Risk factors for Extended Hospitalization due to Sickle Cell Pain Crisis

Robert Block[1,2], PharmD Candidate; Danielle Bozzardi-Jerome[1,2], PharmD, BCPS; Ryan Medas[2], PharmD, BCPS
1. Southern Illinois University – Edwardsville School of Pharmacy 2. St. Luke's Hospital, Chesterfield, MO

Southern Illinois University Edwardsville School of Pharmacy

BACKGROUND

- Sickle cell anemia (SCA) is a genetic disorder that results in misshapen red blood cells[1]
- Abnormal blood cells have reduced oxygen carrying capacity which can contribute to pain crises requiring opioid and non-opioid analgesics to control pain[1,2]
- SCA pain crisis is the leading cause of ED visits and hospitalization for patients with SCA. The average length of stay (LoS) is 5 days, however, patients may stay 7 days or longer[1,3]

OBJECTIVE

- This study aimed to identify risk factors associated with short (< 5 days) or extended stay (LoS ≥ 5 days) specific to the patient population at St Luke's Hospital

METHODS

Study Design

- This was a single center, retrospective, observational study. Data was collected on patients that were hospitalized for sickle cell pain crisis between 1/1/18 – 12/31/21.

Study Population

- 18 years old or older
- Admitted with a primary diagnosis of SCA pain crisis

Study Outcomes

- Multiple patient factors were analyzed to determine a relationship between the patient factors and length of stay
- Demographics and history: race, sex, SCA type, SCA pain crisis admission history, co-occurring disease states requiring analgesics
- Outpatient disease management: home medication regimen
- Admission and Inpatient parameters: BMI, SCA relevant lab values, provider specialty consults, pain score and location, inpatient medication regimen, discharge medication regimen

Statistical Analysis

- Factors were considered statistically significant based on an alpha of 0.05. All statistical tests were conducted using SPSS.
- A Pre-Admission model was developed based on patient factors available before admission. A Post-Admission model was similarly developed based on patient factors that are collected in the first 24 hours of admission

RESULTS

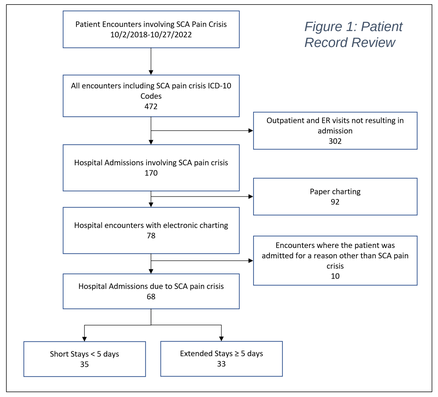

Figure 1: Patient Record Review

Continuous Patient Characteristics		
Characteristic	**Short Stay Mean (SD)**	**Long Stay Mean (SD)**
Length of Stay Overall (Days)	**5.88 (3.95)**	
Length of Stay (Days)	3.17 (1.32)	8.76 (3.78)
Age (years)	32.71 (4.98)	33.61 (6.36)
Home total MME (IV morphine)	143.05 (179.65)	119.94 (117.83)
Day 1 Pain	7.39 (1.04)	7.90 (0.98)
hemoglobin	8.82 (1.13)	9.22 (1.61)
hematocrit	24.99 (3.10)	26.80 (4.12)
Number of admissions in the past 1 year for SCA pain crisis	4.40 (2.60)	4.15 (2.99)

Categorical Patient Characteristics		
Characteristic	**Short Stay No. (%)**	**Long Stay No. (%)**
Total	**n=35**	**n=33**
Race		
African American	35 (100%)	33 (100%)
Gender (M)	1 (3%)	9 (27%)
Hydroxyurea used at home	15 (43%)	24 (73%)
SCA pain crisis admission in previous 30 days	14 (40%)	5 (15%)
PCA		
Hydromorphone	19 (54%)	24 (73%)
Morphine	1 (3%)	6 (18%)
None	15 (43%)	3 (9%)

Pre-Admission Logistic Regression Model				
	Sig.	Odds Ratio	95% CI for Odds Ratio	
			Lower	Upper
Hydroxyurea (Y)	**0.042**	**3.708**	**1.051**	**13.080**
Sex (F)	0.106	0.136	0.012	1.530
WBC	0.510	0.936	0.770	1.139
Hemoglobin	0.361	1.272	0.759	2.130
Home High Dose Opioid (> 90 MME)	0.699	1.268	0.380	4.236

Post-Admission Logistic Regression Model				
	Sig.	Odds Ratio	95% CI for Odds Ratio	
			Lower	Upper
PCA (Y)	**0.005**	**11.418**	**2.093**	**62.278**
Palliative Consult (Y)	0.070	4.676	0.879	24.860
Age	0.633	1.032	0.906	1.177
Sex (F)	**0.016**	**0.041**	**0.003**	**0.553**
SCA Type	0.333	0.633	0.251	1.598

DISCUSSION

- Hydroxyurea use, PCA therapy, and male gender were associated with longer LoS
- Hydroxyurea and PCA therapy are more common in severe SCA, supporting a link between more severe disease and longer LoS[4]
- Female patients make up the majority of admissions analyzed (85%). It's unclear if this trend is indicative of local epidemiology, or if this is a complication of small sample size
- Home opioid use, lab values, and admission pain score are used clinically to guide therapy (drug choice, dosing, blood transfusions), but these factors didn't show statistical significance
- Individualized care plans have previously shown to reduce admission rates, shorten LoS, and improve quality of life for patients.[4] The results of this study could be used to identify patients that would most benefit from those targeted interventions.
- Limitations
  - This is a retrospective observational study, so causation cannot be determined
  - This study also had a small sample size, which can introduce bias into the statistical analysis and increase the potential for type 2 error
  - All data was collected from a single site, limiting external validity

CONCLUSIONS

Home hydroxyurea and inpatient PCA use were both associated with prolonged length of hospital stay for SCA pain crisis. Female gender was associated with a reduced length of stay as well. These findings suggest that worse disease severity, indicated by hydroxyurea use and need for PCA for pain control, could put patients at risk for prolonged lengths of stay. With this in mind, interventions to control pain and reduce length of stay should be particularly targeted in this patient population.

REFERENCES

1. Ballas SK, Gupta K, Adams-Graves P. Sickle cell pain: a critical reappraisal. Blood. 2012 Nov 1;120(18):3647–3656.
2. Brandow AM, Carroll CP, Creary S, Edwards-Elliott R, Glassberg J, Hurley RW, Kutlar A, Seisa M, Stinson J, Strouse JJ, Yusuf F, Zempsky W, Lang E. American Society of Hematology 2020 guidelines for sickle cell disease: management of acute and chronic pain. Blood Adv. 2020 Jun 23;4(12):2656–2701. PMCID: PMC7322963
3. Characteristics of Inpatient Hospital Stays Involving Sickle Cell Disease, 2000-2016 #251 [Internet]. [cited 2022 Oct 20]. Available from: https://www.hcup-us.ahrq.gov/reports/statbriefs/sb251-Sickle-Cell-Disease-Stays-2016.jsp
4. Evidence-Based Management of Sickle Cell Disease: Expert Panel Report, 2014 | NHLBI, NIH [Internet]. [cited 2022 Oct 14]. Available from: https://www.nhlbi.nih.gov/health-topics/evidence-based-management-sickle-cell-disease

Printed 04/01/2023