

Enhancement of Wound StO₂

with Best Practice TIMERS Methodology and Utilization of Cellular, Acellular and Matrix-Like Products (CAMPs)



Authors: Ali Saberi, MD | Christina Asher, APRN | Amber Gephart, APRN, FNP-C | Patrick Reid, APRN | Yisel Ruiz, APRN | Lori Back, APRN | Evan Brewer, APRN | Audrey K Moyer-Harris, BSN, RN, MBA, CWS

Introduction

The proliferative phase of wound healing is associated with the formation of granulation tissue which represents the onset of neo-angiogenesis. Matrix formation is critical to support wound proliferation which then allows for fibroblast replication and function which is then followed by epithelialization, wound closure, and healing. A variety of advanced Cellular, Acellular and Matrix-Like Products (CAMPs) have come to the Wound Healing Market over the years. CAMPs technologies are available for the Wound Care Providers to use to manage compromised ulcers on Complex Patients. As wounds/ulcers progress through the phases of wound healing, non-healing/chronic wounds become stalled in the inflammatory phases of healing.

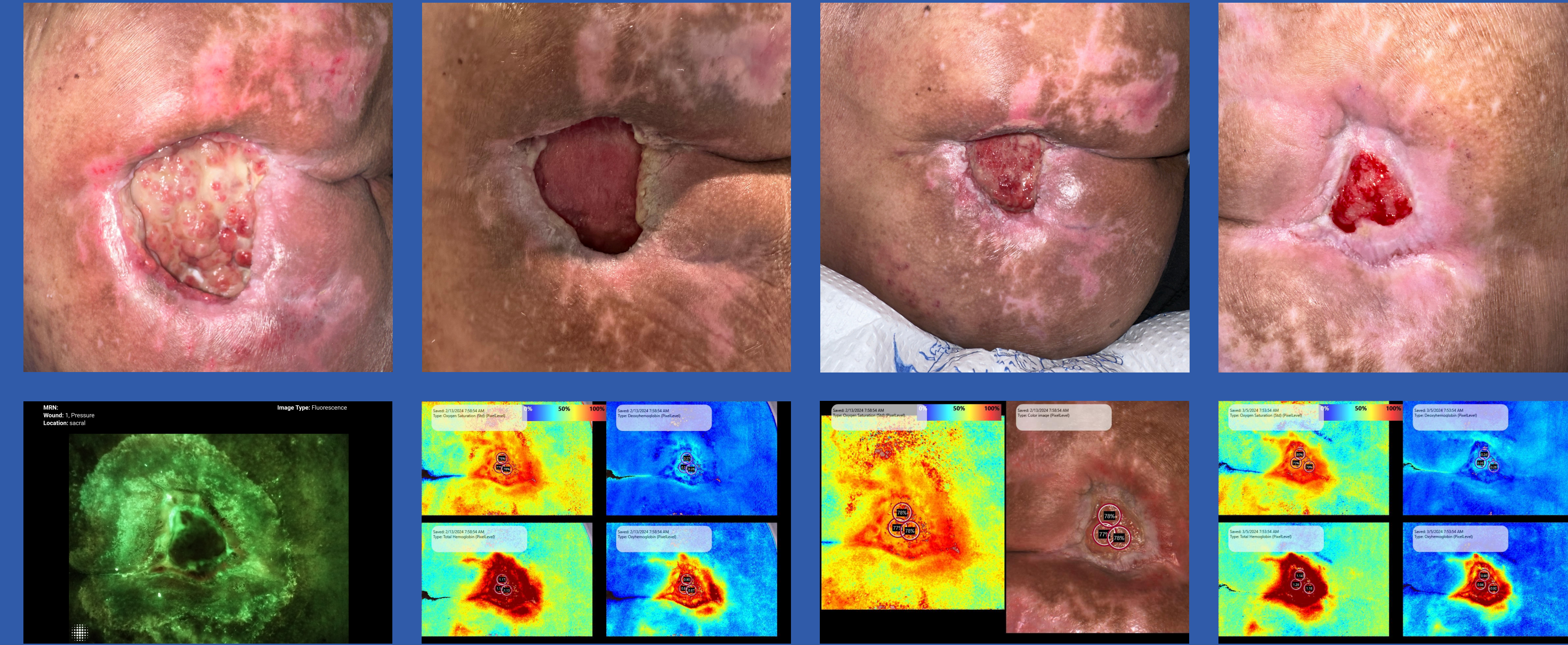
Near infra-red spectroscopy (NIRS) has been used to evaluate tissue oxygen saturation (StO₂) through the phases of wound healing to assist the Wound Care Providers on their Plan of Care and expectation towards wound healing progression or regression with Chronic Ulcers. This case series illustrates enhancement of wound base StO₂ using NIRS to assess for adequate wound bed preparation and integration of the product and reapplication process following wound management with a variety of CAMPs since each patient is uniquely different and responds to these advanced technologies differently.

Methods

Wound Care Providers followed best practices standard of therapy (TIMERS) protocols to evaluate and manage any underlying comorbidities/conditions. Next, they identified the best CAMPs technology on their formulary to meet the criteria of these complicated/complex wounds/ulcers. NIRS is a non-invasive imaging device that can measure oxygenated and deoxygenated levels of hemoglobin in the wound and periwound tissues to calculate tissue oxygen saturation. A series of cases is presented to demonstrate the effectiveness of these CAMPs technologies in promoting granulation tissue, increasing wound base oxygenation using SnapshotNIR.

Results

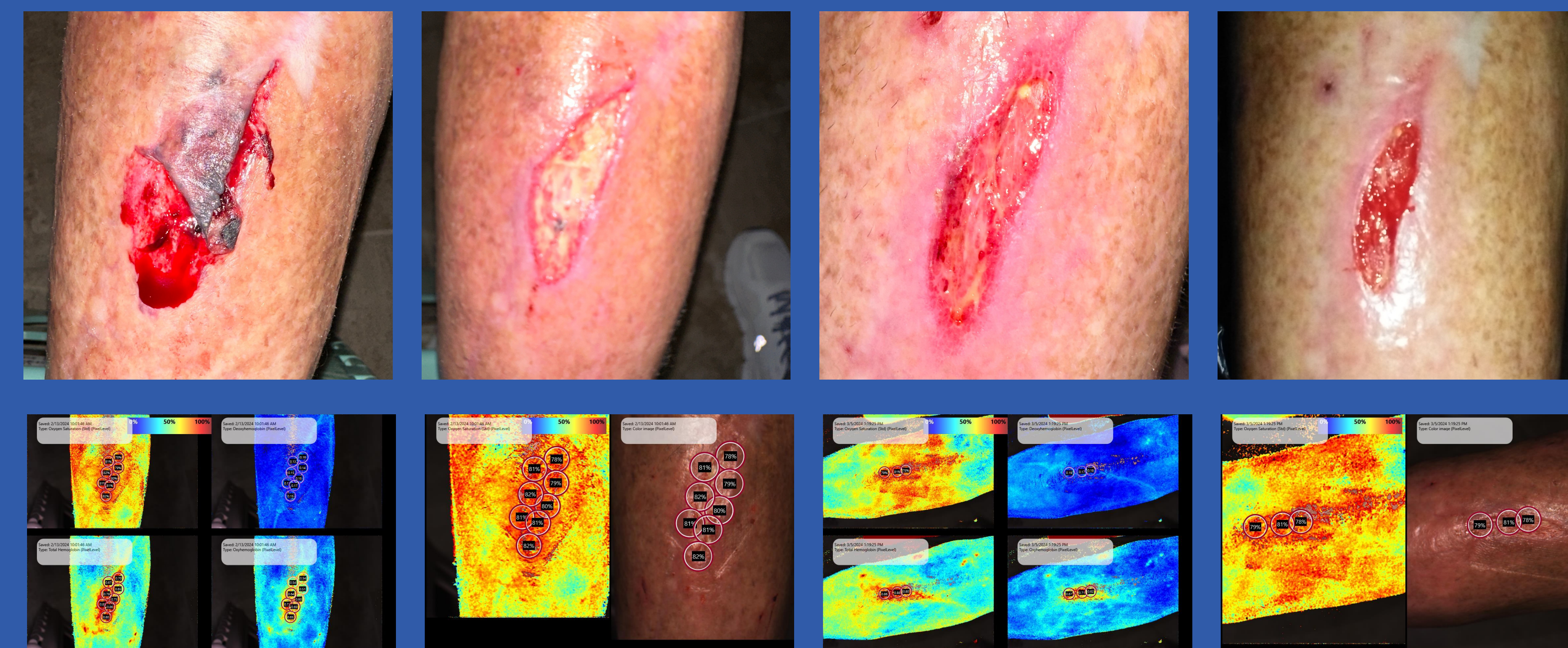
This study is the first of many to demonstrate enhancement in tissue oxygenation and perfusion through the duration of wound management and following the application of CAMPs which correlates to improved wound healing trajectories. NIRS should be considered to complement clinical management strategies to enhance monitoring of wound progress and complement the assessment of the response of a compromised wound to a therapeutic plan.



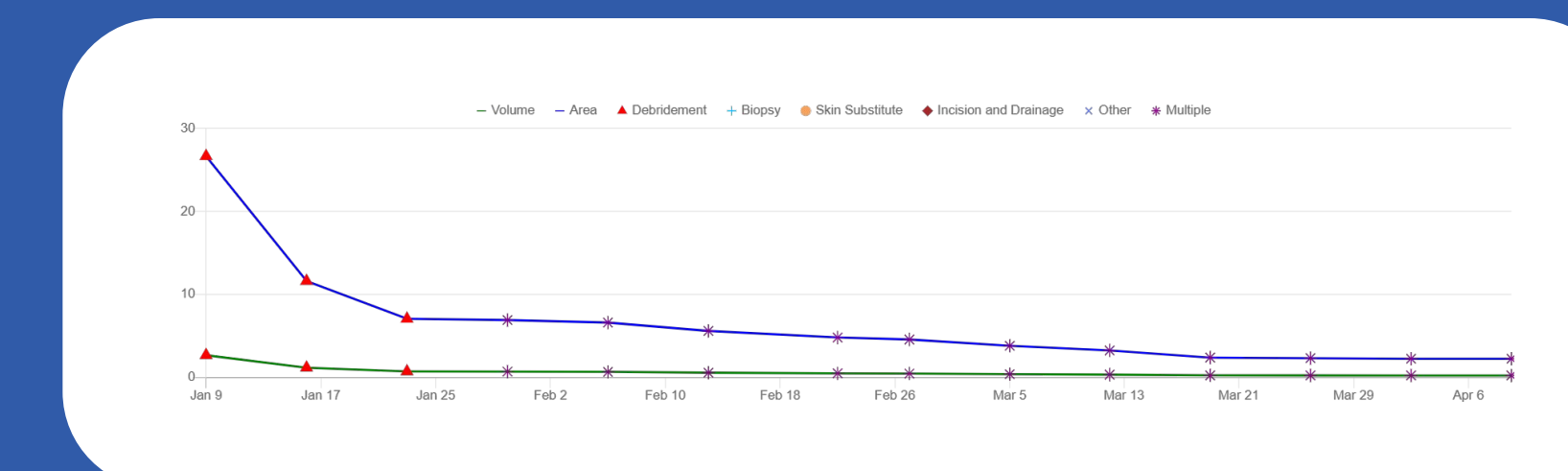
Pt #1 - 60 year old male with a Stage 4 Sacral Pressure Injury - patient states he was hospitalized for failure to thrive and was in the hospital for several weeks. Onset 8/21/23, 1st visit 9/26/23 44.86 sq cm with and 4.0cm depth - standard care including patient education, nutrition, offloading, infection management, surgical debridements, advanced wound care dressings and NPWT. Initiated CAMPs on 11/4/23 27.56 sq cm, 2.2cm depth & undermining of 1.8 cm- after the 4th application of CAMPs the depth improved from 2.2 cm to 0.7cm and the undermining improved from 1.8 cm to 0 undermining. After last application wound is measuring 5.28 sq cm with 0.1 cm depth. NIRS imaging - 65% in wound bed pre-debridement and 80% post debridement. Goals showing improvement outcomes with surgical debridement and changes in StO₂ oxygen saturation post debridement.



Pt #2 - 73 year old female presents with a wound LLE secondary to a dog jumping on her and scratching her and it progressively was just getting worse - Onset 1/8/24 26.65 sq cm depth 0.1cm - standard therapy initiated, concerns with refractory status due to age & underlying comorbidities. Fluorescence Imaging obtained, and NIRS images and interpretation 79% tissue oxygen situation in wound bed representation adequate StO₂ to support wound healing. CAMPs applications initiated after several applications. Wound size is now 2.24 sq cm progressing towards wound healing.



Pt #3 - 99 year old female with history of CHF, HTN, lymphedema and chronic venous insufficiency with multiple ulcers on both legs, onset at least a year prior to her 1st visit with our Mobile Wound Management Program. Standard of Care has been implemented including arterial assessment, compression management etc. In addition, fluorescence imaging to determine bacteria loads status determining it was (-), NIRS anterior lateral - 60% oxygen saturation pre-debridement, 75% post-debridement, lateral - 57% oxygen saturation pre-debridement, 73% post-debridement. Representing adequate tissue oxygen saturation. The provider's plan of care was decided to add the CAMPs modalities at the next visit.



Discussion

Granulation tissue is thought to be associated with increased tissue oxygenation and perfusion. Historically, this premise has been hypothetical as providing subjective supportive data of increased tissue oxygenation has been limited to benchtop and invitro methods of analysis. NIRS is a point of care imaging modality that uses near infrared light to provide an instantaneous assessment of tissue oxygenation. Using NIRS to monitor the progress of therapeutic intervention is helpful in assessing the effectiveness and response to the decided advanced technologies including CAMPs intervention and plan of care.

Providers are improving outcomes and reducing complications with NIRS point of care diagnostic technology. The providers could identify in real time the microcirculation tissue oxygen in the wound bed. These results impact in the moment decision making for plan of care.

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