The "Clinical Pathways" as an improvement strategy in the management of Acute Coronary Syndrome, a scoping review

Las "Vías Clínicas" como estrategia de mejoramiento en el manejo del Síndrome Coronario Agudo, una revisión de alcance

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Conflict of interest: Authors no have conflict of interest.

Abstract

Introduction: In Colombia, between 2005 and 2017, diseases of the circulatory system were the leading cause of mortality, and for that last year, ischemic heart diseases produced 53.3% of deaths within this group of diseases. The increase in cardiovascular diseases is part of an epidemiological transition, increasing the financial burden and the sustainability of the system. Different clinical management strategies have been implemented worldwide to improve service delivery and contribute to the effectiveness and efficiency of health systems, among which are the so-called "clinical pathways".

Objective: To carry out a scoping review of the results of the Clinical Pathways in the management of acute coronary syndrome.

Method: The databases Medline Lilacs, SCOPUS, OVID, the journal Critical Pathway in Cardiology and the Google Escolar search engine were reviewed. The Mesh words used: Acute coronary syndrome, critical pathway and effectiveness

Results: The studies showed a positive effect for the improvement of the door-to-balloon opportunity, a decrease in hospital stay and an increase in early discharges, no changes in mortality, complications, or in the door-needle and door-ECG opportunity were evidenced.

Conclusions: The clinical pathways show positive effects on the timing of care, the reduction of stay and the stimulation of early discharges, without detriment to the safety of care or clinical results.

Resumen

Introducción: En Colombia, entre 2005 y 2017 las enfermedades del sistema circulatorio fueron la primera causa de mortalidad, y para ese último año, las enfermedades isquémicas del corazón produjeron el 53.3% de las muertes dentro de ese grupo de enfermedades. El aumento de las enfermedades cardiovasculares hace parte de una transición epidemiológica aumentando la carga financiera y la sostenibilidad del sistema. Se han implementado diferentes estrategias de gestión clínica a nivel mundial para mejorar la prestación de servicios y contribuir a la eficacia y eficiencia de los sistemas de salud, entre las cuales se encuentran las denominadas "vías clínicas".

Objetivo: Realizar una revisión de alcance sobre los resultados de las vías clínicas en el manejo del síndrome coronario agudo.

Métodos: Se revisaron las bases de datos Medline, Lilacs, SCOPUS, OVID, la revista Critical Pathway in Cardiology y el buscador Google Escolar. Las palabras Mesh utilizadas: Síndrome Coronario agudo, vía crítica y efectividad

Resultados: Los estudios demostraron un efecto positivo para el mejoramiento de la oportunidad puerta-balón, disminución de la estancia hospitalaria y aumento de altas tempranas, no se evidencian cambios en la mortalidad, complicaciones, ni en la oportunidad puerta-aguja y puerta-ECG.

Conclusiones: Las vías clínicas muestran efectos positivos en la oportunidad de la atención, la disminución de la estancia y la estimulación de altas tempranas, sin detrimento de la seguridad de la atención ni de los resultados clínicos.

Se realizó búsqueda de la información en las bases de datos Pubmed, Lilacs, SCOPUS, OVID, la

Key study Facts

Objective	To evaluate the results of the Clinical Pathways in the management of acute coronary syndrome
Study design	Scoping review
Source of information	The information was searched in Pubmed, Lilacs, SCOPUS, OVID, the journal Critical Pathway Cardiology and the Google search engine.
Population / sample	14 studies published between 2003-2020
Statical analysis	does not apply.
Main finding	The studies showed a positive effect on the improvement of door-to-balloon opportunity, decrease in hospital stay and increase in early discharges; no changes in mortality, complications, door-to-needle and door-to-EKG were evidenced .

Introduction

In 2015, the WHO reported 17.7 million deaths from 'cardiovascular diseases', which accounted for 31% of global mortality, and more than 75% of these deaths occurred in low- and middle-income countries (1). In Colombia, between 2005 and 2017, diseases of the circulatory system were the leading cause of mortality. For the latter year, ischaemic heart disease accounted for 53.3% (38,618) of deaths within that group of diseases, exhibiting adjusted mortality rates ranging from 78.89 to 80.07 deaths per 100,000 population (2).

The increase in cardiovascular diseases is part of the epidemiological transition towards a more costly morbidity profile (predominance of chronic non-communicable diseases), population growth, and the changing demographic structure (aging), threatening the sustainability of the health system. In addition, in terms of quality, the limitations to access and continuity in the provision of services, the disarticulation of the system's actors, and the inefficiency of spending create significant challenges for improving efficiency and health outcomes (3).

As a strategy to improve health care delivery and contribute to the sustainability of the system, clinical management strategies have been designed and implemented worldwide, called 'clinical pathways', also known as 'clinical pathways' or 'critical pathways', and are proposed as a process to reduce the gap between the recommendations that are theoretically documented in 'clinical practice guidelines' (CPG) and the actual application of the concepts by health care teams in their daily practice (4).

Clinical pathways are defined as interdisciplinary and structured plans that seek to implement recommendations based on scientific evidence into local care structures, detailing the steps in a time sequence to standardize care for a specific clinical problem, procedure, or episode of care in a population (5) and are used in clinical conditions of relevance, frequency and population impact such as cardiovascular diseases. These are a group of pathologies that have been sufficiently studied and have recommendations based on the best evidence to guide clinical practice in a standardized, effective, and efficient manner. Despite this, multiple studies show that these objectives are not achieved (6,7), which is all the more important given their high frequency and mortality at the global and local levels.

Although there is abundant international literature on the benefits of clinical pathways in managing acute coronary syndrome, there are also contradictory results. Systematic reviews suggest that the evidence is insufficient to formally recommend 'clinical pathways' as a strategy that could become an integral part of public policy in different health systems (8-11). Therefore, the objective of this study was to review the results of clinical pathways in the management of acute coronary syndrome due to the complexity of variables (biological, cultural, political, economic, etc.) that may represent variations in the international context and because it is necessary to continue adding evidence that validates or discards this clinical management strategy as a tool for quality improvement and can contribute to the sustainability of the Colombian health system.

Materials and methods

The search for information was carried out in the databases Medline, Lilacs, SCOPUS, OVID, the journal Critical Pathway in Cardiology, and the Google Scholar search engine; the following words were determined as MESH for the search strategy: acute coronary syndrome and critical pathway and effectiveness. Other terms such as comparative, effectiveness, research, quality indicators, health care, clinical paths, clinical pathways, and myocardial infarction were also explored; however, no precise results were obtained or directly related to the topic of interest.

The search was limited to English and Spanish, no time limit was established, and as selection criteria, articles related to the evaluation of the results of the 'clinical pathway' strategy in the management of acute coronary syndrome were included, where at least one of the following domains and components were included:

- Processes of care aimed at assessing timeliness of care.

- Clinical outcomes aimed at assessing mortality and complications.

- Administrative and financial outcomes, aimed at assessing length of stay and early discharge.

Articles with:

- Qualitative outcomes

- Reports of experiences in the implementation of clinical pathways.

- Expert opinions

- Editorial comments

The exploration of the information in the databases was done by two reviewers independently, selecting articles by title that were related to the research topic, to be consolidated by year and source of information in an Excel file. Duplicate articles were eliminated and then the selection criteria were applied to the abstracts, detailing the reasons for their exclusion.

The selected articles were re-evaluated for eligibility criteria and applied to the complete text, specifying the reasons for exclusion, in compliance with the PRISMA ScR extension guideline for scoping reviews (12). The articles that were included were not assessed for bias because it was considered that data can be extracted from all articles for the synthesis of qualitative analysis of the evaluation of the clinical pathway strategy for the management of the acute coronary syndrome.

The indicators for the clinical pathway endpoints were classified according to the domains: processes of care, clinical outcomes, and administrative and financial outcomes, as well as their components: timeliness, mortality, complications, hospital stay, and early discharge (Table 1).

For the final assessment of the effect of the pathway on the different components of the domains evaluated, the indicators of each study were taken into account, classifying their results as follows:

Positive effect: when the results of the evaluated variable showed a statistically significant variation towards improvement and the desired effect.

Adverse effect: when the results of the variable evaluated showed a statistically significant variation against the desired effect.

No change: When the results of the endpoint showed no change with the implementation of the clinical pathway, or the

Table 1. Clinical pathway evaluation indicators

Domain	Components	Indicator	Reference	Positive effect	without change	final effect assessment **
care process	Oportunidad	door-ECG	Daghash, 2020	0 (1/3) *	1 (2/3) *	without change
			Daghash, 2020	1 (3/5) *	0 (2/5) *	
		door-needle	Xin Du, 2017		1	without change
			Yangfeng Wu, 2019		1	
		ballon-door	Daghash, 2020	1 (5/6)*	0 (1/6)*	positive change
			Aeyels, 2018	1		
			Xin Du, 2017		1	
Clinical findings	Mortalidad	Intrahospital	Daghash, 2020	0 (1/3)*	1 (2/3)*	without change
			Mahler, 2018		1	
			Polanczyk, 2003	1		
		to 30 days	Dhaliwal, 2020	1		undetermined
			Mahler, 2018		1	
			Daghash, 2020	0 (1/3)*	1 (2/3)*	
		30 days to a year	Stopyra, 2020	1		without change
			Jo-JoHai, 2019	1		
			Xin Du, 2017		1	
	Complications	MACE	Daghash, 2020	1 (3/4)*	0 (1/4)*	without change
			Than, 2018		1	
			Mahler, 2015		1	
			Polanczyk, 2003		1	
			Xin Du, 2017		1	
			YangfengWu, 2019		1	
			Siebens, 2010		1	
			Dhaliwal, 2020		1	
Financial and administrative results	Stay	average stay	Daghash, 2020	1 (5/9)*	0 (4/9)*	positive change
			Mahler, 2015	1		
			Siebens, 2010	1		
			Than, 2018	1		
	earlydischarge	earlydischarge	Mahler, 2018	1		positive change

* For the SR of Hanan Daghash et al, 1 or 0 is assigned in the columns of the effects of the pathway, depending on whether the trend is positive, no change or negative, and between parentheses the total number of studies that evaluated that indicator is listed in the denominator and in the numerator those that had the effect corresponding to the column

o ** The final assessment of the effect of the pathway on the indicator is a qualitative concept summarizing the trend, according to the number and quality of studies that assessed the indicator. When it was not possible to establish a trend, the value is indeterminate
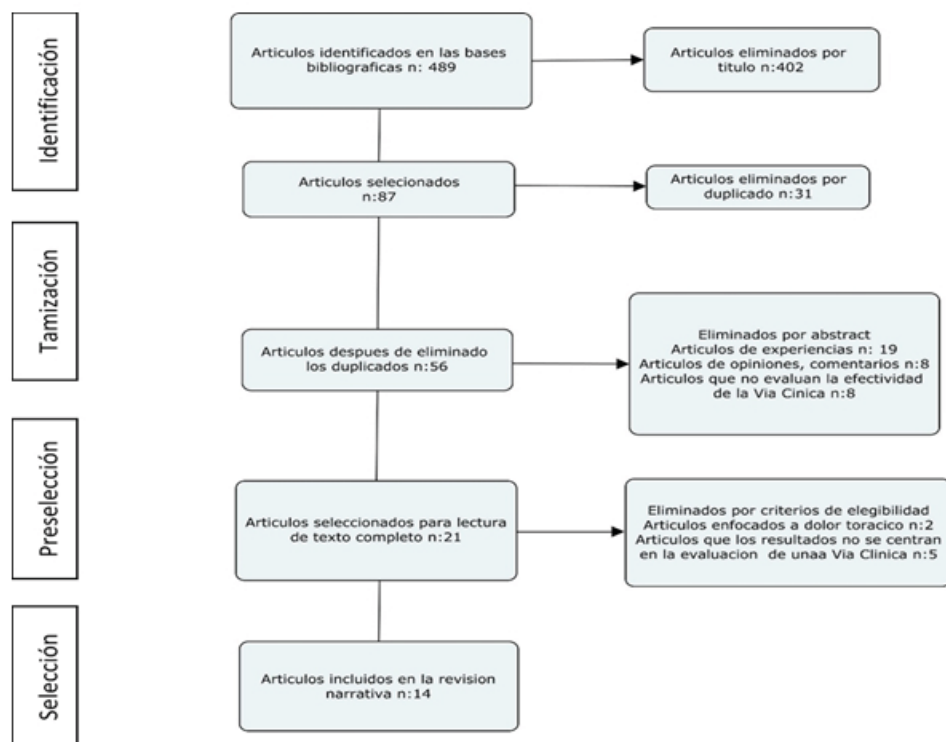
Figure 1. Article selection process

resulting changes were not statistically significant. Indeterminate: despite reporting statistically significant changes in the different studies, the effects between studies were contradictory and did not allow an actual positive or negative trend on the variable to be assessed.

For the systematic review by Daghash et al. (11), the total number of studies that evaluated each variable was taken into account. Their effect was rated (positive, negative, or no change) according to the trend in the number of each study. In brackets, the total number of studies that evaluated that indicator was listed in the denominator, and those that had the corresponding effect in the numerator to finally conclude the final assessment of the effect according to the positive or negative trend (Table 1).

The final assessment of the effect of the pathway on the indicator is a quantitative concept summarising the trend, based on the number of studies that assessed the indicator. Where no trend was possible, it was assessed as undetermined.

Results

A total of 489 articles were obtained as a result of the initial search, and after filtering the information, the articles were filtered by title and abstract. Fifty-six articles were selected after the elimination of duplicates. After reading and analyzing the abstracts, 14 articles were included for full-text reading, as they met the inclusion and exclusion criteria, complying with the recommendations of the PRISMA ScR extension guide for scoping reviews (Figure 1).

The 14 selected studies were published between 2003 and 2020, and 86% of these were published in the last seven years.

Among the studies included in this review, six are quasi-experimental (before-after) studies, four randomized clinical trials (RCTs), two prospective observational cohort studies, one descriptive observational study, and one systematic review (SR). These studies were conducted in seven different countries (USA, China, Belgium, New Zealand, Australia, Brazil, and Colombia), and the systematic review that is part of our study included research from six additional countries (Italy, Denmark, Turkey, Singapore, South Korea and Japan) (Table 2).

Mortality

Among the 14 articles selected in the present review, nine studies evaluated the behavior of ACS mortality after the implementation of clinical pathways. This clinical outcome indicator was assessed by the different authors at three time points: in-hospital mortality, 30-day mortality after hospital discharge, and 1-year mortality.

In a systematic review (11), five studies evaluated mortality rates and found variable results, where two of them showed a reduction in mortality rate. The study by Pelliccia et al. (13) reported an 8% reduction (mortality with pathway implementation: 12%, without pathway implementation: 20%) in-hospital mortality rates when care

Table 2. Summary of selected studies.

Year	Author	Title	Desing type
2020	Daghash	The effect of acute coronary syndrome care pathways on in-hospital patients: A systematic review	Systematic review
2020	Stopyra	Heart pathway implementation safely reduces hospitalizations at one year in patients with acute chest pain	Quasiexperimental
2020	Dhaliwal	Reduced admission rates and resource utilization for chest pain patients using an electronic health record-embedded clinical pathway in the emergency department	Quasiexperimental/Retrospective
2019	Jo-Jo Hai	Guideline-based critical care pathway improves long-term clinical outcomes in patients with acute coronary syndrome	Quasiexperimental
2019	Yangfeng Wu	Effect of a quality of care improvement initiative in patients with acute coronary syndrome in resource-constrained hospitals in China: a randomized clinical trial	Randomized clinical trial
2018	Aeyels	Care pathway effect on in-hospital care for ST-Elevation myocardial infarction	Cuasiexperimental
2018	Than	ICare-ACS (Improving Care Processes for Patients With Suspected Acute Coronary Syndrome)	Pragmatic clinical trial
2018	Mahler	Safely identifying emergency department patients with acute chest pain for early discharge: Heart pathway accelerated diagnostic protocol	Quasiexperimental
2017	Xin Du	Treatment and outcomes of acute coronary syndromes in women: An analysis of a multicenter quality improvement Chinese study	clinical trial
2015	Sprockel	Quality of care in acute coronary syndromes: A critical path implementation	Observational descriptive prospective
2015	Mahler	The heart pathway randomized trial	clinical trial
2014	Scott	"Implementation of a chest pain management service improves patient care and reduces length of stay"	Prospective cohort
2010	Siebens	Implementation of the guidelines for the management of patients with chest pain through a critical pathway approach improves length of stay and patient satisfaction but not anxiety	Quasiexperimental
2003	Polanczyk	Improvement in clinical outcomes in acute coronary syndromes after the implementation of a critical pathway	Prospective cohort

pathways were implemented (P<0.05), while Corbelli et al. reported a 19% reduction in mortality rates at one year post-discharge when care pathways were implemented (PAG<0.05) (14). In contrast, Cheah et al. (15) and Corbelli et al. (16) found no significant reduction in in-hospital mortality, while Holmboe et al. (17) and Ryu et al. (18) found no significant reduction in mortality rates between 30 days and one year after discharge.

Likewise, three different studies evaluated the effectiveness of the HEART Pathway (history, ECG, age, risk factors, and baseline troponin), which involves an accelerated diagnostic protocol designed to identify low-risk patients with chest pain for early discharge without stress testing or angiography who were recruited in the emergency department. In one of these studies (17), 8,474 adults with the possible acute coronary syndrome (without evidence of ST-elevation AMI) were prospectively evaluated in a 12-month before-and-after design at three health centers in the United States. In this study, the HEART Pathway identified 30.7% (1,461 of 4,761 patients) as low risk, 0.4% (6 of 1,461; 95% CI 0.2-0.9) experienced death or

myocardial infarction from the index ED visit to 30 days. Deaths at index (ED) visits were also reported to occur in 0.3% (15 of 4,761) of patients in the post-implementation cohort, compared with 0.2% (7 of 3,713) of patients before implementation (OR: 2.01; 95% CI: 0.79-5.10). During the 30-day follow-up period (excluding the index visit), rates of death or MI were similar in the post-implementation cohort (1.1%, 51 of 4,761) and the pre-implementation cohort (1.3%, 50 of 3,713; OR 0.88; 95% CI, 0.58-1.33). Death or myocardial infarction at 30 days occurred in 0.3% (6 of 2,046) of patients discharged early in the post-implementation cohort compared with 0.6% (8 of 1,390) in the pre-implementation cohort (OR: 0.71; 95% CI, 0.2-2.8).

Similarly, Stopyra et al. (18), following up on the previous study, increased the follow-up of mortality to one year, finding that, among patients classified by the HEART Pathway as low risk, 2.5% (36 / 1,461; 95% CI 1.7%-3.4%) suffered death or myocardial infarction since the initial visit during one year. Five were myocardial infarctions (5 / 1,461, 0.3%; 95% CI 0.1% to 0.8%). Therefore, the negative

predictive value of the HEART pathway for death or myocardial infarction at one year was 97.5% (95% CI 96.6%-98.3%). Death and myocardial infarction rates at one year (including index visit events) were similar in the post-implementation and pre-implementation cohorts (11.6% versus 12.4%; adjusted OR: 1.00; 95% CI: 0.87-1.16). However, during the 1-year follow-up period (excluding the index visit), death and myocardial infarction occurred less frequently in the post-implementation cohort (5.6%, 266 / 4,761) compared to the pre-implementation cohort (6.9%, 258 / 3,713; adjusted OR 0.77; 95% CI 0.64 to 0.94).

Similarly, about the evaluation of the HEART pathway, an RCT conducted at a hospital center in North Carolina (USA) recruited 282 patients with symptoms suggestive of ACS between 2012 and 2014, of whom 141 patients were randomly assigned to each arm. Among the 141 patients assigned to the HEART pathway, 46.8% (66/141) were risk-stratified into a low-risk group and 53.2% (75/141) into a high-risk group. No patients identified for early discharge died in either group during the 30-day follow-up period (19).

Leaving aside the evaluation of the 'Heart' pathway and following other mortality findings in other studies, Hai et al. (20), in a retrospective 'Before-After' study, evaluated the care of 2,023 patients admitted to the coronary care unit of Queen Mary Hospital, Hong Kong, for ACS between 2004 and 2015. They compared the outcomes 628 versus 1,059 patients (mean age 66.1 ±13.3 years, 74% male) before and after full implementation of the acute coronary syndrome intensive care pathway (aCCP). A total of 235 (22.2%) patients admitted after and 293 (46.7%) patients admitted before aCCP implementation died, of which 95 (9.0%) and 116 (18.5%) were due to cardiac causes, respectively. Sudden arrhythmic death or ventricular tachyarrhythmias requiring intervention were observed in 56 (5.3%) patients admitted after and 66 (10.5%) patients admitted before implementation of the pathway. Likewise, Kaplan-Meier survival analyses showed that patients admitted after aCCP implementation had better survival from all-cause mortality (log-rank P= 0.03).

On the other hand, a stepwise cluster RCT was conducted in non-percutaneous coronary intervention hospitals in China between October 2011 and December 2014. Of 29,346 patients with a diagnosis of definite ACS who were enrolled in 101 hospitals, 14,809 (50.5 %) were in the control period and 14,537 (49.5 %) were in the interventional period. There was no significant difference in the incidence of in-hospital MACE (all-cause mortality, recurrent MI or MI, and nonfatal stroke) between the intervention and control periods after adjusting for group and time effects (3.9% vs. 4.4%; odds ratio, 0.93; 95% CI, 0.75-1.15; P= 0.52) (21).

A retrospective quasi-experimental study evaluated the impact of a clinical pathway integrated with the electronic health record between April 2013 and July 2017. The intervention was implemented in February 2016 in a large tertiary teaching hospital (n= 8,765) and compared with a local community

hospital without the intervention (n= 8,249). No significant difference in MACE occurrences within 30 days (death 0.05%, P= 0.82) was found between the intervention and comparison sites (22).

In a prospective cohort study conducted in a hospital center in southern Brazil between July 1999 and December 2001, 1,003 patients over 30 years of age admitted to the emergency department with suspected ACS were reported. Among all patients evaluated, 390 had ACS eventually, 150 (15%) had a myocardial infarction, and 240 (24%) had unstable angina. There was no difference in clinical characteristics and risk assessment in the periods evaluated. Overall, quality of care improved after the pathway was implemented in January 2000, and mortality was significantly lower in the later semesters (from 13.5% in II / 1999 to 3.4% in II / 2001; p= 0.024 for trend). One semester later, admission resulted in 26% lower in-hospital mortality (OR: 0.74, CI: 0.69- 0.97) (23).

Finally, only one study in Colombia reported an evaluation of mortality associated with the implementation of clinical pathways. This study describes the results of implementing a clinical pathway for managing acute coronary syndromes in the Emergency Department of the Hospital San José de Bogotá. A total of 156 patients were enrolled, 25 corresponded to ST-elevation ACS, and of these, 2 (9.5%) patients died, while 131 patients presented with non-ST-elevation ACS, of whom 4 (3.2%) died. The reported in-hospital mortality was 4.1%, lower than that of other reports such as the GAP in which it was 10.4% and lower than that of a previous institutional study that included patients diagnosed with ACS discharge between 2009 and 2010, where in-hospital mortality was 8.7% (24).

Complications

In a systematic review that focused on evaluating the effect of clinical pathways on the process of care and clinical outcomes of acute coronary syndrome, two studies were found that showed a decrease in significant coronary events after implementation of the clinical pathway (13,25). Likewise, another study evaluated recurrent angina symptoms and nonfatal myocardial infarction rates after implementation of the clinical pathway and found a significant decrease from 28.5% to 13% (P<0.02) and from 15% to 5% (P<0.03), respectively, after implementation of the clinical pathway (11,26).

New Zealand, no difference was found in 30-day major cardiac event (MACE) rates before and after the intervention between patient cohorts. In the control cohort, 5 of 962 (0.52%) had a MACE at 30 days, compared with 16 of 3,632 patients (0.44%) in the intervention cohort (27). Another randomized trial evaluating the HEART Pathway with usual care found that 7 of 141 (5%) of patients who had the clinical pathway implemented compared with 9 in usual care had 6.4% had MACE at 30 days (P= 0.80) (19). In two randomized clinical trials conducted in China, no significant differences in coronary events were found after the implementation of the clinical pathway (21,28).

Similarly, in a prospective study at three US centers, it was identified during the 30-day follow-up period after discharge that rates of death or acute myocardial infarction were similar in the post-implementation cohort (1.1%, 51 of 4,761) and the pre-implementation cohort (1.3%, 50 of 3,713; OR: 0.88; 95% CI: 0.58- 1.33). Death or myocardial infarction at 30 days occurred in 0.3% (6 of 2,046) of patients discharged in the post-implementation cohort, compared with 0.6% (8 of 1,390) in the pre-implementation cohort (OR: 0.71; 95% CI: 0.22-2.80) (19).

Other studies evaluating coronary events greater than 30 days have found no significant difference between before and after clinical pathway implementation (22,23).

Timeliness of care

In a systematic review, six studies evaluated door-to-balloon timeliness, and five found positive outcomes of clinical pathways in the care process after implementation of the ACS management strategy (13,29-32). One study reported that 79% of patients received a percutaneous intervention (PCI) within 90 minutes of arrival at the ED when the clinical pathway was implemented compared with the group of patients in whom the strategy was not implemented, only 57% (p<0.01) had PCI within 90 minutes (29). Likewise, Aeyels et al. (32), showed a statistically significant improvement in patients in whom the care pathway was implemented, 71.8% received a percutaneous intervention within 60 minutes or less, as opposed to 61.9% who did not implement the strategy (p <0.001). On the other hand, in the same systematic review, another study found no significant difference in door-to-balloon reduction times after implementation of the care pathways (11).

Regarding the needle-door opportunity, a systematic review found five studies, of which three showed a positive effect and two showed no significant change in the time reduction. One study found a decrease from 64 to 25 minutes (P<0.02) and from 73 to 37 minutes (P<0.05) post-implementation of clinical pathways (11). Like Cannon et al. (33), they showed a significant door-to-needle difference post-implementation of clinical pathways of 55 to 30 minutes (P<0.01). In contrast, two clinical trials conducted in several hospitals in China reported no significant effect on pre- and post-care pathway door-to-needle reduction times (11,21,28).

In terms of door-to-electrocardiogram timeliness, a systematic review reported one study showing a significant difference in step-down times from 19 to 10 minutes (P<0.05) (11,13). In contrast, two studies found no significant effect on door-to-ECG reduction times for pre- and post-care pathways (11,33,34). A study in Colombia reports a median door-to-ECG of 12.5 minutes RIQ (3-46); 47.8% of patients had an ECG taken in <10 minutes, but few data were recorded, which did not allow an adequate analysis of this variable (24).

Length of stay and early discharge

In the domain of administrative and financial outcomes, effects on 'Length of stay' were assessed in four studies (11,19,27,35), finding positive results in all of them. At the same time, 'Early discharge' was only assessed in one study (17), in which positive effects were also reported.
In a multicentre trial, the odds of being discharged within six hours increased after the implementation of the clinical pathway. The odds ratio of being discharged within six hours was 2.4 (95% CI 2.3-2.6). In patients in whom ACS was ruled out, the mean length of hospital stays was reduced by 2.9 hours (95% CI: 2.4-3.4) (27).

In another clinical trial comparing usual care with a clinical pathway for ACS management, it was shown that patients who were assigned to the clinical pathway had a mean length of stay of 9.9 hours compared to 21.9 hours in the usual care group, a mean reduction in length of stay of 12 hours (p= 0.003). Early discharge also occurred in 39.7% (56/141) of patients who were assigned to the improvement strategy compared to 18.4% (26/141), demonstrating an increase in early discharge in 21.3% (p= <0.001) (19).

Furthermore, the study by Siebens et al. (35) showed that the length of stay was significantly shortened after the implementation of a critical pathway in the control group with a mean of 32.89 (SD 19.01) compared to the intervention group with a mean of 28.71 (SD 17.60) (p= 0.01).

A systematic review identified five studies that demonstrated a positive effect on length of stay. In the study by Cheah et al. (15), the length of stay decreased by 16.5% (p<0.001) after the implementation of the assistive pathway. Kucenic et al. (25) reported a significant decrease in the mean length of stay in the care pathway group (6 days) compared to the non-care pathway group (8.2 days). Corbelli et al. (16) reported a significant 18% reduction in length of stay (p<0.05) after implementation of the care pathway. Likewise, Saint et al. (36) reported a 20.7% (P<0.001) decrease in length of stay. At the same time, the study by Laut et al. (37) demonstrated a decrease in the mean length of stay from 8.3 days without the use of the clinical pathway to 5 days after implementation of the strategy. Four studies did not determine the occurrence of a significant reduction in their results in terms of patient length of stay (11,13,32,38).

On the other hand, Dhaliwal et al. (22), evaluated the outcomes of improved care and reduced length of stay after implementation of a clinical pathway, focusing their findings on calculating the number of admissions saved and the number of days of delay avoided and showed that between November 2005 and March 2013, 5,662 patients were treated according to an ACS management pathway, resulting in a reduction of 5,181 admission nights by identifying more timely low-risk patients who could then

be discharged. In addition, 1,360 days were avoided in high-risk patients who received earlier diagnosis and treatment.

Discussion

The picture of the effectiveness of clinical pathways needs to be more consistent on some indicators. However, our review found an apparent positive effect on improving door-to-balloon time, decreasing hospital stay, and increasing early discharge. These results coincide with those reported in the systematic review by Daghash et al (11).

International literature was found that refers to the implementation and evaluation of the effectiveness of clinical pathways in acute coronary syndrome, but in the national context, the experiences and evaluations that were found were very scarce, the only one selected being a retrospective descriptive observational study conducted by Sprockel et al (24), in the city of Bogotá.

We identified that clinical outcome indicators, such as mortality and complications, were the most evaluated (79%); while administrative and financial outcome indicators, such as length of stay, and process indicators, such as timeliness of care, were the next most evaluated (36%). This partially differs from the data reported in the systematic review by Daghash et al. (11) and other systematic reviews (39-41), where clinical outcome indicators were not the most frequently evaluated, but agrees that timeliness and length of stay indicators are the most frequently examined in those reviews. What is constant in our study and in the different reviews analyzed is that the authors prioritize indicators that evaluate the technical dimension of the care process, leaving aside the interpersonal dimension, such as indicators that evaluate the impact on team communication or user satisfaction, which would provide another perspective on the evaluation of the effectiveness of clinical pathways for future studies.

Clinical outcome indicators vary widely between studies regarding how they are measured, making synthesis and reliability of conclusions in this domain difficult.

Some studies assessing the effects of pathways on in-hospital and 30-day mortality included assessments of all-cause mortality, while others related it specifically to acute coronary events. For the assessment of one-year mortality, in some studies, there was no consistency in the inclusion of 30 days post-hospital discharge within the one-year follow-up, furthermore, in two of these studies, follow-up was longer than one year, and mortality was not reported independently of MACE, without achieving a clear differentiation.

Complications were evaluated in eight of the selected studies (11,19,21-23,27,28,35), but their definition was variable and unclear among the different authors. Some studies examined the presence of MACE (Major Adverse Coronary Events), including all-cause mortality; others included coronary events or recurrent ischemia without specifying their classification, while others were specific in reporting acute myocardial infarction, and one

study even considered heart failure within the reported complications.

Regardless of the shortcomings in the standardization of mortality and complication measures, our review showed a clear tendency to find no significant changes in clinical outcomes with the implementation of clinical pathways, which contrasts with other literature reviews, such as the Cochrane systematic review by Rotter et al. (8), where, despite being an evaluation of the effectiveness of clinical pathways in different pathologies and health conditions and not specifically in ACS, one of the main findings was a significant reduction in hospital complications associated with the introduction of pathways, but this can be explained because 6 of the 7 studies supporting that conclusion in that review examined invasive conditions or interventions, e.g. surgical procedures or mechanical ventilation, where there is more likelihood of using complication measures such as infection and bleeding which are more objective outcome measures. Furthermore, on clinical pathways, it has been previously suggested that this strategy works best for 'phenomena with a predictable course' (4), i.e., conditions, pathologies, or procedures where the process of care or performance can be systematically organised and outcomes have the least possible variability; this may be particularly true for clinical outcomes in ACS.

In our review, we found no adverse changes in clinical outcomes associated with the implementation of pathways but a positive impact on timeliness and length of stay indicators, which confirms the importance of this clinical management tool for the optimization of resources without affecting the safety of care.

The absence of negative results associated with implementing clinical pathways in all the studies in this and other reviews may reflect this strategy's safety and low risk. However, it may also be due to a publication bias, where the authors prefer to report only successful or neutral results rather than the negative results of some implementation experiences.

It is essential to highlight that in the effectiveness studies and the experiences of implementation of clinical pathways that were evaluated, we found that in the international context, the pathways have a more clinical focus, with little integration of administrative processes, which leaves aside one of the implicit benefits of this strategy, where the interdisciplinary coordination of the different actors and the alignment of clinical and administrative processes can improve health care outcomes, and this may be an approach to consider in the Colombian context, where our health system has administrative constraints that directly or indirectly affect the delivery of services to patients.

Conclusion

Clinical pathways are clinical management strategies that have been widely used in many countries for several decades. However, they need a unified international definition, and evaluating their effectiveness has multiple drawbacks due to the scarce standardization used to measure their results. Even so, there is a clear tendency in this and other literature reviews to show positive effects in improving the timeliness of care, reducing

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the length of stay, and stimulating early discharge without detriment to the safety of care or clinical outcomes. On the other hand, there are few outcome evaluations related to the interpersonal dimension, such as indicators assessing the impact on team communication or user satisfaction, which would provide another perspective on the evaluation of the effectiveness of clinical pathways for future studies.

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