

epidermal dysmaturation, and perivascular lymphocytic infiltrates. These biopsy findings resemble chemotherapeutic effects on local tissue. The pathophysiology of docetaxel causing FEP is poorly understood. Local skin reaction can occur if there is local extravasation of the chemotherapeutic agent, however, our patient did not have any detectable local extravasation. Differentiating subclinical local extravasation from FEP may be difficult. Furthermore, the eruption may be an abortive variant of supravenuous hyperpigmentation described with docetaxel previously.⁴ Interestingly, despite developing fixed erythrodysesthesia at peripheral intravenous insertion sites, our patient did not have the reaction when a central catheter was used. However, a case reported by Yamazaki et al. described FEP occurring in a patient on vinorelbine and cisplatin at the site of an indwelling subcutaneous catheter port.⁵

Treatment for fixed erythrodysesthesia has been reported with oral or topical antibiotics and topical steroids, although the rash appears to typically resolve within weeks with postinflammatory hyperpigmentation and desquamation.^{2,3} Our patient did not respond to triamcinolone cream but had a partial response to augmented betamethasone dipropionate cream.

This report serves to alert clinicians to fixed erythrodysesthesia plaques, a rare cutaneous side effect seen in the peripheral intravenous administration of the chemotherapeutic agent docetaxel that potentially may be avoided by infusion via a central venous catheter. The etiology of this unique reaction and differentiating it from local extravasation reaction warrants further evaluation.

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Algorithm-based readability assessment of online patient educational material for erythropoietic protoporphyria

Dear Editor,

Erythropoietic protoporphyria (EPP) is a rare disorder caused by the accumulation of protoporphyrin because of enzyme deficiencies in the heme metabolic pathways.¹ There are many treatment options that can be used to reduce protoporphyrin levels before they cause severe liver damage. The disease involves cutaneous manifestations of photosensitivity, which can have a severe negative impact on patients' quality of life. However, it can be managed with diligent application of broad-spectrum sunscreen (SPF > 30), oral beta carotene, and sun-protective clothing.² It is crucial that patients understand the complexities of this chronic disease so they can make educated decisions about their treatment protocol and effectively manage its progression. Patients should be able to find easily accessible and readable information online regarding EPP.

We used quantitative methods to measure the readability of websites providing patient education material for this disease. On June 30, 2021, a Google search query for “erythropoietic protoporphyria patient information” was conducted, yielding 378,000 results. Two authors (VK and JV) independently screened the top 50 websites and discarded two links for not containing information relevant to EPP patient education. Salient educational content from the remaining 48 sites was extracted and input into the readabilityformulas.com calculator.³

Six different algorithms were used to quantitatively assess the grade level readability of these articles: Gunning Fog Index, Flesch–Kincaid, Coleman–Liau, SMOG Index, Automated Readability Index, and the Linsear Write Formula. Each algorithm outputs a readability score based on several factors such as number of syllables and sentence length. A score of 10.2 means the text can be understood by an average 10th grade student. The average readability score across the six algorithms for the 48 articles was 14.16 with ranges from 12.30 (SMOG Index) to 16.51 (Gunning Fog), indicating that readers had to be at the

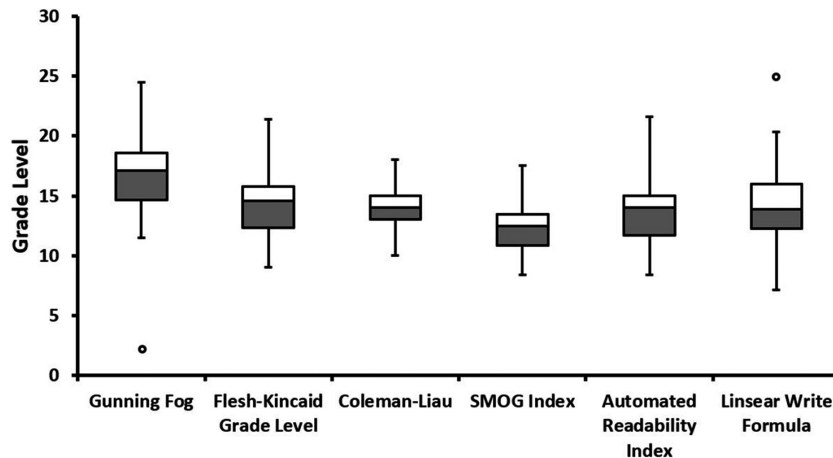


Figure 1 Average grade level assessment of online educational sites regarding Erythropoietic Protoporphyrria. Box and whisker plot analysis was conducted using six readability algorithms: Gunning Fog (median = 17.1), Flesh–Kincaid (median = 14.55), Coleman–Liau (median = 14), SMOG index (median = 12.5), Automated Readability Index (median = 14), and Linsear Write Formula (median = 13.9)

college level and beyond to understand the articles (Fig. 1). Each of the six algorithms demonstrated that readability of these online articles was at least six grade levels higher than the American Medical Association (AMA) recommendation of a target sixth grade reading level for patient educational content.⁴

Another readability algorithm, the Flesch Reading Ease Score, was used to compare the differences in article reading ease between those written by MDs and those by non-MDs. A lower Flesch Reading Ease score indicated more difficult reading. We found that MD authors composed more complex articles (mean = 25.94, $n = 36$) in comparison to their non-MD counterparts (mean = 35.54, $n = 12$) ($P = 0.046$), demonstrated by their lower Reading Ease scores (Fig. 2). However, there was no difference between reading ease of articles authored by dermatologists (mean = 26.61, $n = 17$) compared to those by

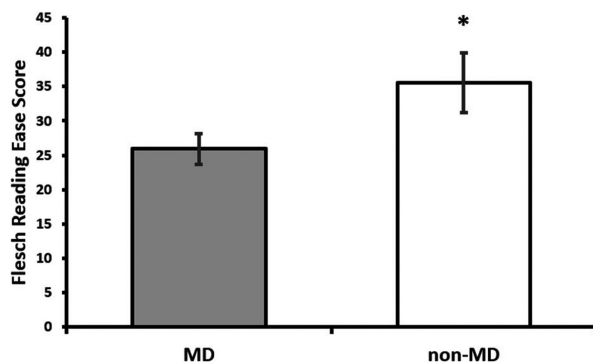


Figure 2 Readability Ease Comparison between MD Authors and non-MD Authors. Results of two-tailed Student's *t* test results showed that Flesch Reading Ease Scores for MD authors (mean = 25.94, standard deviation = 13.33, $n = 36$) were significantly lower ($P = 0.046$) than non-MD authors (mean = 35.54, standard deviation = 14.59, $n = 12$)

nondermatologists (mean = 28.24, $n = 31$) ($P = 0.71$). Study weaknesses include a small sample size of 48 sites and a limited target audience, as the online articles were only written in the English language.

The results of this study suggest that more work needs to be done in order to improve health literacy and patient education, which ultimately impact health outcomes.⁵ Online articles are still several grade levels more complex than they should be for their intended audience. EPP is a complicated disease that needs to be understood by patients in order to reduce complications and improve quality of life. In order to make online patient educational material easier to be read and understand, there should be increased collaboration between physicians and online content providers.

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