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Definitive surgical femur fracture fixation in Northern Tanzania: implications of cost, payment method and payment status

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Abstract

Introduction: *Kilimanjaro Christian Medical Centre (KCMC) covers major orthopaedic trauma for a catchment population of 12.5 million people in northern Tanzania. Femur fractures, the most common traumatic orthopaedic injury at KCMC (39%), require open reduction and internal fixation (ORIF) for definitive treatment. It is unclear whether payment affects care. This study sought to explore associations of payment method with episodes of care for femur fracture ORIFs at KCMC.* ***Methods:*** *we performed a retrospective review of orthopaedic records between February 2018 and July 2018. Patients with femur fracture ORIF were eligible; patients without charts were excluded. Ethical clearance was obtained from the KCMC ethics committee. Statistical analysis utilized descriptive statistics, Chi-squared and Fisher's exact Tests, and Student´s t-tests where appropriate.* ***Results:*** *of 76 included patients, 17% (n=13) were insured, 83% (n=63) paid out-of-pocket, 11% (n=8) had unpaid balance, and 89% (n=68) fully paid. Average patient charge ($417) was 42% of per capita GDP ($998). Uninsured patients had higher bills ($429 vs $356; p=0.27) and were significantly more likely to pay an advance payment (95.2% vs 7.7%; p<0.001). Inpatient care was equivalent regardless of payment. Unpaid patients were less likely to receive follow-up (76.5% vs. 25%; p=0.006) and waited longer from injury to admission (31.5 vs 13.3 days; p<0.001), from admission to surgery (30.1 vs 11.1 days; p<0.001), and from surgery to discharge (18.4 vs 7.1 days; p<0.001).* ***Conclusion:*** *equal standard of care is provided to all patients. However, future efforts may decrease disparities in advance payment, timeliness, and follow-up.*

Introduction

The Kilimanjaro Christian Medical Centre (KCMC) is a tertiary referral hospital for the five northern provinces of Tanzania, covering a broad geography and serving a widely disparate population of 12.5 million people. It is the major regional referral center for orthopaedic trauma care with femur fractures being the most common injury encountered (39%) [1]. These injuries typically require open reduction and internal fixation (ORIF) (intramedullary nailing or plate and screw fixation) for definitive treatment. The Lancet Commission on Global Surgery identified affordability as one critical component of surgical care access and based on their complete set of metrics, more than 90% of patients in northern Tanzania lack access to orthopaedic surgical care [2]. Even at KCMC, only 44.5% of patients arriving for care are able to receive definitive orthopaedic surgical intervention when indicated [3].

Previous studies have demonstrated that seeking orthopaedic care in northern Tanzania leads to a significant cost burden on patients and their families [4]. Overrepresentation of insured patients throughout the region´s surgical wards suggests that seeking and receiving surgical care may be linked to payment ability and payment method. It has been shown that the ability to pay alters patient care-seeking behavior [5]. Also, recipients of surgical treatment are more likely to be insured and better able to receive timely care with minimal out-of-pocket costs and lost wages [6].

However, as it pertains to femur fracture fixation, it is unclear what the specific cost burden is and whether payment method (insured vs uninsured) and/or payment status (hospital bill paid in-full or unpaid upon discharge) are associated with care seeking behavior, care delivery and timeliness of care. The aim of this study was to explore associations of payment method (insured or uninsured), and status (paid in-full or unpaid) with episodes of care for femur fracture ORIFs at KCMC.

Methods

Study design and setting: we performed a cross-sectional retrospective review of all orthopaedic procedures performed at KCMC between February 2018 and July 2018, with the aim of identifying all femur fracture ORIF patients. KCMC has a

dedicated orthopaedic ward with its own records, which were used to identify potential cases.

Study population: all patients having undergone femur fracture ORIF during the retrospective timeframe were eligible; patients without available charts and/or payment data were excluded. There were no exclusions based on demographic characteristics. Patient information was de-identified.

Data collection: data was collected from orthopaedic case records which listed procedure names and patient identification numbers. Individual paper patient charts were then requested for confirmation of ORIF, identification of fracture location (i.e. femur or elsewhere), and eventual data collection. De-identified data was collected and entered into a password protected Excel database for statistical analysis.

Variables: demographics and injury data including age, sex, mechanism of injury, specific femur fracture location (proximal, middle or distal third), and the open or closed nature of the fracture were collected. Binary data for payment method (insured or uninsured) and payment status (paid in-full or unpaid) were also documented for all patients. Primary outcomes were based on cost, metrics of care delivery and timeliness of delivered care. All data was collected from charts.

Cost outcomes: cost outcomes consisted of the bill charged to the patient, amount paid by the patient and whether the patient paid an advance prior to receiving care. Costs were reported in patient charts in Tanzanian shillings (TZS), and were converted to USD (TZS 2,280 per USD as of July 31, 2018).

Care outcomes: care outcomes included anesthesia modality (general, spinal or regional blockade), number of radiographs performed, whether post-op imaging was performed prior to discharge, and whether the patient received follow-up care after hospital discharge (binary outcome, yes or no). Intra-operative surgical treatment metrics were also reviewed including anesthesia length (length from induction to procedure end) and procedure length (time from incision to bandage application).

Timeliness outcomes: timeliness outcomes included the time from injury to admission, time from admission to surgery, time from surgery to discharge and hospital length of stay (LOS). All timeliness outcomes were reported in days.

Statistical analysis: descriptive statistics were utilised to demonstrate the raw outcome values, including demographics, insurance coverage, payment status, and all cost, care, and timeliness metrics. Student´s t-tests were performed to determine differences for all cost and timeliness outcomes based on payment method and payment status, as well as for imaging numbers. Chi-squared and Fisher Exact tests were used to determine differences for imaging before discharge, follow-up care after discharge, and anesthesia modality based on payment method and payment status. Statistical analysis was conducted with Stata IC Release 16 (StataCorp LLC, College Station, Texas). All tests were two-sided with the statistically significant p-value set at 0.05 a priori. As this was an introductory study with a smaller sample size than expected, adjustment was not conducted.

Ethical considerations: ethical clearance was obtained from the KCMC Ethics Committee and IRB approval (Research Ethical Clearance No. 2220, Proposal No. 1071) prior to any collection of deidentified retrospective patient data and analysis. All research was in compliance with KCMC research policies and procedures. This study was funded by a travel grant from the University of Pennsylvania Center for Global Health.

Results

Patients characteristics

During the study period, a total of 352 ORIF procedures were identified, for which 186 (53%) had available charts. Of this group, 77(41%) were identified as having undergone femur ORIF. Billing

data was unavailable for one patient; this patient was excluded from the analysis. Therefore, the remaining 76 (41%) patients met the inclusion criteria. The majority of patients included in this study were male (62, 81.6%), were injured in an RTA (43, 56.6%) or sustained a fall (10, 30.3%) and had a closed fracture (69, 90.8%). Middle third femur fractures were the most common fracture location (29, 38.2%) (Table 1). Most patients did not have health insurance coverage (63, 82.9%), although a majority were able to pay their bill in-full (68, 89.5%). Insured patients were all covered by public schemes, with the majority (12, 92.3%) being covered by the National Health Insurance Fund (NHIF). Most patients (61, 80.3%) paid an advance before receiving surgical care, accounting for between 14.1% to 72.6% of their total bill (95% CI 37.5% to 43.5%). The average bill was $417 (95% CI $369, $465), of which the average patient paid $394 (95% CI $348, $440) (2,280.00 TZS per USD) (Table 2).

Cost

Patients with an unpaid balance were charged significantly more than patients who paid in-full ($558 vs $400; p=0.049), although statistically they paid the same amount ($339 vs $400; p=0.43). Uninsured patients were significantly more likely to have paid an advance prior to receiving surgical care compared to insured patients (95.2% vs. 7.7%; p<0.001). Unpaid patients had an average remaining balance of $219 (95% CI $95 to $343), or 39.2% of the average bill (Table 3).

Care delivery

Patients did not differ across most care metrics based on payment method or payment status. However, only 2 (25%) patients with an unpaid balance were seen for post-operative follow-up compared to 52 (76.5%) of patients who paid in-full (p=0.006) (Table 4).

Timeliness

No statistically significant timeliness associated differences were observed based on payment method. However, insured patients waited less time across all categories: from injury to admission (11.4 vs. 16.0 days; p=0.30), from admission to surgery (9.5 vs. 13.8 days; p=0.29) and from surgery to discharge (9.1 vs 4.6 days; p=0.075). Insured patients also exhibited a shorter overall LOS (14.1 vs. 22.9 days; p=0.12). Statistical significance was observed between groups with regards to patient payment status. Unpaid patients waited significantly longer across all categories: from injury to admission (31.5 vs 13.3 days; p<0.001), from admission to surgery (30.1 vs 11.1 days; p<0.001), and from surgery to discharge (18.4 vs 7.1 days; p<0.001). Unpaid patients had nearly three times the LOS (48.5 vs 18.2 days; p<0.001) (Table 5).

Discussion

This introductory analysis quantified the cost burden and characterised the payment method and payment status of patients undergoing femur fracture ORIF at KCMC. We found a large cost burden on patients as well as differences in follow-up care and timeliness of care delivery based on payment status. With respect to charges, the direct medical costs observed for femur fracture ORIF were high for the average Tanzanian. For all patients, the average hospital bill was $417; the 2018 GDP per capita in Tanzania was $998. Therefore, direct hospital costs for surgical care of a femur fracture represented nearly half of per capita GDP [7]. This did not include expenses such as travel and foregone income. Previous studies have demonstrated that work-loss associated costs for KCMC outpatients were higher than the cost of care - in excess of $600 per patient. When combined with the average bill, receiving femur fracture ORIF at KCMC may result in catastrophic out-of-pocket expense for the average Tanzanian [4].

While most patients were uninsured, we found that 15.8% of the cohort was insured by NHIF, more than double the coverage seen in the general Tanzanian population (7.1%) [8]. While overall insurance coverage (17.1%) in our cohort was similar to that of the general population (16%), we

observed overrepresentation of NHIF coverage. This could be secondary to governmental success in improving patient enrollment [9,10]. Compared to previous findings looking at all surgical conditions at KCMC, overall insurance coverage is actually lower amongst femur ORIF patients (17.1% vs. 41%) [6]. The negative impact on mobility and returning to work may compel patients to seek care regardless of insurance status [11]. This is supported by our patient demographics; the average patient was 35-years-old and over 80% of our cohort was male. This is a key demographic of economic labor, creating an added incentive for seeking definitive treatment [11-14].

Despite high costs associated with care, most patients (89.5%) paid in-full, with uninsured patients paying more overall than insured patients. Patients who were uninsured more often paid an advance prior to receiving ORIF than insured patients (95.2% vs 7.7%), adding to the overall cost. This suggests that an advance functioned as a deposit to demonstrate that the patient could pay [15,16]. This disparity contributes to the larger cost burden on uninsured patients.

Our data demonstrates that regardless of payment method and payment status, patients received the same standard of care. However, patients with unpaid bills were less likely to receive follow-up care after discharge. Following ORIF, continued follow-up and rehabilitation are necessary to ensure adequate healing [17]. A potential reluctance exists on the end of the hospital, unpaid patients, or both for follow-up care. One hypothesis is that patients are worried they will have to pay the remainder of their bill. In addition, a follow-up visit requires additional out-of-pocket expense [18]. After receiving definitive treatment for surgical and/or medical conditions in a variety of LMIC settings, many patients avoid accruing additional costs, missing work, and returning for follow-up [19,20]. Previous studies have found that patients after an orthopaedic injury have experienced disability, loss of employment and lower wages upon discharge [4,21-24]. In addition, other studies have demonstrated an increased risk of treatment abandonment based on payment difficulties [25]. Patients alternatively may be seeking out local, affordable care [26]. An appropriate system is required to ensure patient follow-up.

When analyzing payment status, unpaid patients waited significantly longer than paid patients across all metrics. Previous studies have demonstrated that patients exhibiting difficulty paying were less likely to seek care [27-29]. This contributes to the patient´s decision on whether or not to seek care at KCMC. The availability of local and potentially cheaper options may also cause further delays in presentation to KCMC for patients with an inability to pay [2,26].

For two specific timeliness metrics, admission to surgery and surgery to discharge, unpaid patients also waited significantly longer. It has been described at KCMC that these patients are categorised as D-Still patients - Discharged but still admitted due to an inability to pay [30]. These patients are at risk for absconding due to a fear of debt and being unable to pay in-full [1]. The increased hospital cost burden incentivises the provider side to ensure patient payment at various steps through the care process [25]. Therefore, patients who are unable to pay may be expected to reach a certain level of payment prior to discharge, further prolonging the overall LOS.

Reducing LOS disparities between paid in-full and unpaid patients would decrease the economic burden on patients, increase the ability of KCMC to care for more patients, and improve trainee education by maximizing case-loads [31-34]. This could be done through institutional efforts such as improving insurance coverage through social work programs, establishing extended payment plans and enhancing collaboration with local providers [26,35,36]. These findings naturally feed into the collaborative work currently underway between KCMC and other institutions [37]. Ongoing bilateral work to create an Orthopaedic Center of Excellence is focused on increasing surgical capacity

at KCMC and importantly ensuring equal access to care regardless of a patient´s ability to pay.

This study had several limitations. As KCMC did not utilise an electronic medical record during this study, not all were available which may have created a selection bias. Just over half (53%, n=186) of identified ORIF procedures were available. However, this was the most specific and comprehensive data source available. Of our identified ORIF cohort with available paper charts, 41% (n=76) were for patients undergoing femur fracture fixation. This appears to be in line with previous studies demonstrating that femur fractures account for 31-39% of orthopaedic injuries at KCMC [1,3]. While this was not a complete or purely random sampling of retrospective cases, the percentages support a representative sample. The sample size was also limited, but this study was an introductory exploration and will necessitate further study. Regarding generalizability, these findings are specific to KCMC but we hope this analysis may be pursued beyond KCMC.

Funding: this work was supported by a small travel grant ($500) from the University of Pennsylvania Center for Global Health.

Conclusion

Our findings demonstrate that the current system provides equal surgical care, regardless of payment method. However, inadequate payment status results in a large cost burden, a lack of follow-up care and a disparity in timeliness of care delivery. Future research should continue monitoring trends in insurance coverage, quantify the cost burden and explore associations between payment and other surgical procedures. These factors are critical in order to deliver quality care to all patients.

What is known about this topic

- *It is already well understood that musculoskeletal trauma injuries are a common cause of injury and disability, and femur fracture injuries are the most common at KCMC;*
- *It is also well understood that these injuries require surgical fixation, which may be expensive.*

What this study adds

- *This study demonstrates the direct cost burden on patients for surgical femur fracture fixation;*
- *This study demonstrates differences in the delivery of care to patients based on payment method and payment status, which have not been characterized in any context in sub-Saharan Africa to the best of our knowledge.*

Competing interests

The authors declare no competing interests. One author reports personal fees from Zimmer (consulting), personal fees from Smith and Nephew (consulting), personal fees from Medacta (consulting), personal fees from Microport (consulting), and personal fees from Elsevier (royalites), all outside the submitted work.

Authors' contributions

PPR designed the study, collected data, interpreted data, and assisted in manuscript drafting. HM, MJ, RT assisted in study design, data collection, and manuscript revision. NPS set up study design, assisted in data analysis, interpretation, and manuscript drafting. All authors read, edited, and approved the final manuscript.

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References

1. Premkumar A Massawe H, Mshabaha DJ, Foran JR, Ying X, Sheth NP. The burden of orthopaedic disease presenting to a referral hospital in northern Tanzania. Global Surgery. 2015;2(1): 70-5. **PubMed**| **Google Scholar**
2. Premkumar A, Ying X, Mack Hardaker W, Massawe HH, Mshahaba DJ, Mandari F *et al*. Access to Orthopaedic Surgical Care in Northern Tanzania: A Modelling Study. World J Surg. 2018;42(10): 3081-8. **PubMed**| **Google Scholar**
3. Hardaker WM, Jusabani M, Massawe H, Pallangyo A, Temu R, Masenga G *et al*. The Burden of Orthopaedic Disease in Sub-Saharan Africa: A Focus on Tanzania. Research Square. Pre-print 2020. **PubMed**| **Google Scholar**
4. Davey S, Bulat E, Massawe H, Pallangyo A, Premkumar A, Sheth N. The Economic Burden of Non-fatal Musculoskeletal Injuries in Northeastern Tanzania. Ann Glob Health. 2019;85(1). **PubMed**| **Google Scholar**
5. Yeh D, Jones M, Schulman C, Karmacharya J, Velazquez OC. Uninsured South Florida vascular surgery patients are less likely to receive optimal medical management than their insured counterparts. J Vasc Surg. 2010;51(4 Suppl): 4s-8s. **PubMed**| **Google Scholar**
6. Rajaguru PP, Jusabani MA, Massawe H, Temu R, Sheth NP. Understanding surgical care delivery in Sub-Saharan Africa: a cross-sectional analysis of surgical volume, operations, and financing at a tertiary referral hospital in rural Tanzania. Glob Health Res Policy. 2019;4: 30. **PubMed**| **Google Scholar**
7. The United Republic of Tanzania. National Accounts of Tanzania Mainland 2017 National Bureau of Statistics 2018. Accessed on October 2020.
8. Amu H, Dickson KS, Kumi-Kyereme A, Darteh EKM. Understanding variations in health insurance coverage in Ghana, Kenya, Nigeria, and Tanzania: Evidence from demographic and health surveys. PLoS One. 2018;13(8): e0201833. **PubMed**| **Google Scholar**
9. Borghi J, Mtei G, Ally M. Modelling the implications of moving towards universal coverage in Tanzania. Health Policy Plan. 2012;27 Suppl 1: i88-100. **PubMed**| **Google Scholar**
10. Maluka S, Chitama D, Dungumaro E, Masawe C, Rao K, Shroff Z. Contracting-out primary health care services in Tanzania towards UHC: how policy processes and context influence policy design and implementation. Int J Equity Health. 2018;17(1): 118. **PubMed**| **Google Scholar**
11. O'Hara NN, Mugarura R, Slobogean GP, Bouchard M. The orthopaedic trauma patient experience: a qualitative case study of orthopaedic trauma patients in Uganda. PLoS One. 2014;9(10): e110940. **PubMed**| **Google Scholar**
12. Iganus R, Hill Z, Manzi F, Bee M, Amare Y, Shamba D *et al*. Roles and responsibilities in newborn care in four African sites. Trop Med Int Health. 2015;20(10): 1258-64. **PubMed**| **Google Scholar**
13. Exavery A, Lutambi A. M, Wilson N, Mubyazi GM, Pemba S, Mbaruku G. Gender-based distributional skewness of the United Republic of Tanzania's health workforce cadres: a cross-sectional health facility survey. Hum Resour Health. 2013;11: 28. **PubMed**| **Google Scholar**

14. Dillip A, Mboma ZM, Greer G, Lorenz LM. 'To be honest, women do everything': understanding roles of men and women in net care and repair in Southern Tanzania. Malar J. 2018;17(1): 459. **PubMed**| **Google Scholar**
15. Carr T, Teucher U, Casson AG. Waiting for scheduled surgery: A complex patient experience. J Health Psychol. 2017;22(3): 290-301. **PubMed**| **Google Scholar**
16. Gill RS, Majumdar SR, Wang X, Tuepah R, Klarenbach SW, Birch DW *et al*. Prioritization and willingness to pay for bariatric surgery: the patient perspective. Can J Surg. 2014;57(1): 33-9. **PubMed**| **Google Scholar**
17. Rafael Arceo S, Runner RP, Huynh TD, Gottschalk MB, Schenker ML, Moore TJJr. Disparities in follow-up care for ballistic and non-ballistic long bone lower extremity fractures. Injury. 2018;49(12): 2193-7. **PubMed**| **Google Scholar**
18. Binyaruka P, Patouillard E, Powell-Jackson T, Greco G, Maestad O, Borghi J. Effect of Paying for Performance on Utilisation, Quality, and User Costs of Health Services in Tanzania: A Controlled Before and After Study. PLoS One. 2015;10(8): e0135013. **PubMed**| **Google Scholar**
19. Xu LW, Vaca SD, He JQ, Nalwanga J, Muhumuza C, Kiryabwire J *et al*. Neural tube defects in Uganda: follow-up outcomes from a national referral hospital. Neurosurg Focus. 2018;45(4): E9. **PubMed**| **Google Scholar**
20. Frijters EM, Hermans LE, Wensing AMJ, Devillé Wljm, Tempelman HA, De Wit JBF. Risk factors for loss to follow-up from antiretroviral therapy programmes in low-income and middle-income countries. Aids. 2020;34(9): 1261-88. **PubMed**| **Google Scholar**
21. Juillard C, Labinjo M, Kobusingye O, Hyder AA. Socioeconomic impact of road traffic injuries in West Africa: exploratory data from Nigeria. Inj Prev. 2010;16(6): 389-92. **PubMed**| **Google Scholar**
22. O'Hara NN, Mugarura R, Potter J, Stephens T, Rehavi MM, Francois P *et al*. Economic loss due to traumatic injury in Uganda: The patient's perspective. Injury. 2016;47(5): 1098-103. **PubMed**| **Google Scholar**
23. Mock CN, Gloyd S, Adjei S, Acheampong F, Gish O. Economic consequences of injury and resulting family coping strategies in Ghana. Accid Anal Prev. 2003;35(1): 81-90. **PubMed**| **Google Scholar**
24. El Tayeb S, Abdalla S, Heuch I, Van den Bergh G. Socioeconomic and disability consequences of injuries in the Sudan: a community-based survey in Khartoum State. Inj Prev. 2015;21(e1): e56-62. **PubMed**| **Google Scholar**
25. Mostert S, Njuguna F, van de Ven PM, Olbara G, Kemps LJ, Musimbi J *et al*. Influence of health-insurance access and hospital retention policies on childhood cancer treatment in Kenya. Pediatr Blood Cancer. 2014;61(5): 913-8. **PubMed**| **Google Scholar**
26. Card EB, Obayemi JE, Shirima O, Lazaro M, Massawe H, Stanifer JW *et al*. Practices and Perspectives of Traditional Bone Setters in Northern Tanzania. Ann Glob Health. 2020;86(1): 61. **PubMed**| **Google Scholar**
27. Medford-Davis LN, Lin F, Greenstein A, Rhodes KV. "I Broke My Ankle": Access to Orthopedic Follow-up Care by Insurance Status. Acad Emerg Med. 2017;24(1): 98-105. **PubMed**| **Google Scholar**
28. Calfee RP, Shah CM, Canham CD, Wong AH, Gelberman RH, Goldfarb CA. The influence of insurance status on access to and utilization of a tertiary hand surgery referral center. J Bone Joint Surg Am. 2012;94(23): 2177-84. **PubMed**| **Google Scholar**
29. Wang J, Ha J, Lopez A, Bhuket T, Liu B, Wong RJ. Medicaid and Uninsured Hepatocellular Carcinoma Patients Have More Advanced Tumor Stage and Are Less Likely to Receive Treatment. J Clin Gastroenterol. 2018;52(5): 437-43. **PubMed**| **Google Scholar**
30. Obayemi JE, Card EB, Sheth NP. Characterizing Discharged But Still Admitted (DStill) Patients at Kilimanjaro Christian Medical Centre. 2020. Unpublished. **PubMed**| **Google Scholar**

31. Stepaniak PS, Vrijland WW, de Quelerij M, de Vries G, Heij C. Working with a fixed operating room team on consecutive similar cases and the effect on case duration and turnover time. Arch Surg. 2010;145(12): 1165-70. **PubMed**| **Google Scholar**
32. Wilson S, Marx RG, Pan TJ, Lyman S. Meaningful Thresholds for the Volume-Outcome Relationship in Total Knee Arthroplasty. J Bone Joint Surg Am. 2016;98(20): 1683-90. **PubMed**| **Google Scholar**
33. Mathew PJ, Jehan F, Kulvatunyou N, Khan M, O'Keeffe T, Tang A *et al*. The burden of excess length of stay in trauma patients. Am J Surg. 2018;216(5): 881-5. **PubMed**| **Google Scholar**
34. Klimstra MA, Beck NA, Forte ML, Van Heest AE. Did a Minimum Case Requirement Improve Resident Surgical Volume for Closed Wrist and Forearm Fracture Treatment in Orthopedic Surgery? J Surg Educ. 2019;76(4): 1153-60. **Google Scholar**
35. Baine SO, Kakama A, Mugume M. Development of the Kisiizi hospital health insurance scheme: lessons learned and implications for universal health coverage. BMC Health Serv Res. 2018;18(1): 455. **PubMed**| **Google Scholar**
36. Muela SH, Mushi AK, Ribera JM. The paradox of the cost and affordability of traditional and government health services in Tanzania. Health Policy Plan. 2000;15(3): 296-302. **PubMed**| **Google Scholar**
37. Sheth NP, Hardaker WM, Zakielarz KS, Rudolph M, Massawe H, Levin LS *et al*. Developing Sustainable Orthopaedic Care in Northern Tanzania: An International Collaboration. J Orthop Trauma. 2018;32 Suppl 7: S25-s8. **PubMed**| **Google Scholar**

Table 1: patient demographics characteristics, mechanism of injury, and location of femur fracture

	N or Mean [95% CI]	**% or STD**
Sex		
Male	62	81.6%
Female	14	18.4%
Age	35.5 [31.6, 39.4]	± 17.4 years
Mechanism of Injury		
Road Traffic Accident (RTA)	43	56.6%
Fall	23	30.3%
Other	10	13.1%
Open or Closed		
Open	7	9.2%
Closed	69	90.8%
Fracture Location		
Proximal 1/3	26	34.2%
Middle 1/3	29	38.2%
Distal 1/3	21	27.6%

Table 2: payment method and payment status for entire patient cohort (n=76)		
	N or Mean (Range)	**% or STD**
Payment Method (Insured vs Uninsured)		
Covered	13	17.1%
NHIF	12	92.3%
NSSF	1	7.7%
Out-of-pocket	63	82.9%
Payment Status		
Paid in-full	68	89.5%
Unpaid Bills Remaining	8	10.5%
Paid Advance		
Yes	61	80.3%
No	15	19.7%
Average Advance Amount (N=61)	$160 ($110 to $373)	±$70
Average Advance Amount as % of Total Bill (N=61)	40.5% (14.1% to 72.6%)	±12.1%
Charged Bill	$417 ($76.8 to $1016)	±$215
Paid Amount	$394 ($76.8 to $1003)	±$205

Table 3: comparison of charges, payments, and advance by payment method and status						
	Insured	**Uninsured**	**P-Value**	**Fully Paid**	**Unpaid**	**P-Value**
Bill charged	$356±$213	$429±$258	0.2650	$400±$207	$558±$246	0.0491*
Amount paid	$356±$213	$402±$205	0.4703	$400±$207	$339±$207	0.425
Paid advance						
Yes	1 (7.7%)	60 (95.2%)	<0.0001*	53 (87.9%)	0 (0%)	0.138
No	12 (92.3%)	3 (4.8%)		15 (22.1%)	8 (100%)	

Table 4: comparison of care delivery metrics by payment method and status						
	Payment Method			**Payment Status**		
	Insured	Uninsured	P-Value	Fully Paid	Unpaid	P-Value
Anesthesia						
GA	0 (0%)	8 (12.7%)	0.337	7 (10.3%)	1 (12.5%)	1.000
SA	13 (100%)	55 (87.3%)		61 (89.7%)	7 (87.5%)	
X-Rays Performed	3.6±1.7	4.8±3.2	0.1948	4.6±3.1	5.0±3.1	0.711
Imaging Prior to Admission?						
Yes	13 (100%)	57 (90.5%)	0.582	62 (91.1%)	8 (100%)	1.000
No	0 (0%)	6 (9.5%)		6 (8.9%)	0 (0%)	
Post-Op Imaging Prior to D/C?						
Yes	13 (100%)	62 (98.4%)	1.000	67 (98.5%)	8 (100%)	1.000
No	0 (0%)	1 (1.6%)		1 (1.5%)	0 (0%)	
Pt. Seen F/U After D/C?						
Yes	8 (61.5%)	46 (73.0%)	0.504	52 (76.5%)	2 (25.0%)	0.006*
No	5 (38.5%)	17 (27.0%)		16 (23.5%)	6 (75.0%)	
Anesthesia Length (minutes)	156.5±47.6	156.8±50.3	0.9835	158.5±50.2	141.5±43.3	0.3619
Procedure Length (minutes)	124.2±38.7	121.5±47.4	0.8467	122.2±46.9	119.9±37.2	0.8920

Table 5: comparison of timeliness metrics by payment method and status, days						
	Insured	**Uninsured**	**P-Value**	**Fully Paid**	**Unpaid**	**P-Value**
Injury to admission	11.4±7.9	16.0±14.6	0.3008	13.3±9.6	31.5±28.6	0.0003*
Admission to surgery	9.5±7.6	13.8±14.3	0.2911	11.1±8.8	30.1±28.9	0.0001*
Surgery to discharge	4.6±2.1	9.1±8.8	0.0750	7.1±6.5	18.4±13.7	0.0001*
Length of stay	14.1±8.8	22.9±19.7	0.1196	18.2±12.3	48.5±36.2	<0.0001*