CICER
Tacaíocht don Treoirlíne Chliniciúil
Clinical Guideline Support

PAEDIATRIC EARLY WARNING SYSTEMS IN EMERGENCY SETTINGS

Protocol for a systematic review of clinical guidelines

August 2025

Health Information and Quality Authority
An tÚdarás Um Fhaisnéis agus Cáilíocht Sláinte

Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

NATIONAL CLINICAL EFFECTIVENESS COMMITTEE

HRB An Bord Taighde Sláinte Health Research Board

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About CICER

In 2016, the Department of Health requested that the Health Research Board (HRB) fund an evidence synthesis service to support the activities of the Ministerially-appointed National Clinical Effectiveness Committee (NCEC). Following a competitive process, HIQA was awarded research funding spanning the period from 2017 to 2024 to produce the evidence to support the development of National Clinical Guidelines and National Clinical Audits. This funding was renewed through a competitive process to support the work of the Centre in Ireland for Clinical guideline support and Evidence Reviews (CICER) from 2024 to 2028. The CICER team comprises a dedicated multidisciplinary research team supported by staff from the Health Technology Assessment team in HIQA, the Discipline of Public Health and Primary Care in the School of Medicine in Trinity College Dublin, as well as national and international clinical and methodological experts.

With regard to clinical guidelines, the role of the CICER team is to independently review evidence and provide scientific support for the development, by guideline development groups (GDGs), of National Clinical Guidelines for the NCEC. The CICER team undertakes systematic reviews of the clinical effectiveness and cost-effectiveness of interventions included in the guidelines, as well as estimating the budget impact of implementing the guidelines. The CICER team also works closely with the GDGs and provides tailored training sessions; assists in the development of clinical questions and search strategies; performs systematic reviews of international clinical guidelines and supports the assessment of their suitability for adaption to Ireland; and supports the development of evidence-based recommendations informed within the National Clinical Guidelines.

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List of abbreviations that appear in this report

AGREE	Appraisal of Guidelines for Research and Evaluation
CICER	Centre in Ireland for Clinical guideline support and Evidence Reviews
ED	emergency department
EMEWS	Emergency Medicine Early Warning System
EWS	early warning system
GDG	guideline development group
GRADE	Grading of Recommendations, Assessment, Development, and Evaluations
HIQA	Health Information and Quality Authority
HRB	Health Research Board
ICTS	Irish Children's Triage System
ICU	intensive care unit
NCEC	National Clinical Effectiveness Committee
NCG	National Clinical Guideline
PEWS	Paediatric Early Warning System
PICO	population, intervention, comparison, outcome
PIC	population, interest, context

1 Background

1.1 Description of the problem

Every year, there are approximately 1.7 million visits to emergency departments and injury units in Ireland. [1] Of these, approximately 400,000 are by children less than 16 years of age. In Ireland, in the years 2019-2023, the vast majority of paediatric mortality (63% for ages 1-14 and 92% for those aged under 1 year) occurred in the hospital setting. [2]

When a patient arrives to the emergency department, a triage assessment is conducted to determine the severity of their condition and to assign a priority level based on urgency. This system is designed to help ensure that those with the most critical needs receive immediate attention. However, between initial triage and assessment by a treating clinician, a patient's condition may unexpectedly worsen, leading to a deterioration in their vital signs, mental status, or other indicators of their overall health.

There are several conditions that may lead to life-threatening post-triage deterioration in the emergency department that are over-represented among children. For example, sepsis affects more than 25 million children globally each year, representing over half of all sepsis cases worldwide: [3] case-fatality rates in paediatric sepsis are currently about 4% among inpatients in Ireland, [4, 5] and rise to about 20% for severe sepsis and septic shock in developed countries. [6]

It can be challenging to recognise post-triage clinical deterioration for a number of reasons. The emergency department can be a challenging care environment, with patients presenting with a diverse range of urgent conditions and comorbidities in a context of finite resources. Detecting clinical deterioration in children can be especially difficult. Children may have limited ability or unwillingness to communicate their symptoms and the events that may have caused them. They also tend to have a higher capacity for early physiological compensation that can mask clinical signs of deterioration: for example, hypotension (drop in blood pressure) during shock may show up later than expected, [9, 10] and then deteriorate very quickly in children. [11-13] Furthermore, the term “child” encompasses a diverse range of

ages, and normal vital signs vary substantially between neonates and adolescents. [12, 14] Even when clinical deterioration is recognised, there can be barriers to effectively escalating the issue, including lack of standardisation and a lack of clinical confidence. [15]

Early warning systems (EWSs) are one way to help clinicians identify and communicate clinical deterioration. EWSs are a combination of an afferent (recognition) scoring system with an efferent (response) pathway delineating clear escalation actions and plans for patient review and intervention. They are used in healthcare settings to identify and track potential deterioration in a patient's condition. Originally developed for use with inpatients (adult and paediatric), they have now been developed for emergency department (ED) settings and their utility has been studied for paediatric patients in unscheduled care settings. For example, one study in the Netherlands from 2013 evaluated 10 different paediatric early warning systems in the ED with almost 18,000 patients aged less than 16 years participating. [16] The various tools were found to be moderate to good at predicting intensive care unit (ICU) admission and poor to moderate at predicting hospitalisation. The authors noted that scoring systems, where parameters are summed to a numeric value, were better able to identify at-risk patients than triggering systems that required one positive parameter.

1.2 Relevant clinical practice guidance

There is no existing Irish national clinical guideline focused on a post-triage EWS for paediatric patients in unscheduled care. However, there are several national clinical guidance documents in Ireland focusing on triage and post-triage systems in paediatric and or emergency department settings, the most relevant being the following:

- The Irish Paediatric Early Warning System (PEWS) [18]

This National Clinical Guideline was published by the NCEC in 2016 and applies only to infants and children less than 16 years of age admitted to **paediatric inpatient** settings in Ireland. Its aim is to improve prevention and recognition of, and response to, children at risk of clinical deterioration in paediatric inpatient settings through the implementation of a standardised paediatric early warning system.

- Emergency Medicine Early Warning System (EMEWS) [19]

This National Clinical Guideline was published by the NCEC in 2018 and applies to **adult**

patients (16 years and older) attending an ED in Ireland. Its purpose is to implement a standardised emergency medicine early warning system in order to improve the recognition and response to clinical deterioration in adult patients in the ED.

- Irish Children's Triage System (ICTS) [20]

The second edition of this tool was published by the Health Service Executive in 2021 and applies to children less than 16 years of age presenting to emergency departments (ED) in Ireland. It outlines the Irish Children's Triage System (ICTS) for the prioritisation and assessment of paediatric ED patients. In contrast to the two guidelines mentioned above, the ICTS guidance is currently primarily **focused on initial triage**, not ongoing, post-triage recognition of (and response to) clinical deterioration. As shown in Table 1.1, none of the existing Irish guidance presents a post-triage EWS for children in the ED.

Table 1.1 Existing relevant clinical guidance in Ireland around triage or post-triage in unscheduled care and or paediatrics

	Tool type	Age group	Setting
The Irish Paediatric Early Warning System (PEWS)	Post-triage early warning system	Children <16 years	Inpatient
Emergency Medicine Early Warning System (EMEWS)	Post-triage early warning system	Adults 16 years or older	Emergency department
Irish Children's Triage System (ICTS)	Triage system	Children <16 years	Emergency department

1.3 Purpose of this review

The purpose of this review is to identify and appraise current state, national or international clinical guidelines on paediatric emergency medicine early warning systems, that could potentially be used as part of an ADAPTE process [21] to support the development of a National Clinical Guideline (NCG) on a children's emergency medicine early warning system in Ireland.

2 Methods

This protocol outlines the planned approach to conducting a systematic review of clinical guidelines on paediatric emergency medicine early warning systems.

2.1 Review question

This review will consider the following question:

- What relevant clinical guidelines on paediatric emergency medicine early warning systems are currently in use nationally and internationally?

The review question was formulated in line with the Population, Interest, Context (PIC) framework a modified version of the PICO (Population, Interest, Context, Outcome) framework, as presented in Table 2.1.

Table 2.1 Population, Interest, Context (PIC) for review of guidelines

Population	Children (less than 16 years of age) attending emergency departments and or urgent care facilities
Interest	Clinical guidelines that describe the use of post-triage early warning systems for children less than 16 years of age attending unscheduled care
Context	▪ Clinical guidelines (state, national, international level) as defined in Table 2.2 ▪ Local or hospital-specific guidelines will be excluded

2.2 Search strategy

Electronic searches will be conducted in Medline via EBSCOhost, Embase via Elsevier, CINAHL and PsycINFO via EBSCOhost. The search terms are provided in Appendix 1 and include database specific thesauri and free-text terms. Grey literature sources will also be searched, including guideline repositories, guideline developer websites, websites of national ministries of health, and specific clinical specialty websites. The full list of grey literature sources is provided in Appendix 2. Members of the guideline development group (GDG) will also be

consulted to identify any other relevant state, national and international clinical guidelines based on their expert knowledge.

2.3 Eligibility criteria

The inclusion and exclusion criteria for this review are provided in Table 2.2. Clinical guidelines will be defined as 'systematically developed statements about specific health problems, intended to assist practitioners and patients in making decisions about appropriate health care', as per the ADAPTE collaboration definition. [21]

Table 2.2 Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
Guidelines that: ▪ cover emergency departments and or urgent care facilities ▪ include recommendations about post-triage early warning systems for children less than 16 years of age attending unscheduled care ▪ are at state, national, or international level ▪ clearly state the systematic approach and evidence base that underpins the guideline recommendations ▪ include a rating of the quality of evidence that underpins the recommendations using an approach such as the Grading of Recommendations Assessment, Development and Evaluation (GRADE) [22] ▪ are novel or have been adapted.	Guidelines that: ▪ refer only to other care settings, such as primary care or outpatient clinics, prehospital services, or inpatient hospital settings ▪ focus only on initial triage systems or scores ▪ refer only to adults aged 16 years or older ▪ are at local or hospital level ▪ have been superseded by a more recent guideline ▪ are adopted directly from, or duplicate, another guideline ▪ were published prior to 2015 ▪ not published in English.

Key: GRADE - Grading of Recommendations Assessment, Development, and Evaluation

2.4 Selection of eligible publications

All citations identified from the collective search strategy (see Appendix 1) will be exported to EndNote (Version 21) for reference management, [23] where duplicates will be identified and removed. Using Covidence, [24] two reviewers will independently review the titles and

abstracts of the remaining citations to identify those for full-text review. The full texts will be obtained and independently evaluated by two reviewers applying the defined inclusion and exclusion criteria. Where disagreements occur, discussions will be held to reach consensus and where necessary, a third reviewer will be involved. Citations excluded during the full-text review stage will be documented alongside the reasoning for their exclusion and included in a study flow diagram.

2.5 Data extraction and management

Data will be extracted from guidelines and peer-reviewed articles by one reviewer and checked for accuracy and omissions by a second. Where disagreements occur, discussions will be held to reach consensus and where necessary, a third reviewer will be involved. Data extraction will be conducted in Microsoft Excel, using a purposely designed data extraction form (Appendix 3). The data extraction form will be piloted before use and refined as necessary.

2.6 Quality appraisal

Two reviewers will independently assess the quality of included guidelines using the Appraisal of Guidelines for Research & Evaluation (AGREE) II instrument. [25] AGREE II scores will be calculated and reported in accordance with the AGREE II manual, including the average percentage score and the overall assessment score. Significant discrepancies for any domain will be discussed and, where necessary, reviewed by a third member of the research team.

2.7 Data synthesis

As the main data to be extracted for this review is descriptive in nature, a narrative synthesis of included guidelines will be produced.

2.8 Currency of guidelines

As recommended by the ADAPTE methodology, [21] currency of the included guidelines will be assessed by reviewing the publication date of the guideline and the dates covered by the most recent evidence search, to determine whether the most current evidence has been included.

If a significant number of relevant guidelines are returned following full-text review, currency and or quality will be used as considerations for inclusion.

2.9 Timeline

It is estimated that this review will require 12 weeks to complete following agreement of the protocol. This timeline is based on preliminary scoping searches of the literature and is dependent upon available resources and the magnitude of guidelines returned from the definitive search.

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Appendix 1: Search strategy

Database: Medline via Ebsco

Run: 19/6/25

#	Query	Limiters/Expanders	Results
S28	S3 AND S8 AND S12 AND S27	Expanders - Apply equivalent subjects Search modes - Proximity	145
S27	S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23 OR S24 OR S25 OR S26	Expanders - Apply equivalent subjects Search modes - Proximity	1,134,847
S26	XB guideline*	Expanders - Apply equivalent subjects Search modes - Proximity	580,834
S25	XB guidance	Expanders - Apply equivalent subjects Search modes - Proximity	195,184
S24	XB ((care N4 (pathway or pathways))	Expanders - Apply equivalent subjects Search modes - Proximity	13,724
S23	XB (practice N4 (parameter or parameters))	Expanders - Apply equivalent subjects Search modes - Proximity	3,056
S22	XB (clinical N4 (pathway* or protocol*))	Expanders - Apply equivalent subjects Search modes - Proximity	39,485
S21	PT "Consensus Development Conference, NIH"	Expanders - Apply equivalent subjects Search modes - Proximity	801
S20	PT "Consensus Development Conference"	Expanders - Apply equivalent subjects Search modes - Proximity	12,845
S19	PT practice guideline	Expanders - Apply equivalent subjects Search modes - Proximity	33,178
S18	PT guideline	Expanders - Apply equivalent	16,412

		subjects Search modes - Proximity	
S17	(MH "Guideline") OR (MH "Practice Guideline") OR (MH "Guidelines as Topic+") OR (MH "Health Planning Guidelines")	Expanders - Apply equivalent subjects Search modes - Proximity	220,452
S16	(MH "Critical Pathways")	Expanders - Apply equivalent subjects Search modes - Proximity	8,329
S15	(MH "Consensus Development Conferences as Topic+") OR (MH "Consensus Development Conference") OR (MH "Consensus Development Conferences, NIH as Topic") OR (MH "Consensus Development Conference, NIH")	Expanders - Apply equivalent subjects Search modes - Proximity	16,125
S14	(MH "Consensus")	Expanders - Apply equivalent subjects Search modes - Proximity	25,320
S13	(MH "Clinical Protocols+")	Expanders - Apply equivalent subjects Search modes - Proximity	201,158
S12	S9 OR S10 OR S11	Expanders - Apply equivalent subjects Search modes - Proximity	69,103
S11	XB (“clinical deterioration” or escalation polic* or escalation protocol* or "risk assessment report")	Expanders - Apply equivalent subjects Search modes - Proximity	7,198
S10	XB (“Early warning" OR "warning system*" OR "warning score*" OR "scoring tool*" OR EWS OR NEWS OR NEWS2 OR "track and trigger" OR "trigger score")	Expanders - Apply equivalent subjects Search modes - Proximity	59,541
S9	(MH "Early Warning Score") OR (MH "Pediatrics+/OG")	Expanders - Apply equivalent subjects Search modes - Proximity	3,191
S8	S4 OR S5 OR S6 OR S7	Expanders - Apply equivalent subjects Search modes - Proximity	518,773
S7	XB ((trauma or injury) N2 (clinic* or unit* or center* or centre*))	Expanders - Apply equivalent subjects	48,116

		Search modes - Proximity	
S6	XB ((emergenc*) N3 (room* or ward or wards or unit or units or department* or team or physician* or doctor* or nurs* or treatment* or presentation OR visit OR visits OR setting OR patient OR patients OR medicine OR care OR consult* OR center* OR centre*))	Expanders - Apply equivalent subjects Search modes - Proximity	259,602
S5	XB (“urgent care” or "casualty department*" or triage or “accident and emergency” OR A&E)	Expanders - Apply equivalent subjects Search modes - Proximity	45,490
S4	(MH "Emergency Medical Services+") OR (MH "Emergency Treatment+") OR (MH "Emergency Medicine+")	Expanders - Apply equivalent subjects Search modes - Proximity	310,034
S3	S1 OR S2	Expanders - Apply equivalent subjects Search modes - Proximity	5,643,457
S2	XB (babies or baby or infant* or neonat*or neo-nat* or newborn* or new-born or perinat* or juvenil* or minor or paediatric* or pediatric* or SCBU or PICU or preschool or pre-school* or young or youngster* or youth* or adolescen* or preadolescen* or pre-adolescen* or pre-adolescen* or preteen* or pre-teen* or pubescen* or teen* or child*)	Expanders - Apply equivalent subjects Search modes - Proximity	3,557,843
S1	(MH "Infant+") OR (MH "Child+") OR (MH "Adolescent") OR (MH "Minors+") OR (MH "Pediatrics+")	Expanders - Apply equivalent subjects Search modes - Proximity	4,194,620

Appendix 2: Grey literature searches

Guideline Sites	URL
Agency for Healthcare Research and Quality, USA	https://www.ahrq.gov/prevention/guidelines
American College of Emergency Physicians	https://www.acep.org/
Association of Paediatric Emergency Medicine	https://www.apem.org.uk/
Australasian College for Emergency Medicine	https://acem.org.au/
Belgian Health Care Knowledge Centre	https://kce.fgov.be/
BMJ Best Practice	https://bestpractice.bmj.com/info/
Canada's Drug Agency	https://www.cda-amc.ca/
Canadian Task Force on Preventive Health Care	https://canadiantaskforce.ca/guidelines/published-guidelines/
Clinical Guidelines Committee of the American College of Physicians	https://www.acponline.org/
Danish Health Authority	https://www.sst.dk/en/english/publications?searchWord=clinical%20guideline#/side-1
Department of Health (including National Clinical Guidelines), Ireland	http://health.gov.ie
European Society for Emergency Medicine	https://eusem.org/
Federation Medical Specialists, Netherlands	https://richtlijnendatabase.nl/en/
Finnish Medical Society Duodecim	https://www.kaypahoito.fi/suositukset
French National Authority for Health	https://www.has-sante.fr/jcms/fc_2875208/en/search-for-a-guideline-an-assesment
Geneva Foundation for Medical Education and Research	https://www.gfmer.ch/000_Homepage_En.htm
German Association of Scientific Medical Societies	https://register.awmf.org/de/start
Google	https://www.google.com/
Google Scholar	https://scholar.google.com/
Guia Salud, Spain	https://portal.guiasalud.es/gpc/
Guideline Central	https://www.guidelinecentral.com/
Guidelines International Network international guideline library and registry of guidelines	https://g-i-n.net/international-guidelines-library
Health Service Executive, Ireland	www.hse.ie
Institute for Clinical Systems Improvement, US	https://www.icsi.org/guideline/
International Federation for Emergency Medicine	https://www.ifem.cc
Irish Association for Emergency Medicine	https://iaem.ie/
Irish Paediatric Emergency Medicine Association	https://ipem.ie/

Guideline Sites	URL
Japan Council for Quality Health Care	https://minds.jcqhc.or.jp/search/
Lenus	www.lenus.ie
MAGIC Evidence Ecosystem Foundation	https://app.magicapp.org/#/guidelines
National Academy of Medicine, US	https://nam.edu/about-the-nam/
National Board of Health and Welfare, Sweden	https://www.socialstyrelsen.se/en/regulations-and-guidelines/national-guidelines/
National Health and Medical Research Council Clinical Practice, Australia	https://nhmrc.gov.au/about-us/publications
National Institute for Health and Care Excellence, England and Wales	http://www.nice.org.uk
New Zealand Ministry of Health	https://www.health.govt.nz/publications?f%5B0%5D=topic%3A368
Norwegian Directorate of Health	https://www.helsedirektoratet.no/
Paediatric Research in Emergency Departments International Collaborative	https://www.predict.org.au/
Pediatric Emergency Medicine Switzerland	https://www.pemswiss.org/
Pediatric Emergency Care Applied Research Network	https://pecarn.org/
Pediatric Emergency Research Network	https://www.pern-global.com/
Paediatric Emergency Research network UK and Ireland	https://www.peruki.org/
Public Health Agency of Sweden, Sweden	https://www.folkhalsomyndigheten.se/the-public-health-agency-of-sweden/
Ravijuhend, Estonia	https://www.ravijuhend.ee/
Royal College of Emergency Medicine	https://rcem.ac.uk/
Royal College of Paediatrics and Child Health	https://www.rcpch.ac.uk/
Scottish Intercollegiate Guidelines Network	www.sign.ac.uk
Singapore Ministry of Health	https://www.moh.gov.sg/
Society for Academic Emergency Medicine	https://www.saem.org/home
Society for Pediatric Urgent Care	https://urgentcarepeds.org/
Spanish Society of Pediatric Emergency Medicine	https://sperg.es/en/
Swiss Centre for International Health	https://www.swisstph.ch/en/
The Best Practice Advocacy Centre New Zealand	https://bpac.org.nz/guidelines/
Trip Database	https://www.tripdatabase.com/
UpToDate	https://www.uptodate.com/
US Preventive Services Task Force	https://uspreventiveservicestaskforce.org/uspstf/
World Health Organization	www.who.int

Appendix 3: Data extraction template

Organisation and country	
Guideline title	
First published, last updated	
Key clinical questions	
Search dates	
Population(s)	
Overall setting(s)	
Topics covered in the guideline	
Recommendations, strength of recommendations and level of evidence	
Rating system used for recommendations	
Evidence to Decision process	