The Use of Clinical Pathways in Emergency Departments: A Scoping Review

Health Services Insights
Volume 18: 1–20

DOI: 10.1177/11786329251328527
journals.sagepub.com/home/his
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Abstract

Introduction: Clinical pathways (CPWs) are evidence-based, standardised, clinical management plans that are designed to deliver a sequence of clinical interventions to improve the efficiency and effectiveness of healthcare. The aim of this study was to identify and summarise the current available evidence on the use of CPWs in emergency departments (EDs).
Study design: A literature search was conducted in Scopus, Embase, Emcare, and PubMed academic databases. The search strategy was guided by Arksey and O'Malley's framework and results reported according to the Preferred Reporting Items for Systematic Reviews and Meta-analysis Extension for Scoping Reviews Checklist. Studies were included if they reported empirical data either qualitatively or quantitatively, studied the use of CPW practices, and reported on the use of at least one CPW activity.
Results: Sixty-four articles were eligible for the scoping review. Variation and quality of treatment, resource utilisation and time to treatment were identified as the three main patient and organisational outcomes from the use of CPWs. Three main categories of barriers to use were identified: Organisational environment factors, Healthcare professional-related factors, and CPW operational issues.
Conclusions: CPW implementation has wide positive patient and organisational outcomes in the ED. Whilst no single strategy would result in implementing CPWs in the ED settings successfully, broad engagement with clinicians of all disciplines who use the pathways and involvement of multidisciplinary teams in implementation is vital to increase visibility of the CPW.

Keywords

clinical pathways, emergency department, health services research, implementation science, health care systems

Received: 13 November 2024; accepted: 3 March 2025

What do we already know about this topic?

CPWs are increasingly being utilised in the healthcare sector to align practice with evidence-based guidelines. Although the use of CPWs has increased, their use in complex settings like the ED is poorly understood.

How does our research contribute to the field?

This review reported on a range of CPW clinical conditions, their use and impact on patient and organisational outcomes. A range of factors influencing the successful implementation of CPWs in the ED setting are discussed and contribute to future CPW implementation and research efforts.

What are our research's implications toward theory, practice, or policy?

Our review informs current and future research efforts on the implementation and evaluation of CPW use in the ED. Outcomes for future research studies on the impact of CPWs should be more patient-focused and include

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treatment quality satisfaction from the patient's perspective. Future research should explore collaboration between researchers and clinicians to enhance the use of CPW.

Introduction

Clinical Pathways (CPWs) are increasingly being utilised in the healthcare sector to align practice with evidence-based guidelines.[1] They aim to identify an appropriate sequence of clinical interventions, timeframes, milestones, and decision points for specific patient cohorts making them useful for quality assurance and process improvement.[2] The operational definition of CPWs includes structured multidisciplinary plans of care, guidelines or evidence translated into specific steps within the pathway along with a timeframe in a course of treatment, and standardised care for a specific patient cohort.[3] Therefore, CPWs are designed to enhance clinical processes by lowering risk, eliminating duplication, and reducing variation in the provision of healthcare.[2] They differ from general treatment guidelines which offer a range of reasonable treatment options without a specific sequence of steps.[3]

Hospital systems are complex and evolving. Research suggests that 60% of current care is evidence-based, 30% contributes to waste or low-value care, and 10% is harmful.[4] Consequently, it is fundamental to ensure that quality and standardisation of care delivery is maintained.[5] Literature identifying best practices for addressing Emergency Department (ED) service delivery and quality issues, to promote safety, and positive patient experiences is rapidly evolving . Increasing coordinated, evidence-based patient care and efficiency is vital in complex systems, such as the ED, which are made up of numerous interdependent, fragmented components that produce varying levels of quality and safety.[6] ED presentations are increasing globally, creating challenges for quality, safety, and timeliness of care.[7,8] Patients are having to wait longer to be seen impacting on service delivery outcomes.[9] Delays in the assessment, diagnosis, and treatment of time-sensitive diseases as well as in the delivery of necessary medications like antibiotics and analgesics are among the adverse effects of increased ED presentations and resultant overcrowding.[10] The increased interest in addressing these issues is evidenced by the growing body of work focusing on improving patient outcomes.[11] This includes the use of CPWs to address known ED challenges like reducing length of stay (LOS) and improving patient quality of care.[12]

There is extensive literature demonstrating the value of CPWs. Beginning in the UK in the 1990s, the use of CPWs has been growing throughout Europe, and there is increased focus on the further development and implementation of CPWs globally.[13] Although the use of CPWs in the health sector has increased, their use in complex settings like the ED is generally poor and the reasons for this are not well understood.[14] Evidence for effective implementation strategies of CPWs in ED remains variable.[15] Therefore, it is critical to get a thorough understanding of the available evidence on the use of CPWs in the ED context. The objective of this review was to identify and summarise the current available evidence on how CPWs are implemented and used in the ED. This includes reported barriers and enablers for CPW implementation and outcomes reported with the use of CPWs in the ED setting.

Methods

Study Design

This scoping review followed the methodological recommendations described in Arksey and O'Malley's[16] framework. This methodological approach was deemed appropriate to map important concepts, and communicate the scope and depth of research about the use of CPWs in the ED setting.[17-19] The framework steps provided guidance for identifying the research question, identifying relevant studies, study selection, charting and collating the data, summarising, and reporting the results. Findings of the review were reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-analysis extension protocol for scoping reviews (Supplementary file 1 PRISMA – ScR).[20] A protocol for this study was registered prospectively with Open Science Framework.[21]

Search Strategy

Stage One: Identifying the Research Question. The objective of this review was to identify and summarise the current available evidence on the implementation and use of CPWs in the ED. The research questions were left broad to allow rigorous searches for all sources of evidence simultaneously with one search strategy and to provide a greater sensitivity in the search.[22] The CPW needed to meet the construct requirements of a CPW definition of either structured multidisciplinary plan of care, guidelines or evidence translated into specific steps within the pathway along with a timeframe in a course of treatment, or standardised care for a specific patient cohort.[3] Our review sought to answer three research questions:

Research Question 1 (*RQ1*): What original research evidence is available on the use of CPWs in the ED setting?

Research Question 2 (*RQ2*): What are the reported outcomes with the use of CPWs in the ED setting?

Research Question 3 (*RQ3*): What are the reported barriers and enablers for CPW implementation in the ED setting?

Stage Two: Identifying Relevant Articles. *Inclusion and exclusion criteria*: The authors (ITM, SJP, PG, and ET) included studies focused on the implementation and use of CPW in the ED setting for all age groups. Studies were included if they reported descriptive data about the implementation

Table 1. Inclusion and exclusion criteria for studies included in the scoping review.

	Inclusion criteria	Exclusion criteria
Population	• Studies focused on the implementation and use of clinical pathway (CPW) practices in emergency department (ED) for specific patient cohorts. • All age groups	• Studies not providing evidence on CPW use in ED.
Intervention	• CPW intervention • Structured multidisciplinary plan of care, guidelines translated into specific steps within the pathway along with a timeframe in a course of treatment, or standardised care for a specific patient cohort.[3] • Described in enough detail to be replicable • At least part of the study was undertaken in ED.	• Grey literature and non-academic papers that did not provide insights into CPW implementation and use in ED. • Conference abstracts • Book chapters
Comparator	• Any study design: no comparator necessary	
Outcomes	• Descriptive data about the implementation and use of CPWs in ED settings. • Quantitative outcome measures such as length of stay (LOS), mortality. • Qualitative outcome measures such as barriers and enablers.	
Study design	• Any study design • Publication was written in English. • Publication period between 2013 and 2023.	• Editorial, opinion, and discussion pieces

Table 2. Database search terms.

Concept 1	Concept 2	Concept 3
Patients presenting to emergency department (ED) • ED or emergency department • Emergency unit • A & E or accident and emergency • Critical care • Crisis unit • Trauma cent • Casualty department • Acute care	Action • User • Utilisation • Uptake • Implementation • Adoption • Adherence • Compliance • Guidelines	Clinical pathway (CPW) • CPW or clinical pathway • Care pathway • Critical pathway • Care map • Treatment pathway

and use of CPWs in ED settings including empirical data either qualitatively or quantitatively, or if they were systematic literature reviews. The authors excluded studies that were conference abstracts, grey literature or did not provide insights into how CPWs were implemented or used in the ED setting. The authors also excluded editorials and discussion papers, and research protocols. The full inclusion and exclusion criteria are shown in Table 1.

To ensure the identification of relevant studies, the authors critically reviewed the search strategies, search terms, inclusion and exclusion criteria. A preliminary search was developed by identifying and then searching one database relevant to the topic. The purpose of the preliminary search was to assist in refining search terms. A preliminary search from Scopus database was completed on the 6th of December 2023 (Supplementary file 1_preliminary search). This search was followed by analysis of the text words in the abstracts, titles, and MeSH terms of retrieved papers to inform terms for CPW use. The search terms and combinations related to CPWs was built on Boolean operators "AND" "OR" and "NOT" to facilitate custom combinations of search terms.

Table 2 summarises the final search terms used for the scoping review. The following databases were searched in December 2023: Scopus, Embase, Emcare, and PubMed academic databases. The authors reviewed the reference lists of studies identified and included relevant studies in the scoping exercise. A review strategy was developed and approved by the first four review authors prior to searching the database.

Stage Three: Selecting the Articles for Full Text Review. The study selection process is illustrated in the PRISMA flow diagram (Figure 1). Search results from each of the databases was aggregated and imported into an Endnote library and duplicate entries were removed. The authors met regularly to discuss their assessments of the abstracts and full-text articles and the inclusion and exclusion criteria to reach agreement on the studies to be included. Two authors undertook a two-stage screening process against inclusion criteria for selection of studies using Covidence systematic review software. Reasons for exclusion of sources of evidence included screening by title and abstract to identify potentially eligible studies. Reasons for exclusion of

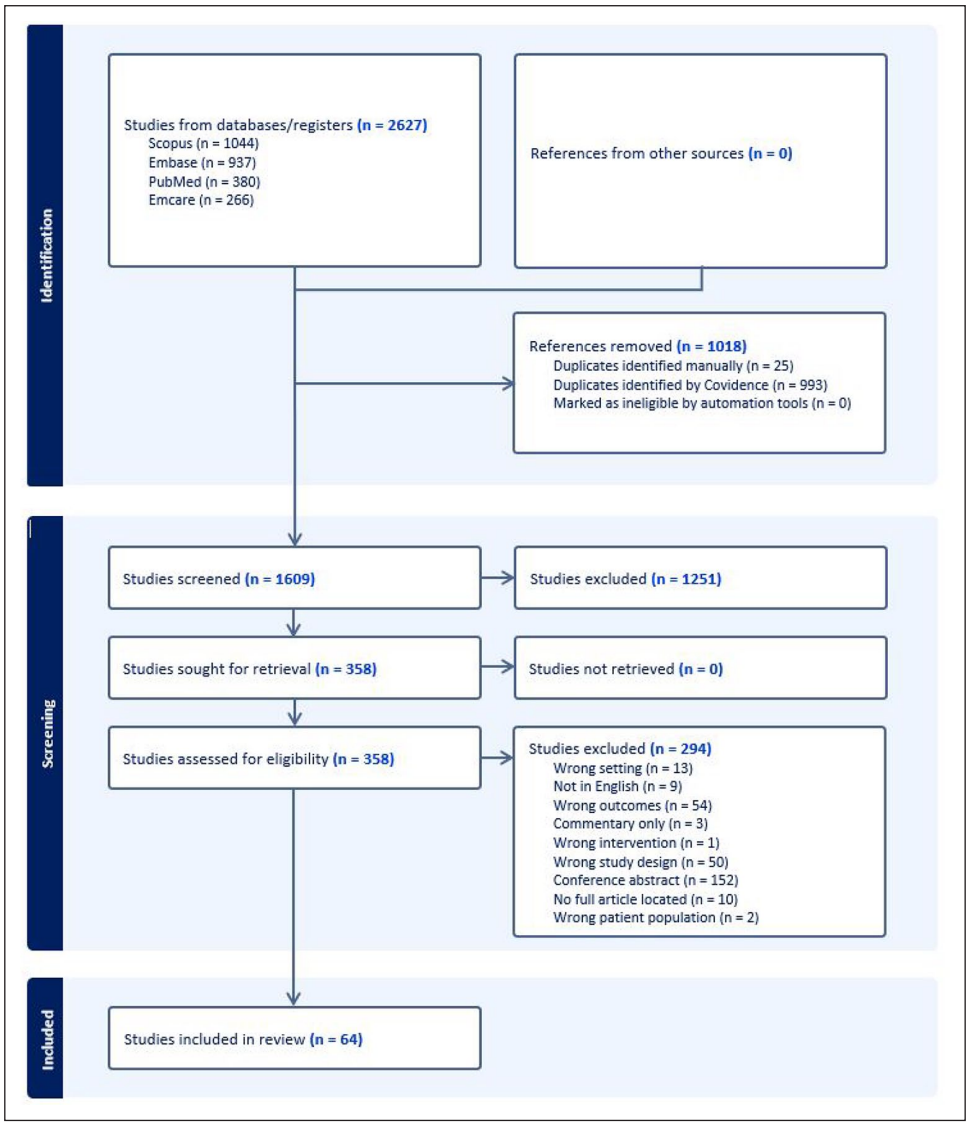

Figure 1. Identification and selection of studies for inclusion in our review (PRISMA flowchart).

sources of evidence at the full text that did not meet the inclusion criteria were recorded and reported (see Figure 1 – studies excluded n=294). Any disagreements that arose between the authors was resolved through discussion (see Supplementary form 3_example of conflict resolution discussion).

Stage Four: Charting the Data. Data were extracted from each included article according to a data extraction template which was developed and agreed by the authors. The template was piloted by the authors using a random selection of ten eligible articles. Authors clarified ambiguous items through discussion, and this process was repeated several times to improve agreement before the template was finalised (Supplementary file 2 – Data extraction form). For each article, two authors independently extracted the required information. Additional authors provided consensus. The extracted key data items were organised in Covidence using checkboxes or free text boxes. These identified study details (author(s), location, study sample, setting), the CPW intervention/characteristic details (format, content, implementation, and evaluation), and reported outcomes (positive, negative or no change; Tables 3-5). The free text boxes captured the study reference, title, year of publication, aim of study, and the number of participants. The checkboxes included the rest of the information (see Supplementary file 2).

Stage 5: Collating, Summarising, Reporting Results. The data were analysed and summarised according to categories consistent with the research questions. Using a flow chart, table, and narrative summaries to track significant elements of information, we presented results in accordance with PRISMA guidelines. The authors did not evaluate the quality of evidence presented in the included studies as it was not a part of the scoping review methodical recommendation.[16] Reported outcomes were described and included reporting on variation, resource utilisation, time to treatment and length of stay. Barriers and enablers were categorised according to organisational environment factors, healthcare professional-related factors, and CPW operational issues.[37]

Table 3. Summary of included study characteristics.

Country of study	Study n (%)
USA	33 (50.8)
Australia	7 (10.8)
Republic of Korea	5 (7.7)
Canada	4 (6.2)
United Kingdom	3(4.6)
Ireland	3 (4.6)
The Netherlands	2 (3.1)
Italy	2 (3.1)
France	1 (1.5)
Singapore	1 (1.5)
Spain	1 (1.5)
Taiwan	1 (1.5)
Thailand	1 (1.5)
Turkey	1 (1.5)
One study was a collaboration between two countries	
Study population	
Adult	30 (46.9)
Paediatric	30 (46.9)
Mixed	4 (6.3)
Study design	
Quasi-experimental	35 (54.7)
Cohort	17 (26.6)
RCT	3 (4.7)
Observational	2 (3.1)
Cross-sectional	2 (3.1)
Descriptive qualitative	2 (3.1)
Economic evaluation	1 (1.6)
Narrative	1 (1.6)
Systematic review	1 (1.6)
Type of data	
Quantitative	58 (90.6)
Qualitative	3 (4.7)
Mixed	3 (4.7)

Results

Covidence systematic review software was utilised to itemise stages of data analysis. Records for 2627 publications were initially identified through database searches. After duplicates were removed, 1609 studies were identified for title and abstract review. Of these, 1251 were excluded based on eligibility criteria and marked as ineligible by covidence software at this abstract and title screening stage. 358 articles were retrieved for full text review, of which 292 were excluded for not meeting the eligibility criteria. Full list of reasons is highlighted in Figure 1. Sixty-four (N = 64) publications were deemed eligible for inclusion in our review (Figure 1). Tables 3 and 4 describe the characteristics of included articles and summary of the peer reviewed publications.

Characteristics of Included Studies

Most included studies were conducted in the United States of America (USA; n = 33), Australia (n = 7) and the Republic of Korea (n = 5). Studies from eleven other countries were included with between one to four studies from each. Thirty-four studies were published within the last 5 years. Fifty-eight studies utilised quantitative methods whilst three studies each focused on qualitative and mixed data collection methods. An equal number of studies reported on the adult and paediatric population (n = 30), with four (n = 4) studies accounting for mixed populations. Quasi-experimental design was the most utilised study design (n = 35), followed by cohort design (n = 17), and randomised controlled trials (RCT; n = 3). Observational, cross-sectional and descriptive qualitative designs reported two studies each whilst economic evaluation, systematic review and narrative design, reported one study each.

RQ1. What Original Research Evidence Is Available on the Use of CPWs in the ED Setting?

Thirty-five different CPW conditions were identified from the included studies (Table 4). Seven studies focused on ast hma.[25,29,36,37,39,41,52] Of these, six focused on the paediatric population and one focused on mixed adult and paediatric populations.[37] Chest pain accounted for five adult population studies[12,31,48,59,65] and one paediatric population study.[53] Sepsis accounted for two adult population studies[62,77] and three paediatric population studies.[67,76,81] Atrial fibrillation (AF),[51,60,71] acute appendicitis,[34,64,68] and concussion[23,42,84] were the focus in three studies each. Other notable CPW conditions, fractured neck of femur (#NOF) and stroke, had two[35,55] and one studies respectively.[82]

RQ2. What Are the Reported Outcomes with the Use of CPWs in the ED Setting?

Fifty-nine studies reported on patient and organisational outcomes of CPW use in the ED. Eighteen variables were identified (Table 5).

Variation and Quality of Treatment. Twenty-eight studies reported on variation and quality of treatment. Of these, 27 reported improved quality and reduced variation of treatment with implementation of CPWs. Asthma CPW implementation was associated with improved adherence to National Institute of Health (NIH) Guidelines, fewer hospital admissions, and reduced length of hospital stay.[25,29,36] CPW allowed clinical diagnostic clearance of more cervical spine patients without compromising patient care.[45] Implementation of a seizure CPW led to more neurological examination and improved documentation around driving safety and legal guidelines.[80] Introduction of vestibular physiotherapy for vertigo/dizziness CPW in ED was associated with greater diagnostic specificity and efficiency of care.[72] Following the implementation of an ED skin and soft tissue infections (SSTI) CPW, hospitalisation rates dropped considerably.[73] Implementing CPWs was associated with improved outpatient follow-up.[84] The adoption and increased awareness of sepsis CPW was linked to an immediate rise in the rate of lactate testing.[62] Disparities in door to balloon times decreased, independent of arrival

Table 4. Summary of peer reviewed included publications.

Authors	Country	Design/population	Objective	Clinical pathway (CPW) and sample size/single/multiple sites	Key conclusion/s
Alberts et al[23]	USA	Quantitative Adults/paediatrics	Changes in health care utilisation	Concussion (N = 3937) Single site	• Increased case identification. • Reduced time to referral. • Improved resource utilisation.
Balai et al[24]	UK	Quantitative Adults	Implementation of CPW protocol	Acute tonsillitis (N = 65) Single site	• Reduced time to treatment • Increased patients being discharged.
Bekmezian et al[25]	USA	Quantitative Paediatrics	Effect of CPW implementation on medication administration and imaging utilisation.	Asthma (N = 1249) Single site	• Improved adherence to medication guidelines. • Fewer hospital admissions
Blythe et al[26]	Australia	Quantitative Adults	To evaluate the impact of CPW	Accelerated transient attack pathways (N = 2424) Multiple sites	• Reduction in ED length of stay (LOS) • Reduction in costs
Burns et al[27]	USA	Quantitative Paediatrics	To compare the relative changes in hospital admission following CPW implementation	Bloody diarrhea (N = 305) Single site	• Decreased hospitalisation • Reduced overall costs.
Carrie et al[28]	France	Quantitative Adults	Effectiveness of a multidisciplinary CPW	Blunt chest trauma (N = 138) Single site	• Improved pain control. • Increased primary ICU admission
Chen et al[29]	Taiwan	Quantitative Paediatrics	Effectiveness of CPWs	Asthma (N = 2600) Multiple sites	• Reduced LOS
Corwin et al[30]	USA	Quantitative Paediatrics	To assess the pattern of change in CT use with CPW	mild traumatic brain injury (TBI) (N = 21,129) Single site	• Reduced head CT rates
Dhaliwal et al[31]	USA	Quantitative Adults	To determine the incremental impact on process and clinical outcomes	Chest pain (N = 17,014) Single site	• Reductions in hospital admission • Reduced stress testing. *Barriers reported*: • Poor CPW document design
Donã et al[32]	Italy	Quantitative Paediatrics	To assess changes in antibiotic prescription with CPW implementation	Community-acquired pneumonia (N = 129) Single site	• Reduction of broad-spectrum antibiotic prescriptions.
Ender et al[33]	USA	Quantitative Paediatrics	To determine whether a CPW improves condition management	Sickle cell vaso-occlusive pain (N = 68) Single site	• Improvement of pain management.
Fleischman et al[34]	USA	Quantitative Paediatrics	To determine the test characteristics of a CPW.	Acute appendicitis (N = 178) Single site	• No change in ED LOS. • Reduced CT use.

(continued)

Table 4. (continued)

Authors	Country	Design/population	Objective	Clinical pathway (CPW) and sample size/single/multiple sites	Key conclusion/s
Holroyd-Leduc et al[35]	Canada	Qualitative Adults	To evaluate an acute care pathway before broad implementation.	Fractured neck of femur (# NOF) (N = 44) Multiple sites	• Concepts of clinical networks, care pathways, and knowledge translation. *Barriers reported*: • Busy environment. • High workloads. • Competing priorities with CPW implementation. • Access to services beyond the ED. • Lack of clear delineation about individual professional roles. • Poor team communication.
Ittiporn and Prajongdee[36]	Thailand	Quantitative Paediatrics	Effects of adherence to the CPW on the timing of medication.	Asthma (N = 59) Single site	• Reduction hospitalisation. • Higher rate of systemic corticosteroid administration. *Barriers reported*: • Access to services beyond the ED
Jabbour et al[37]	Canada	Qualitative Adults/Paediatrics	Identify set of factors perceived to influence the implementation of CPW	Asthma and vomiting & diarrhea (V&D) (N = 17) Multiple sites	• Three levels of impact – the ED health professional, the ED team, and the hospital context. *Barriers reported*: • Inexperienced staff. • Lack of staff clinical knowledge and skill. • Recruitment difficulties. • High staff turnover. • Poor awareness of the CPW. • Poor CPW document design. • Lack of clear delineation on individual professional roles. • Threats to individual professional scope of practice and autonomy. • The physical design and space within the ED.
Jarhult et al[38]	USA	Quantitative Adults	To assess whether standardised clinical protocol improves efficiency for patients	Transient ischemic attack (TIA) (N = 280) Single site	• Reduced ED LOS. • Reduced hospital LOS.

(continued)

Table 4. (continued)

Authors	Country	Design/population	Objective	Clinical pathway (CPW) and sample size/single/multiple sites	Key conclusion/s
Judge et al[39]	Canada	Quantitative Paediatrics	Evaluation of practice variation and patient outcomes associated with CPW	Asthma (N=385) Single site	• Significant deviation from CPW. • Clinical deterioration beyond the first hour of observation. *Barriers reported*: • Poor CPW document design. • Poor CPW document design.
Kelly and Pannifex[40]	Australia	Quantitative Adult	To improve the condition management	Atrial Fibrillation (AF) (N=607) Multiple sites	• Increase in CPW adherence. *Barriers reported*: • Competing priorities. • Recruitment difficulties. • High staff turnover. • Inexperienced staff. • Lack of clear delineation on individual professional roles. • Poor clinician motivation.
Kennedy et al[41]	UK	Quantitative Paediatrics	Report on the development, implementation and evaluation of a safe discharge care pathway	Asthma (N=81) Multiple sites	• Reduction of future risk of asthma attacks. *Barriers reported*: • Non-optimised computer decision support • Incompatible electronic record.
Knighton et al[42]	USA	Quantitative Paediatrics	Effectiveness of strategy designed to increase uptake and sustain adherence of CPW.	Minor head trauma (N=12,670) Multiple sites	• Sustained improvements. • Safe reduction in CT scans.
Kullgren et al[43]	USA	Quantitative Paediatrics	To evaluate changes in health care cost and use	Somatic and related disorders (N=71) Single site	• Reduced cost
Legramante et al[44]	Italy	Quantitative Adult	Impact of CPW.	Cancer (N=250) Single site	• Reduced inpatient admission rate. • Reduced ED mortality rate. • Reduced mean ED and inpatient LOS.
Luehmann et al[45]	USA	Quantitative Paediatrics	To determine if care improved after the implementation of a CPW.	Paediatric cervical spine trauma (N=228) Single site	• More patients cleared clinically. • Improved utilisation of resources, for example, reduction of radiographs. *Barriers reported*: • Poor CPW document design
Lyon et al[46]	USA	Quantitative Adults/paediatrics	Documenting the multiyear implementation of a CPW	Uncomplicated vaso-occlusive events in sickle cell disease (N=200) Single site	• Improved waiting time to treatment. • Reduced hospital admissions. *Barriers reported*: • Access to services beyond the ED. • Limited education and resources.

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Table 4. (continued)

Authors	Country	Design/population	Objective	Clinical pathway (CPW) and sample size/single/multiple sites	Key conclusion/s
Madran et al[47]	Turkey	Quantitative Adults	Benefit of implementing a CPW	Upper respiratory tract infections (N=351) Single site	• Decreased inappropriate antibiotic use. • Increased CPW awareness among ED physicians.
Mahler et al[48]	USA	Mixed methods Adults	To determine whether CPW can impact outcomes	Chest pain (N=282) Single site	• Reduces objective cardiac testing. • Reduced inpatients LOS. • Early discharges.
Makarewich et al[49]	USA	Quantitative Paediatrics	To evaluate the success of a CPW	Open fracture (N=38) Single site	• Decreased waiting time from ED arrival to antibiotic administration.
Marbus et al[50]	Netherlands	Quantitative Adults/paediatrics	Determine how a new CPW, influences the hospitalisation costs	Influenza (N=2137) Single site	• Reduced cost.
Masica et al[51]	USA	Quantitative Adults	Evaluate the impact of CPW adoption.	AF (N=1924) Multiple sites	• Decreased hospital admission. • Improved delivery of care processes. *Barriers reported*: • Access to services beyond the ED
McCoy et al[52]	USA	Quantitative Paediatrics	To standardise care provided to patients	Asthma (N=~4500) Single site	• Reduced time to treatment. • Reduced hospital admissions. *Barriers reported*: • Competing priorities.
Mohan et al[53]	USA	Quantitative Paediatrics	To streamline patient care and minimise unnecessary testing.	Chest pain (N=1687) Single site	• Reduction in chest x-rays ordered. • Increased adherence to guidelines (ECG ordering increased). • Reduced variation of care. • Reduced ED LOS.
Montejo et al[54]	Spain	Quantitative Paediatrics	To analyse the impact of a CPW that incorporates family and provider experiences	Bronchiolitis (N=735) Multiple sites	• Improved utilisation of resources – decreased use of medications.
Murphy et al[55]	Ireland	Mixed Adults	To improve treatment access	# NOF (N=Not reported) Single site	• Early surgery
Murray et al[56]	USA	Quantitative Paediatrics	To evaluate the impact of CPW on the timeliness and consistency of care.	Febrile illness (N=520) Single site	• Improved timeliness of initiation of investigations (urine collection). • Early treatment (administration of the first antibiotic). • Reduced variation of care. *Barriers reported*: • Competing priorities. • Lack of clear delineation about individual professional roles. • Poor clinician motivation.

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Table 4. (continued)

Authors	Country	Design/population	Objective	Clinical pathway (CPW) and sample size/single/multiple sites	Key conclusion/s
Nelson et al[57]	USA	Quantitative Paediatrics	To see a 20% reduction in the use of MRSA-directed therapy	Skin and soft-tissue infections (N=1072) Single site	• Proportion of patients prescribed MRSA-directed therapy decreased. • No increase in 72-hour revisit rates or ED LOS.
Paek et al[58]	Republic of Korea	Quantitative Paediatrics	To evaluate the impact of CPW implementation.	Intussusception (N=214) Single site	• Decreased time-to-diagnosis. • Reduced time-to-treatment. • Reduced ED LOS.
Park et al[59]	Republic of Korea	Quantitative Adults	Effect of a multidisciplinary organised CPW.	Chest pain (N=488) Multiple sites	• Reduced variation (door-to-data and door-to-balloon times.
Ptaszek et al[60]	USA	Quantitative Adults	To assess the applicability and generalisability of a Multidisciplinary CPW.	AF (N=208) Multiple sites	• Reduction in hospital admission rate. • Reduced average inpatients LOS.
Ranse et al[61]	Australia	Quantitative Adults	Effect of a CPW.	Gastroenteritis (N=110) Single site	• Reduced ED LOS.
Rhee et al[62]	USA	Quantitative Adults	Association of Sepsis bundle implementation with lactate testing, antibiotic use, and mortality	Sepsis (N=117,510) Multiple sites	• Increase in lactate testing rates. • No change in broad-spectrum antibiotic use. • No change in short-term mortality rate.
Richardson et al[63]	USA	Quantitative Adults	Effects of CPW on treatment and ED transfers.	Epistaxis (N=52) Multiple sites	• Reduced variation of treatment. • Significant reduction in transfers
Russell et al[64]	USA	Quantitative Paediatrics	To compare the usage of CT scan	Acute appendicitis (N=166) Single site	• Reduced reliance on CT scanning.
Ryu et al[65]	Republic of Korea	Quantitative Adults	Effects of CPW on patient management	Chest pain (N=175) Single site	• Increased use of recommended medications. • Reductions in the median door-to-balloon time.
Schonenberg Llach et al[66]	USA	Quantitative Paediatrics	Effects of a new combined CPW	Dual cervical spine and blunt cerebrovascular injury (N=358) Single site	• Increased screening radiography. • CT use did not significantly decrease.
Scott et al[67]	USA	Quantitative Paediatrics	To decrease time to antibiotics	Sepsis (N=3843) Multiple sites	• Arrival to recognition time improved. • Reduced proportion of patients requiring intensive care.
Scott et al[12]	Australia	Quantitative Adults	Effectiveness of the introduction of a CPW management protocol	Chest pain (N=5662) Single site	• Early discharge. • Timely treatment.

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Table 4. (continued)

Authors	Country	Design/population	Objective	Clinical pathway (CPW) and sample size/single/multiple sites	Key conclusion/s
Shah et al[68]	USA	Quantitative Paediatrics	To decrease CT utilisation	Acute appendicitis (N=824) Single site	• Decreased CT utilisation.
Shin et al[69]	Republic of Korea	Quantitative Adults	To compare outcomes for patients in a CPW.	Acute aortic disease (N=198) Single site	• Hospital mortality improved. *Barriers reported*: • Poor awareness of the CPW. • Poor CPW document design.
Shubin et al[70]	USA	Quantitative Paediatrics	To determine the effectiveness of a CPW.	ileocolic intussusception (N=2164) Single site	• Reduction in abdominal radiographs. • Improved antibiotic stewardship. • Reduction in laboratory studies. • Fewer inpatient admissions. • Reduced cost.
Skalley et al[71]	UK	Quantitative Adults	To improve the quality of care for patients.	Hyperemesis gravidarum (N=not reported) Single site	• Reduced cost. • Reduced ED LOS. • Reduced admissions.
Stewart et al[72]	Australia	Quantitative Adults	To determine the effects of a vertigo/ dizziness ED CPW incorporating vestibular physiotherapy on the quality and efficiency of care.	Vertigo (N=543) Multiple sites	• Improved quality and efficiency of care. • Reduced ED LOS. *Barriers reported*: • Competing priorities. • Recruitment difficulties. • High staff turnover. • Inexperienced staff. • Access to services beyond the ED.
Talan et al[73]	USA	Quantitative Adults	Effects of CPW implementation	Skin and soft tissue infections (N=309) Multiple sites	• Significant reduction in hospitalisation rate.
Tan and Kwek[74]	Singapore	Quantitative Adults	Clinical outcomes before and after the implementation of a CPW.	Open tibial and femur fractures (N=89) Single site	• Reduction of external fixation surgeries. • Reduced hospital LOS.
Taylor et al[75]	Australia	Quantitative Paediatrics	To evaluate the impact of a nurse-initiated analgesia pathway (NIAP).	Pain (N=102) Single site	• Reduced waiting time to analgesia. • Improved parental satisfaction.
Tuuri et al[76]	USA	Quantitative Paediatrics	Align local care with guidelines.	Sepsis (N=106) Single site	• Improved waiting time to critical interventions.
Uffen et al[77]	Netherlands and Australia	Quantitative Adults	Effect of implementing CPW on patient management and outcomes.	Sepsis (N=38 articles) Multiple sites	• CPW feasible to address the severity and poor outcome of sepsis.

(continued)

Table 4. (continued)

Authors	Country	Design/population	Objective	Clinical pathway (CPW) and sample size/single/multiple sites	Key conclusion/s
Wendel et al[78]	USA	Quantitative Adults	Effect of a CPW on the identification of patients who would benefit from hospice.	Hospice care (N=31) Single site	• Increased social work consultation. • Reduced ED LOS • Reduced hospital LOS.
Williams et al[79]	Ireland	Mixed Adults	To identify barriers to implementation of a CPW.	Seizures (N=42) Single site	• Barriers to use fell into three categories: (1) environmental, (2) pathway design/process, and (3) user related issues. Other *barriers reported*: • Poor awareness of the CPW. • Physical location of the CPW document within ED.
Williams et al[80]	Ireland	Quantitative Adults	Utilisation and implementation of a CPW.	Seizure (N=544) Single	• Increased neurological examination. • Improved documentation. • Lower rates of seizure readmission. *Barriers reported*: • Competing priorities. • Poor CPW document design.
Workman et al[81]	USA	Qualitative Paediatrics	To better understand the clinical and electronic health record (EHR) process and resources.	Sepsis (N=not reported) Multiple sites	• Recommendations, include (1) improving shared situation awareness; (2) simulation for knowledge, skill, and team-based training; and (3) promoting a culture of continuous learning. *Barriers reported*: • Competing priorities. • Varying levels of staff clinical skill set. • Poor CPW document design.
Yang et al[82]	Republic of Korea	Quantitative Adults	To investigate whether an organised CPW can improve outcomes.	Stroke (N=649) Single site	• Reduced waiting time
Yarbrough et al[83]	USA	Quantitative Adults	Evaluate changes in process metrics, clinical outcomes, and cost.	Cellulitis (N=677) Single site	• Reduced broad-spectrum antibiotic use. • Reduced pharmacy costs. • Reduced total facility costs.
Yeates et al[84]	Canada	Quantitative Paediatrics	Effects of actively implementing a CPW on health care utilisation and costs.	Concussion (N=2878) Multiple sites	• Increased outpatient follow-up. • Reduced waiting time from physician initial assessment to disposition.
Zee et al[85]	USA	Quantitative Paediatrics	Optimise management of condition	Testicular torsion (N=135) Single site	• Decreased time from ED to theatre. *Barriers reported*: • Limited education and resources.

Table 5. Outcome variables reported with CPW use.

Outcome	Studies reporting positive change (n)	Studies reporting no significant change (n)
Variation (quality)	27	1
Resource utilisation	24	2
Time to treatment	24	6
ED~LOS	17	17
Hospitalisation	16	8
Case identification	15	
Inpatient~LOS	15	
Time to investigations	14	1
Cost	12	3
CPW compliance	11	
ED representation	5	16
Timely referral to other disciplines/services	5	
Door to triage time	4	
ICU admission	4	2
ICU~ED	3	1
Patient experience	3	1
Mortality	2	8
Organisational culture change	1	

times with the adoption of chest pain CPW.[65] The door to balloon time is recommended to be less than 90 minutes and is at EDs with percutaneous coronary intervention (PCI) facility.[65]

Resource Utilisation. Twenty-four studies reported on resource utilisation with CPW implementation in ED. Chest pain CPW implementation resulted in an increase in the administration of recommended medications and reduction of stress testing.[31] Utilisation of imaging and associated costs of care decreased with adoption of CPW.[23,30,43] Antibiotic prescription changed with introduction of CPW with reduction in inappropriate antibiotic use and broad-spectrum antibiotic prescriptions.[32,47]

Time to Treatment. Of the 30 studies that reported on waiting time to treatment, 24 studies reported improvement with the use of CPWs. The improved waiting time to treatment ranged from time to administration of pain control medications,[28,33,58] antibiotics,[49,56] corticosteroids,[36,76] and early access to operation room.[55,85] Median door-to-balloon time improved with chest pain CPW use.[65]

Other Variables. Seventeen studies reported reduced ED LOS, although an equal number of studies also reported no change in ED LOS after CPW implementation. The heart pathway study demonstrated an increase in early discharge rate which was defined as the proportion of patients discharged directly from the ED, a decrease in hospitalisation rate at 30 days which included inpatient admission, transfer, or observation.[48] Out of twenty-one studies reporting on ED representations, only five reported reductions with CPW use. Six studies reported on mortality with five reporting no improvement in mortality rate with CPW use.

RQ3. What Are the Reported Barriers and Enablers for CPW Implementation in the ED Setting?

Twenty-six (n=26) studies reported on these enablers and barriers.[23-26,31,35-37,39-41,45-47,51,52,54-56,69,72,76,79-81,85] A range of specific enablers and barriers for the successful implementation and use of CPW in the ED setting were described. Three main categories of barriers emerged in our review namely: (i) Organisational environment factors, (ii) healthcare professional-related factors, and (iii) CPW operational issues.

Organisational Environment Factors. The overarching organisational environment includes external and internal factors (summarised in Table 6). External factors are those that the organisation cannot control, such as economic issues, societal trends, availability of skilled professionals and services available outside the individual organisation.[86] The infrastructure, characteristics of the healthcare delivery system and management and organisational culture are categories of internal factors.

Barriers. The ED was reported to be a busy environment with high workloads where staff were constantly under work pressure and had limited time for new initiatives like CPWs.[35] Many existing organisational initiatives were reported to create competing priorities with CPW implementation.[35,40,52,56,72,80,81] Recruitment difficulties and high staff turnover associated with ED departments were reported as barriers to the use of CPWs and inexperienced staff, part time staff, and/or locum/agency staff who may not be familiar with the CPW processes were also reported as contributing to poor uptake of CPWs.[37,40,72] Furthermore, varying levels of staff clinical skill set were shown to affect readiness to care for critically ill patients including

Table 6. Organisational environment factors barriers and enablers to CPW implementation strategies.

Category	Barrier	Enabler
Organisational environment factors	• Busy environment with high workloads • Competing priorities • High staff turnover • Difficulties with recruitment of skilled staff • Difficulties with access to services beyond the ED • Poor physical design of the ED • Lack of IT support • Limited education and resources	• Interest in evidence-based guidelines • Commitment to education • Strong clinical leadership • Technology enhanced systems • Availability of resources • Use of audits

Table 7. Healthcare professional-related factors barriers and enablers to CPW implementation strategies.

Category	Barrier	Enabler
Healthcare professional-related factors	• Lack of staff clinical knowledge and skills • Lack of clarity on individual professional role with CPWs • Poor motivation and attitudes • Poor communication	• Broad engagement • MDT focus • Targeted individual education modules

the implementation of CPWs.[81] When CPWs were used, access to services beyond the ED, including downstream obstructions to discharge and availability of rehabilitation beds was reported as a barrier to continued and consistent CPW use.[35,36,46,51,72] Limitations around access to services beyond the ED also included waiting for other departments like Pharmacy, limited availability of inpatient beds, and unavailability of community-based services.[36] The physical design and space within the ED were reported as barriers for successful implementation of CPWs.[37] Non-optimised computer decision support and an incompatible electronic record system to support the CPW was reported by one study as impacting significantly on implementation.[41] Limited education and resources on CPWs and processes were also viewed as barriers in two studies.[46,85]

Enablers. Organisational interest in evidence-based guidelines and commitment to staff education were viewed as major facilitators for successful CPW implementation. This included development and testing of guidelines, performance feedback, and audits.[23,25,27,32,35,37,40,41,45,49,51,52,54-57,59,68,72,79,81,83,85] Strong clinical leadership was viewed positively as it allowed accountability, sense of responsibility, and flexibility when faced with work pressures.[40,81] Access and availability of resources was also reported as contributing to CPW uptake success.[35,51,71,72] Technology enhanced systems like electronically enhanced CPW use, SMS alert system, and QR code scanning were reported to contribute to the successful implementation and use of CPWs.[26,45,49,52,57] Clinical decision tools like prompts were also reported enablers to promote use and uptake of CPWs.[42,72] The use of periodic, retrospective or prospective audits was reported as a justification for the successful introduction and implementation of CPWs.[24-26,49] Incremental dissemination of CPW information and integration with existing systems was reported as an enabling strategy.[23,24] Extensive broad marketing prior to implementation of CPWs was reported in one study as being an enabler for successful implementation.[24-27,49] This broad marketing approach ranged from utilisation of print material, notice boards, educational campaigns, case study presentations, email feedback, information on both internal and external facing organisational websites, and electronic newsletters.[24-27,49] To enhance sustainability and long-lasting improvements, several strategies were highlighted by some studies. One study incorporated experiences of both families and professionals in the development of CPW whereby families highlighted the decision points that they considered most important in the pathway[54] and another recommended utilisation of clinician-led redesign efforts.[26]

Healthcare Professional-Related Factors. Healthcare professional-related factors include professional competency, motivation and attitudes.[86] These are summarised in Table 7 below.

Barriers. Lack of staff clinical knowledge and skill is a perceived conflicting issue affecting individual staff confidence in interdisciplinary capabilities to use the CPW.[37] This was reported as affecting patient flow, timely room placement for patients, and administration of medication.[25] Lack of clear delineation about individual professional roles and responsibilities within the CPW were frequently reported barriers.[35,37,40,56] CPWs were also perceived in one study to cause threats to individual professional scope of practice and autonomy.[37] Clinician lack of motivation and poor attitude towards use of CPWs were reported barriers. This was evident with some clinical professionals with more experience for example consultants opting to disregard the CPW document in favour of their own clinical expertise and knowledge.[40,56] Poor team communication about the CPW process was reported as a significant barrier

Table 8. CPW operational related factors barriers and enablers to CPW implementation strategies.

Category	Barrier	Enabler
CPW operational issues	• Poor CPW document design • Unclear CPW document physical location • Unclear stocking procedures of CPW document	• Simplification of CPW instructions • Shortening the CPW document • Electronic CPW

impacting CPW implementation.[35] This was reported as creating poor awareness of the CPW which resulted in the CPW not being utilised, especially during busy periods in the ED.[37,69,79] In one study, staff reported that they were unfamiliar with scoring tools associated with the CPW.[72] Competing organisational initiatives at the same time were reported to result in change fatigue where staff were not able to prioritise new processes.[37]

Enablers. A number of included studies suggested that the most successful approaches to improving health professional behaviour were built on good communication and broad engagement from multiple parties.[24-27,35,40,45,49,55] This ranged from working across departments, having engagement champions, to support of the multidisciplinary team (MDT) during development and implementation of the CPW.[44,51,76] Adopting MDT focus was reported to lead to mutual ownership, respect, and adoption of the CPWs.[76] In addressing CPW implementation, targeted individual education modules for new staff at each changeover time was suggested.[79] One study suggested a review of team skills and roles at the beginning of each shift and use of low-cost, low-resource tools like dry-erase boards or paper-based visual prompts to lessen the cognitive load on staff as a strategy for successful implementation and use of CPWs.[81]

CPW Operational Issues. CPW Operational issues were categorised as the design of the CPW document and accessibility issues like its location and stocking.[87,88] Table 8 summarises the operational issues.

Barriers. CPW document design was flagged frequently as a reason for not using the CPW.[31,37,39,40,45,69,80,81] The CPW document design was perceived to be lengthy and created double documentation.[35] It was also perceived to cause inconsistency, variation in practice, and general non-adherence with the use of the CPW.[39,40,45] The physical location of the CPW document within ED was reported as a barrier with some staff reporting uncertainty on its location.[79] Logistical issues were also flagged such as staff unsure of the restocking process for the CPW paper documents.[79]

Enablers. One study proposed simplification of instructions and shortening the CPW order sets.[35] The simplicity of the CPW in its design and documentation with single-page CPW were preferred.[41,53] Electronic CPW would simplify the process and reduce inconsistency and variation in practice.[41]

Discussion

This scoping review reports on the approaches to implementation and use of CPWs in the ED as well as patient and organisational outcomes associated with the use of CPWs in the ED setting. The range of specific clinical conditions targeted in the ED suggest that the CPWs target medical conditions that are prevalent, costly to the healthcare system, and require extensive communication to prevent catastrophic effects on patient, carers and the healthcare organisation.[89] CPWs are context specific compared to clinical practice guidelines and therefore are inherently difficult to compare between health services as most will have different targeted pathways.

Many positive impacts of CPW use were noted, consistent with other studies reporting on CPW outcomes in departments outside the ED.[89-98] Our review suggests that CPW can reduce variation and improve quality of treatment in the ED setting, an important component of improving the safety, efficiency and effectiveness of healthcare for patients. Improvements in documentation quality, reduced clinical complications and decreased LOS were also apparent following the implementation of CPWs, factors which have been associated with better patient experience and improved staff satisfaction.[79] Whilst a reduction in LOS has many positive flow on effects in the ED, CPW implementation can also improve micro-level performance indicators like diagnostics which includes ordering tests and the provision of prescriptions,[95,97,99] further contributing to improved outcomes for patients and for organisations. The micro-level performance indicators were reported in our study as evidenced by reduction in inappropriate imaging, prescriptions and antibiotic use.[97,99] Further, the implications of a reduction in hospital complications include improved safety, efficiency and timeliness of care.[94] Whilst broadly suggesting positive outcomes with CPW implementation, our review also highlighted some mixed outcomes. These include an increased (or no change in) LOS, mortality and representation to the ED. This is also demonstrated in previous studies where there is inconclusive evidence around the impact of CPWs on mortality,[89] and on reducing hospital LOS.[95] Inconsistent findings across studies suggests that CPW use is different across settings and may be dependent on a range of barriers and enablers.

The three main categories of barriers that emerged in our review are consistent with other studies[86-88,96,97,100,101] and they incorporate issues like time constraints, workload, poor communication, limited availability of resources, lack of clarity with the CPW, lack of knowledge and skills, unclear individual professional role, motivation and attitude. These variables are common constraints in healthcare and worse in

complex settings like the ED where staff are constantly working at high levels of pressure. There is no single strategy that is likely to result in successful implementation of CPW into the ED setting[79] as contextual factors will play a role in their development and use. Therefore, a thorough understanding of current and potential barriers and enablers for implementation is necessary to understand the individual components that will influence success and also the barriers that include organisational environment factors such as economic issues and availability of skilled professionals and external services to support ED discharge.[37,79]

Our review demonstrates that wide engagement with clinicians of all disciplines who use the pathways and involvement of multidisciplinary teams in implementation is vital to increase visibility of the CPW. This type of engagement allows gap analysis and involvement of multidisciplinary improvement teams resulting in increased adoption of CPWs.[100] The benefits of engagement and integration with existing systems, building intrinsic capacity and capability to create new innovations have been broadly reported enablers and are essential for the success of CPW use.[97,102] Education strategies that ensure that healthcare staff are aware of the rationale behind CPW implementation have been suggested in other studies to bring successful CPW implementation.[97] CPW adherence can be increased through incorporating relevant education and training materials to already-existing education programs.[101] Barriers like low motivation, inadequate knowledge and skills could be overcome through timely and appropriate education.[101] Unclear guidance about each individual's professional role in CPW implementation can result in poor engagement with the pathway and affects CPW implementation.[97,102] One study argues that poor engagement is linked to historical fragmentation at organisational environment level and lack of strong leadership in the health sector.[103] CPW will bring organisational culture change which includes the process of modifying values, beliefs, and behaviours within an organisation.[103] However, this can be overcome through strategic alignment, improved information systems, feedback, and audits in organisations to enhance uptake and use of CPWs.[103]

Positive benefits of CPWs are not only restricted patients but include benefits to the greater health care industry including staff.[90,98] A previous study highlights the importance of promoting positive patient outcomes through a combination of professional and patient perspectives.[96] There were no patient perspective studies identified in our review. More meaningful decisions are made for a responsive health care service when a patient is asked about their values in addition to their wants or needs.[89,104,105] Patient perspective in the frame of CPWs is of importance and the adoption of CPWs will not only give patients a good experience but assist in proactively addressing potential misunderstandings.[106]

Limitations

Due to the wide range of CPW conditions covered by the included studies, subgroup analysis was not conducted, making it difficult to generalise findings to any one specific CPW condition. It is also critical to understand the constraints of the scoping review approach. In general, scoping reviews lack the empirical rigor of more quantitative literature studies like meta-analyses. There may be some reporting bias in our results as people who investigate the use of CPWs are usually engaged in the ED setting potentially resulting in positive reporting. Some useful publications may have been excluded as our review was only limited to English publications. Excluding conference abstracts may have impacted on identifying relevant evaluations including those with no impact or a negative outcome.

Future Research

Most of the studies in our review were conducted in the USA and studies in other countries with different funding models will be valuable. This will allow comparisons to be made on reported outcomes and different implementation approaches based upon healthcare funding models.[107] Future studies could further explore successful implementation strategies to assist with reliability and replicability. Evidence suggests that CPWs have a place in the ED, but developing, implementing, and evaluating them will require worldwide benchmarking and knowledge exchange.[14] Future research should explore collaboration between researchers, patients and their families, and clinicians to enhance sustainability.[106] To support iterative cycles of knowledge generation and improvement in healthcare, learning health systems have recently gained popularity.[108] The predominancy of quasi-experimental designs in our review demonstrates real-world practical solutions and a quality improvement approach in the ED setting. However, further research is required to investigate the effects of CPWs when drawing conclusions about causality.[89] Further research could also involve conducting meta-analyses and systematic review, and built standards based on the barriers and enablers to provide better generalisable real-world solutions

Conclusion

CPW implementation has wide positive patient and organisational outcomes in the ED. Whilst no single strategy would result in implementing CPWs in the ED settings successfully, broad engagement with clinicians of all disciplines who use the pathways and involvement of multidisciplinary teams in implementation is vital to increase visibility of the CPW. Key factors influencing the successful implementation of CPWs include organisational environment factors, healthcare professional factors and clinical pathway operational issues and should inform future implementation efforts in the ED setting.

Acknowledgements

The project is part of the IMplementing CPWs for Acute Care in Tasmania (IMPACT) initiative which aims to promote adherence of CPWs into current patient-centred models of care across Tasmanian EDs.

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Ethics and Dissemination

This study did not require ethical approval. The results of this research will be published in a relevant journal and will be presented at relevant international scientific events in emergency medicine and implementation science.

Author Contributions

The authors confirm contribution to the paper as follows: study conception and design: ITM, SJP, PG, ET; data collection: ITM, SJP, PG, ET; analysis and interpretation of results: ITM, SJP, PG, ET, VT; draft manuscript preparation: ITM, SJP, PG, ET, VT. All authors reviewed the results and approved the final version of the manuscript.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This project is supported by a National Health and Medical Research Council (NHMRC) Medical Research Future Fund (MRFF) grant (No. GNT2018041).

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Supplemental Material

Supplemental material for this article is available online.

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