases this will be set at $345 per day ($43.12 per hour) for members.

Any travel required for face-to-face meetings will be arranged and paid for by Te Tāhū Hauora.

Standards of Integrity and Conduct

All members are expected to adhere to the Standards of Integrity and Conduct set by the State Services Commissioner as per the State Sector Act 1988, section 57, which outlines the four main pillars of being fair, impartial, responsible and trustworthy.

Any major breach of the standards, after investigation, may result in the termination of the appointment.

Review

The terms of reference for the EAG will be reviewed and updated every 10 months or sooner if required.

Appendix 2:
Semi-structured interviews

Āpitihanga 2:
Ngā uiui āhua hanganga

ARC project team interview (semi-structured)

1. Tell me what it has been like introducing DEWS to practice

2. Did anything unexpected occur because of the DEWS pilot?

   Prompts
   - *Please explain*

3. How hard or easy was it to drive this project?

   Prompts
   - *What really helped with the implementation?*
   - *What challenges did you face? And how did you resolve them?*

2. If you were going to do this project again who would be in your project team and why?

   Prompts
   - *Was there anyone who was not in your project team initially that you needed to involve later?*

3. Tell me about your experience of the "how-to" in-person workshop

   Prompts
   - *On reflection did it provide enough information (get detail tell me about that)*
   - *What would you do differently?*
   - *Did it help (left with clear expectations)?*
   - *Did it hinder (confuse/overwhelm)?*

4. Tell me your thoughts about the fortnightly zoom meetings with the project leadership team

   Prompts
   - *Did they help (leave you with clear goals and outcomes)? Hinder (confuse/overwhelm)?*
   - *Did they hinder (confuse/overwhelm)?*
   - *What would you do differently?*

5. Describe the approach you took when working through your escalation pathway

   Prompts
   - *What worked well*
   - *What would you do differently*

6. How did you socialise / talk about DEWS with your staff?

   Prompts
   - *Did you talk about it in team meetings, handover, use notice boards, staff newsletters*

7. How useful were the supporting documents and resources?

   Prompts
   - *Tell me about the DEWS tools*
   - *Tell me about the quality improvement resources*
   - *Tell me about the educational resources*
   - *What would you do differently?*
   - *What was missing from the resources?*
   - *What were the most useful?*
   - *Overall did they, help (clear ideas and outcomes)? Or hinder (confuse/overwhelm)?*

8. What encouraged staff to use DEWS?

9. What discouraged staff to use DEWS?

10. What differences in practice have you seen or heard about?

    Prompts
    - *Impact on communication between staff (HCA-RN-HCA, or RN-GP/NP-RN)*
    - *Impact on nurse assessments*
    - *Impact/feedback from primary care providers*

11. If you could change one thing about DEWS what would it be

12. Our expert advisory group identified this issue (*to be completed*) what do you think of that?

13. During this process (*to be completed)* became an issue what do you think about that?

14. Overall would you recommend implementing to the DEWS to another facility?

    Prompts
    - *Why is that?*
    - *What changes to DEWS tool or implementation package would you recommend?*

    - *What encouraged staff to use DEWS*
    - *What discouraged staff to use DEWS*

    - *Overall*
        - *what worked well*
        - *what would you do differently*

15. What else is important for us to know?

ARC user group interview (semi-structured)

Participants: all team members using DEWS tools

1. Tell me what it has been like introducing and using DEWS in practice
2. Did anything unexpected occur because of the DEWS pilot?

   Prompts
   - *Please explain*

3. How did you find the DEWS tools

   Prompts
   - *Can you tell me about* **Quick DEWS**?
   - *Can you tell me about* **DEWS-RN assessment?**
   - *Can you tell me about* **SBARR-DEWS**?

4. Tell me about the impact of DEWS on communication

   Prompts
   - *Can you tell me about* **Quick DEWS**?
   - *Can you tell me about* **DEWS-RN assessment?**
   - *Can you tell me about* **SBARR-DEWS***?*

5. How has DEWS impacted on primary care?

   Prompts
   - *Do you call the GP/NP more often?*
   - *Have conversations with GP/NP changed?*
   - *Has information provided to or by GP/NP changed?*

6. How easy or hard are the DEWS tools to use?

   Prompts
   - *Any confusion?*
   - *Any frustrations? Or joys?*
   - *For each tool Quick-DEWS, DEWS-RN, SBARR-DEWS*

7. How has the escalation pathway been working

   Prompts
   - *What were your experiences?*

8. What have been your experiences using the modifications section of the DEWS-RN Chart
9. What was your experience of the DEWS education?

   Prompts
   - *Tell me about the education session,*
   - *Tell me about the DEWS guideline*

10. Has having DEWS changed practice?

    Prompts
    - *Can you give me specific example?*

11. Has there been any workload impact?

    Prompts
    - *Can you give me specific example?*

12. Have families or residents asked you about DEWS?

    Prompts
    - *Tell me about that?*

13. What recommendations do you have for DEWS

14. If you could change one thing about DEWS what would it be

15. Our expert advisory group identified this issue (*to be completed*) what do you think of that?

16. During this process (*to be completed)* become an issue what do you think about that?

17. Overall would you recommend implementing the DEWS to another facility?

    Prompts
    - *Why is that?*

Appendix 3:
Survey questions for DEWS tool user groups

Āpitihanga 3:
Ngā pātai rangahau mō ngā rōpū whakamahi taputapu o DEWS

Survey of health care assistants

Testing the deterioration early warning system for aged residential care. A feasibility study

Demographic information – *this helps us understand the survey results more clearly*

Name of facility:							
Your age:	☐ 18–24	☐ 25–34	☐ 35–44	☐ 45–54	☐ 55–64	☐ 65–74	☐ 75+
Your gender:	☐ Male	☐ Female	☐ Another gender				
Your ethnicity:	☐ European	☐ Māori	☐ Pacific peoples	☐ Asian (please name)			
	☐ Middle Eastern, Latin American & African			☐ Other (please name)			
How long have you worked in aged residential care?	☐ Less than 1 year	☐ 1–5 years	☐ 5–10 years	☐ 10+ years			

Questions about the deterioration early warning system (DEWS) – *this helps us understand the impact of the DEWS tools*

1. **Compared with your usual observation of one resident, how much time did the Quick DEWS take?**
   - ☐ No more time (it is what I do every day)
   - ☐ A little more time (I had to think about it a bit more than usual)
   - ☐ Lots more time (it really added to my workload)
   - ☐ 100% more time (I never usually observe for these items)

2. **Please estimate how much time it takes to complete Quick DEWS documentation for one resident:**
   - ☐ Less than 10 seconds
   - ☐ Less than 30 seconds
   - ☐ 30–60 seconds
   - ☐ More than 1 minute
   - ☐ Other: please state time here _____

3. **Thinking about the DEWS, did it do the following?** (Circle)

	No	a little	some	quite a lot	a lot
a. Increase your knowledge about acute deterioration	1	2	3	4	5
b. Increase your confidence with identifying acute deterioration	1	2	3	4	5
c. Help you communicate with the registered nurse (RN)	1	2	3	4	5
d. Help you communicate with whānau/families	1	2	3	4	5
e. Empower you to do your job	1	2	3	4	5

4. **Did you see the DEWS do the following?** (Circle one: 1 = none, 3 = some, 5 = a lot)

	No	a little	some	quite a lot	a lot
a. Help RNs recognise and respond to acute deterioration	1	2	3	4	5
b. Increase RN confidence with clinical reasoning	1	2	3	4	5
c. Help RNs communicate with whānau/families	1	2	3	4	5
d. Help RNs get support from the primary care provider (General Practitioner / Nurse Practitioner)	1	2	3	4	5
e. Help RNs get support from the ambulance service	1	2	3	4	5

5. **What else would you like to tell us about the Quick DEWS or the DEWS overall?**

Ngā mihi – thank you for your feedback

Survey of registered nurses

Testing the deterioration early warning system for aged residential care. A feasibility study

Demographic information – *this helps us understand the survey results more clearly*

Name of facility:							
Your age:	☐ 18–24	☐ 25–34	☐ 35–44	☐ 45–54	☐ 55–64	☐ 65–74	☐ 75+
Your gender:	☐ Male	☐ Female	☐ Another gender				
Your ethnicity:	☐ European	☐ Māori	☐ Pacific peoples	☐ Asian (please name)			
	☐ Middle Eastern, Latin American & African			☐ Other (please name)			
How long have you worked in aged residential care?	☐ Less than 1 year	☐ 1–5 years	☐ 5–10 years	☐ 10+ years			
Your profession:	☐ Registered nurse (RN)	☐ Enrolled nurse	☐ Nurse practitioner (NP)				

Questions about the deterioration early warning system (DEWS) – *this helps us understand the impact of the DEWS tools*

1. **Compared with your usual resident assessment in the event of acute deterioration, how much time did the DEWS RN assessment take?**
   - ☐ No more time (it is what I do every day)
   - ☐ A little more time (I had to think about it a bit more than usual)
   - ☐ Lots more time (it really added to my workload)
   - ☐ 100% more time (I never usually observe for these items)
   - ☐ Not applicable

2. **Compared with your usual communication/escalation process how much time did the DEWS SBARR communication tool take?**
   - ☐ Not applicable: I did not complete a DEWS-SBARR
   - ☐ No more time (it is similar to our usual process)
   - ☐ A little more time (I had to think about it a bit more than usual)
   - ☐ Lots more time (it really added to my workload)
   - ☐ 100% more time (I never usually prepare for a conversation with a GP or NP)

3. **Please estimate how much time it takes to complete the following.**

a.	Initial DEWS RN assessment	minutes
b.	Follow-up DEWS RN assessment	minutes
c.	DEWS SBARR communication	minutes

4. **Thinking about the DEWS, did it do the following? (**Circle one)

	no	a little	some	quite a lot	a lot
a. Help you recognise and respond to acute deterioration	1	2	3	4	5
b. Provide a chance to gain new knowledge and skills	1	2	3	4	5
c. Support you to use all of your own knowledge and skills	1	2	3	4	5
d. Increase your confidence with clinical reasoning	1	2	3	4	5
e. Help you communicate with whānau/families	1	2	3	4	5
f. Help you communicate with the health care assistant team	1	2	3	4	5
g. Help you communicate with the primary care provider (GP/NP)	1	2	3	4	5
h. Help you communicate with emergency services (ambulance/emergency department)	1	2	3	4	5
i. Empower you to work better	1	2	3	4	5

5. **Would you recommend DEWS for other facilities?** YES / NO

6. **What changes (if any) would you make to DEWS?**

7. **What else would you like to tell us about your experience with the DEWS tools?**

Ngā mihi – thank you for your feedback

Appendix 4:

Project leadership group and user group recommendations

Āpitihanga 4:

Ngā tohutohu a te rōpū ārahi kaupapa me te rōpū whakamahi

Table A1 and Table A2 present recommendations from the project leadership and Deterioration Early Warning System (DEWS) user groups.

Table A1: Project leadership group recommendation Deterioration Early Warning System (DEWS)

Aged residential care facility	Recommendation to the sector	Interest for wider organisation	Interest at facility level
V	'I hope that most aged care facility in New Zealand embrace it with open arms and go here's something for the care staff to hang their assessment on and you know and feel confident that they can utilise this tool to make the best decisions they can at the time.'	Not appliable.	'To me, it already probably in the first week it proved itself to be really worthy so, I'm all for it.'
W	'I think a lot of the sector would really appreciate it. Because a lot in our sector, there are a lot of complaints or HDCs or coroners when you do an analysis of the data. And it would just stop that happening. So it would make our lives a lot easier, you know, not having to spend hours and weeks doing HDC complaints and things.'	'Yes, it's a very good tool. It's very helpful for nurses. At the same time for healthcare assistants. As I said for healthcare assistance, it will guide them on what to look for. And for nurses, it's also a guidance on what to do. And like it would tell them what to assess. I think in addition to that with the changes happening in internationally qualified nurses, I think this is one of the things that's really helpful as well. When you're a newbie without any experience working in aged care sector in New Zealand the perfect tool to use is something like that, because it keeps everyone safe.'	'I would like the project to really go on and be used and implemented in the future once it's finalised, because, and from the very beginning, I do think that it's really helpful. You know, it would really, it really guides everybody else on what's needed and what's necessary because it's an overall tool for everyone. Again, in the future, you know, if it's implemented, I'm 100% on board into using it on our facility it's that helpful.'

Aged residential care facility	Recommendation to the sector	Interest for wider organisation	Interest at facility level
X	'I think this tool should be incorporated within the aged care sector. It would help us nurses to keep us safe with how we operate. Keep you know everyone else as safe as well.'	'I think we need tools like this, not just for this, but other things as well. And I think they as well as researching how to design them and what best practice is, the actual tool itself needs to be embedded in the systems we use and be self-populating. And be as useful and supportive as possible because otherwise we are just constantly imposing more and more workload on people who are already swamped and dancing to all of these different drums, some of them which make sense and many of them don't. And you know, streamlining it, good practise [sic], good evidence, and tools that make it easy to do would just transform our capacity to deliver good care.'	'The staff have been committed to DEWS, like I love walking around and seeing the DEWS posters on the walls, but they also know that it was time limited, and it's ended now, and I think that the energy for it has probably been expended... It's just that it added to what they do really well anyway. DEWS came and it's showing us the good things we have in place already.'
Y	'So maybe once that this this you know actually rolled out and whole hospital team and everyone's quite aware maybe it will be easier for us to communicate with the paramedics to actually explain the state of the resident, because it's a constant battle.'	'I know there was some barriers like time and their being paper based, but I think overall I see the value in it for our nurses and our healthcare staff, and I think it's only been a positive thing.' 'I'm very interested. I think this is incredibly useful to orientate new staff to aged care. And to give them, you know that framework and the tools so that they can pin their sort of knowledge and learning onto that. And I think about, you know, their novice to expert pathway. Often when you've got a nurse whose experienced and has worked in one area for a long time, they don't think about tools individually, it just all comes together and they do it without thinking. But when you're teaching somebody and you know, you have to give them those little bite size pieces and pull it together and the escalation piece, I'm very interested in that.'	'Yeah, I would say it was positive... At the moment within the escalation pathway I receive emails regarding the deterioration. So from my perspective it was quite useful to actually understand what is going on in the whole village like I would know from zero to 100. And I know what is going on with all our residents in terms of deteriorating residents.'

Aged residential care facility	Recommendation to the sector	Interest for wider organisation	Interest at facility level
Z	'I think given the large number of international nurses and the change from working in their environments in their own countries to coming here. Aged care is a unique setting and to have that support its huge. Definitely needs to be implemented widely, embedded.' 'So we are thinking if we have a national tool rolled out everyone will know exactly what that means. So if we had a national standardised tool saying what's happening here and then, you know, they're interpreting this effectively as we've all got the same situation. At the moment it's a little bit like whispers we are saying what's happening here and they are interpreting that and so if we have all got the same standard nationalised tool we can see that we are not unnecessarily transferring residents to hospital.'	'Yeah, it's perfect. It's a good tool that we can probably implement next year if given the opportunity, like to introduce to other [name] care homes as well. Because it's really a good tool to help most especially the nurses, the international nurses.'	'It's quite helpful in the escalation pathway for the nurses. Definitely it's quite big help, how many times you have to do the clinical observation, you know the monitoring and what's the next step. As opposed to a tool that just sits there does nothing, doesn't actually provide you with help.'

Note: HDC = Health and Disability Commissioner.

Table A2: Deterioration Early Warning System (DEWS) user group recommendations

Aged residential care facility	Registered nurse (RN)	Health care assistant (HCA)
V	'I was just going to say to tell the other places that are going to use it, that don't be afraid of it, to embrace it wholeheartedly, that it's the easy tool to use once you actually use it more than once.'	'It's, yeah, definitely useful, very good and indicative of deterioration. It helped us, I reckon it helped us quite a bit with like getting action done as well.'
W	'I would actually recommend them to use them, especially if they're not, you know, if they're quite new to nursing, this will actually help them to improve their knowledge and critical thinking in regards to easily identifying any acute issue. So, they could try and see if it's gonna work for them, which I believe it will work cause it did work for us. Mainly for the new grad nurses who doesn't have, also those who are coming from the overseas, maybe that's good for them to, maybe it will help them from the critical thinking skills.'	"Well, it's actually quite helpful. So, I think some of the facilities will actually be, like I think it will help the RNs and the caregivers to communicate better. Better communication and better documentation as well.' 'With this tool at least, we will see, oh, this one is deteriorating. And everyone on the team is actually on one page because everyone can see the DEWS. Everyone can see the deterioration. I think it's good and it's one way of seeing when, if, she bounced back and then it goes back again.'
X	'You've picked a facility that sounds terrible, but it runs really well and it's a really good system in place. So, it does make it hard, but I'd like this in other places I've worked. There I would thoroughly recommend the DEWS.'	'Probably if they didn't have the same systems like we've got. Yeah, because I think what made it easy for us because we were sort of doing something similar. So if yeah, I guess if they weren't doing something like that, it would be a big help.'
Y	'It's good with nurse patient ratio is not that good. So at least caregivers can escalate you the things and then you can follow up. So, it will set up a good communication and you are empowering caregivers where you can't split yourself for 16 different ways. So your caregivers act on your behalf and do the quick DEWS and you know, escalate things to you. So I think it's helpful in the that way. It's sort of narrowing your focus to the people that need you.' 'To be honest, I'll say maybe trial the DEWS to a different facility where they don't have online escalation process, because we already have one, if there's a trigger, if there's a change there, we already have, like an automatic trigger.'	'It's worth it because it's a new kind of learning, we do the cares, we do the how the resident is, how we done the cares. So, this is to know about their condition, how they are and then at least something, some knowledge and some learning for us.' 'If they doesn't have computer based system, they are paper based then they could have, it's really good, it really works. Yeah, it will work for them.'

Aged residential care facility	Registered nurse (RN)	Health care assistant (HCA)
Z	'I would recommend it as well. I mean it's good at least a lot of us, not just one or two facilities will be able to experience this because it's helpful. In addition, also initially, definitely, most of us at first will be well, this is another work. Yes, but it's it's like a new thing, it's a change. It's hard at first, but eventually if we get used to it, we'll be right with it. But at the end of the day, the purpose of it is for the resident. In order for us also to identify as much, as early before the further decline of the residence. So, it's it's a helpful tool. So, I would recommend.' 'It's a proof even though something happens, at least we have a proof we have deduced, and we found something unusual and we contacted GP [general practitioner] and we did this all kind of things. So there is a proof, so it's better to use DEWS RN, even though it's like even it's causing little more task to us at least we have proof. Like it's our registration, so we our licence is saved.' 'DEWS is not helping only for documentation, not only helping the RNs but it's really helping more of our patients, which is our, I mean, our real concern is the safety, or that our patients can benefit a lot from it. So, it benefits them because if there is this, and usually this, we can act as fast as we could. So, we can refer promptly. And also, for me it enhances my critical thinking, my assessment skills. I mean with the guide on what's on the DEWS, then it's really helpful because some of it, we're not aware that we need to do it, but it's provided. So, it's really a very nice tool.'	'It will make them engage with their residents a lot more because when we look at our residents specifically, because obviously the RNs have their part to play in for each resident, which is more like the medical side of them, but we're more like the you know, the physical side and control the behaviour, etcetera, but then we're having the DEWS that will make us more alert of that resident rather than just doing the basic cares or checking how they are like how we normally do it as a caregiver.' 'Yes, yes, 110%, highly recommended really.' 'We can advise, this is really very helpful not only with us, but for the rest. To have a better collaboration with the group, teamwork. And the last one is to incorporate it on the [digital system].'

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