A retrospective review of all patients who underwent a bone biopsy at our facility was performed and lab values were evaluated with regard to the pathology results. Our hypothesis is that there is a statistically significant relationship between RDW and biopsy proven osteomyelitis. The aim of this study is to evaluate the diagnostic and mortality in a wide variety of systemic diseases. The principle finding of this study is that there exists between RDW and osteomyelitis. Malabu et al reported that RDW > 14.5 gave a sensitivity of 67% and a specificity of 63% in the diagnosis of osteomyelitis\(^4\). However, in their study RDW was among the least effective markers, while in our study RDW was superior to ESR, CRP, Hb and WBC in diagnosing osteomyelitis. In conclusion, the principle finding of this study is the relationship between RDW and osteomyelitis. The diagnostic accuracy of RDW was found to be superior to that of the established biomarkers ESR and CRP. These findings suggest that RDW provides valuable clinical information with regards to osteomyelitis in the foot and ankle. Given that RDW is routinely reported as part of the complete blood count this has the distinct advantages of being easily accessible without incremental costs. Further prospective analysis is of course necessary to validate these findings.

### Methods and Hypothesis

A review of all patients who underwent a bone biopsy at our facility was performed and lab values were evaluated with regard to the pathology results. Our hypothesis was that there exists a significant relationship between RDW and biopsy proven osteomyelitis.

### Procedures

The medical records database for our facility was searched for records containing procedure codes 77.07-77.09 (sequestrectomy of tibia and fibula, tarsal and metatarsal, and other), 77.47-77.49 (biopsy of bone from tibia and fibula, tarsal and metatarsal, and other), 7.67-7.69 (local excision of lesion or tissue from bone of tibia and fibula, tarsal and metatarsal, and other), 77.87-77.89 (other partial ostectomy from tibia and fibula, tarsal and metatarsal, and other), 77.97-99.97 (total ostectomy of tibia andfibula, tarsal and metatarsal, and other) for the period October 1, 2011 to June 1, 2015. Patients under the age of 18 and those without a pathology report were reviewed and the presence of osteomyelitis (OM+), as explicitly reported by the pathologist, was recorded. The search returned 440 records containing the combination of clinical examination and radiographic studies. Serum inflammatory markers, such as erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP), have been shown to supplement in the diagnosis of osteomyelitis. Red cell distribution width (RDW) is a quantitative measure of anemia, the variability in size of circulating erythrocytes, and traditionally it was almost exclusively used in the evaluation of anemia. More recently, however, a number of studies have found a persistent association between elevated RDW and morbidity and mortality in a wide variety of systemic diseases. The aim of this study is to evaluate the diagnostic performance of RDW with regard to biopsy proven osteomyelitis.

### Literature Review

The diagnosis of osteomyelitis is based on a combination of clinical examination and radiographic studies\(^1\). Serum inflammatory markers, such as erythrocyte sedimentation rate (ESR), C-reactive protein (CRP) and procalcitonin (PCT), have been shown to supplement in diagnosis, but their utility as stand-alone diagnostic biomarkers remains unclear and inconsistent between studies\(^2\). The ideal biomarker would have high sensitivity and specificity and would be minimally invasive, while also being inexpensive and accessible to most laboratories\(^3\). RDW is routinely reported as part of the complete blood count and therefore incurs no additional cost, unlike other biomarkers. Previously, an elevated RDW was utilized only in evaluation of anemia, but multiple recent investigations have demonstrated an association with a variety of illnesses, their complications and mortality in the population thought that the primary mechanism responsible for anisocytosis is inflammation\(^4\), and it has been demonstrated that a strong positive association exists between RDW and conventional inflammatory biomarkers such as ESR and CRP, and this relationship persists even when controlling for confounding variables\(^5\).

### Results

The diagnosis of osteomyelitis is based on a combination of clinical examination and radiographic studies. Serum inflammatory markers, such as erythrocyte sedimentation rate (ESR), C-reactive protein (CRP) and procalcitonin (PCT), have been shown to supplement in diagnosis, but their utility as stand-alone diagnostic biomarkers remains unclear and inconsistent between studies. The ideal biomarker would have high sensitivity and specificity and would be minimally invasive, while also being inexpensive and accessible to most laboratories. RDW is routinely reported as part of the complete blood count and therefore incurs no additional cost, unlike other biomarkers. Previously, an elevated RDW was utilized only in evaluation of anemia, but multiple recent investigations have demonstrated an association with a variety of illnesses, their complications and mortality in the population. Thought that the primary mechanism responsible for anisocytosis is inflammation, and it has been demonstrated that a strong positive association exists between RDW and conventional inflammatory biomarkers such as ESR and CRP, and this relationship persists even when controlling for confounding variables.

### Discussion

The principle finding of this study is that there exists a statistically significant association between RDW and osteomyelitis. Additionally we have demonstrated that RDW has equivalent or superior sensitivity and specificity in the diagnosis of osteomyelitis compared to the two most commonly utilized acute phase reactants, ESR and CRP. We found that RDW ≥ 14.9 was the most accurate cutoff in diagnosed osteomyelitis across all diagnostic operational characteristics, with a sensitivity of 62%, a specificity of 58% and an OR of 2.23. To our knowledge only a single small study has previously reported a relationship between RDW and osteomyelitis. Malabu et al reported that RDW > 14.5 gave a sensitivity of 67% and a specificity of 63% in the diagnosis of osteomyelitis. However, in their study RDW was among the least effective markers, while in our study RDW was superior to ESR, CRP, Hb and WBC in diagnosing osteomyelitis.

References