The Cost-Effectiveness of Intramedullary Nailing versus External Fixation for the Treatment of Open Tibia Fractures in Tanzania

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Purpose: Open tibia fractures represent a significant cause of orthopedic morbidity in low and middle-income countries (LMICs). These injuries represent a significant cost burden to both individuals and society due to their high propensity for complications such as infection, nonunion, and malunion. External fixation and intramedullary nailing are both used for definitive management of open tibia fractures but given the differences in cost and lack of clear superiority of intramedullary nailing, cost-effectiveness becomes important to consider in LMICs. This study aimed to examine the cost-effectiveness of intramedullary nails (IMNs) versus external fixation utilized within Tanzania.

Methods: This was a secondary analysis using previously collected cost and treatment effectiveness data from a randomized controlled trial conducted at a single tertiary hospital in Dar Es Salaam, Tanzania. Direct costs were collected using an internal audit of operating costs and hospital staff time. Indirect costs were collected from patients in a long-term follow-up study assessing total lost work. TreeAge Pro software was used to build a Markov model to run the cost-effectiveness simulations. The primary outcome was the incremental cost-effectiveness ratio (ICER) over a lifetime time horizon. Both the payer and societal perspective were considered. To account for uncertainty, both 1-way and probabilistic sensitivity analysis were performed. Costs were reported in 2022 US dollars. We used a willingness-to-pay threshold (WTP) of $1099 based on World Health Organization (WHO) recommendations.

Results: From the payer perspective, the cost of external fixation (396 USD) was lower than that of the SIGN IMN (529 USD), driven primarily by shorter procedure time. However, IMNs were associated with more quality-adjusted life years (QALYs). From the payer perspective, the ICER was $499/QALY with a donated nail and $701/QALY using a purchased locally available nail (Samay surgical). From the societal perspective the ICER was lower at $70/QALY, driven largely by a quicker recovery among patients who received an IMN (Figure 1).

Conclusion: From both the payer and the societal perspective, intramedullary nailing is considered highly cost effective using WHO WTP thresholds. This finding was consistent whether the IMN was donated or purchased from local suppliers. These results are likely generalizable to other tertiary referral centers in LMICs.