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UNIVERSITY OF SAN DIEGO
Hahn School of Nursing and Health Science
DOCTOR OF NURSING PRACTICE

Treatment Evaluation of Iron Deficiency Anemia in Women of an Underserved Community

by

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Abstract

Background/Purpose: Iron deficiency anemia (IDA) is the most common micronutrient deficiency globally. More than 20% of women experience IDA during the reproductive year. As the first-line treatment in IDA, oral iron supplement (IOS) is associated with gastrointestinal side (GI) effects, and it is often a barrier to achieving normal hemoglobin (Hb) and serum ferritin (SF) levels. Ineffective treatment fueled by a lack of guidelines increases the dilemma of dosing frequency in primary care, leads to poor quality of life, and increases the burden of anemia.

Intervention: Evidence showed that intermittent OIS is as effective as daily dosing. It is associated with fewer GI side effects, increased Hb and SF, and compliance.

Methods: The San Diego (SD) 8A's Evidence-Based Practice (EBP) Model guided this practice change. Research articles were reviewed for evidence. The project evaluated the application of EBP guidelines among the primary care providers (PCPs), identified patients diagnosed with IDA with a Hb <12 g/dl and SF < 20 ng/mL who are currently on daily OIS dosing and educated PCP for practice change to alter the dosing frequency to every other day. Levels of Hb, SF, and GI side effects at pre-and post-intervention were evaluated to assess practice change.

Results: Providers' survey revealed the lack of consensus in applying EBP guidelines.

Comparison of data shows the mean of Hb and SF were significantly different between pre-and post-data with $p = .001$ for Hb and $p = .003$ for SF. The results indicate that a change to every other day dosing effectively increased levels of Hb and SF and decreased GI side effects.

Implication for Nursing: Clinicians should adopt the practice with positive patient outcomes.

The results will guide clinicians to select every other day OIS as a preferred form of treatment of IDA, resulting in fewer GI side effects, improved compliance, and effectiveness of anemia reversal.

Keywords: *Hemoglobin, serum ferritin, oral iron, iron deficiency anemia, heavy menstruation, women*

Treat Evaluation of Iron Deficiency Anemia in Women of an Underserved Community

Iron deficiency anemia (IDA) in women is defined as a hemoglobin (Hb) level below 12 g/dL along with serum ferritin (SF) < 20 ng/ml (Burz et al., 2019). IDA is a chronic disease and the most common micronutrient deficiency globally and accounts for 50% of all cases of anemia (Quintana-Díaz et al., 2017). IDA affects more than 20 percent of women during the reproductive year (Percy et al., 2017) due to chronic blood loss from heavy menstruation, one of the main mechanics by which anemia occurs in women (Burz et al., 2019; Percy et al., 2017).

Oral iron replacement is the cheap and effective first-line treatment in IDA (Munoz et al., 2017). The 325 mg Ferrous Sulfate (FeSO₄) as 65 mg elemental iron is mostly prescribed in primary care. In adults, 150 to 200 mg of elemental iron is recommended daily (Rockey et al., 2020; Stoffel et al., 2020). However, the daily estimated absorption is only 25 mg (Düzen et al., 2020). The unabsorbed amount leads to gastrointestinal (GI) inflammation, alterations of the microbiota, and erosive mucosal damage (Düzen et al., 2020; Stoffel et al., 2020). Adherence to oral iron therapy is often a barrier to achieving normal Hb and serum ferritin (SF) levels due to the GI side effects, such as stomach ache, nausea, vomiting, constipation, diarrhea, and metallic taste (Düzen et al., 2020; Percy et al., 2017; Stoffel et al., 2020). The inability to tolerate the OIS impedes treatment continuation, leads to poor adherence, and is often a barrier to achieving normal SF and Hb levels (Munoz et al., 2017; Stoffel et al., 2020).

This evidence-based practice project aimed to introduce the application of evidence-based guidelines, utilize intermittent oral iron supplementation in the treatment of IDA, foster practice change among clinicians, improve treatment compliance, and improve patient outcomes in a clinically underserved family practice clinic.

Background and Evidence of the Problem

Iron deficiency anemia, primarily due to chronic blood loss, is prevalent among women of reproductive age (Hempel & Bollard, 2016). In the United States, anemia affected 12% of women between 12 years to 49 years of age, with an estimated 2.9% prevalence in North America in 2010 (Rockey et al., 2020). Unfortunately, it is often underdiagnosed and poorly managed.

The nonadherence to treatment leads to severe anemia, defined as Hb less than 8 g/dL (Burz et al., 2019), while a patient with low Hb less than 6 g/dL requires immediate referral to urgent care or the emergency department (ED) for blood transfusion (Cooke et al., 2017). In some cases, stable patients can be referred to an outpatient infusion center for blood transfusion. However, treatment is often delayed for several weeks due to health insurance barriers requiring pre-authorization. Emergency department referrals for blood transfusion are not cost-effective and frequently expensive (Quintana-Díaz et al., 2017).

Poorly treated or underdiagnosed IDA leads to decreased physical activities, poor quality of life, hair loss, brittle nails, dry pale skin, decreased immune response, and increased susceptibility to infections. IDA is associated with poor maternal outcomes such as low neonatal weight, perinatal complications, and preterm labor, increasing maternal and newborn mortality (Cappellini et al., 2020). Undertreated or poorly managed IDA can lead to hemodynamic instability and cardiomyopathies (Quintana-Díaz et al., 2017), such as tachycardia, cardiac murmur, dyspnea, and angina (Cappellini et al., 2020). A low daily dose or intermittent iron supplement is associated with fewer GI side effects, thus increasing compliance, tolerance, and absorption (Auerbach & Scgrier, 2017; Burz et a., 2019; Fernández-Gaxiola & De-Regil, 2019; Munoz et al., 2017;).

The discordance in selecting daily dose or alternate day dosing is often noticed in primary care. Another existing problem is the lack of guidelines for the treatment of IDA. Ineffective management of IDA increases the global burden of anemia, leads to poor maternal health, increases mortality and morbidity, and decreases work productivity (Shim et al., 2018)

Literature Review of Evidence

Kaundal et al. (2019) tested the hypothesis that a single dose of OIS on alternate days is better than the twice daily standard of care in the treatment of IDA by comparing the twice daily (BD) dosing with alternate days (AD) dosing. The RCT was nonblinded, with n=62, mixed-gender of 54 females and eight males, age greater than 15. All participants have baseline Hb of 11 – 11.4 g/dl as mild, 8 – 10.9 g/dl as moderate, and 6 - 8 g/dl as severe anemia with SF less than 20 ng/ml. The trial reported an increase in the BD arm at three weeks (32.3% vs. 6.5%, $p < 0.0001$) and six weeks (58% vs. 35.5%, $p = 0.001$) and a rise in the median Hb at 3 weeks (1.6 vs. 1.1, $p = 0.02$) and 6 weeks (2.9 vs. 2.0 g/dl, $p = 0.03$) in the BD arm with more report of nausea in the twice daily arm. They concluded that the choice of therapy, AD versus BD, should depend on the severity of the anemia, the rapidity of response desire, and patient preference due to adverse effects.

A more in-depth study is a two open-label, nonblinded RCT conducted by Stoffel et al. (2017) to compare iron absorption from OIS given on consecutive days (CD) versus alternate days (AD) and given as single morning doses versus twice-daily split dosing as against the current guideline of ferrous iron in divided doses throughout the day. Participants were women, ($n = 40$; $n = 20$, aged 18 years to 45 years, iron-depleted, nonpregnant, non-lactating, no blood donor within 4 months, nonsmoker, no intake of minerals or vitamins within 2 weeks, and be

within certain ranges (i.e., SF ≤ 25 $\mu\text{g/L}$; Hb $> 8\text{g/dL}$; CRP < 5 mg/L ; BMI 18.5 – 26.5 kg/m^2 ; weight < 80 kg).

In study one, CD versus AD, participants with similar Hb and SF were randomized into two groups; both received 60 mg of OIS. CD for 14 days while AD for 28 days. Outcomes measured are FIA, TIA, Hb, SF, faecal calprotectin. Results showed FIA 16.3% (9.3, 28.8) in CD compared to 21.8% (13.7, 34.6) in AD ($p = 0.001$); TIA 131.0 mg (71.4, 240.5) in CD compared to 175.3 mg (110.3, 278.5) in AD ($p = 0.001$), SHep greater in CD than AD at the endpoint, and 33% GI side effects in CD than AD ($p = 0.57$).

The second study was a crossover randomized study of whole dose versus divided dose. Participants were assigned in a 1:1 ratio based on SF. One arm received 120 mg for 3 days, while the other arm received 60 mg at 0800 and 1700 for 3 days, then crossed over after 14 days of the last dose, then FIA and SHep were measured. On Day 3, the divided doses showed a higher SHep than once daily dose ($p = 0.013$), but SHep was higher in both dosing on Day 2 ($p < 0.001$) and Day 3 ($p < 0.007$) than on Day 1 and higher on Day 2 compared to Day 3 ($p = 0.007$).

Stoffel et al. (2017) concluded that in iron-depleted young women, AD dosing of 60 mg iron as ferrous sulfate (FeSO_4) significantly increased FIA and total TIA compared with CD dosing, and FIA and TIA did not increase by splitting a dose of 120 mg iron into two divided daily doses; thus the common practice of splitting an oral OIS into two divided daily doses in an attempt to increase iron absorption was unnecessary because divided dosing did not significantly affect FIA or TIA; instead, it increased SHep and decreased iron absorption. The study also showed that GI side-effects were higher with CD than with AD dosing.

To further support and emphasize the result of the above study, Stoffel et al. (2020) tested another hypothesis that "single oral iron doses of 100 and 200 mg acutely increase serum

hepcidin (SHep) and the increase persists for 24 hours, but not 48 hours. They conducted another crossover, nonblinded RCT to assess whether an AD administration of 100 mg and 200 mg iron increased iron absorption compared to CD dosing by correlating iron absorption with SHep and other iron parameters. Healthy women ($n = 19$), participating in a blood donation drive with borderline Hb 12.0 - 12.5 g/dL, ages 19 years to 26 years, were randomized. The participant receives three doses of 100 mg or three doses of 200 mg for 6 days and then waited for 16 days before crossing over. The result shows that SHep was significantly affected by time ($p < 0.001$) but not by dose ($p = 0.733$), and there was no significant time-dose interaction ($p = 0.815$). Result also shows that TIA from a single dose of 200 mg given on AD was approximately twice that from 100 mg given on CD. The same total amount of iron was recommended to be provided with AD dosing and twice the daily target dose on alternate days.

Mehta et al. (2020) conducted a similar nonblinded, hospital-based two-arm RCT with no hypothesis by comparing daily dose (DD) with AD regimen in terms of Hb, reticulocyte hemoglobin equivalent (RET-He), and GI side effects by using SHep as a biomarker. The study was conducted with 40 patients newly diagnosed with mild to moderate IDA, mean age of 33.7 years, 23 females and 17 males, excluding patients with severe IDA, anemia other than ID, an inflammatory disorder, malabsorption, and bariatric surgery. Subjects were randomized into two arms ($n = 20$) each with 60 mg oral iron, given to both arms for 21 days. Results were considered significant ($p < 0.05$) and GI side effects measured in percentage. In AD, OIS results in mean Hb (1.58 ± 0.53 gm/dl) compared to DD (0.41 ± 0.25 gm/dl; $p < 0.05$), with 1.5% of constipation and epigastric distress in both arms, but more nausea and a metallic taste in DD arm. Also, iron absorption was better in AD therapy than in DD therapy, as reflected in a significant rise in Hb.

Table 1*Synopsis of Evidence*

Author(s) Name of Article	Ranking	Summary of Evidence
Fernández-Gaxiola, A. C., & De-Regil, L. (2019). Intermittent iron supplementation for reducing anemia and its associated impairments in adolescent and adult menstruating women.	I	<ul style="list-style-type: none"> • <u>GI side effects are less in OIS and higher in daily dosing.</u> • Treatment with an intermittent supplement is probably as effective in controlling anemia as a daily oral supplement (DOS).
Kaundal et al. (2019) Randomized controlled trial of twice-daily versus alternate-day oral iron therapy in the treatment of iron-deficiency anemia	II	<ul style="list-style-type: none"> • Choice of therapy, alternate dose (AD) versus twice daily (BD), should depend on the severity of the anemia, the rapidity of response desire, and patient preference due to adverse effects.
Stoffel et al. (2017) Iron absorption from oral iron supplements given on consecutive versus alternate days and as single morning doses versus twice-daily split dosing in iron-depleted women: Two open-label, randomized controlled trials	II	<ul style="list-style-type: none"> • Treating IDA with iron supplements on <u>AD and in a single dose optimizes iron absorption</u> and might be a preferable dosing regimen
Stoffel et al. (2020) Iron absorption from supplements is greater with alternate day than with consecutive day dosing in iron-deficient anemic women.	II	<ul style="list-style-type: none"> • The same total amount of iron be provided with AD dosing, and twice the daily target dose be given on alternate days. <u>AD dosing of OIS was better tolerated and increased iron absorption by increasing Hb and SF levels.</u>
Mehta et al. (2020) A Prospective, Randomized, Interventional Study of Oral Iron Supplementation Comparing Daily Dose with Alternate Day Regimen Using Hepcidin as a Biomarker in Iron Deficiency Anemia.	II	<ul style="list-style-type: none"> • <u>60 mg of elemental iron on alternate days is more effective and better tolerated</u> • iron absorption was better in AD therapy compared to Daily Dose (DD) therapy, as reflected in a significant rise in Hb.
Düzen Oflas et al., (2020) Comparison of the effects of oral iron treatment every day and every other day in female patients with iron deficiency	II	<ul style="list-style-type: none"> • <u>Oral iron given on alternate days has the same effect compared with the daily or twice a day dose but has less GI side effects</u>
Rockey (2020) Aga technical review on gastrointestinal evaluation of iron deficiency anemia.	I	<ul style="list-style-type: none"> • Ferritin cut off to 45 ng/mL over 15 ng/mL • <u>Lower dosing or every-other-day dosing may improve tolerability and absorption</u>
Stoffel et al. (2020) Oral iron supplementation in iron-deficient women: How much and how often?	VII	<ul style="list-style-type: none"> • <u>To maximize FIA in women with ID and mild IDA, give oral doses of elemental iron <40 mg daily and ≥60 mg on alternate days.</u>

Design

The San Diego (SD) 8A's Evidence-Based Practice (EBP) Model was selected to guide and complete the project. A survey was designed to evaluate current practice among the clinicians. Ten clinicians managing females 18 years to 50 years old diagnosed with IDA from

chronic blood loss and taking a 323 mg FeSO₄ were surveyed (Table 2). The clinicians were provided with the 2020 American Gastroenterology Association (AGA) guideline for IDA. The survey included the questions in Table 3 with education and evidence-based research findings to emphasize the effectiveness of intermittent IOS for treating IDA in patients with poor adherence due to GI side effects. The goal was to alter dosage frequency to intermittent dosing as suggested by the 2020 AGA guideline.

Methods

The project was approved by the Institutional Review Board of the University of San Diego as exempt for human subjects. Research articles were reviewed for evidence. The project evaluated the application of EBP guidelines among practicing clinicians and identified patients diagnosed with IDA (Hb <12 g/dl; SF < 20 ng/mL) who are currently on daily OIS dosing.

Data Collection

Data collected include Hb, SF, and report of GI side effects, gender, race, use of Docusate Sodium, and insurance status. Pre-and post-intervention data were collected and evaluated to assess practice change among the clinicians. Retrospective-prospective data was reviewed from September 2021 to December 2021. The standard of practice at the clinical site is a routine visit at least every two months to evaluate the OIS's effectiveness by laboratory assessment of complete blood count (CBC) with SF or anemia panel.

Setting and Sample

Ten clinicians at St. John's Community Health (Formerly St. John's Well Child and Family Center) were surveyed with questionnaires to evaluate current practice and the application of evidence-based guidelines. A total of 31 patients records were assessed. Patient

cases included women with heavy menstruation previously diagnosed with IDA and on OIS.

Unfortunately, 9 patients were lost at follow-up and no data was available for comparison.

Table 2

Frequency of Nominal Variables

Variables	Pre-Intervention		Post-Intervention	
	N31	Percentage	N31	Percentage
Dosage				
Intermittent	4	12.90	13	41.94
Daily	27	87.10	10	32.26
			9*	29.03
GI Side Effects				
Yes	23	74.19	9	29.03
No	8	25.81	13	41.94
			9*	29.03
Colace				
Yes	27	87.10	12	38.71
No	4	12.90	10	32.26
Heavy Menstruation				
Yes	29	93.55		
No	2	6.25		
Race				
Hispanic	30	93.55		
Others	1	3.23		
Gender				
Female	31	100		

* Loss at follow-up

Table 3*Providers' Questionnaire*

	Questions	Responses
1	Do you use a specific guideline for the management of iron deficiency anemia?	A. Yes B. No C. If yes, which guideline?
2	What intervention do you implement when dealing with poor adherence to oral iron supplement due to side effects?	A. Decrease dosage B. Change dosage C. Educate patient to improve adherence – keep on same dosage D. Discontinue medication
3	If dosage is decreased, what frequency?	A. Decreased daily dosage B. Decreased to every other day C. Same dose

Data Analysis

Intellectus Statistics software was used to compare the difference between pre-and post-intervention groups. Data were analyzed to determine whether the mean difference between the values of Hb and SF at pre-and post-intervention were statistically significant. A 2-tailed paired samples *t*-test was conducted to evaluate the findings. Also, a 2-tailed Mann-Whitney two-sample rank-sum test was conducted to evaluate the effectiveness of dosage change and whether there exists a significant difference between the values of Hb and SF at post-intervention. A Chi-square Test of Independence was also conducted to examine the difference between the report of GI side effects of both groups.

Results

Providers' survey revealed the lack of consensus in applying EBP guidelines. The pie chart in Figure 1 shows that 7 of the 10 clinicians prescribed OIS in daily dosing while 3 prescribed alternate day dosing and only 3 were applying EBP guidelines. Four of the 10

clinicians will decrease dosage when there is a poor outcome or poor adherence, while 3 of the 4 would decrease to intermittent dosing. Eight of the 10 clinicians understood the importance of patient education to improve patient care, as reflected in Figure 2.

Twenty seven of the 31 patients were on daily dosing at pre-intervention, while 13 of the 22 patients were switched to intermittent dosing at post-intervention. A comparison of the data showed the mean of Hb and SF were significantly different between pre-and post-data for Hb ($p = .001$) and SF ($p = .003$). Although the patient sample was small, the results indicate that a change to intermittent dosing effectively increased levels of Hb and SF and decreased GI side effects within 3 months.

Figure 1

Current Practice Dosing

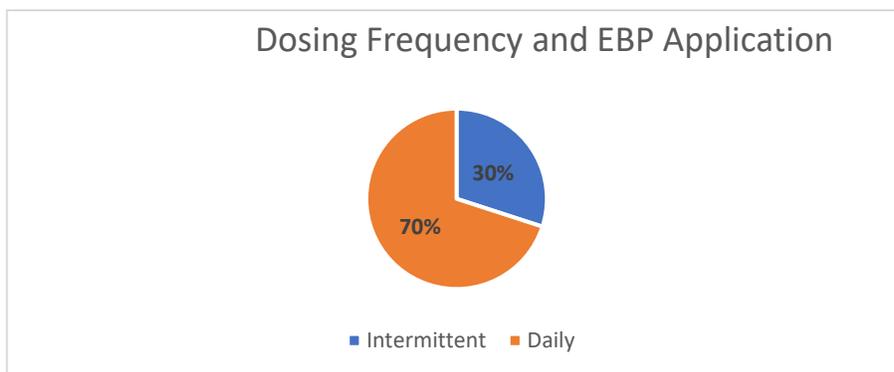
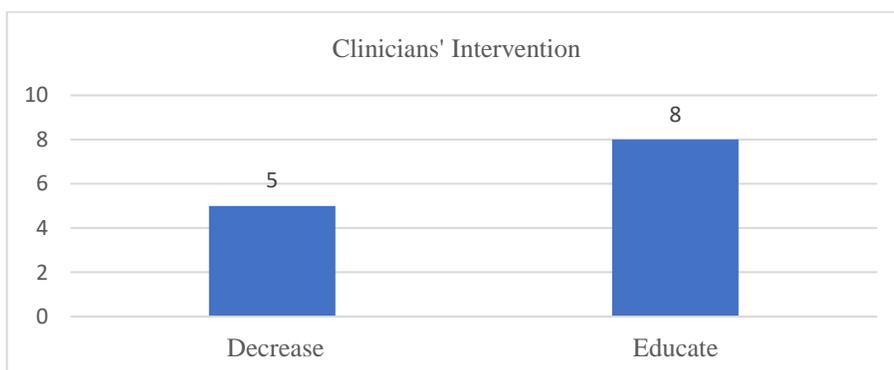


Figure 2

Providers' Intervention for Poor Outcomes/Adherence



The results were significant for Hb ($t[23] = -4.76, p < .001$). The difference in the mean of Hb (pre-intervention) and the mean of Hb (post-intervention) was significantly different from zero. The mean of Hb (pre-intervention) was significantly lower than the mean of Hb (post-intervention). The results are shown in Table 4, and Figures 3 and 5 show the plot box of the mean values of Hb and SF.

Table 4

Two-Tailed Paired Samples t-Test for the Difference Between Pre and Post Hb

Hb (Pre)		Hb_Post		<i>t</i>	<i>p</i>	<i>d</i>
<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
9.77	1.46	10.93	1.38	-4.76	< .001	0.97

The results for SF was also significant ($t[15] = -3.59, p = .003$). The mean value of SF was lower at pre intervention compared to post intervention as shown in Table 5 and Figures 4 and 6

Table 5

Two-Tailed Paired Samples t-Test for the Difference Between Pre and Post SF

SF(Pre)		Ferritin (Post)		<i>t</i>	<i>p</i>	<i>d</i>
<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
5.06	4.63	8.96	5.61	-3.59	.003	0.90

Figure 3 and Figure 4

Bar Plots of the Means of Hb and SF with 95.00% CI Error Bars

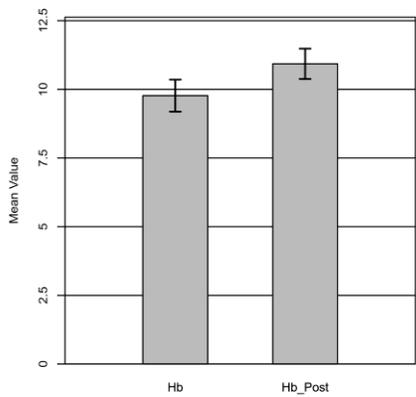


Figure 3

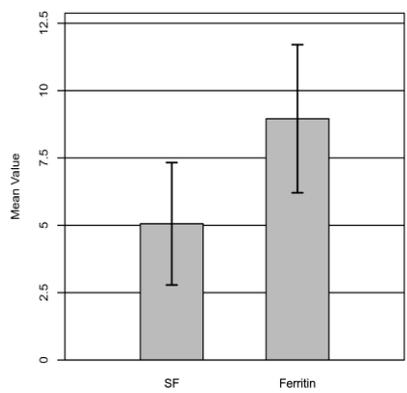


Figure 4

Keys:
SF: Pre-intervention
Ferritin: Post-Intervention
Hb: Pre-intervention
Hb_Post: Post-intervention

Figure 5 and Figure 6

Ranked Values of Hb and SF

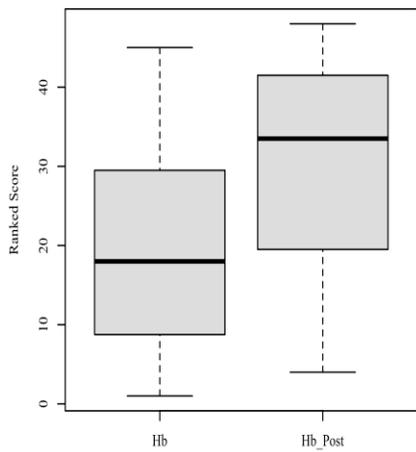


Figure 5

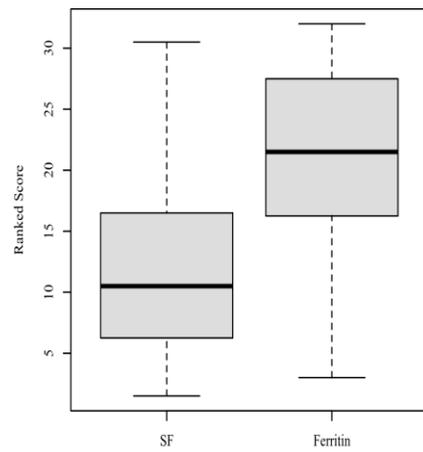


Figure 6

The Chi-square test results for the evaluation of the report of GI side effects were not significant ($\chi^2[1] = 3.38, p = .066$) due to the small sample size and loss of patients at follow-up. However, the findings are clinically significant, with a decrease in the documented GI side effect at post-intervention, as shown in Table 6.

Table 6*Observed and Expected Frequencies of GI side effects*

GISE (Pre)	GI SE (Post)		χ^2	df	p
	Yes	No			
Yes	9[7.36]	9[10.64]	3.38	1	.066
No	0[1.64]	4[2.36]			

A 2-tailed Mann-Whitney two-sample rank-sum test results showed a clinically significant increase in the mean values of Hb and SF at post-intervention with the change in dosage, as shown in Tables 7 and 8. The results of the mean value of SF showed a significant difference. There was an increase in the levels of SF with dosage changed to intermittent dosing at post-intervention compared to the daily dosing prior to the intervention ($U = 43$, $z = -2.31$, $p = .021$; Table 8). Conversely, the difference between the mean values of Hb after dosage change was not statistically significant ($U = 85$, $z = -1.24$, $p = .214$). Nevertheless, there was an increase in the mean value of Hb with dosage change, as shown in Table 7. Figures 7 and 8 showed the box plot of the increase in Hb and SF after changing the dosage to intermittent.

Table 7*Two-Tailed Mann-Whitney Test for value of Hb after Dosage Change*

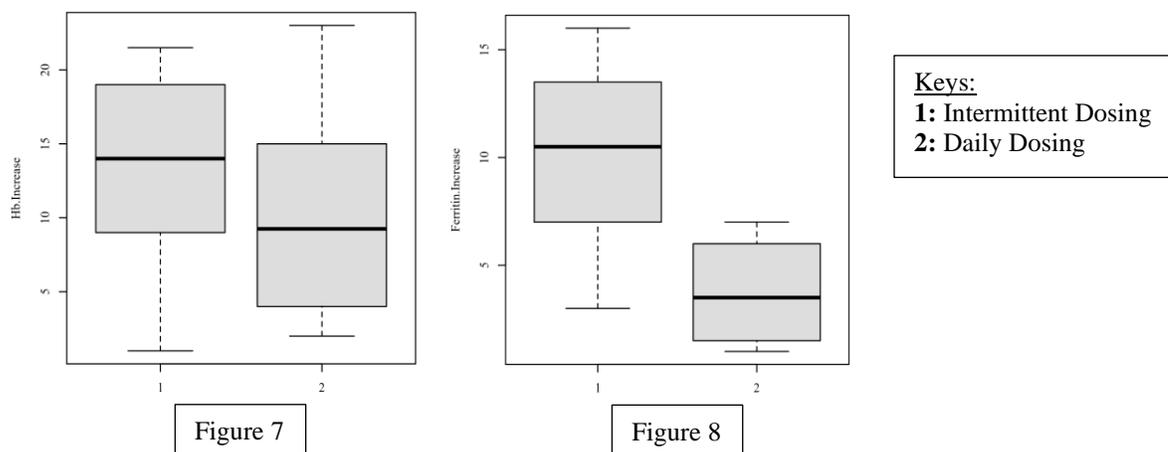
Variable	Mean Rank		U	z	p
	Intermittent Dose	Daily Dose			
Hb	13.54	10.00	85.00	-1.24	.214

Table 8*Two-Tailed Mann-Whitney Test for the Ferritin after Dosage Change*

Variable	Mean Rank		U	z	p
	Intermittent Dose	Daily Dose			
Ferritin	10.08	3.75	43.00	-2.31	.021

Figure 7 and Figure 8

Box Plot for the Ranks of Hb and SF with Dosage Change



Study Limitations

The number of patient records assessed was limited due to a lack of uniformity in evaluating and assessing patients with IDA. There were differences in diagnosis with the absence of diagnostic laboratories such as SF and CBC in some patients taking OIS. Communication was a barrier to effective management due to the large proportion of Hispanic/Latino patients as compared to the numbers of non-Spanish speaking clinicians.

Discussion

IDA is the leading cause of anemia and is prevalent among women of low socioeconomic status due to individual and community factors that affect dietary choices (Moor et al., 2017) and chronic as blood loss from heavy menstruation. St John's Community Health (formerly St. John's Well Child and Family Center) is a community healthcare provider located in the underserved area of Southern Los Angeles with a high proportion of undocumented, minority, and low-income patients. The patient population is 79% Hispanic/Latino, 13% African American, mostly female, of which 39% are between the age of 20 to 44 years (*Southside Coalition of Community*

Health Centers, 2021). It is imperative to understand the needs of this population with an approach to improve life and deliver cost-effective quality care.

The clinicians' survey revealed the lack of applications of evidence-based guidelines, mainly among the nurse practitioners at the clinical site. Nurse practitioners account for 70% of the PCPs. The result indicates the need for practice change, further education on practice guidelines for the management of IDA, and the need to advance the adoption of this project's findings beyond the clinic's scope. It is important to note that the clinicians were surveyed solely to understand the need for intervention and intervene if clinically appropriate. The intervention was needed to provide evidence-based guidelines and research findings to alter the dosing frequency; hence, no post-intervention survey was conducted. It is anticipated that the results will further encourage practice change among the clinicians.

A portion of the statistical data analysis was not significant due to the small sample size and the loss of patients at follow-up. However, the findings are clinically significant for practice change. The laboratory values of Hb and SF of patients on every other day OIS increased by more than 30% after the dosage was altered, with a decrease in the report of GI side effects by more than 40%. In addition, the common habit of prescribing stool softener (docusate sodium) in anticipation of the GI side effects of the OIS can be avoided, thereby decreasing the overall cost and the burden of IDA on the patients and the health care system. The results demonstrate that every other day's dose of OIS is effective if not better than daily dosing to increase Hb and SF. One can argue that the results of this project demonstrated intermittent dosing is a better treatment option due to the chance of the daily-dose patients not taking the medication due to the GI side effects. The intermittent dose can improve patient compliance due to the fewer GI side effects recorded.

Furthermore, the hormone, hepcidin, controls iron absorption through the gastrointestinal tract. A high level of unabsorbed iron from high daily dosing results in elevated serum hepcidin, decreasing iron absorption, and lowering serum iron levels. Therefore, the common unnecessary practice of splitting daily dosing should be avoided to prevent this occurrence because only 38.5% of the 65 mg elemental iron (325 mg of ferrous sulfate) is the estimated daily capacity.

Effective management of IDA will lead to a better outcome and prevent the need to refer patients with severely low Hb levels to the emergency department for blood transfusion. It will decrease or prevent the mortality and morbidity of IDA, leads to healthy maternal and neonatal health, improve work productivity, and in the long run, decrease the cost of health care.

Implications for Practice

The results of this project support the overwhelming available findings from the literature, thus further necessitating the following actions to increase the application of evidence-based guidelines and the adoption of the best practice that yields positive patient outcomes. There is a need for consensus on the treatment and evaluation of women with IDA through the uniform guideline and assessment tools. Primary care clinicians should be aware that intermittent dosing of OIS is effective and reverses anemia in women with IDA due to chronic blood loss or lack of dietary supplementation. It is also essential to be aware that daily dosing of OIS increases serum hepcidin and decreases iron absorption. The practice of prescribing docusate sodium alongside OIS to improve compliance and adherence can be avoided and save the overall cost of treatment when OIS is taken as an intermittent dose.

Conclusions

Iron deficiency anemia affects women of childbearing age and women in the underserved communities due to socioeconomic reasons affecting the ability to procure iron-rich food to

replace what is lost or maintain a normal serum iron level. Primary care providers should adopt the practice with positive patient outcomes. This project will guide PCPs to select every other day OIS as a preferred form of treatment for IDA, which results in fewer GI side effects, improves compliance, and effectively reverses anemia.

The need to educate, effectively evaluate, and treat to prevent complications such as cardiomyopathy lies with the primary care provider. The sustainability of the findings of this project lies in the ability to continue to evaluate the application of evidence-based practice guidelines. Therefore, more studies are needed to advance the results internally and externally and assess the adoption of the finding to sustain evidence-based practices. In addition, more studies are needed to evaluate the assessment of IDA, understand the differences in practice approach, and streamline practice towards a common approach. Furthermore, evidence-based guidelines in the treatment of IDA are limited. Studies are needed to evaluate what is available and advocate for nursing professional organizations to review and establish more practice guidelines for NPs in primary care.

Every other day OIS is the preferred form of treatment for IDA. To achieve the daily recommended dose of 150 mg to 200 mg of elemental iron, the 325 mg FeSO₄, which contained 65 mg of elemental iron, should be given once or twice on alternate days. It increases fractional iron and total iron absorption by decreasing serum hepcidin, fewer GI side effects, and improves compliance.

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