RESEARCH ARTICLE

Effectiveness of implementation of standard clinical pathway through healthcare professionals among acute myocardial infarction patients undergoing angiography / angioplasty in a public tertiary care hospital, Karachi

Shahzad Bashir[1], Sarfraz Masih[2], Rubina Barolia[3], Muhammad Nawaz Lashari[4], Iram Amin[5]

Abstract

Objective: To assess the effect of acute myocardial infarction standard clinical pathway among acute myocardial infarction patients on length of stay in public tertiary care setting.

Methods: The quasi-experimental non-randomised study was conducted at the Department of Cardiology, Dr Ruth Pfau Civil Hospital, Karachi, from September to December 2018, and comprised acute myocardial infarction patients. Those admitted before the implementation of acute myocardial infarction standard clinical pathway formed the control group, while those admitted after the implementation were in the intervention group. Acute myocardial infarction standard clinical pathway was implemented and the interventional clinical practices of healthcare professionals, including cardiologists, postgraduates, residents, nurses and critical care technicians, were assessed using a standard checklist. Data was analysed using SPSS 21.

Results: Of the 100 participants, 50(50%) were in the control group; 31(62%) males and 19(38%) females. The intervention group also had 50(50%) patients; 35(70%) males and 15(30%) females. Regarding effectiveness of the implementation of standard clinical pathway, length of hospital stay reduced significantly in the intervention group compared to the control group (p=0.003).

Conclusion: The implementation of acute myocardial infarction standard clinical pathway reduced the length of hospital stay of acute myocardial infarction patients.

Keywords: Acute Myocardial Infarction, AMI Standard Clinical Pathway, Length of Hospital Stay (LOS), Angiography, Angioplasty, Health Care Professionals. (JPMA 72: 492; 2022) **DOI: https://doi.org/10.47391/JPMA.2468**

Introduction

Acute myocardial infarction (AMI) is one of the leading and common cardiovascular diseases (CVDs), which are composed of heart and blood vessels, including coronary artery disease (CAD). It is also preventable and treatable condition like other chronic diseases, such as stroke, chronic respiratory diseases and diabetes mellitus (DM). The burden of AMI is increasing in developed and under-developed countries along with increased length of hospital stay (LOS), resulting in increased financial burden on AMI patients. Globally, 17.5 million people died of CVDs in 2014, which is 31% of all global deaths, whereas 7.4 million deaths occurred due to coronary heart disease (CHD).[1] In fact, now AMI is also one of the leading causes of death and disability in the Asia Pacific region which is half of the global burden.[2] Likely, the highest prevalence of AMI is seen in those aged <45 years in south Asian countries Pakistan, India, Bangladesh and Nepal.[3]

The management of AMI is divided into three segments; medical, surgical and clinical pathway (CP). The initial management of unstable angina (UA) / non-ST elevation myocardial infarction (NSTEMI) starts with morphine, oxygen therapy, nitrates and aspirin (MONA) and subsequently aggressive medical therapy and revascularisation are initiated.[3-9] Along with medical therapy, CPs is one of the medical approaches to treat AMI patients. Primarily, it was developed in the 1980s and has been implemented in different healthcare settings.[2] Indeed, initially it was made for hospital use only, but now it is being used in other healthcare setups as well, such as home-care, etc.[10] CPs are also known as care pathway, critical pathway, integrated care pathway or an integrated care map that is the main tool used for the management of different diseases and also for quality assurance.[10] CP is a teamwork and an interdisciplinary goal-oriented care plan that particularly focusses on necessary teamwork approach.[2,10] Standard CPs are being used to reduce the patients' stay in hospitals, such as in the United States,[11] the United Kingdom,[12] Australia,[13] China[1,12] and South Korea.[10]

[1]Institute of Nursing, Jinnah Sindh Medical University, Karachi, Pakistan; [2]Institute of Nursing, Dow University of Health Sciences (DUHS), Karachi, Pakistan; [3]School of Nursing and Midwifery (SONAM), Aga Khan University, Karachi, Pakistan; [4]Department of Cardiology, Dow Medical College, Dr. Ruth K.M. Pfau Civil Hospital, Dow University of Health Sciences, Karachi, Pakistan; [5]Department of Cardiology, Dr. Ruth K.M Pfau Civil Hospital, Karachi, Pakistan.
Correspondence: Shahzad Bashir. e-mail: shahzad.bashir@jsmu.edu.pk

However, standard CPs are also used for diseases, such as pneumonia,[10,14] ischaemia stroke,[12,13] cancer[11] as well as for cardiac rehabilitation[1] among AMI patients. There is strong evidence that CPs provide evidence-based practices in healthcare setting.[14]

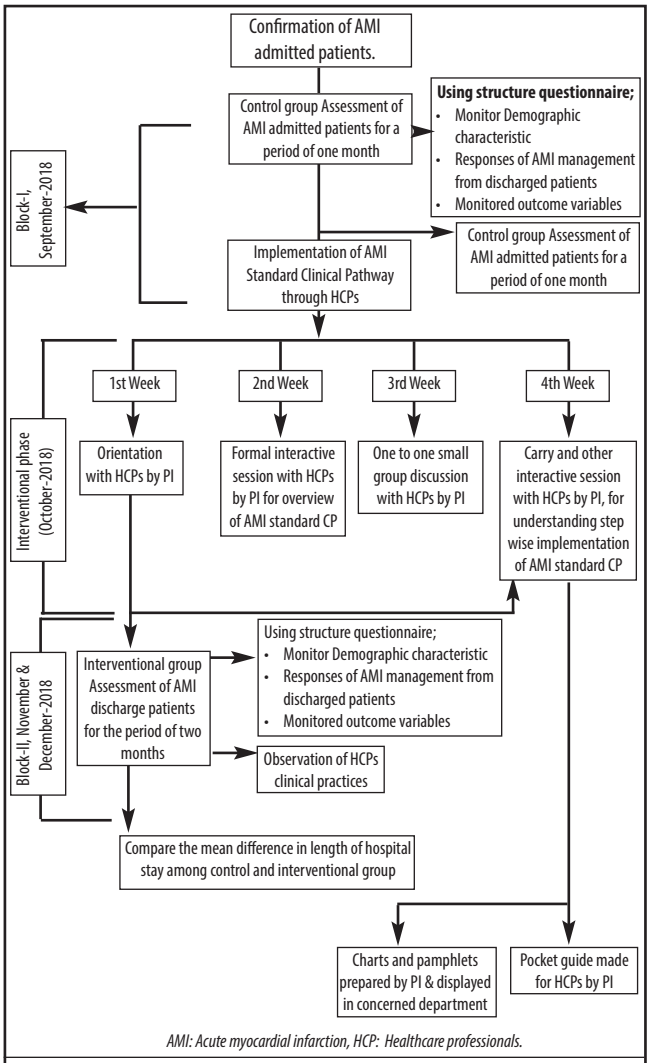
The current study was planned to assess the effect of AMI standard CP among AMI patients on LOS in public tertiary care setting.

Patients and Methods

The quasi-experimental non-randomised study was conducted at the Department of Cardiology, Dr Ruth Pfau Civil Hospital, Karachi (CHK), from September to December 2018. After approval from the Institutional Review Board (IRB) [IRB-1094/DUHS/Approval/2018, 18th August, 2018] of Dow University of Health Sciences (DUHS), Karachi, the sample size was calculated for intervention and control group using Power Analysis and Sample Size System NCSS Statistical software. Sample size and power; Power Analysis and Sample Size System (PASS) version 11.[15] With 92% power to detect a difference of -2.6 between the null hypothesis that both group means are 5.5 and the alternative hypothesis that the mean of group 2 is 8.2 with estimated group standard deviations of 1.4 and 2.3 and with a significance level (alpha) of 0.01000 using a two-sided two-sample t-test.[16]

After permission from the CHK administration [MS/CHK/18/7855, 26th, May: 2018], the sample was raised using non-probability consecutive sampling technique. AMI Patients admitted pre-implementation of AMI standard CP were pre-assessed in September 2018, and were included in the control group. Others were included in the intervention group on which AMI standard CP was applied in October-2018. Intervention group was post-assessed in November and December 2018 (Figure). A group of healthcare practitioners (HCPs) comprising cardiologists, post-graduates (PGs) / residents, nurses and critical care technicians (CCTs) were recruited using purposive sampling technique for skill evaluation through the AMI standard CP checklist.

The Data were collected after taking written informed consent from the study participants. Assessment and intervention were carried out in three phases Using AMI standard CP tool[17] whose language was modified according to the contextual need of the study setting. AMI standard CP is composed of eight components: investigations; pre-angiography care; post-angiography care; medications; observation and continuation of treatments vital signs and other parameters; nutritional status; mobility, elimination hygiene; and expected outcomes. Permission for use of AMI CP was obtained



AMI: Acute myocardial infarction, HCP: Healthcare professionals.

Figure: Flow diagram of data collection and intervention plan.

through email. The content validity index (CVI) of the tool was computed to be 0.9266 for relevancy and 0.9333 for clarity based on feedback from the experts in the field, like cardiologists and cardiac nurses. Cronbach's alpha coefficient was 0.83.

Phase-I comprised pre-assessment of the control group using questionnaires regarding AMI management comprising 15 questions related to their timely (immediately, within 10 minutes, 11-15 minutes, 16-30 minutes) management on different components, such as electrocardiogram (ECG), vital sign, medications prescription and administration etc. HCP's conventional clinical practices were monitored within the same duration through the AMI standard CP checklist.

Phase-II was meant for intervention. For planning the intervention, a meeting was arranged with HCPs and clinical supervisors for establishing effective comfortable

environment for interaction and data collection. The HCPs were gathered from morning, evening and night shifts in the seminar room of the study setting after permission from the department head. Flyer and pamphlets were also prepared and displayed in the relevant departments for the HCPs, resulting in positive outcome during the interactive session for an overview and easy understanding of AMI standard CP.

A power point presentation was shared with the HCPs about the implementation and importance of the AMI standard CP. After discussion, pocket guides were made and distributed among the HCPs for use as guidelines for the management of AMI standard CP protocol. A hard copy was kept in the emergency room (ER) and coronary care intensive care unit (CCICU), and was handed over to clinical supervisor and his team members, charge nurse, CCTs and others senior HCPs.

During the third week of the implementation month, discussion was held with individual HCPs and in small groups for effective implementation of AMI standard CP. In addition, facilitation and consultation was sought from the clinical supervisor regarding having a good understanding about the implementation of CP. In the last week of the intervention, another formal interactive teaching session was held for thorough discussion about the systematic implementation of the AMI standard CP. A proforma was attached to all newly-diagnosed AMI patients' files, which was filled up by the Primary Investigator or Primary author. During the implementation phase, Primary Investigator or Primary author were present in all the shifts for observing the implementation process and answered all the queries raised by the participants.

In Phase-III, post-implementation data were collected from AMI discharge patients using the same structured questionnaire. In addition, post assessment was done through hard copy of AMI Standard CP attached with each patient's file separately for both groups, which were filled and checked by the HCPs for effective implementation of AMI Standard CP.

Data was analysed using SPSS 21. Frequencies with percentages were used for sociodemographic data and paired sample t-test was used to compare the mean differences in LOS. Chi-square test was used for AMI standard CP between the two groups and among the HCPs. $P<0.05$ was considered statistically significant.

Results

Of the 100 patients, 50 (50%) were in the control group; 31 (62%) males and 19 (38%) females. The intervention group also had 50(50%) patients; 35 (70%) males and 15 (30%) females (Table 1).

Table-1: Sociodemographic characteristics.

Study variables		Control group (n=50) n (%)	Interventional group (n=50) n (%)
Gender	Male	31 (62)	35 (70)
	Female	19 (38)	15 (30)
Marital status	Single	4 (8)	1 (2)
	Married	39 (78)	48 (96)
	Separated	7 (14)	1 (2)
Level of education	Primary	28 (56)	32 (64)
	Middle	10 (20)	9 (18)
	Matric	5 (10)	2 (4)
	Intermediate	5 (10)	7 (14)
	Graduate	2 (4)	-
Co-morbidities	DM & HTN	32 (64)	37 (74)
	TB	4 (8)	2 (4)
	IHD	10 (20)	6 (12)
	Asthma	4 (8)	5 (10)
ECG timing within ER	Immediately	21 (42)	32 (64)
	11-15 min.	20 (40)	11 (22)
	Within 10 min.	8 (16)	5 (10)
	16-30 min.	1 (2)	(4)

DM: Diabetes mellitus; HTN: Hypertension; TB: Tuberculosis; IHD: Ischaemic heart disease; ECG: Electrocardiogram; ER: Emergency room.

Table-2: Length of hospital stay (LOS).

LOS	Mean ± SD	p-value
Control group	4.96 (0.9)	0.003
Interventional group	4.30 (0.9)	

SD: standard deviation.

Mean LOS reduced significantly in the intervention group compared to the control group (Table 2).

Significant differences were found in 24 components in all the eight categories of AMI standard CP post-intervention (Table 3).

Discussion

The current study, to our knowledge, is the first to implement AMI standard CP through HCPs and to evaluate its effectiveness in the Pakistani context. The overall mean LOS of AMI patients significantly decreased post-intervention, which is supported by studies done globally.[8,9,11,18-21]

The male-female ratio in the control group was 3:19, while it was 3:15 in the intervention group. A Singapore study supports the findings with a reported ratio of 2.84:1 in the control group and 3.12:1 in the intervention group.[6] In the present study, majority of the patients were married males.

In the control group, significant differences were reported in ECG on arrival in ER, documentation of troponin I and T,

Table-3: Acute myocardial infarction standard clinical pathway followed by healthcare professionals (HCPs) in control and interventional groups (n=100).

Category of tests		Control group (n=50) n (%)	Interventional group (n=50) n (%)	p-value
ECG at ER	Yes	26 (5)	37 (7)	0.038
	No	24 (4)	13 (2)	
Troponin I or T	Yes	30 (6)	44 (8)	0.003
	No	20 (4)	6 (1)	
Cardiac Biomarkers	Yes	25 (5)	39 (7)	0.006
	No	25 (5)	11 (2)	
Glucose level	Yes	23 (4)	38 (7)	0.004
	No	27 (5)	12 (2)	
CBC	Yes	28 (5)	38 (7)	0.057
	No	22 (4)	12 (2)	
Angiography/ Angioplasty	Yes	24 (4)	36 (7)	0.024
	No	26 (5)	14 (2)	
D2B PCI	Yes	24 (4)	36 (7)	0.024
	No	26 (5)	14 (2)	
Pre-Angiography Care				
Vital Signs	Yes	27 (5)	38 (7)	0.035
	No	23 (4)	12 (2)	
NPO & start IV hydration	Yes	25 (5)	38 (7)	0.012
	No	25 (5)	12 (2)	
Elevate the bed	Yes	24 (3)	38 (7)	0.007
	No	26 (6)	12 (2)	
Pressure dressing	Yes	13 (2)	36 (7)	0.000
	No	37 (7)	14 (2)	
Check bleeding site	Yes	23 (4)	38 (7)	0.004
	No	27 (5)	12 (2)	
Observation/monitoring& Continuation of Treatments Vital Signs and Other Parameters				
BP	Yes	21 (4)	36 (7)	0.004
	No	29 (5)	14 (2)	
HR	Yes	16 (3)	36 (7)	0.000
	No	34 (6)	14 (2)	
RR	Yes	13 (2)	38 (7)	0.000
	No	37 (7)	12 (2)	
Temperature	Yes	14 (2)	38 (7)	0.000
	No	36 (7)	12 (2)	
Pain score	Yes	16 (3)	38 (7)	0.000
	No	34 (6)	12 (2)	
Glucose level	Yes	18 (3)	38 (7)	0.000
	No	32 (6)	12 (2)	
Nutritional Status				
Nausea, Vomiting	Yes	23 (4)	38 (7)	0.004
	No	27 (5)	12 (2)	
Mobility, Elimination, and Hygiene				
Oral Hygiene	Yes	26 (5)	38 (7)	0.021
	No	24 (4)	12 (2)	
Personal hygiene	Yes	24 (4)	36 (7)	0.007
	No	26 (5)	14 (2)	

Continued on next column.

documentation of cardiac biomarkers, monitoring of glucose level, angiography / angioplasty procedure, door to balloon procedure within 90 minutes respectively in the current study. A study conducted in Egypt showed

Table-3: *Continued from previous column*.

Category of tests		Control group (n=50) n (%)	Interventional group (n=50) n (%)	p-value
Expected Outcomes				
Angina pain controlled	Yes	24 (4)	36 (7)	0.024
	No	26 (5)	14 (2)	
Successful PCI	Yes	24 (4)	38 (7)	0.007
	No	26 (5)	12 (2)	
Timely preparation for angiography procedure	Yes	23 (4)	38 (7)	0.004

ECG: Electrocardiogram; ER: Emergency room; CBC: Complete blood count; D2B: Door to balloon; PCI: Percutaneous coronary intervention; NPO: Nothing per oral; IV: Intravenous; BP: Blood pressure; HR: Heart rate; RR: Respiratory rate.

significant result only in blood glucose level.[22] The current study found non-significant outcomes related to continuous cardiac monitoring, glycosylated haemoglobin (HbA1c), complete blood count, serum urea creatinine and electrolytes, serum magnesium, prothrombin time, activated partial thromboplastin time, and international normalised ratio, door to needle time for fibrinolysis within 30 minutes, and echocardiography. The Egyptian study[22] reported non-significant result in lipid profile, cardiac enzymes, and electrolytes in study and control groups.

Only two AMI standard CP components showed non-significant findings; written consent prior to procedure, and post-angiography monitor vital sign. No study was found that evaluated these components.

A similar study conducted in China promoting and implementing different treatment strategies in this regard has given a blue print for other countries to follow.[23]

On the basis of the findings, it is strongly suggested that the HCPs, particularly the doctors, nurses and CCTs, should follow the systematic approaches of AMI standard CP during care of AMI patients.

Conclusion

The intervention group managed by AMI standard CP had a significantly reduced LOS compared to the control group.

Disclaimer: None.

Conflict of interest: None.

Source of Funding: None.

References

1. Ko JU, Lee GJ, Kim HM, Bang HJ. The effect of the revised clinical pathway of cardiac rehabilitation on participation rates in patients with myocardial infarction: A retrospective study. Korean J Adult Nurs. 2018; 30:536-45.
2. Chan MY, Du X, Eccleston D, Ma C, Mohanan PP, Ogita M, et al. Acute coronary syndrome in the Asia-Pacific region. Int J Cardiol. 2016; 202:861-9.

3. Malcon MC, Menezes A, Assunção MCF, Neutzling MB, Challal P. Effectiveness of an educational intervention on smoking among school adolescents. Rev Bras Epidemiol. 2011; 14:63-72.
4. Khan HG, Rashid A, Khan SA, Yousaf MJ, Aman F, Shoaib M. Comparison of the effects of broiler and domestic chicken meat on serum testosterone and luteinizing hormone levels in rats. J Ayub Med Coll Abbottabad. 2019; 31:485-90.
5. Kolansky DM. Acute coronary syndromes: morbidity, mortality, and pharmacoeconomic burden. Am J Manag Care. 2009; 15:S36-41.
6. Nizami S, Sobani ZA, Raza E, Baloch NUA, Khan J. Causes of smoking in Pakistan: an analysis of social factors. J Pak Med Assoc. 2011; 61:198-201.
7. Roffi M, Patrono C, Collet JP, Mueller C, Valgimigli M, Andreotti F, et al. 2015 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation: Task Force for the Management of Acute Coronary Syndromes in Patients Presenting without Persistent ST-Segment Elevation of the European Society of Cardiology (ESC). Eur Heart J. 2016; 37:267-315.
8. Tahlil T, Coveney J, Woodman RJ, Ward PR. Exploring recommendations for an effective smoking prevention program for Indonesian adolescents. Asian Pac J Cancer Prev. 2013; 14:865-71.
9. Xu X, Leung DYP, Li B, Wang P, Zhao Y. Smoking-related knowledge, attitude, social pressure, and environmental constraints among new undergraduates in Chongqing, China. Int J Environ Res Public Health. 2015; 12:895-909.
10. Almatar M, Peterson GM, Thompson A, McKenzie D, Anderson T, Zaidi STR. Clinical pathway and monthly feedback improve adherence to antibiotic guideline recommendations for community-acquired pneumonia. PLoS One. 2016; 11:e0159467.
11. Daly B, Zon RT, Page RD, Edge SB, Lyman GH, Green SR, et al. Oncology Clinical Pathways: Charting the Landscape of Pathway Providers. J Oncol Pract. 2018; 14:e194-200.
12. Platz T. Evidence-based guidelines and clinical pathways in stroke rehabilitation—an international perspective. Front Neurol. 2019;10:200.
13. Huang X, Fan C, Jia J, Wang L, Li X, Wu Y, et al. The effect of transient ischemic attack clinical pathway. J Neuropsychiatry Clin Neurosci. 2014; 26:386-91.
14. Zhu L, Bai J, Chen Y, Xue D. Effects of a clinical pathway on antibiotic use in patients with community-acquired pneumonia: a multi-site study in China. BMC Infect Dis. 2018; 18:471.
15. NCSS Statistical software. Sample size and power; Power Analysis and Sample Size System (PASS) version 11. [Online] 2021 [Cited 2021 September 23]. Available from: URL: https://www.ncss.com/software/pass/
16. Aniza I, Saperi S, Zafar A, Aljunid S, Wan Norlida I, Oteh M, et al. Implementation of clinical pathways in Malaysia: Can clinical pathways improve the quality of care. Int Med J. 2016; 23:34-45.
17. Buckmaster N, Heazlewood V, Scott I, Jones M, Haerer W, Hillier K. Using a clinical pathway and education to reduce inappropriate prescribing of enoxaparin in patients with acute coronary syndromes: a controlled study. Int Med J. 2006; 36:12-8.
18. Bushra R, Aslam N, Bano UKN, Jamal A, Baig AASMT, Sherwani SK. Prevalence of smoking in teenagers male undergraduate students a study of Karachi, Pakistan. Int J Basic Med Sci Pharma. 2013; 3:49-54.
19. Tahlil T, Woodman RJ, Coveney J, Ward PR. The impact of education programs on smoking prevention: a randomized controlled trial among 11 to 14 year olds in Aceh, Indonesia. BMC Public Health. 2013; 13:367.
20. Bjurling-Sjöberg P. Clinical Pathway Implementation and Teamwork in Swedish Intensive Care: Challenges in Evidence-Based Practice and Interprofessional Collaboration: Acta Universitatis Upsaliensis, 2018.
21. Kalmet P, Koc B, Hemmes B, Ten Broeke R, Dekkers G, Hustinx P, et al. Effectiveness of a multidisciplinary clinical pathway for elderly patients with hip fracture: a multicenter comparative cohort study. Geriatr Orthop Surg Rehabil. 2016; 7:81-5.
22. Ahmed SES, Abbas NI, Khalil SS. Effect of Implementing Clinical Pathway Guidelines on Patients' Clinical Outcomes with Acute Coronary Syndrome. Am J Nurs. 2017; 6:401-17.
23. Gilani SI, Leon DA. Prevalence and sociodemographic determinants of tobacco use among adults in Pakistan: findings of a nationwide survey conducted in 2012. Popul Health Metr. 2013; 11:16.