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Managing Unstable Angina In a Patient with a Spinal Cord Stimulator and Tremors: A Case Report From a Rural Setting

Morgan Brown-Walker, B.S., Dr. Alexa Namba, D.O., MPH

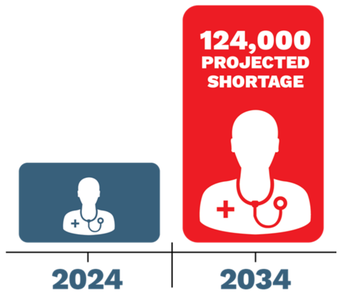
Background

Unstable Angina (UA) is a medical emergency characterized by chest pain that occurs unpredictably and does not resolve with rest. It is commonly caused by coronary atherosclerosis and can lead to life-threatening cardiac events if not promptly managed. Standard treatments include antiplatelet therapy, anticoagulants, and anti-ischemic agents. The purpose of this case report is to highlight the unique challenges in diagnosing and managing unstable angina in a patient with multiple comorbidities, including a spinal stimulator and neurological tremors, in a rural healthcare setting. The interactions between her conditions complicated both diagnostic accuracy and therapeutic intervention.

Goal

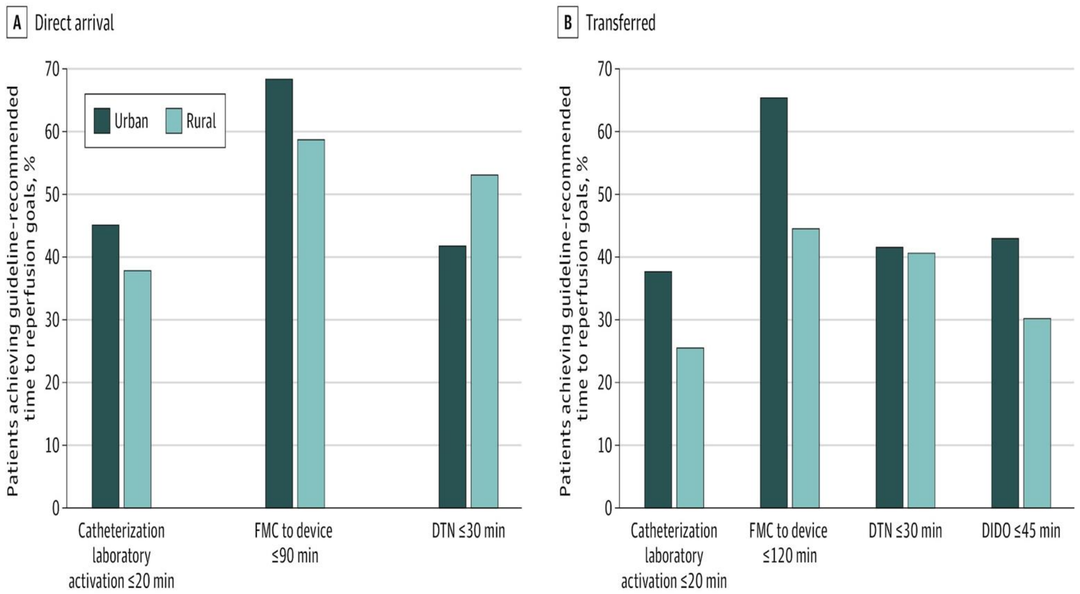
The primary goal of this manuscript is to illustrate the complex diagnostic and management challenges posed by unstable angina in a medically complex patient residing in a rural healthcare setting.

1. **Highlight the Diagnostic Barriers**
2. **Expose Limitations in Rural Healthcare Infrastructure**



Case Presentation

A 67-year-old female with a history of myocardial infarction, hypertension, tremors, and chronic pain managed with a spinal cord stimulator presented to her primary care physician with complaints of worsening dyspnea and chest pain. The pain had woken her from sleep, prompting her to take nitroglycerin. Additionally, she reported a progressive worsening of her tremors over several months. An electrocardiogram (ECG) was performed in the primary care setting, but significant artifacts due to severe tremors and potential interference from the spinal cord stimulator complicated interpretation. Given her presentation and history, the patient was advised to seek immediate evaluation at the nearest hospital with a catheterization laboratory. Upon further workup, including coronary angiography, no acute ischemic changes were found, and she was discharged once a normal sinus rhythm was confirmed.



Discussion

Managing acute coronary syndromes in rural healthcare settings presents inherent difficulties, as these regions often lack immediate access to specialists, advanced imaging, and interventional cardiology services. Addressing these disparities requires improved telemedicine integration, expanded emergency transport options, and better training for primary care providers to recognize and manage complex cardiac cases in resource-limited settings.This case is drawn from a rural primary care context in North Carolina, where infrastructure, resource allocation, and patient demographics may differ significantly from other rural regions nationally or globally. These geographic and specific factors may limit applicability to urban or differently resourced healthcare environments.

Conclusion

This case underscores the unique challenges of diagnosing and managing unstable angina in a medically complex patient with comorbid neurological tremors and a spinal cord stimulator, particularly within the constraints of a rural healthcare setting. It highlights how atypical presentations, device interference, and limited diagnostic clarity can complicate timely cardiovascular risk stratification. Furthermore, it brings attention to the systemic limitations faced by rural providers, which can directly impact patient outcomes. This case reinforces the need for enhanced provider education, expanded telemedicine capabilities, and integrated referral pathways to support frontline clinicians in rural areas.

References

1. Hedayati T, Yadav N, Khanagavi J. Non-ST-Segment Acute Coronary Syndromes. *Cardiol Clin*. Feb 2018;36(1):37-52. doi:10.1016/j.ccl.2017.08.003
2. Hillerson D, Li S, Misumida N, et al. Characteristics, Process Metrics, and Outcomes Among Patients With ST-Elevation Myocardial Infarction in Rural vs Urban Areas in the US: A Report From the US National Cardiovascular Data Registry. *JAMA Cardiol*. Oct 1 2022;7(10):1016-1024. doi:10.1001/jamacardio.2022.2774
3. Nuako A, Liu J, Pham G, et al. Quantifying rural disparity in healthcare utilization in the United States: Analysis of a large midwestern healthcare system. *PLoS One*. 2022;17(2):e0263718. doi:10.1371/journal.pone.0263718
4. Aljassim N, Ostini R. Health literacy in rural and urban populations: A systematic review. *Patient Educ Couns*. Oct 2020;103(10):2142-2154. doi:10.1016/j.pec.2020.06.007
5. Greenwood-Ericksen MB, Kocher K. Trends in Emergency Department Use by Rural and Urban Populations in the United States. *JAMA Netw Open*. Apr 5 2019;2(4):e191919. doi:10.1001/jamanetworkopen.2019.1919
6. Maita KC, Maniaci MJ, Haider CR, et al. The Impact of Digital Health Solutions on Bridging the Health Care Gap in Rural Areas: A Scoping Review. *Perm J*. Sep 16 2024;28(3):130-143. doi:10.7812/TPP/23.134
7. Gizaw Z, Astale T, Kassie GM. What improves access to primary healthcare services in rural communities? A systematic review. *BMC Prim Care*. Dec 6 2022;23(1):313. doi:10.1186/s12875-022-01919-0
8. Renner DM, Westfall JM, Wilroy LA, Ginde AA. The influence of loan repayment on rural healthcare provider recruitment and retention in Colorado. *Rural Remote Health*. Oct-Dec 2010;10(4):1605.
9. Afifi RA, Parker EA, Dino G, Hall DM, Ulin B. Reimagining Rural: Shifting Paradigms About Health and Well-Being in the Rural United States. *Annu Rev Public Health*. Apr 5 2022;43:135-154. doi:10.1146/annurev-publhealth-052020-123413
10. Khan IA. Differential electrocardiographic artifact from implanted thalamic stimulator. *Int J Cardiol*. Aug 2004;96(2):285-6. doi:10.1016/j.ijcard.2003.04.061
11. Siddiqui MA, Khan IA. Differential electrocardiographic artifact from implanted spinal cord stimulator. *Int J Cardiol*. Feb 2003;87(2-3):307-9. doi:10.1016/s0167-5273(02)00355-8
12. McMaughan DJ, Oloruntoba O, Smith ML. Socioeconomic Status and Access to Healthcare: Interrelated Drivers for Healthy Aging. *Front Public Health*. 2020;8:231. doi:10.3389/fpubh.2020.00231
13. Schroder SL, Richter M, Schroder J, Frantz S, Fink A. Socioeconomic inequalities in access to treatment for coronary heart disease: A systematic review. *Int J Cardiol*. Sep 15 2016;219:70-8. doi:10.1016/j.ijcard.2016.05.066
14. Schroder SL, Fink A, Richter M. Socioeconomic differences in experiences with treatment of coronary heart disease: a qualitative study from the perspective of elderly patients. *BMJ Open*. Nov 13 2018;8(11):e024151. doi:10.1136/bmjopen-2018-024151
15. Quatromoni J, Jones R. Inequalities in socio-economic status and invasive procedures for coronary heart disease: a comparison between the USA and the UK. *Int J Clin Pract*. Dec 2008;62(12):1910-9. doi:10.1111/j.1742-1241.2008.01943.x