

Anemia Management Clinic: A Cost-effective Patient Care Model



Sundara Reddy, MBBS., MBA^{1*} and Usha Perepu, MBBS., MRCP²

¹Department of Anesthesia, University of Iowa Healthcare, USA

²Department of Internal Medicine - Hematology, Oncology and Blood and Marrow Transplantation, University of Iowa Healthcare, USA

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***Corresponding author:** Sundara Reddy, MBBS., MBA, Department of Anesthesia, University of Iowa Healthcare, 6 JCP, 200 Hawkins Dr, Iowa City, Iowa 52242, USA, Tel: +1 319-356-2108

Abstract

Introduction: Most patients presenting for major elective surgery with preoperative anemia can be managed without allogeneic transfusion. However, prompt access to an outpatient setting that can provide comprehensive anemia management while accommodating the time constraints of surgical scheduling is a major challenge.

Description: Therefore, to address this problem, we developed a novel anemia management clinic (AMC), which offers easy access and comprehensive anemia management services to patients scheduled for major elective surgery.

Discussion: We present our experience in implementation and subsequent expansion of this clinic into a high demand service attending to multiple disciplines, including surgical and medical specialties across our healthcare system.

Abbreviations: AMC: anemia management clinic, US: United States, APP: advanced practice provider, EBL: estimated blood loss, EMR: electronic medical records

Introduction

Preoperative management of modifiable risk factors such as anemia, frailty, malnutrition, diabetes, smoking, and chronic pain prior to major elective surgery remains sub-optimal at many healthcare institutions in the United States (US), resulting in poor patient outcomes and increased cost of care [1,2]. A well-coordinated, interdisciplinary approach that is inexpensive, easy to access, has revenue generation potential, providing comprehensive optimization of all modifiable risk factors in one setting is the ideal solution for perioperative care. The optimal care delivery model for such a solution remains unclear [1,3].

Preoperative anemia is an independent predictor of poor perioperative outcomes [2,4-6] in addition to being strongly associated with blood transfusion [7,8]. Lack of timely screening for anemia and prompt access to an outpatient setting that can serve as a comprehensive solution for all aspects of anemia management are major limitations [8,9]. Surgeons in the US largely rely on primary care physicians or hematologists to manage preoperative anemias, who may not always be flexible enough to accommodate

surgical schedules, which in turn interferes with prompt diagnosis and treatment of anemia prior to surgery.

Description

To ensure rapid and reliable access, we developed a novel clinic model staffed by an advanced practice provider (APP) to offer a comprehensive outpatient anemia management service at a large academic tertiary health care system, performing more than 30,000 surgeries annually. Planning and implementing the AMC occurred over a one-year period. Key aspects of added value and quality improvement in the business plan presented to hospital leadership are illustrated in Tables 1,2 and the timeline for planning and implementation is illustrated in Table 3.

The AMC opened in December 2014, initially targeting patients with anemia undergoing elective, high blood loss surgery defined as expected blood loss (EBL) > 500 mL. These included vascular, general, orthopedic, cardiothoracic, urologic, neurologic, and gynecologic surgeries. The target patients were screened by

matching with a list of elective high blood loss procedures, which was generated for each surgical service by means of historical review of EBL data from the electronic medical record (EMR). The selected procedures were further vetted by surgeons from each service to ensure accuracy. If a high blood loss procedure is contemplated, surgeon proceeds to screen for anemia. Screening is done by using a hemoglobin value obtained within the last thirty days or by point of care hemoglobin testing on site. If the patient is anemic (Hb < 12 g/dL), a nurse can initiate a protocol-based order set in the EMR, enabling referral to AMC and blood sample collection for further testing (lavender top EDTA tube –

CBC and light green top PST tube – for serum Ferritin, Iron panel, Creatinine, Vit B12, TSH etc.) [9]. The AMC provider then promptly triages the referral, assigns scheduling priority, orders additional lab tests from the pre-drawn PST sample, initiates insurance pre-authorization if iron infusion or erythropoietin administration is anticipated and secures a provisional infusion slot. Same-day clinic appointments are offered during weekdays if possible and patients needing infusion therapy may choose to receive their treatment at our outpatient infusion suite, or in their own community, which AMC staff coordinate.

Clinical Impact	Financial Impact	Administrative Impact
Decreased blood use in elective surgery	Costs: <ul style="list-style-type: none"> • 1 FTE APP • 1 FTE MA • Medical Director (0.2 FTE) • Shared outpatient center clinic space 	<ul style="list-style-type: none"> • Cost-effective human resource • Easy to scale-up • Faster access • Decompresses anemia management workload for multiple subspecialties
Decreased Costs	Revenue: <ul style="list-style-type: none"> • Reimbursement (infusions) • Professional fees • Savings in reduced blood usage • Savings from decreased LOS 	<ul style="list-style-type: none"> • Independent reimbursement for pre-operative anemia management, shifting costs to outpatient treatment • Revenue generation potential
<ul style="list-style-type: none"> • Decreased adverse outcomes from transfusion • Reduction in hospital length of stay 	Net revenue positive	<ul style="list-style-type: none"> • Reduction in nursing time related to transfusion • Improved patient satisfaction survey results

Table 1: Value addition and quality improvement.

Financial projection for AMC	
Number of patients expected to be seen annually	500
Expenses:	
• 1.2 FTE APP (salary, fringe benefits and overhead)	(\$162,000)
• 1.2 FTE MA (salary, fringe benefits)	(\$42,000)
• 0.2 FTE Medical Director oversight	(66,000)
• Clinic space and Infusion Suite costs	(\$1,500,000)
Total expenses	(\$1,770,000)
Revenues:	
• Average Professional fees per patient for clinic visits (net) \$464	\$227,000
• Average IV Iron infusion revenues per patient (net) \$3,678	\$1,839,000
Total Revenues	\$2,066,000
Net Income:	\$296,000
✦ Net does not include overhead expenses ✦ This analysis does not include cost savings from RBC transfusion saved, reduction in M&M, decrease in LOS ✦ Additional 0.2 FTE for APP and MA to account for vacation and unplanned absences	

Table 2: Financial projection for AMC.

Planning timeline

Q4 2013	Blood management identified as a key metric in our institutional clinical quality and service goals; UIHC strategic plan (FY 2014-2016)
Jan 2014	Pre-operative Anemia Management Clinic taskforce created (Representatives from Hematology, Anesthesiology, General surgery, OB GYN, Internal Medicine, Hospital administration, IT support and Pharmacy)
Feb 2014	Based on a pilot in 2012, a business plan was prepared
May 2014	Plan approved by Hospital leadership and Project Manager assigned
June-Nov 2014	Medical Director, Staff Hire, EMR workflow, Clinic space, Staff education and Data collection plan
Dec 2014	Anemia Management Clinic (AMC) opened

Table 3: Planning and implementation timeline.

Our original model was a self-contained clinic with two monitored infusion chairs staffed by a part time APP (0.4 FTE), medical assistant (0.4 FTE), and a medical director (0.2 FTE) open two days per week. In addition to direct clinical care such as focused history and physical, formulate treatment plan, insert intravenous catheters, administer iron infusions, and monitor patients. The clinic staff also managed clerical tasks such as facilitate patient schedules, insurance pre-authorizations and field phone calls. With the high task load and staffing constraints, this model became unsustainable as the number of referrals increased. It became obvious that we needed to rethink our strategy to reduce clerical and some clinical task load specifically - infusion management to decompress the workload of our staff and grow the clinic to accommodate more consults. We readjusted our strategy to establish several important partnerships within our healthcare system to streamline our workflow and to enable

sustained growth of the AMC. Examples include:

- a. Partnership with outpatient infusion center within our healthcare system to outsource infusion management and allow AMC staff to focus solely on consults
- b. Partnership with the hospital patient appointment center to manage all scheduling and insurance pre-authorizations
- c. Partnership with pharmacy, resulting in addition of sterile hoods and staff to prevent delays in preparing iron infusions.
- d. Partnership with IT services to implement data analytics software (Tableau™) to generate monthly reports for surgical providers showing their transfusion rates, referral trends to AMC and missed opportunity for pro-active anemia management resulting in peri-operative transfusion and increased length of stay.

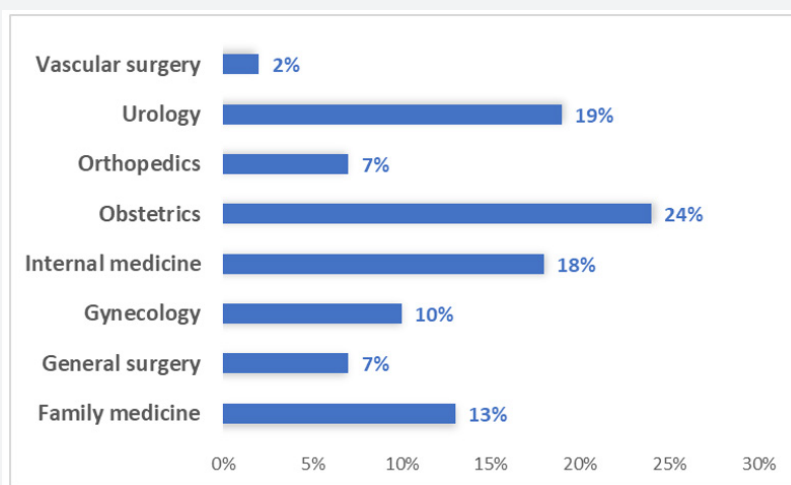


Figure 1: Distribution of referral services.

These changes, along with initiatives such as simplified EMR referral pathway, improved surgical provider awareness of the value of pre-operative anemia management through internal communication channels and patient education through information leaflets enabled us to increase our surgical patient volumes. In the five years since its founding, the AMC increased its scope of practice beyond perioperative care to several other service lines, including obstetrics gynecology, internal medicine, family medicine, gastroenterology, cardiology, and nephrology

- Figure 1. Since implementation, AMC received over 5000 clinic visits, of which 40% were new consults and 60% were follow-up visits to assess response to treatment. The number of patient visits has increased steadily with a 30% increase in new consults and 65% increase in follow-ups over the last 2 years - Figure 2. In addition, the clinic has become a referral center for Jehovah's Witnesses and others whose religious beliefs prohibit the acceptance of blood products.

AMC Patient Visit Data

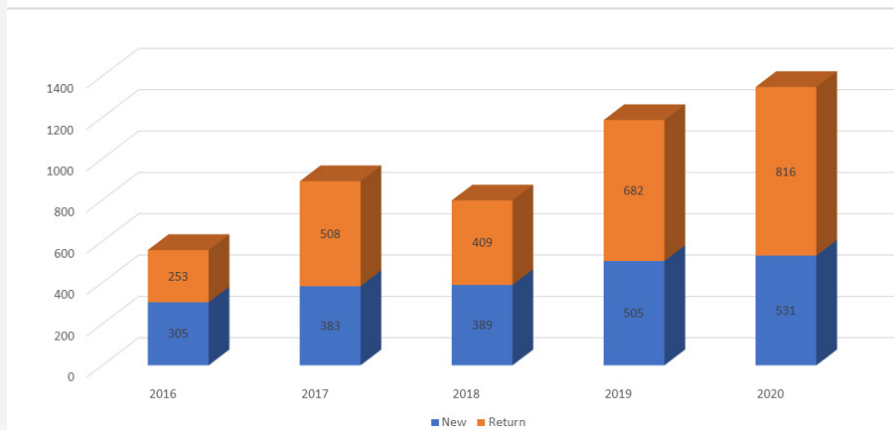


Figure 2: AMC patient visit data.

Discussion

Anemia is prevalent in the general population [10,11] and specifically in certain populations such as perioperative [7,12-14] and peripartum patients [15,16], in whom anemia needs to be addressed in a time-sensitive manner. Lack of easy access to a comprehensive anemia management service in the outpatient setting can be a major limitation, resulting in adverse patient outcomes [5,7,15].

A novel AMC staffed by an APP was created to address this limitation and improve quality of care in preoperative patients. The key supportive rationale for this model is:

- a. Cost-effective human resource compared to the clinic being staffed by a full-time physician anesthesiologist
- b. Easier to scale because of lower HR cost
- c. Faster access for patients requiring basic anemia management
- d. Consistent patient care guided by simple management algorithms derived through multidisciplinary consensus
- e. Amenable to remote supervision by physician medical director

Majority of the referrals (85%) include anemias from nutritional deficiencies (40%), chronic blood loss (10%), chronic inflammation (25%) or a combination (25%). The remaining (15%) are hereditary or acquired hemolytic anemias and anemia from chronic kidney disease are routed back to hematology and nephrology services, respectively to establish specialist care.

The clinic quickly established itself as a useful resource for anemia management and gained acceptance across the institution. Based on rising demand for our service, we recognized early in our experience that there is a large, underserved need for basic anemia management in our community and the scope for the AMC extended well beyond managing preoperative anemias alone. The ability to scale created an opportunity to improve patient access, experience and population health in a cost-efficient manner across the institution- The triple aim of healthcare [17,18]. The AMC evolved as a service that could decompress basic anemia management workload for multiple subspecialties including obstetrics gynecology, hematology, nephrology, and gastroenterology. The increased patient numbers enabled the clinic to generate break even revenue from clinic visits alone to support staff expense (APP & MA- 1 FTE and Medical Director - 0.2 FTE). AMC also created new revenue streams for the healthcare system via infusions, pharmacy, and laboratory test charges in

addition to cost savings generated by means of decreased blood transfusions and hospital length of stay (yet to be quantified accurately). As the number of referrals grew, we increased the clinic days from 2 to 4 per week. Our sole focus on clinic visits, without the distraction of clerical tasks and managing infusions, helped us implement a clinic scheduling template with 40-minute slots for new patients and 20-minutes for follow-up visits. This template enabled us to better define our clinic capacity, monitor capacity utilization and forecast future staffing needs.

We prioritize patients scheduled for surgery within 3 weeks for same or next day appointments by holding two new patient slots in the schedule twice weekly with a two-day release and by overbooking if needed while accommodating referrals from non-surgical specialties to maximize our capacity utilization. We were fortunate to find a willing partner in our hospital's infusion center which had excess capacity that was underutilized. We learned through experience that managing consults and infusions in a self-contained setting is both resource intensive and makes patient throughput less predictable. We also learnt that more clinic consults will translate to more infusions and gave us leverage in building strategic partnerships with infusion center and pharmacy and the ability to negotiate dedicated resources such as infusion chairs and staff. With some modifications this model could be successfully replicated at other academic medical centers and community hospitals.

Authors Contribution

Dr. Sundara Reddy helped conceptualize and design the work; acquire, analyze, and interpret the data; draft and revise the manuscript; and gave final approval of the version to be published. Dr. Usha Perepu helped conceptualize the work, interpret the data, revise the manuscript, and gave final approval of the version to be published.

Disclosure

There is no HIPAA protected data disclosed in this manuscript.

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