Utilization of the Clinical Pathway Guideline in the Management of Open Fractures of the long Bone in a Tertiary Hospital: A Retrospective Study

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Abstract- Open fractures are common problems in orthopedic practice that requires immediate management and intervention because of the high incidence of complications. This study presented the initial report after piloting of the clinical pathway to compare the efficacy of using clinical pathway versus nonclinical pathway in the management of open fracture of the long bone in a tertiary hospital. Specifically, this study aimed to determine a) the clinical profile of the patients in the pathway in terms of age, sex, mechanism of injury and type of open fracture based on the Gustilo-Anderson classification; b) determine the time interval from the initial consult at the emergency department to admission, time interval from admission to operative procedure, time interval from admission to discharge, the rate infection or need for repeat surgery related to infection and the clinical and statistical significance of the variables between the clinical pathway group vs non-pathway group.

This is a retrospective descriptive study. The study included patients with isolated open fracture of the long bones admitted at WVSUMC during the years 2018 to 2022 who underwent operative procedure, with or without initial stabilization. Data gathering was done from April 2022 to December 2023. Chart review of all patients with open fractures of the long bone who were admitted within 2-year period before and after the implementation of the pathway was done. Data of the selected patients including the parameters stated in the objectives were extracted. Statistical significance of identified parameters were analyzed using the Mann Whitney U test with p value of 0.05.

Results showed that out of 68 patients, 50% are below 32 years old and 50% are above 32 years old with the majority of male patients (89.7%). For the mechanism of injury, motor vehicular accident accounted for 70.6% of the cases, followed by fall (19.1%), pedestrian accidents (4.4%), and gunshot and grinder injuries which is less common. As per classification according to the Gustillo-Anderson, 38.2% were categorized as type IIIA and 29.4% were IIIB. When comparing the time interval and rate of infection between the two groups, the non-pathway group has a slightly shorter interval from initial consult to the ER up to admission with a mean of 12.34 hours, compared to the pathway group which has mean of 13.49 hours. For the time interval from admission to OR, the pathway group has a shorter time with mean of 15.39 hours, compared to non-pathway group with mean of 26.83 hours. The total length of hospital stay is also shorter in the pathway group with mean of 230.70 hours, compared to the non-pathway group which has a mean of 390.63 hours. The rate of infection is also lower in the pathway group which has 8%, compared to non-pathway group which has 16%.

This study demonstrates that the implementation of clinical pathway guideline for open fractures has a significant decrease in number of hours from admission to operation/initial debridement and length of hospital stay.

Index Terms- *Clinical Pathway Guideline, Open Fractures, Utilization of CPG, West Visayas State University Medical Center Orthopedics*

I. INTRODUCTION

Open fractures of the long bones occur with frequency of 11.5 for every 100,000 persons per year. The incidence is higher in developing countries due to abundant road traffic accidents[1].

In the management of open fractures, the guiding principles are immobilization, tetanus prophylaxis, reduction with or without fixation, restoration of soft tissue and prevention of infection thru surgical debridement and administration of antibiotics. The presence of open wound implies contamination, but not primarily infection.

Debridement is the mainstay of treatment, and it should be done as soon as possible. The golden period is within six hours, with the aim of preventing contamination from becoming infection. There is a significant increase of the colony count beyond this period which can overrun the immune defenses.[1]

The time elapsed between trauma and surgical debridement is greater than 6 hours due to various factors such as delayed of transfer of patients from other health units, need for treatment of associated injuries before treatment of fractures. It also includes logistical issues, such as vacant rooms or wards for admission and operating room availability.

Clinical pathway (CPWs) is a tool used to guide evidence-based healthcare. It aims to translate clinical practice guideline

recommendations into clinical care processes within a healthcare institution's unique culture and environment. It details the steps in the course of treatment or care in a plan, pathway, algorithm, guidelines, or protocol. It aims to standardize care for a specific clinical problem, procedure, or healthcare episode in a particular population.[2]

Thus, this study was conducted to assess the effectiveness of utilizing the Clinical Pathway Guideline for open fractures of the long bone.

II. MATERIALS AND METHODS

This is a retrospective descriptive study. The study included patients with isolated open fracture of the long bones admitted at WVSUMC during the years 2018 to 2022 who underwent operative procedure, with or without initial stabilization. Data gathering was done from April 2022 to December 2023. Chart review of all patients with open fractures of the long bone who were admitted within 2-year period before and after the implementation of the pathway was done. Data of the selected patients including the parameters stated in the objectives were extracted. Statistical significance of identified parameters were analyzed using the Mann Whitney U test with p value of 0.05.

III. RESULTS

Results showed that out of 68 patients, 50% are below 32 years old and 50% are above 32 years old with the majority of male patients (89.7%). For the mechanism of injury, motor vehicular accident accounted for 70.6% of the cases, followed by fall (19.1%), pedestrian accidents (4.4%), and gunshot and grinder injuries which is less common. As per classification according to the Gustillo-Anderson, 38.2% were categorized as type IIIA and 29.4% were IIIB.

Table I. Clinical Profile of Patients

	Variables	f	%
Age	32 years and younger	34	50
	Older than 32 years	34	50
Sex	Male	61	89.7
	Female	7	10.3
Mechanism of Injury	Motor Vehicular Accident	48	70.6
	Fall	13	19.1
	Pedestrian	3	4.4
	Gunshot	2	2.9
	Grinder Injury	1	1.5
Type of Open Fracture Classification (Gustillo-Anderson System)	Type I	11	16.2
	Type II	11	16.2
	Type IIIA	26	38.2
	Type IIIB	20	29.4
Total		**68**	**100**

When comparing the time interval and rate of infection between the two groups, the non-pathway group has a slightly shorter interval from initial consult to the ER up to admission with a mean of 12.34 hours, compared to the pathway group which has mean of 13.49 hours. For the time interval from admission to OR, the pathway group has a shorter time with mean of 15.39 hours, compared to non-pathway group with mean of 26.83 hours. The total length of hospital stay is also shorter in the pathway group with mean of 230.70 hours, compared to the non-pathway group which has a mean of 390.63 hours. The rate of infection is also lower in the pathway group which has 8%, compared to non-pathway group which has 16%.

Table II. Time Interval and Infection Rate

Variables	Non-Clinical Pathway Group (n=35)		Clinical Pathway Group (n=33)	
	Mean	**SD**	**Mean**	**SD**
Time interval of initial ER consult to admission *(in hours)*	12.34	21.564	13.49	13.262
Time interval from admission to OR *(in hours)*	26.83	26.346	15.39	10.923
Time interval from admission to discharge *(in hours)*	390.63	471.527	230.70	208.812
Infection after initial debridement f (%)	16 (23.5%)		8 (11.8%)	

Table III. Significant Difference Between Groups

Variables	U or x^2-value	p-value	Interpretation
ER to admission *(hours)*	448.00	0.11^{ns}	Not Significant
Admission to OR *(hours)*	387.50	0.02*	Significant
Admission to discharge *(hours)*	332.50	<0.01**	Significant
Rate of infection	3.429	0.06^{ns}	Not Significant

Interpretation: *^{ns} – not significant p-value > 0.05; * 0.05 ≥ p-value > 0.01; ** p-value ≤ 0.01*

IV. DISCUSSION

Open fractures continue to be a common injury with a high risk of complications such as wound infection and problems with healing of bone and soft tissues.[3] The basic objectives in the management of open fractures are to prevent infection, reconstruct soft tissue defects and achieve bony union.[1,3]

The study was conducted to evaluate the result after implementation of Clinical Pathway Guideline for isolated fractures of the long bones in a tertiary hospital.

For the clinical profile, out of 68 patients, 50% are below 32 years old and 50% are above 32 years old with the majority of male patients (89.7%). For the mechanism of injury, motor vehicular accident accounted for 70.6% of the cases, followed by

fall (19.1%), pedestrian accidents (4.4%), and gunshot and grinder injuries which is less common. As per classification according to the Gustillo-Anderson, 38.2% were categorized as type IIIA and 29.4% were IIIB.

These results conform to the study by Nwagbara last 2019 about the epidemiology of open fractures, wherein they review the epidemiology of open fractures of the long bone in a Nigerian teaching hospital from 2014 to 2016. Seventy open fractures were treated in the period of the study. Results showed Male to female ratio was 4.3:1, and the peak incidence was 20-39 years old (30%). The most common cause of the injury was motor vehicular accidents (82.9%). The leg bones were the most affected site (63%), and 67.1% were Gustillo type III.

The non-pathway group has a slightly shorter interval from initial consult to the ER up to admission with a mean of 12.34 hours, compared to the pathway group which has mean of 13.49 hours. For the time interval from admission to OR, the pathway group has a shorter time with mean of 15.39 hours, compared to non-pathway group with mean of 26.83 hours. The total length of hospital stay is also shorter in the pathway group with mean of 230.70 hours, compared to the non-pathway group which has a mean of 390.63 hours. The results conform to the study of Tan and Kwek in 2020, wherein in the study that they conducted, there is a significant decrease in the total number of hospital stay by 37.5% from a median of 11.2 to 7 days after implementation of an open fracture clinical pathway.[18]

The rate of infection is also lower in the pathway group which has 8%, compared to non-pathway group which has 16%.

V. CONCLUSION

This study demonstrates that the implementation of clinical pathway guideline for open fractures has a significant decrease in number of hours from admission to operation/initial debridement and length of hospital stay. However, there is no significant difference in the number of hours interval from the ER to admission and rate of infection between the two groups.

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