



Quality Improvement in Preoperative Anemia: Addressing Folate and B12 Deficiencies—Perioperative Impact and Cost-Effectiveness



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Introduction

Vitamin deficiency anemias, particularly those related to folate and vitamin B12, represent a clinically significant subset of macrocytic anemias. In the perioperative setting, untreated anemia is linked to increased morbidity and mortality¹.

The University of Rochester Center for Perioperative Medicine (CPM) offers a comprehensive anemia optimization program, focusing primarily on iron deficiency anemia (IDA) through oral and IV iron supplementation. However, the incidence of vitamin deficiency anemias has not been evaluated, despite their inclusion in the anemia panel.

Aims

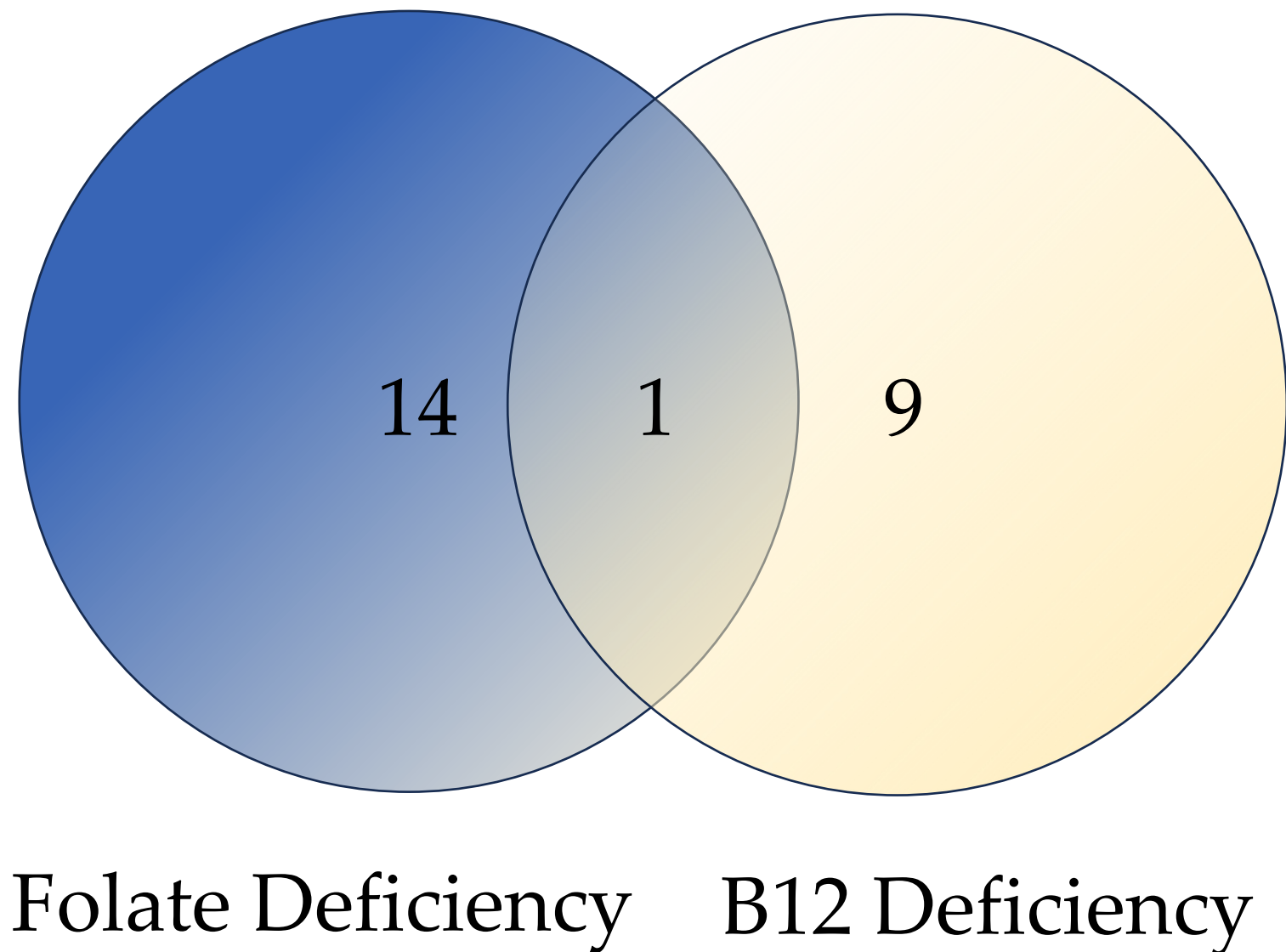
1. Evaluate the incidence of folate and vitamin B12 deficiencies in preoperative patients
2. Assess current optimization strategies
3. Analyze the cost-effectiveness of diagnostic testing and treatment options in the perioperative setting

Methods and Patient Selection

- Data from May 2024 to May 2025
- Included patients on anemia pathway (n = 364) undergoing elective surgeries with a high risk of blood loss or a history of anemia
- Collected folate and B12 levels within 3 months of CPM visit
 - Vitamin deficiency was defined as folate < 4.6 ng/mL and/or vitamin B12 < 232 pg/mL
- Anemia panel lab values were analyzed by healthcare providers at the CPM, and a diagnosis of IDA was recorded for appropriate patients
- Costs of prescription folate and B12 supplementation strategies were collected from billing data. Average cost estimates of generic over-the-counter (OTC) supplements were compiled from retailers and calculated.

Findings

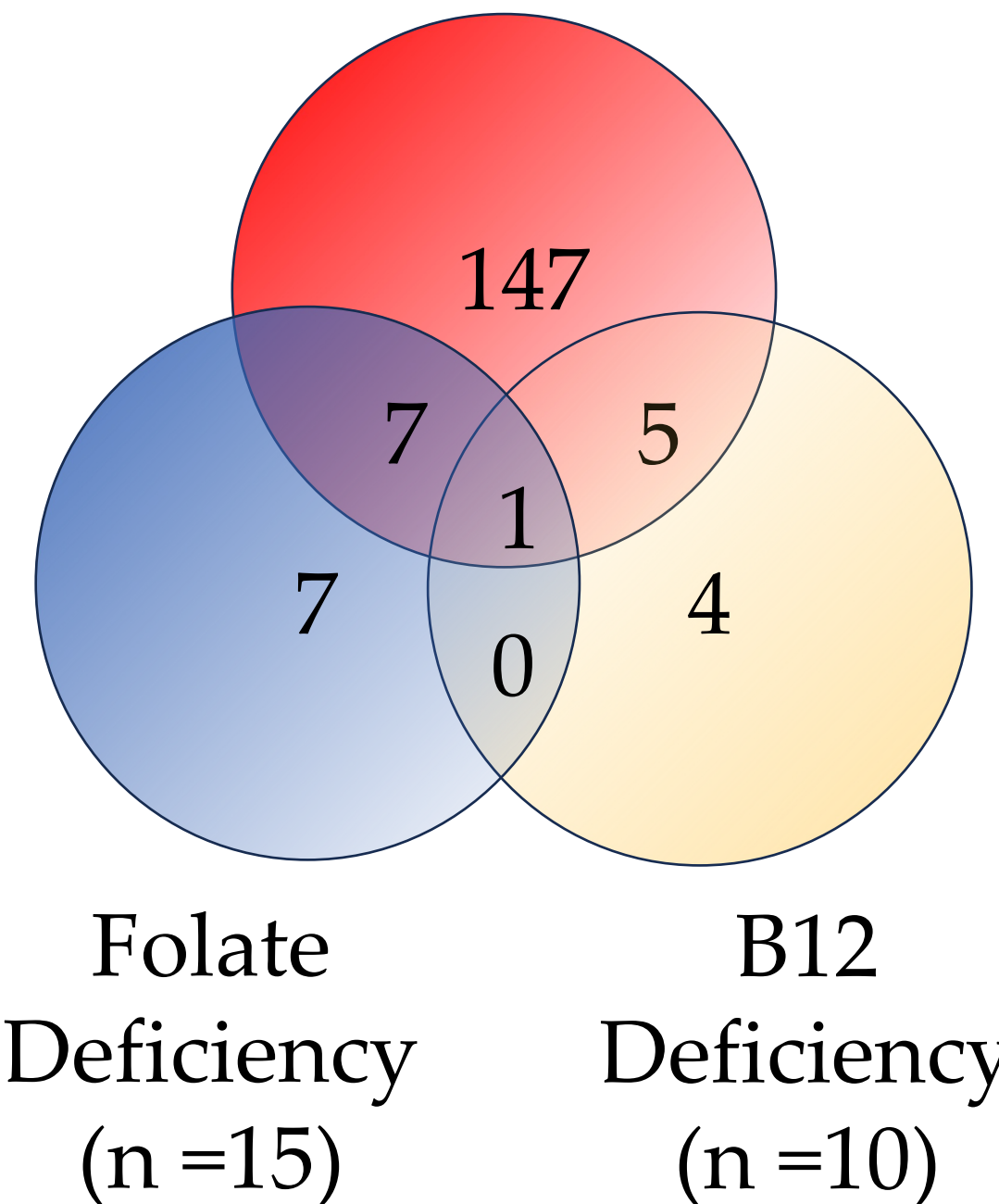
Vitamin Deficiency Anemia (n = 24)



Deficiency Type	Count	% of Population
Folate	15/364	4.1%
B12	10/364	2.8%
Total	24/364	6.6%

Figure 1. Vitamin deficiency anemia among CPM patients on the anemia pathway. Patients undergoing elective surgery with potential for high blood loss or history of anemia were screened with an anemia panel within 3 months of CPM visit or on day of CPM visit. Patients were classified as vitamin deficient if folate < 4.6 ng/mL or vitamin B12 < 232 pg/mL.

Combined Anemias
IDA (n = 160)



Deficiency Type	Count	% Among Group
IDA	160/364	44.0%
IDA + Folate	8/160	5.0%
IDA + B12	6/160	3.8%

Figure 2. Combined anemias among CPM patients on the anemia pathway. Patients undergoing elective surgery with potential for high blood loss or history of anemia were screened with an anemia panel within 3 months of CPM visit or on day of CPM visit. Patients were classified as vitamin deficient if folate < 4.6 ng/mL or vitamin B12 < 232 pg/mL. Diagnosis of IDA was made by healthcare providers at the CPM after reviewing lab values from anemia panel.

Description

Folate + B12 Labs	\$169
Prescription Folate	\$33
OTC Folate	\$5-10
Cyanocobalamin Injection	\$17
OTC B12	\$8-10

Average Cost Estimate

Table 1. Average cost estimate for prescription and over-the-counter vitamin supplements. The cost of URMCLab draw for folate and vitamin B12, prescription folate tablets, and cyanocobalamin injections was determined from billing data. The average cost of OTC vitamin supplements were compiled from various retailers and averaged.

Conclusions

Our investigation identified that vitamin deficiencies contributed to 6.6% of anemia cases at the CPM.

Current optimization strategies for vitamin deficiency anemia include prescription oral folate, prescription cyanocobalamin injections, and over-the-counter folate and vitamin B12 tablets.

Prescription supplementation for folate and B12 deficiencies are available at a higher out-of-pocket cost to patients compared to over-the-counter options.

Considering the low incidence and high costs associated with screening, we are evaluating the cost structure of our anemia panel, comparing prescription versus over-the-counter vitamin supplementation, and assessing the risk/benefit of universal perioperative folate and B12 supplementation. This quality improvement project underscores the potential to optimize patient care and reduce costs by integrating broad-spectrum, over-the-counter supplements into the anemia management pathway, particularly for perioperative patients.

References

1. Musallam, K. M., Tamim, H. M., Richards, T., Spahn, D. R., Rosendaal, F. R., Habbal, A., Khreiss, M., Dahdaleh, F. S., Khavandi, K., Sfeir, P. M., Soweid, A., Hoballah, J. J., Taher, A. T., & Jamali, F. R. (2011). Preoperative anaemia and postoperative outcomes in non-cardiac surgery: a retrospective cohort study. *The Lancet*, 378(9800), 1396–1407. [https://doi.org/10.1016/S0140-6736\(11\)61381-0](https://doi.org/10.1016/S0140-6736(11)61381-0)