Cardiology Research and Cardiovascular Medicine
Medepalli AM, et al. Cardiolog Res Cardiovasc Med 8: 220.
www.doi.org/10.29011/2575-7083.100220
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Research Article

Development of a Cardio-Oncology VEGF-I Algorithm at a Large Community Hospital

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Citation: Medepalli AM, Ninan M, Chi M, Bonta I, Cantuaria G, et al. (2024) Development of a Cardio-Oncology VEGF-I Algorithm at a Large Community Hospital. Cardiol Res Cardiovasc Med 8: 220. DOI: https://doi.org/10.29011/2575-7083.100220

Received Date: 25 December, 2023; **Accepted Date:** 02 January, 2024; **Published Date:** 05 January, 2024

Abstract

Abnormal activation of vascular endothelial growth factor (VEGF) plays a role in the increase in the angiogenic process of numerous metastatic malignancies. VEGF-inhibitor (VEGFi) chemotherapy agents are commonly used as indicated in several malignancies, including renal cell, lung, gastric, hepatocellular, colorectal, and ovarian cancer. However, the use of VEGFi chemotherapy agents can lead to an increased incidence of vascular toxicity, particularly when used alone or in patients with a history of prior radiation and chemotherapy toxicities or experiencing rebound hypotension with intermittent dosing. To address these complications, the cardio-oncology task force (COTF) at Northside Hospital created and implemented practical guidelines and algorithms for risk monitoring, adapted from the 2022 ESC guidelines. These guidelines include a cardiovascular risk assessment algorithm for monitoring patients initiating VEGFi and tyrosine kinase inhibitor (TKI) treatments, as well as an algorithm for the acute management of hypertension prior to VEGFi infusion. Moving forward, the COTF aims to develop a research protocol to evaluate the efficacy and reduced cardiovascular toxicity associated with the simplified algorithms. The goal is to minimize treatment interruptions and premature discontinuations while improving treatment outcomes. Overall, the collaboration of various healthcare professionals within the COTF demonstrates a proactive approach in improving cardio-oncology care and patient outcomes.

Keywords: Cardio-oncology, vascular endothelial growth factor, VEGF inhibitor, cardio-oncology task force, Blood pressure, echocardiography

Abbreviations: VEGF: Vascular Endothelial Growth Factor, VEGFi: VEGF inhibitor, CV: Cardiovascular, COTF: Cardio-Oncology Task Force, BP: Blood Pressure, ECHO: Echocardiography.

Introduction

North side Hospital is a large community hospital system with an analytic case volume greater than 14,000 per year. VEGFi usage is associated with several cardiovascular (CV) complications, such as hypertension, heart failure, and QTc prolongation [1]. To address this, the cardio-oncology task force (COTF) at North side Hospital employed the 2022 ESC cardio-oncology (CO) guidelines [2] as a foundation to develop practical guidelines.

Materials and Methods

The set of guidelines created includes a CV risk assessment algorithm designed to monitor patients initiating VEGFi and tyrosine kinase inhibitor (TKI) treatments (Figure 1) and a separate algorithm for the acute management of hypertension prior to VEGFi infusion, triggered when the systolic blood pressure reaches or exceeds 160 mmHg and the diastolic pressure is equal to or greater than 100 mmHg (Figure 2). By implementing these guidelines, north side Hospital took proactive measures to enhance patient care and mitigate potential CV complications associated with VEGFi treatment. The utilization of evidence-based guidelines, such as those provided by the 2022 ESC, ensured that the developed algorithms were aligned with the latest research and best practices in CO.

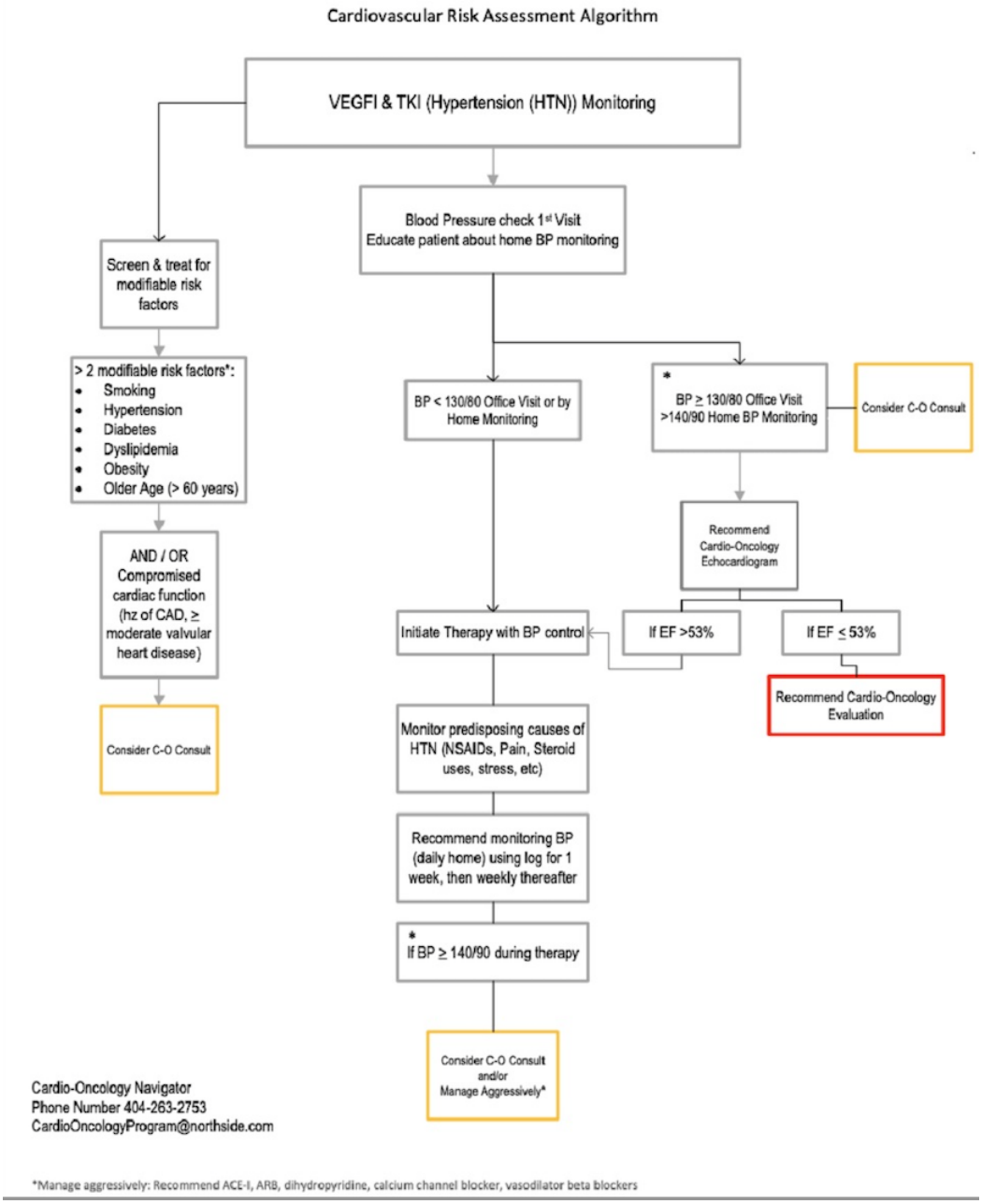

Figure 1: VEGFi and TKI (Hypertension (HTN)) Monitoring Algorithm.

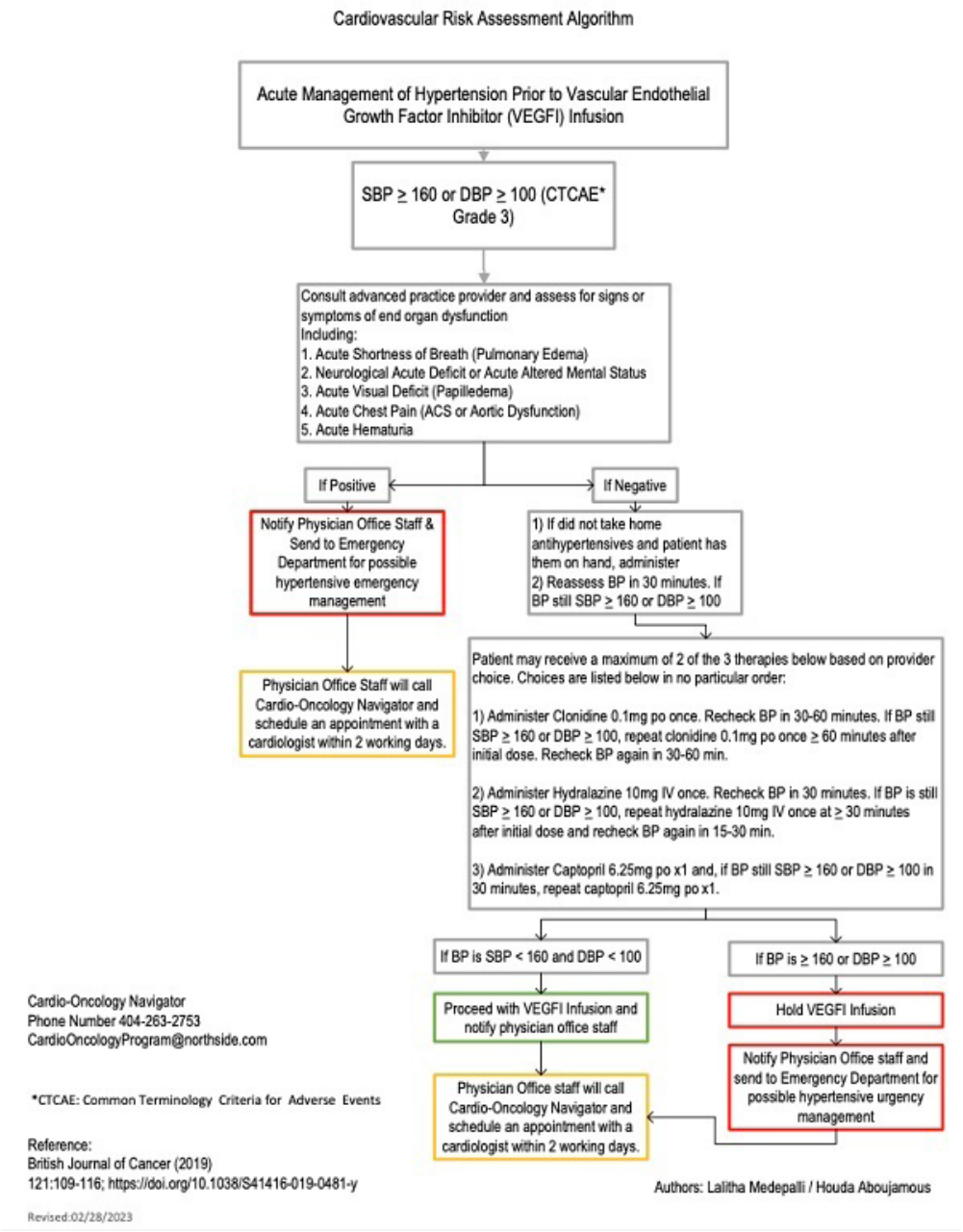

Figure 2: Acute Management of Hypertension Prior to Vascular Endothelial Growth Factor Inhibitor (VEGFi) Infusion Algorithm.

2022 ESC Guidelines In a patient treated with a VEGFi

1. Blood pressure (BP) measurement is recommended for patients treated with VEGFi at every clinical visit with daily home BP monitoring during the 1st treatment cycle, after each increase in VEGFi dose, and every 2-3 weeks thereafter. Baseline echocardiography (ECHO) is recommended in high- and very high-risk patients treated with VEGFis. (Class I recommendation, level C evidence)
2. Baseline ECHO should be considered in low- and moderate-risk patients treated with a VEGFi (class II recommendation, level C evidence)

Practical Guidelines developed by Northside Hospital

The COTF created two CV risk assessment algorithms, as shown in Figures 1 and 2 below. Cardiovascular risk assessment algorithm to monitor patients being initiated on VEGFI and tyrosine kinase inhibitors (TKIs) (Figure 1).

Cardiovascular risk assessment algorithm for acute management of hypertension prior to VEGFi infusion, if the systolic blood pressure is greater than or equal to 160 mmHg and the diastolic pressure is equal to or greater than 100 mmHg (Figure 2).

Results

The COTF successfully developed algorithms for CV risk assessment of VEGFi during cancer treatment. Additionally, the implementation of these algorithms led to several positive outcomes, such as a significant increase in physician referrals and, most importantly, the successful consolidation and simplification of treatment guidelines, making them more accessible to a broader base of healthcare providers. To enhance patient care, the COTF introduced a dedicated CO Nurse navigator to provide support, education, and coordination of patient CO care. Additionally, the implementation of standardized intake and referral forms improved the efficiency and expedited program delivery to cardiologists and oncologists in the Northside system. Due to the importance of monitoring blood pressure in patients receiving VEGFi treatment, the COTF secured a grant from the Northside Hospital system foundation to facilitate the administration of free blood pressure monitors to underserved patients. This ensures that everyone will have access to essential monitoring tools, thus enhancing the safety and quality of care of their treatment.

Discussion and Conclusion

Moving forward, the COTF at Northside is focused on advancing the implementation of the simplified algorithms developed for CV risk assessment in patients receiving VEGFi treatment. To accomplish this, the COTF is currently developing a research protocol aimed at evaluating the impact of these algorithms on treatment efficacy, as well as the reduction of CV toxicity, with the goal of minimizing treatment interruptions and premature discontinuations. The findings will provide valuable insights into the optimization of cardio-oncology care, enhancing the safety and efficacy of VEGFi treatment.

Declarations

Ethics approval and consent to participate: Not applicable

Consent for publication: Not applicable; no patient/individual data were used.

Availability of data and materials: Not applicable

Competing interests: Not applicable

Funding for this article: None.

Authors' contributions

AM: Major contributors in writing the manuscript

MN: Oncologist in the COTF

MC: Oncologist in the COTF

IB: Oncologist involved in patient care

GC: Gynecology surgeon in the COTF

LM: Cardio-oncologist and a major contributor to developing the task force and algorithms

BS: Advanced practitioner in the COTF

CB: Program development, COTF

HA: Clinical Research pharmacist in the COTF

Acknowledgments: Not applicable.

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