Preoperative Anemia

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CLEVELAND CLINIC HEALTH SYSTEM

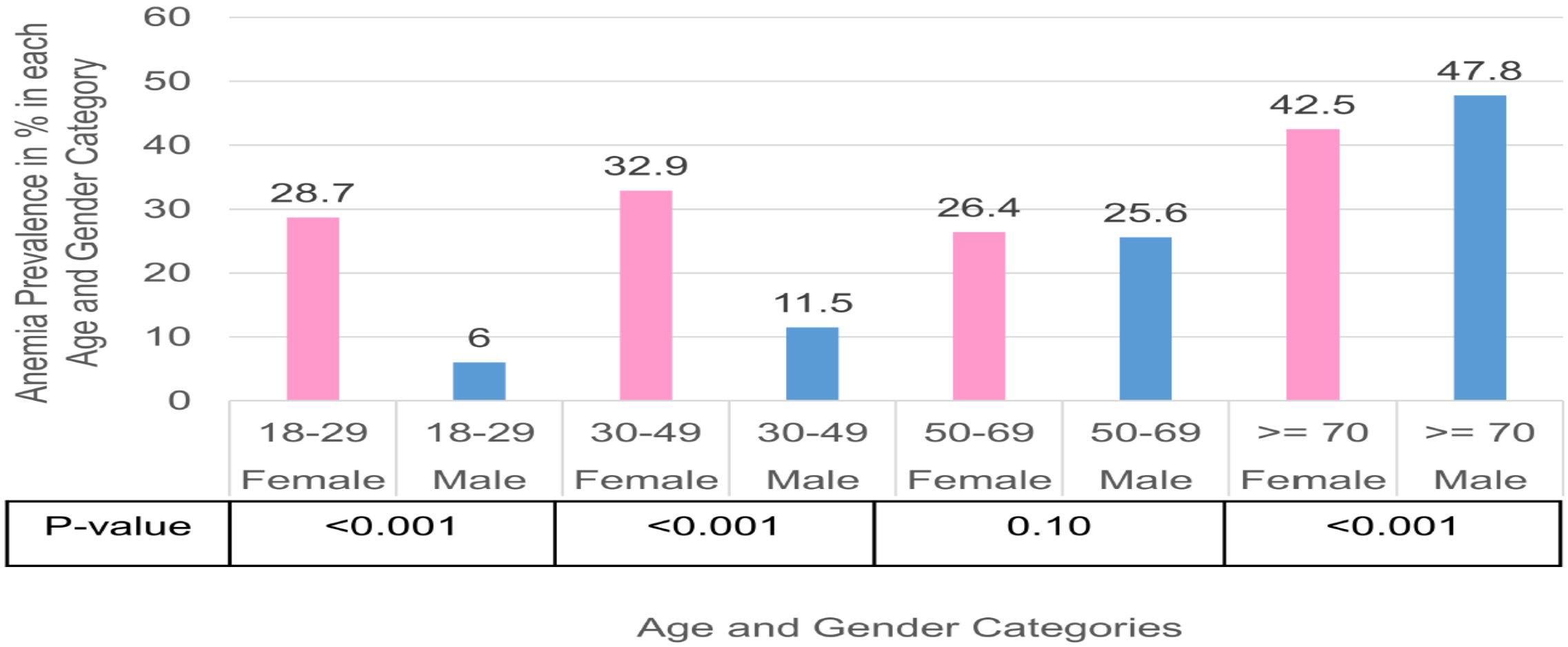
CLEVELAND, OH

Objectives

- Data analysis for current and future state
- Consider models for care delivery
- Constructing a workflow

Disclosures: None

Incidence Preoperative Anemia



P-value	<0.001	<0.001	0.10	<0.001

Sim et al (2017*)

*See reference slide

Distribution of Preoperative Anemia

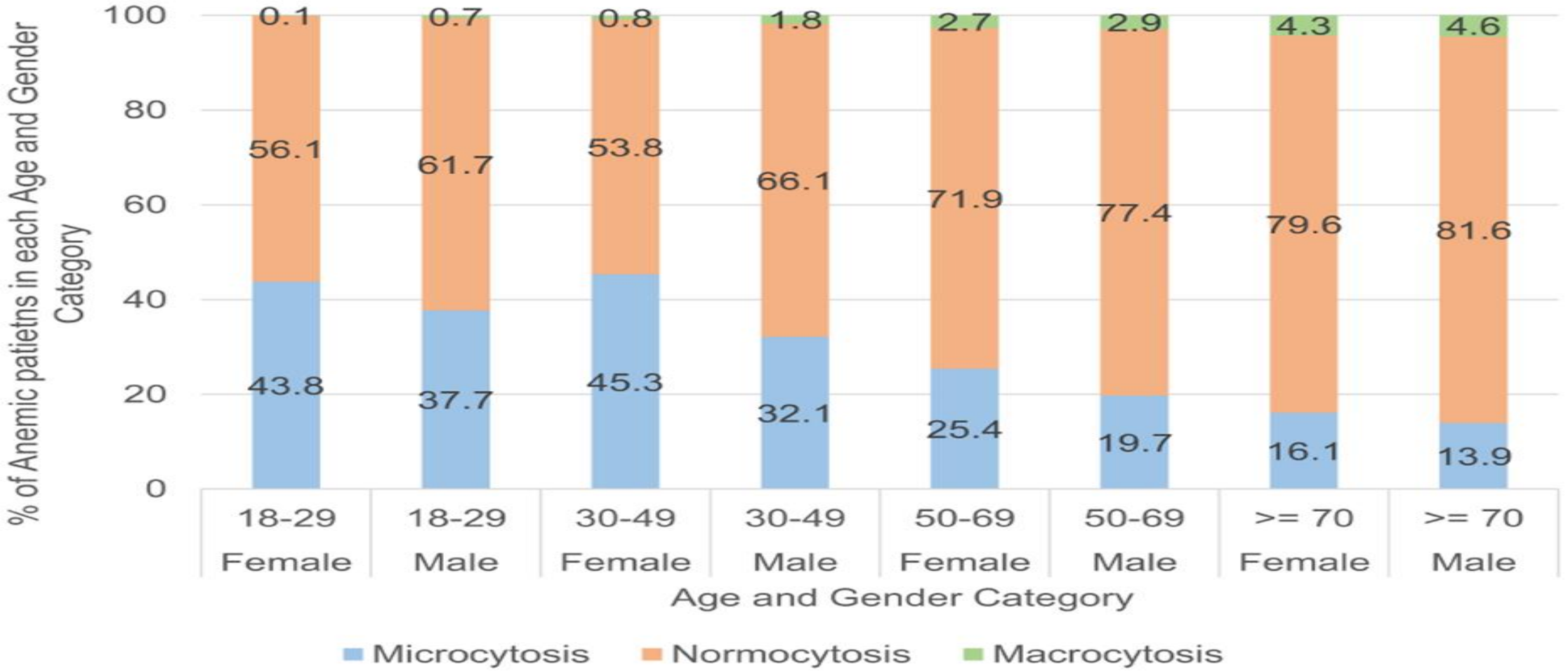
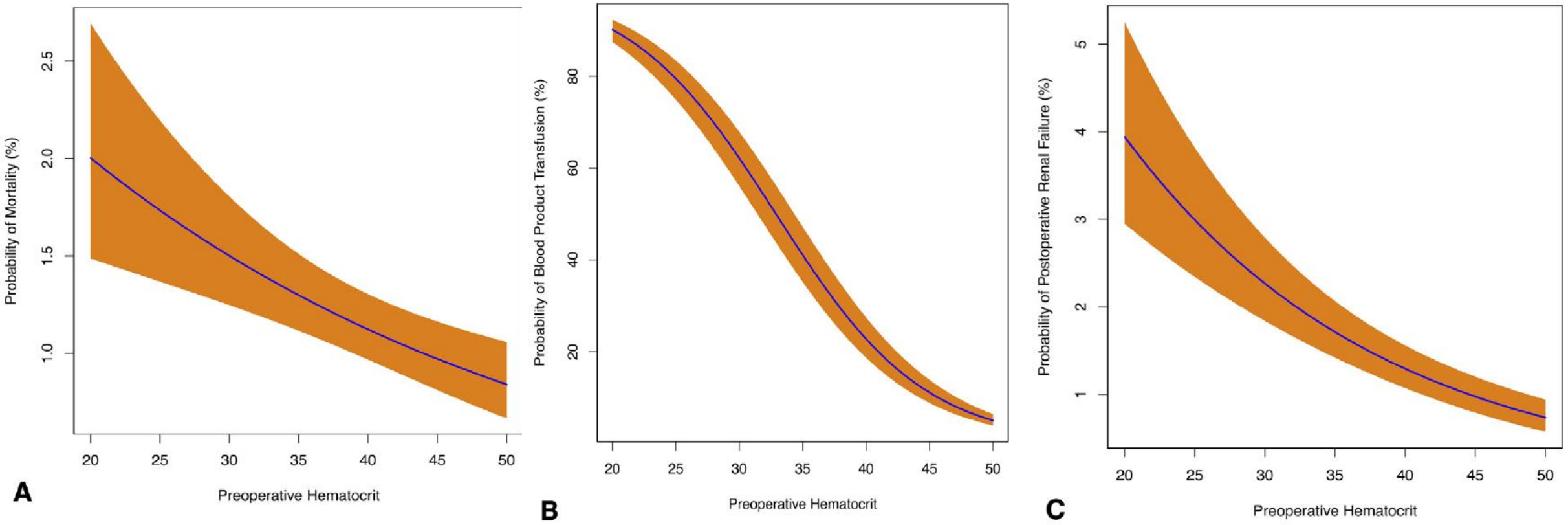


Fig 3. Distribution of microcytosis, normocytosis, macrocytosis in anemic patients of various age and gender groups.

Sim et al (2017*)

Preoperative anemia versus blood transfusion: Which is the culprit for worse outcomes in cardiac surgery?

Damien J. LaPar, MD, MSc,[a] Robert B. Hawkins, MD, MSc,[a] Timothy L. McMurry, PhD,[a] James M. Isbell, MD, MSCI,[a] Jeffrey B. Rich, MD,[b] Alan M. Speir, MD,[c] Mohammed A. Quader, MD,[d] Irving L. Kron, MD,[a] John A. Kern, MD,[a] and Gorav Ailawadi, MD,[a] Investigators for the Virginia Cardiac Services Quality Initiative



J Thor CV Sg (2018) doi.org/10.1016/j.jtcvs.2018.03.109

Preoperative anaemia and postoperative outcomes in non-cardiac surgery: a retrospective cohort study

Khaled M Musallam, Hani M Tamim, Toby Richards, Donat R Spahn, Frits R Rosendaal, Aida Habbal, Mohammad Khreiss, Fadi S Dahdaleh, Kaivan Khavandi , Pierre M Sfeir, Assaad Soweid, Jamal J Hoballah, Ali T Taher, Faek R Jamali

N = 227 425 patients (69 229 preoperatory anemia)

Postoperative mortality (30 days) (OR 1.42, 95% CI 1.31-1.54)

- Mild Anemia (OR 1.41, 1.30-1.53)
- Moderate-severe Anemia (OR 1.44, 1.29-1.60)

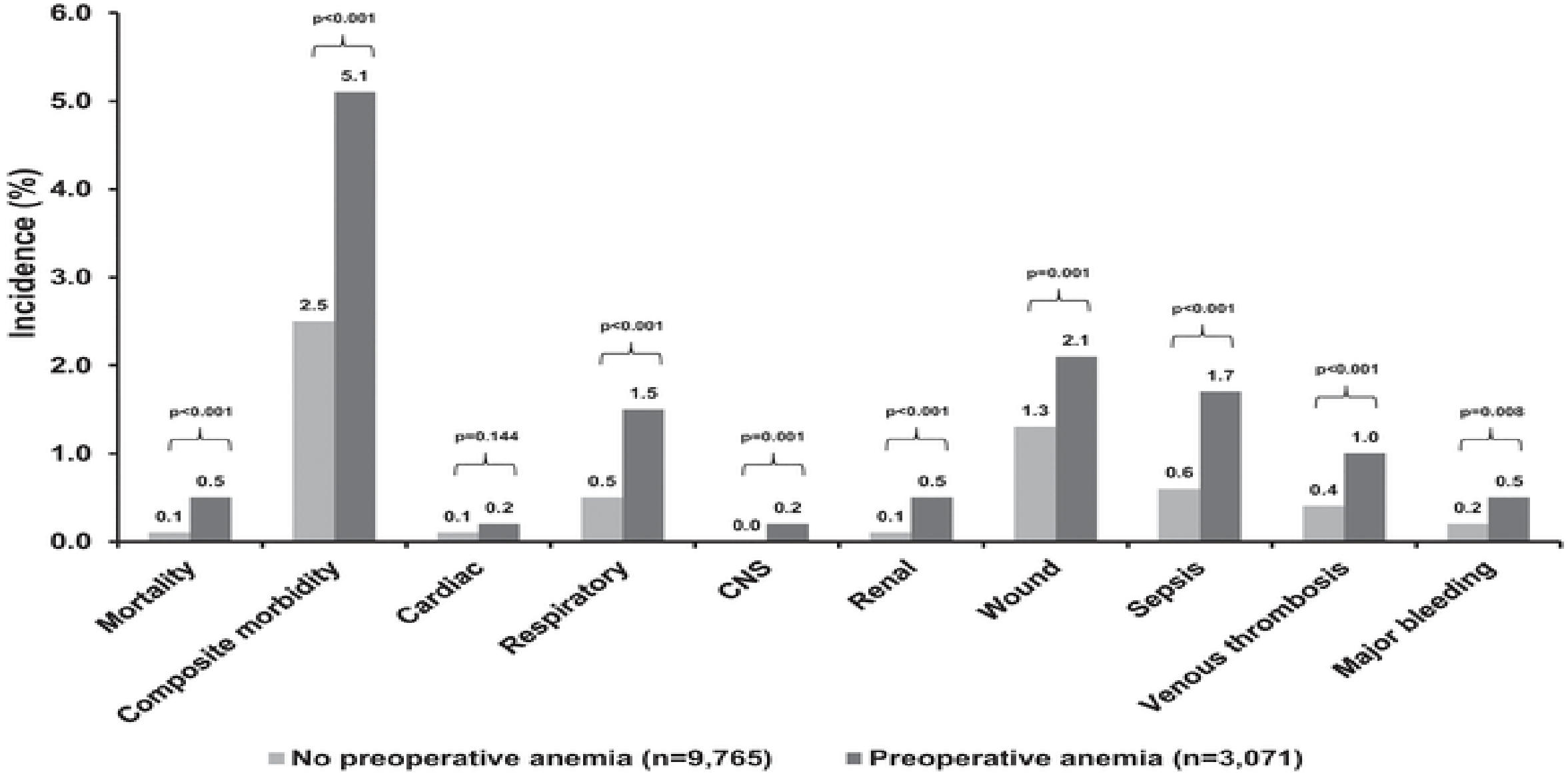
Postoperative morbidity (30 days) (OR 1.35, 1.30-1.40)

- Mild Anemia (OR 1.31, 1.26-1.36)
- Moderate-severe Anemia (1.56, 1.47-1.66)

- Preoperative anemia is associated with increased postoperative morbidity and mortality

Lancet 2011; 378: 1396–407.

Fig 1. Crude 30-day postoperative mortality and morbidity rates in patients with and without preoperative anaemia.



Richards et al (2015)

* See Reference slide

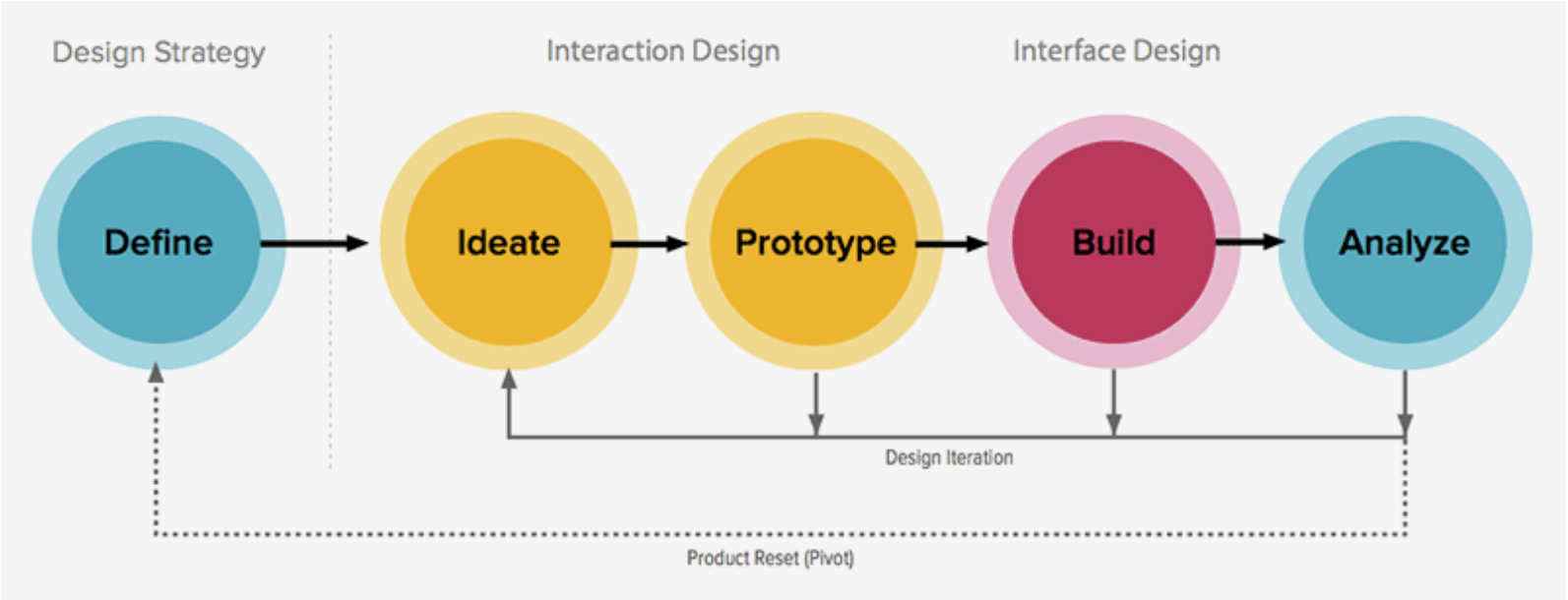
PLOS ONE

Synthesis of Evidence

- Preoperative anemia as predictor of transfusion risk
- Preoperative anemia as modifiable risk factor
- Decrease transfusion requirements = lower complication rates
- Transfusion and increased LOS
- Transfusion dose-dependent risk
- Prolonged postoperative anemia

How to Develop a Preoperative Anemia Clinic (PAC)

- ❑ Evidence of opportunity
- ❑ Business plan
- ❑ Guidelines & algorithm
- ❑ Workflow
- ❑ Pre-implementation
- ❑ Launch
- ❑ Results



Feasibility & Defining Scope

- ❑Goals & outcomes
- ❑Data current state
- ❑Resources
- ❑Support
- ❑Sustainability


Business PLAN
Executive Summary
Mission Statement
Company Background
Product Description
Marketing Plan
Competitor Analysis
SWOT Analysis
Operations
Financial Planning
Timeline

Transfusion & Anemia Rates

Center Name	Inpatient Encounter	Inpatient Encounter with Transfusion	Transfusion Rate	RBC Units Per Patient	Pre-surgical Anemia Rate	Red Blood Cell Units
Colorectal Surgery	3113	394	12.66%	3.20	28.38%	1309
Gastroenterology & Hepatology	2327	452	19.42%	2.96	26.73%	1308
General Surgery	3762	725	19.27%	6.23	23.00%	4313
Obstetrics & Gynecology	869	226	26.01%	3.04	40.26%	725
Orthopedic Surgery	2677	541	20.21%	3.05	21.83%	1613
Spine	1162	175	15.06%	2.98	15.31%	514
Thoracic & Cardiovascular Surgery	5682	2380	41.89%	5.50	14.47%	13141
Urology	2170	339	15.62%	3.42	20.23%	1129
Vascular Surgery	1606	501	31.20%	4.14	18.88%	2051

Transfusion Rate is percentage of RBC transfused inpatient encounters, RBC units per patient is average unit per transfused patient, pre-surgical anemia rate = numerator number of patients with a hemoglobin of 12.5 or below within 30 days prior to date of surgery with denominator total number of surgical patients with an outpatient hemoglobin value 30 days prior to date of surgery.

Tolich D "Business plan or proposal," *Preoperative Anemia Management*, Bethesda: AABB Press, 2019. 7-15. Print.

Name, Encounter, Transfusion

Center Name	Inpatient Encounter	Inpatient Encounter with Transfusion
Colorectal Surgery	3113	394
Gastroenterology & Hepatology	2327	452
General Surgery	3762	725
Obstetrics & Gynecology	869	226
Orthopedic Surgery	2677	541
Spine	1162	175
Thoracic & Cardiovascular Surgery	5682	2380
Urology	2170	339
Vascular Surgery	1606	501

Surgical patient total volume & volume that received RBC transfusion

Transfusion Rate

Center Name	Transfusion Rate
Colorectal Surgery	12.66%
Gastroenterology & Hepatology	19.42%
General Surgery	19.27%
Obstetrics & Gynecology	26.01%
Orthopedic Surgery	20.21%
Spine	15.06%
Thoracic & Cardiovascular Surgery	41.89%
Urology	15.62%
Vascular Surgery	31.20%

TX Rate =
Number of RBC Transfused Pts. (N)
Divided by
Total Number of Pts. (D)

Avg. RBC Units Per Patient

Center Name	RBC Units Per Patient
Colorectal Surgery	3.20
Gastroenterology & Hepatology	2.96
General Surgery	6.23
Obstetrics & Gynecology	3.04
Orthopedic Surgery	3.05
Spine	2.98
Thoracic & Cardiovascular Surgery	5.50
Urology	3.42
Vascular Surgery	4.14

Avg. RBC per Patient =
Total RBC Units (N)
Divided by
Number of Pts. w/ Transfusion (D)

Pre-surgical Anemia Rate

Center Name	Pre-surgical Anemia Rate
Colorectal Surgery	28.38%
Gastroenterology & Hepatology	26.73%
General Surgery	23.00%
Obstetrics & Gynecology	40.26%
Orthopedic Surgery	21.83%
Spine	15.31%
Thoracic & Cardiovascular Surgery	14.47%
Urology	20.23%
Vascular Surgery	18.88%

Percentage of surgical Pts. w/ hemoglobin 12.5 or below up to 30 days prior to DOS

Financial Impact

4.0 Sample Financial Projections

Center Name	Encounter	Encounter with Transfusion	Transfusion Rate	RBC/ TX. Patient	Anemia Rate	RBC	Potential Anemia Volumes*	Est. Revenue 25% treated	Acquisition Cost Savings
Colorectal Surgery	3113	394	12.66%	3.2	28.38%	1309	883	$132,450	$26,180
Gastroenterology & Hepatology	2327	452	19.42%	2.96	26.73%	1308	622	$93,300	$26,160
General Surgery	3762	725	19.27%	6.23	23.00%	4313	865	$129,750	$86,260
Obstetrics & Gynecology	869	226	26.01%	3.04	40.26%	725	350	$52,500	$14,500
Orthopedic Surgery	2677	541	20.21%	3.05	21.83%	1613	584	$87,600	$32,260
Spine	1162	175	15.06%	2.98	15.31%	514	178	$26,700	$10,280
Thoracic & Cardiovascular Surgery	5682	2380	41.89%	5.5	14.47%	13141	822	$123,300	$262,820
Urology	2170	339	15.62%	3.42	20.23%	1129	439	$65,850	$22,580
Vascular Surgery	1606	501	31.20%	4.14	18.88%	2051	303	$45,450	$41,020
Total or Avg.	23368	5733	22.37%	3.84	23.23%	26103	5047	$756,900	$522,060

*Potential anemia volumes= anemia rate x encounter volume,
Assumptions= average contribution margin for iron sucrose 300 mg infusion technical services $200 (infusion) IV push will be less, estimate average 3 visits
Reduction in RBC transfusion 10% of stated utilization, acquisition cost $200

Tolich D "Business plan or proposal," *Preoperative Anemia Management*, Bethesda: AABB Press, 2019. 7-15. Print.

Potential Treatment Pool

Center Name	Encounter	Anemia Rate	Potential Anemia Volumes*
Colorectal Surgery	3113	28.38%	883
Gastroenterology & Hepatology	2327	26.73%	622
General Surgery	3762	23.00%	865
Obstetrics & Gynecology	869	40.26%	350
Orthopedic Surgery	2677	21.83%	584
Spine	1162	15.31%	178
Thoracic & Cardiovascular Surgery	5682	14.47%	822
Urology	2170	20.23%	439
Vascular Surgery	1606	18.88%	303
Total or Avg.	23368	23.23%	5047

Potential Anemia Volume = Total Encounters X Anemia Rate

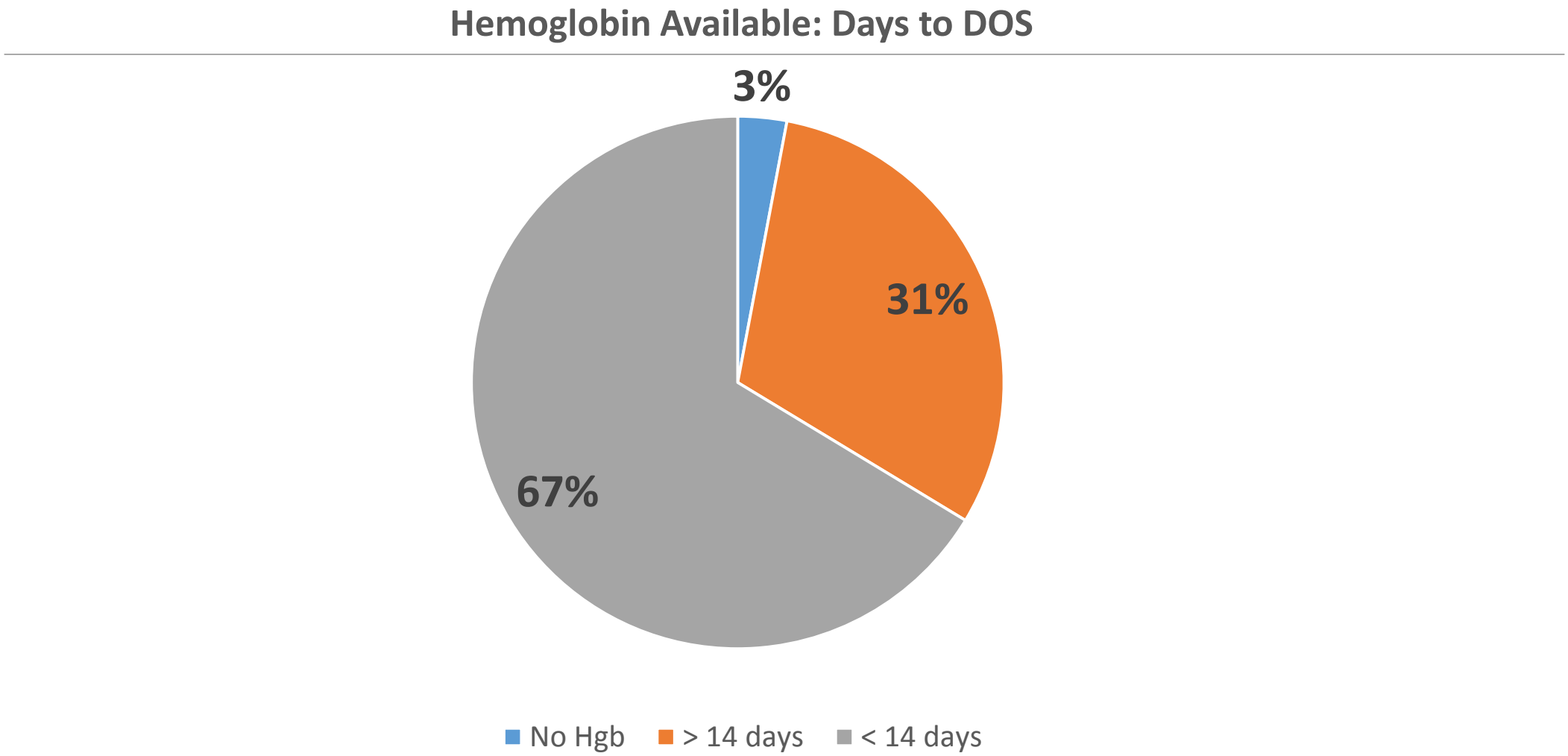
Financial Estimates

- A) Determine a percentage of "Potential"
  B) List several i.e. 10%, 20% etc.

- Medication revenue
  A) Formulary IV iron & EPO
  B) Avg. revenue for both med & technical
- Reduction in RBC Utilization
  A) Optional
  B) Literature suggests 40%
  C) Conservative = 5-15%

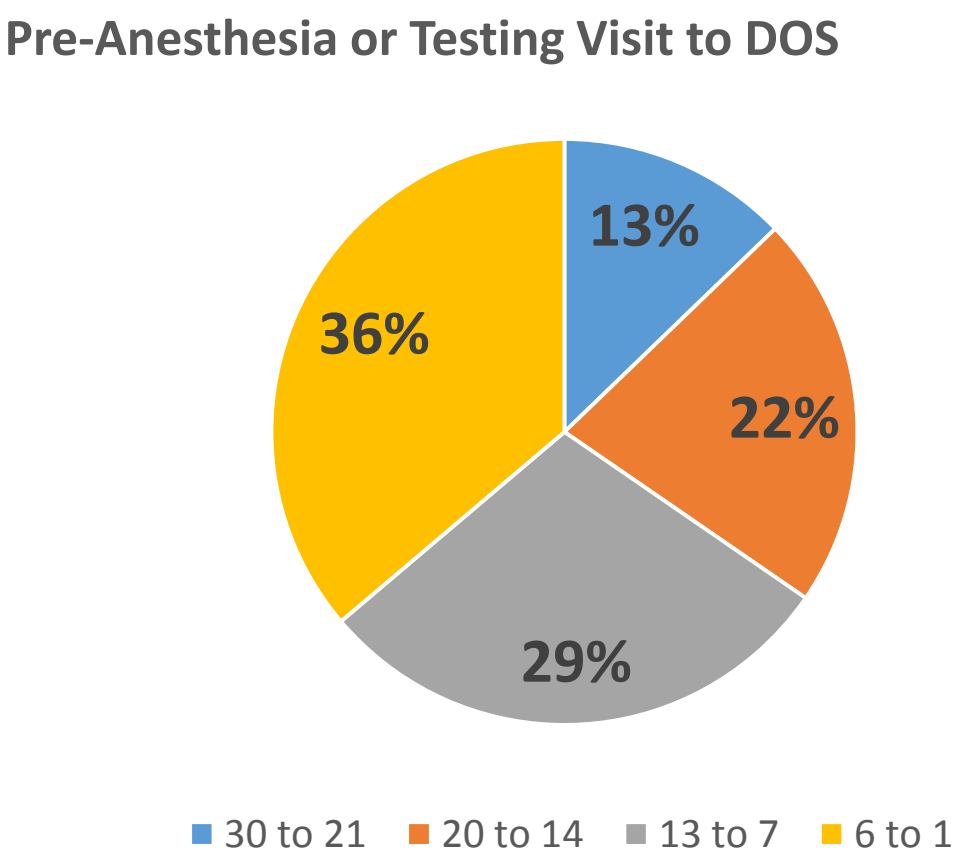
Potential Anemia Volumes*	Est. Revenue 25% treated	Acquisition Cost Savings
883	$132,450	$26,180
622	$93,300	$26,160
865	$129,750	$86,260
350	$52,500	$14,500
584	$87,600	$32,260
178	$26,700	$10,280
822	$123,300	$262,820
439	$65,850	$22,580
303	$45,450	$41,020
5047	$756,900	$522,060

Timing of Hemoglobin



Example from Cleveland Clinic Blood Management Program

Timing of Pre-Anesthesia Visit



Example from Cleveland Clinic Blood Management Program

It takes a TEAM

- Project Roles: Executive sponsor, Team Leader, Process Owners, IT Liaison
- Active in workflow
- Controllers of resources
- Impacted by outcomes/workflows
- Late adopters/ resisters

Tools of the Trade

Implementation Plan (Macro)

PREOPERATIVE ANEMIA CLINIC WORKPLAN

Phases	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	
Phase I													
Define scope													
Collect/analyze data													
Financial impact													
Prepare Business Plan/proposal													
Leadership Approval & Support													
Phase II													
Assemble Team & Stakeholders													
Establish Guidelines & Algorithms													
Evaluate & Finalize Model													
Phase III (Pre-Implementation)													
Build, Test, Validate ITD													
Documents & Materials													
Communication Plan													
Education & Training													
Phase IV (Implementation)													
Go Live													
Measure & Evaluation													
Phase V													
Evaluation													
Process Improvement													
Report Outcomes													

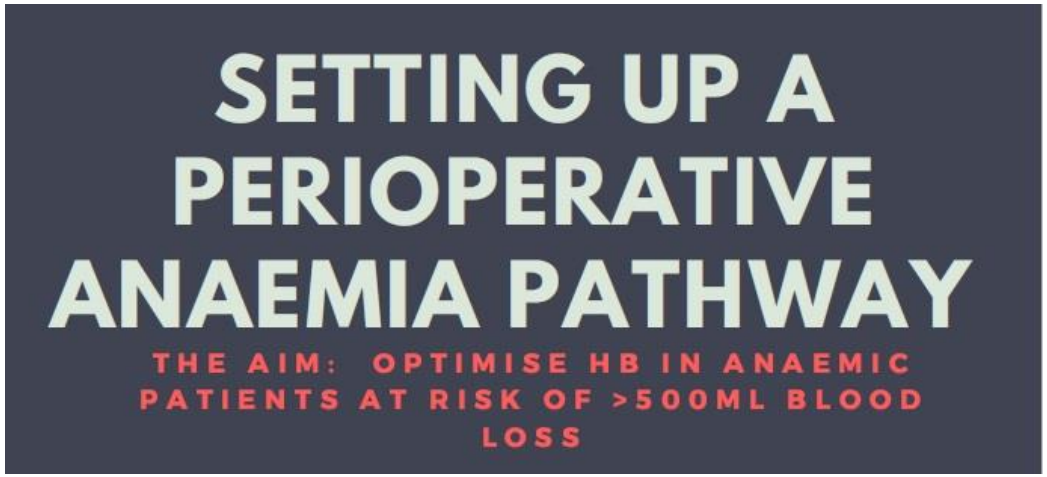
Task List (Micro)

PREOPERATIVE ANEMIA TASK LIST

Executive Sponsor: MT
Team Leader: DT
Project Manager: NF

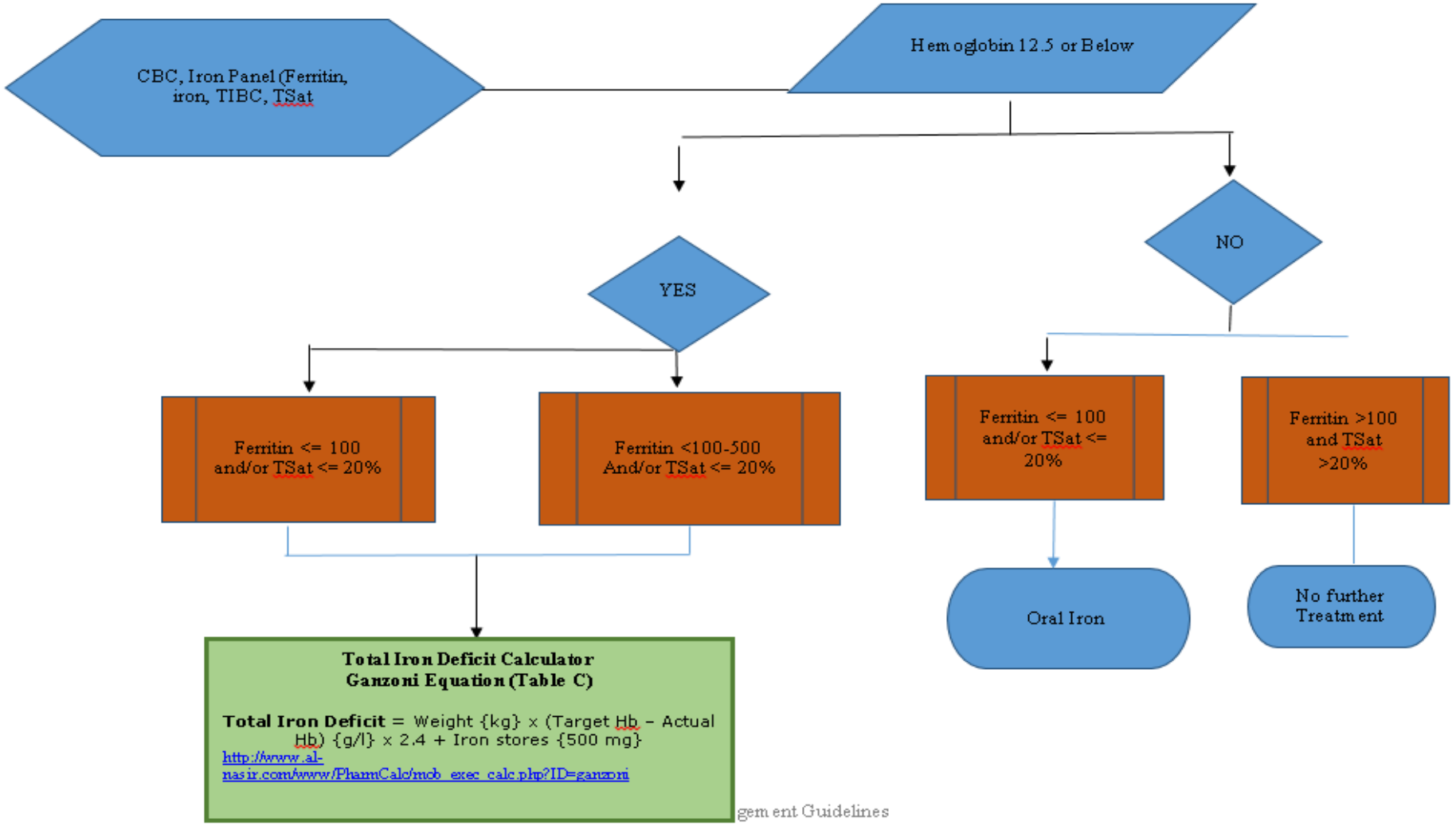
TASK	ASSIGNED	Due	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Collect & Analyze Data	KM	Jan												
Obtain Financial Impact Data	JS	Jan												
Prepare Business Plan	DT/MA	Mar												
Review BP with section leadership	MA													
Present to Leadership	MA	May												
Create Stakeholder and Core Team	MA/DT	May												
Schedule Team Meetings (frequency)	NF	May												
Meeting Agendas	NF					X								
Team Analysis (use Tool)	CORE	Apr												
Guidelines: (by Section)														
Blood Product Criteria	TM													
Emergency Release/ CONABO	NQ													
Blood Not an Option	SS													
Differential DX Chart	SM													
Preop Anemia	SM, DT, MA, KM													
Observe target clinic workflows	CC, KM, DW													
Create EPIC referral/ order set														
Develop EPIC BPA for anemia														

Setting Clinical Parameters



- ❑ Define eligibility
- ❑ Identify exclusions
- ❑ Assessment & Treatment guideline
- ❑ Treatment algorithms
- ❑ Resources

Algorithms



Tolich D "Guidelines and algorithms." Preoperative Anemia Management, Bethesda: AABB Press, 2019, 31-35. Print

Model

- ❑ Anesthesia
- ❑ Hematology
- ❑ Infusion Center
- ❑ Pathology
- ❑ PBM or designated provider(s) (LIP)
- ❑ Pharmacy
- ❑ Hospitalist

Old, New & In Between

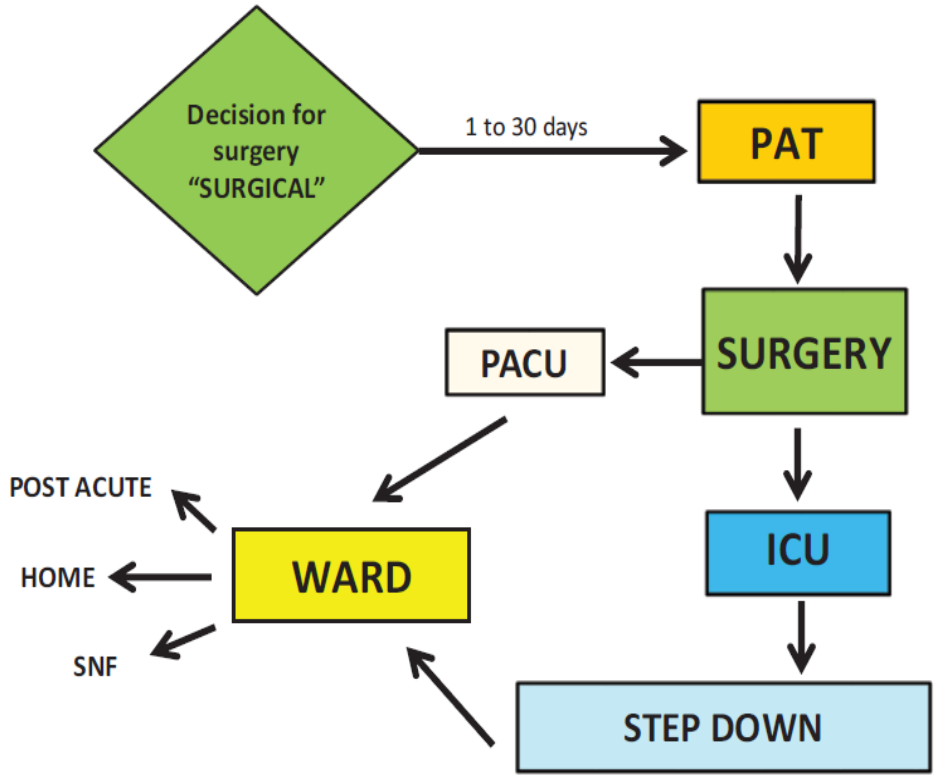


Figure 1. Old paradigm of pathway to surgery after declaration of surgery is made. ICU indicates intensive care unit; PACU, postoperative care unit; PAT, preanesthesia testing; SNF, skilled nursing facility.

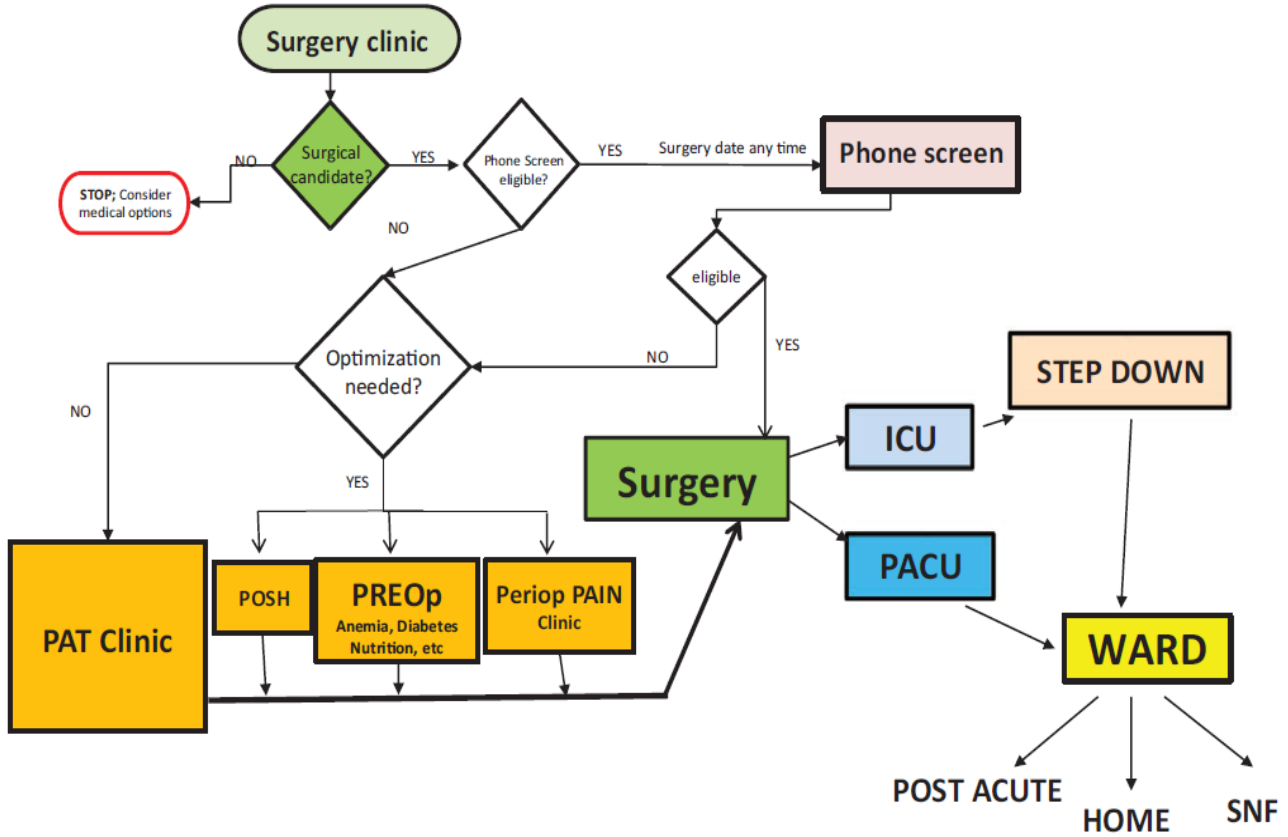
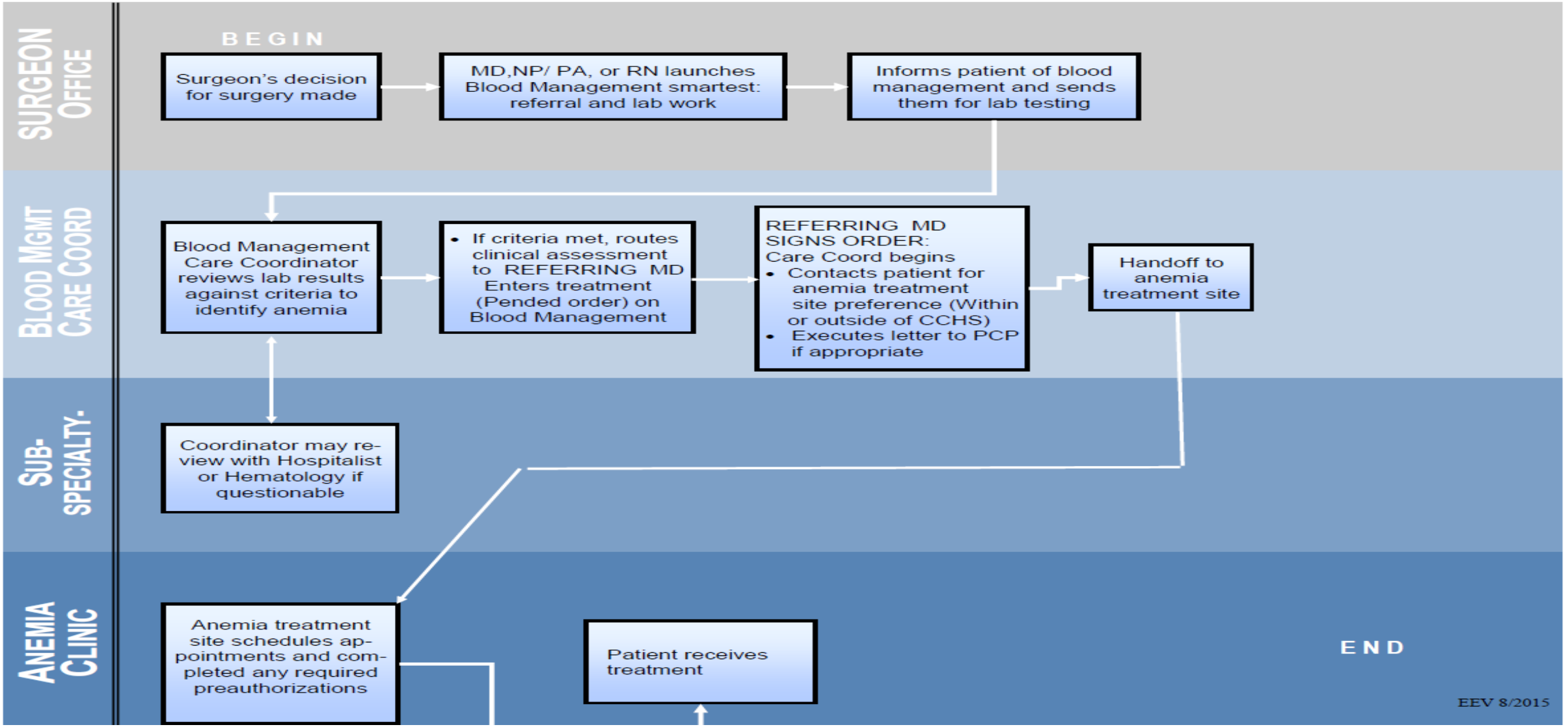


Figure 2. POET process from surgery contemplation to PREOp. POET indicates perioperative enhancement team; PREOp, perioperative risk evaluation and optimization.

Aronson et al, 2018*

*See reference slide

Workflow



McCoy D, Tolich D "Workflow: The nuts and bolts," *Preoperative Anemia Management*, Bethesda: AABB Press, 2019. 37-43. Print.

Pre-implementation

- ❑ Approvals & Awareness
- ❑ Document & Material Procurement
- ❑ Communication Plan
- ❑ Education & Training
- ❑ Maintenance

IMPLEMENTATION PLAN (SAMPLE)

1. **Organizational Awareness and Approval**
   - Identify key stakeholders and committees needed to approve the initiative and policy.
   - Obtain buy-in; begin to get included in meeting agendas for approval.
   - Update various key stakeholders and leadership.
   - Finalize implementation date – "Go Live" date. California hospitals are encouraged to adopt the standardized emergency codes by January 1, 2010.
   - Approve policy and implementation plan.

2. **Documents and Materials Procurement**
   - Develop training forms and communication materials and obtain organizational approval for forms if necessary.
   - Work with materials management to have the necessary posters, phone stickers, badge buddies and other materials available prior to the "Go Live" date.
   - Maintain a surplus supply of materials for post "Go Live" date needs.

3. **Communication Plan**
   - Draft a letter from the CEO or other senior leadership to physicians and staff.
   - Publish articles for the employee newsletter.
   - Create e-mails and send to the staff periodically leading up to the "Go Live" date.
   - Distribute posters for training.
   - Distribute badge buddies to trainers.
   - Update new hire orientation education materials.
   - Identify and set up briefings for external providers (e.g., fire, EMS, etc…)

4. **Educations & Training Plan**
   - Identify trainers and schedule train-the-trainer sessions.
   - Familiarize yourself/trainer with training content and tools (PowerPoint presentation, emergency codes document, policy, training competency).
   - Identify session preferences (e.g., day/time/length) for medical and patient care staff/units, managers, practice councils and quality groups.
   - Schedule presentations with various groups within the hospital like physicians, nursing practice council, etc…
   - Schedule meetings with managers and educators.
   - Schedule in-service for staff to update on new emergency codes.
   - Share new emergency codes at staff meetings, safety meetings, and all new hospital personnel orientation meetings.

Quast S. "Implementation planning and rollout" *Preoperative Anemia Management*, Bethesda: AABB Press, 2019. 45-50. Print.

Setting Targets

•Anemia Clinic Initial Targets
Orthopedics anemia rate 21.83%, average monthly surgeries 440, approximately 96 anemic per month, Total number of surgeons 14.

Launch Month	Target Referrals	Target Treated	Target Volume IV Iron	Target Volume EPO
Month 1- 5%	22	6	20	2
Month 2- 10%	44	11	40	4
Month 3- 15%	66	17	60	6
Month 4- 20%	88	22	80	8
Month 5- 25%	110	28	100	10
Month 6- 30%	132	33	120	12

Tolich D "Measuring and evaluating." *Preoperative Anemia Management*, Bethesda: AABB Press, 2019. 51-61. Print.

Monitoring

Surgeon	Pre-surgical Anemia Rate	Anemic Patients	Anemia Clinic Referrals	Anemia Clinic Treated	Number of Treatments	Surgical Volume
475280	29.20%	10	3	2	3	36
962841	24.30%	10	2	2	6	42
285974	19.50%	5	0	0	0	26
957426	35.20%	17	10	6	14	47
584687	27.40%	9	4	3	9	35
368541	15.60%	3	0	0	0	18
Totals		**54**	**19**	**13**	**32**	**204**

•Anemia Clinic Operations: Surgeon

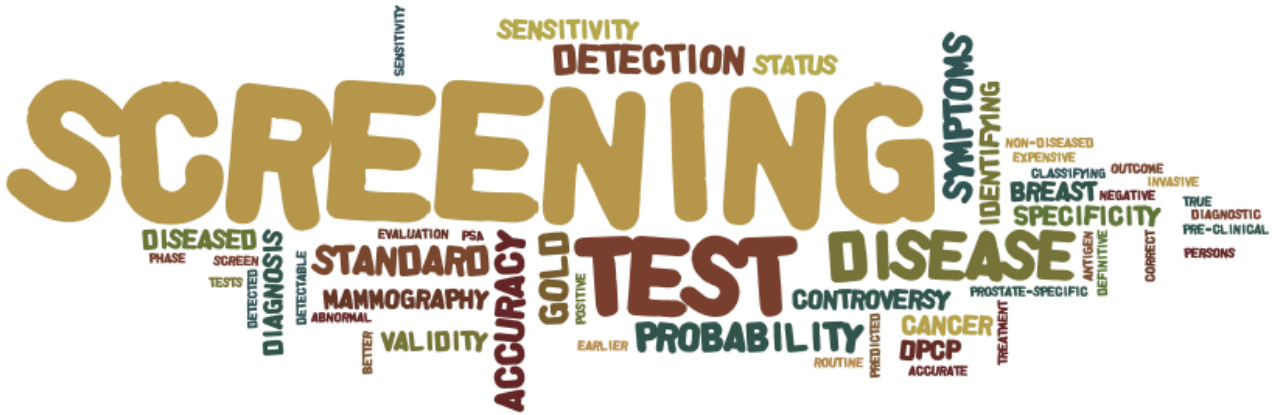
Tolich D "Business plan or proposal," *Preoperative Anemia Management*, Bethesda: AABB Press, 2019. 7-15. Print.

Challenges: Screening

- Physician referral
- Relies on surgeon or designee to refer
- Poor predictors of anemia
- Not all patients schedule at time of surgical consult

Potential Solutions:

- Automation
- Create logic to flag patients based upon specific parameters



Challenge: Time to Treat

- ❑ Short time to surgery
- ❑ Pre-authorization
- ❑ Infusion scheduling

<u>Potential Solutions:</u>

- ❑ Deep dive into avg. service line surgical decision to DOS
- ❑ Explore automation or internal resources to expedite turn around
- ❑ Brain storm with infusion centers
- ❑ Explore additional infusion locations

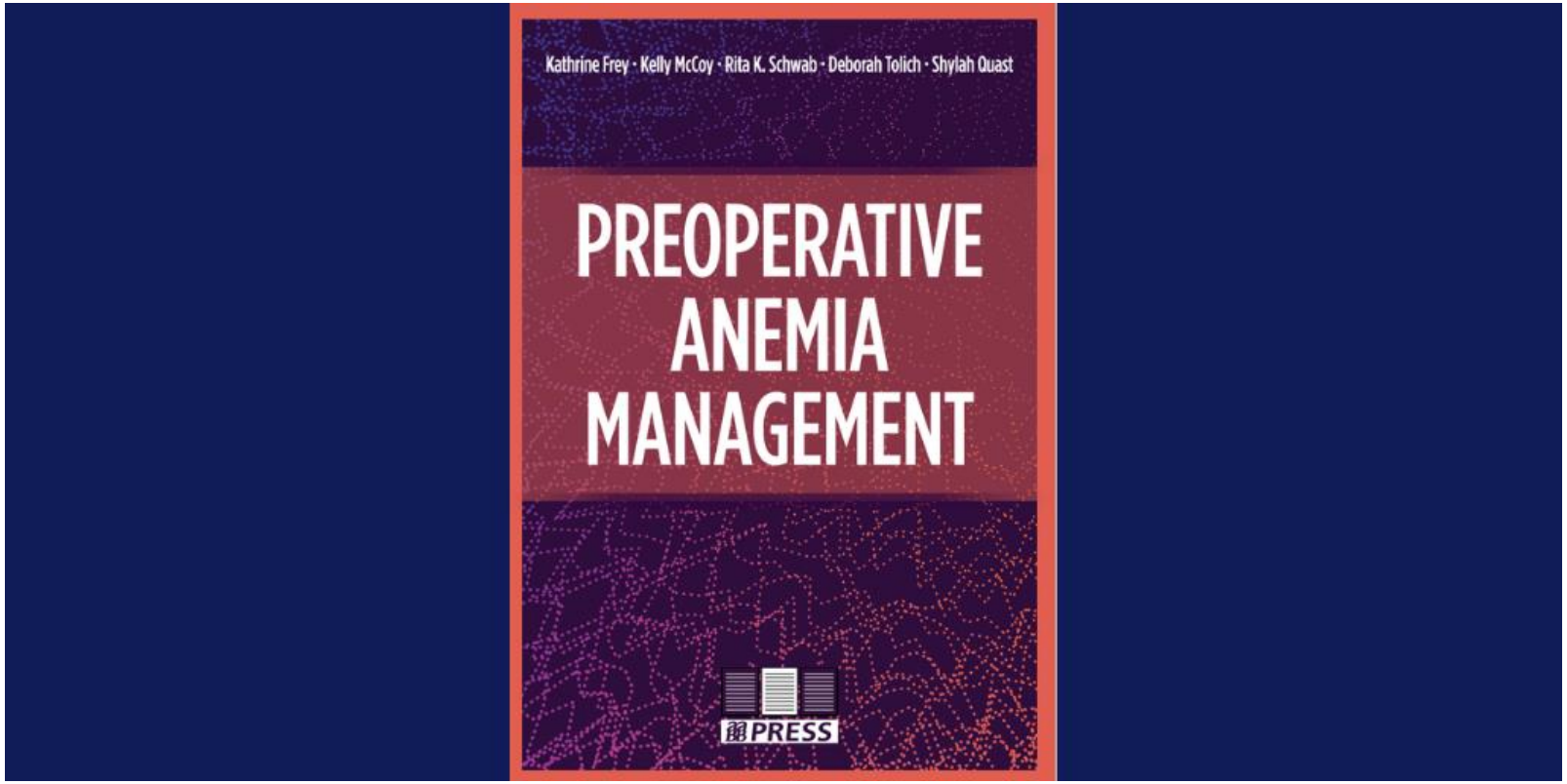
Challenge: Automation & EHR

- ❑ Embed into consult notes
- ❑ Pre-checked ordersets
- ❑ Electronic Alerts
- ❑ Logic generated reports

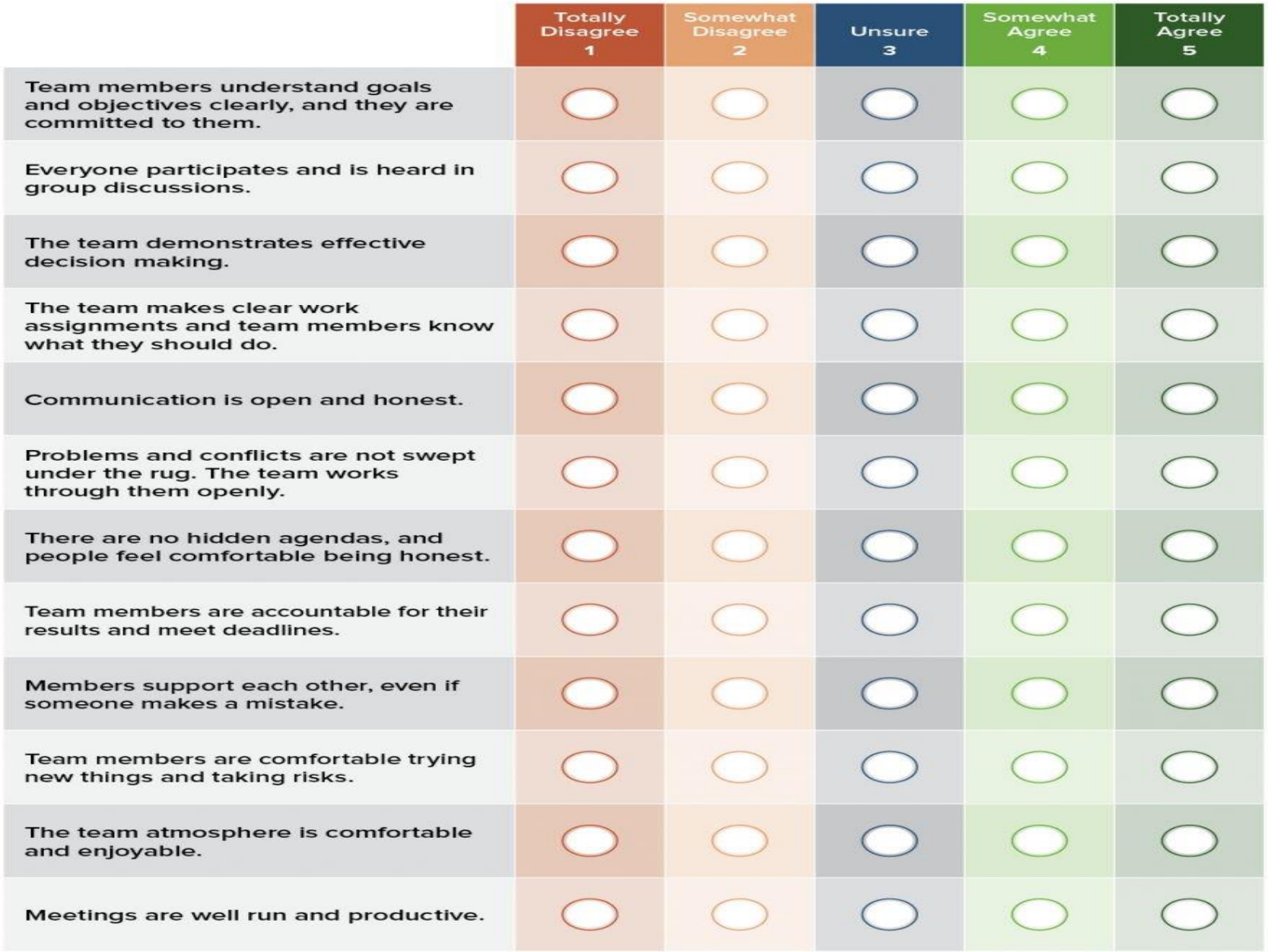
Expansion

- High-Risk OB
- Menorrhagia (non-surgical)
- GI – non-surgical inflammatory bowel, home TPN, chronic malabsorption
- GU
- Head & Neck – radical neck, free flaps

Thank You!


Kathrine Frey · Kelly McCoy · Rita K. Schwab · Deborah Tolich · Shylah Quast
PREOPERATIVE ANEMIA MANAGEMENT
PRESS

Supplemental Materials



	Totally Disagree 1	Somewhat Disagree 2	Unsure 3	Somewhat Agree 4	Totally Agree 5
Team members understand goals and objectives clearly, and they are committed to them.	○	○	○	○	○
Everyone participates and is heard in group discussions.	○	○	○	○	○
The team demonstrates effective decision making.	○	○	○	○	○
The team makes clear work assignments and team members know what they should do.	○	○	○	○	○
Communication is open and honest.	○	○	○	○	○
Problems and conflicts are not swept under the rug. The team works through them openly.	○	○	○	○	○
There are no hidden agendas, and people feel comfortable being honest.	○	○	○	○	○
Team members are accountable for their results and meet deadlines.	○	○	○	○	○
Members support each other, even if someone makes a mistake.	○	○	○	○	○
Team members are comfortable trying new things and taking risks.	○	○	○	○	○
The team atmosphere is comfortable and enjoyable.	○	○	○	○	○
Meetings are well run and productive.	○	○	○	○	○

Example of Team member assessment:
https://www.smartsheet.com/all-about-team-assessments

ILLUSTRATIVE –
TO BE ADAPTED TO COUNTRY

Capacity assessment team

Team member	Role
…	• Project director ….
…	• Project manager …
…	• Consultant …
…	• …
…	• …
…	• …

Add in Traits both positive and negative:

Examples: has good ideas, tends to talk too much at meetings, disruptive, effective leader and influencer

https://slideplayer.com/slide/8351535 /

PROJECT OVERVIEW

Purpose: Write project overal objectives. Write project overal objectives .Write project overal objectives. Write project overal objectives. Write project overal objectives .Write project overal objectives.

1. Key Objective
2. Key Objective
3. Key Objective

Background and Scope: Write about project backround and scope. Write about project backround and scope. Write about project backround and scope.

The Scope of this project includes:

1. Key Objective
2. Key Objective
3. Key Objective

Key Deliverables: Write about project key deliverables

1. About your key deliverable 1. It includes:
   - i. Key deliverable output 1
   - ii. Key deliverable output 2
2. About your key deliverable 2. It includes:
   - i. Key deliverable output 1
   - ii. Key deliverable output 2
3. About your key deliverable 3. It includes:
   - i. Key deliverable output 1
   - ii. Key deliverable output 2

PROJECT BUDGET

	Quantity	Cost	Total
Resource			
Tools			
Budget			
Total			

PROJECT MILESTONES

Project Start Date. <Date>

Milestone 1: Describe what you will be accomplishing on this milestone <Date>

Milestone 2: Describe what you will be accomplishing on this milestone <Date>

Milestone 3: Describe what you will be accomplishing on this milestone <Date>

Milestone 4: Describe what you will be accomplishing on this milestone <Date>

Project End Date: <Date>

PROJECT MANAGEMENT

Project Title: <Project Title>

Customer/ Stakeholder:
Name: <Name>
Phone: <Number>
Email : <Email>

Company Name & Address:
<Name>
<Address 1>
<Address 2>

Project Manager:
Name: <Name>
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Email : <Email>

PROJECT TEAM

- Name: <Name> | Responsibility
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PROJECT GAINS

Cost Savings:
Mention cost savings in Currency (ex: $250)

- Because of this process 150
- Because of this activity $100

Quality Improvement:
Mention the Quality of the deliverables (ex: 98%)

- Because of this process
- Because of this process

Time Savings:
Mention the process time savings in hourse (ex: 200 hours)

https://analysistabs.com/project/management/powerpoint-templates/charter/

Pre-operative haemoglobin levels and iron status in a large multicentre cohort of patients undergoing major elective surgery*

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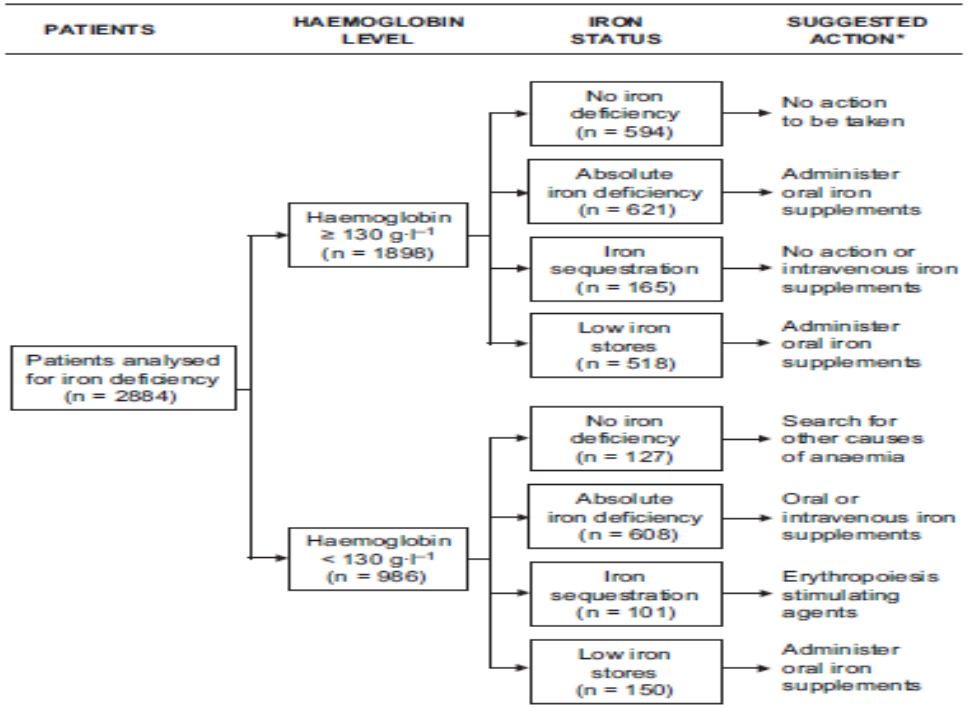


Figure 2 Patients' classification, according to pre-operative haemoglobin levels and iron status, and *suggested actions to be taken, as per a recent international consensus statement [18]. Absolute iron deficiency defined by ferritin < 30 $\mu g.l^{-1}$ or ferritin 30–100 $\mu g.l^{-1}$, plus transferrin saturation < 20% and/or C-reactive protein > 5 $mg.l^{-1}$; iron sequestration defined by ferritin > 100 $\mu g.l^{-1}$, plus transferrin saturation < 20% and/or C-reactive protein > 5 $mg.l^{-1}$; low iron stores defined by ferritin 30–100 $\mu g.l^{-1}$, plus transferrin saturation > 20%.

Munoz, Laso-Morales, Gomez-Ramirez et al. (2017) Pre-operative haemoglobin levels and iron status in a large multicenter cohort of patients undergoing major elective surgery. Anesth , 72 doi.10.1111/anae.13877.

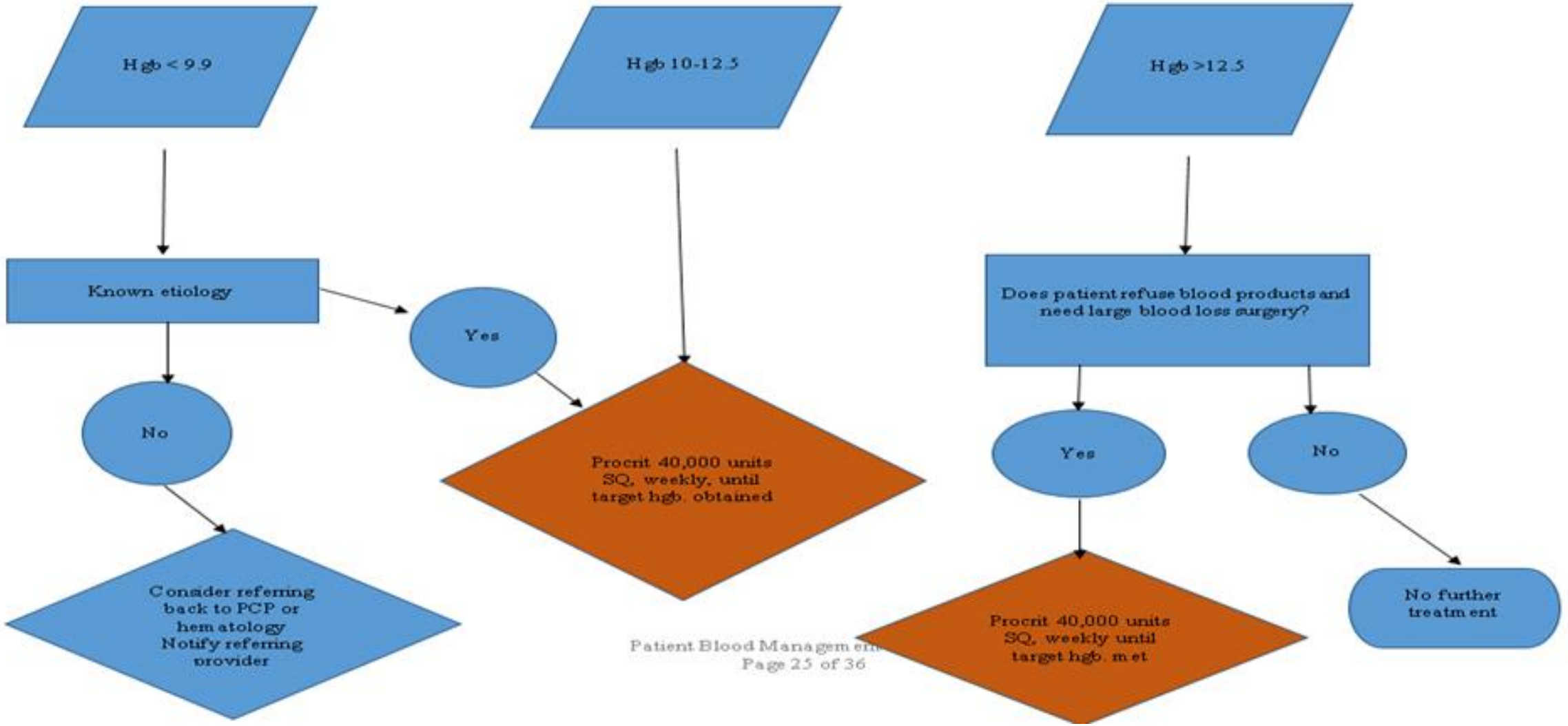
The more iron the better? Maybe not

Table 1. Iron absorption and iron status markers with increasing oral doses of $FeSO_4$ in young women (study 1)

		Iron bioavailability		Iron status					
Fe dose (mg)	Day	Fractional Fe absorption (%)*	Fe absorbed (mg)*	PHep (nM)*	Plasma Fe (μg/mL)†	Transferrin saturation (%)†	PF (μg/L)*	sTfR (mg/L)†	Body iron stores (mg/kg BW)†
40	1	NA	NA	0.30 (0.12-0.48)	0.63 (0.34)	20.9 (15.1)	10.0 (3.4-21.8)	8.2 (4.2)	−0.05 (3.7)
	2	22.7 (14.7-57.1)	9.1 (5.8-22.8)	0.35 (0.11-0.77)	0.55 (0.35)	16.5 (11.7)	9.1 (4.9-25.4)	8.4 (3.8)	−0.8 (3.7)
	9	19.4 (15.8-22.9)	7.8 (6.3-9.2)	0.59 (0.19-4.6)	0.67 (0.61)	21.3 (24.6)	10.3 (5.1-40.8)	7.1 (3.2)	0.11 (4.1)
	10	16.7 (11.8-20.7)‡	6.7 (4.7-8.3)‡	0.45 (0.05-4.3)	0.60 (0.4)	18.6 (16.3)	15 (8.4-51.6)	7.8 (3.5)	1.2 (3.6)
	23	NA	NA	ND	ND	ND	7.7 (4.2-20.1)	5.6 (1.9)	−0.64 (2.4)
80	1	NA	NA	0.93 (0.1-3.7)	1.2 (1.1)	29.8 (12.8)	19.4 (6.0-38.4)	4.8 (1.7)	3.5 (3.5)
	2	19.0 (10.5-30.9)	15.2 (8.4-24.7)	0.90 (0.40-2.2)	0.80 (0.40)	21.3 (8.4)	17.7 (6.0-43.6)	4.8 (1.6)	3.5 (3.4)
	9	18.2 (8.5-26.0)	14.6 (8.5-26.0)	1.1 (0.62-2.1)	0.75 (0.41)	20.9 (9.6)	17.7 (6.5-51.1)	4.5 (2.5)	3.6 (3.4)
	10	11.7 (8.4-24.7)§	9.3 (4.8-12.4)§	2.1 (0.98-5.1)¶	0.96 (0.60)	23.5 (12.5)	33 (24.1-55.0)	3.9 (1.7)	5.3 (2.7)
	23	NA	NA	ND	ND	ND	15.2 (7.2-68.3)	2.9 (1.5)	4.8 (3.7)
160	1	NA	NA	0.93 (0.1-4.21)	5.4 (9.3)	29.5 (9.5)	21.4 (8.8-39.9)	4.6 (1.4)	4.1 (3.1)
	2	15.9 (11.1-26.8)	25.4 (17.8-42.9)	0.95 (0.15-3.8)	0.79 (1.4)	23.2 (12.3)	20.4 (5.8-63.1)	4.8 (1.4)	3.8 (3.0)
	9	14.2 (6.1-48.3)	22.7 (9.7-77.4)	0.50 (0.20-1.3)	0.84 (0.80)	24.3 (5.8)	16.6 (7.2-34.9)	4.8 (1.0)	3.1 (1.9)
	10	9.7 (7.1-22.4)‖	15.6 (11.3-35.9)‖	1.56 (0.90-5.8)#	0.89 (0.81)	25.9 (10.2)	42.1 (6.8-172)#	4.6 (1.0)	5.8 (3.3)**
	23	NA	NA	ND	ND	ND	17.5 (10.5-22.0)	3.5 (1.0)	4.4 (1.3)
240	1	NA	NA	1.0 (0.1-2.4)	0.85 (0.41)	22.1 (12.6)	16.1 (10.5-23.3)	5.8 (1.7)	2.3(2.1)
	2	13.0 (7.1-39.3)	31.1 (17.0-94.3)	0.95 (0.40-4.1)	0.57 (0.22)	15.2 (5.0)	16.1 (12.2-28.3)	6.0 (1.9)	2.3 (2.1)
	9	14.8 (7.4-42.6)	35.5 (17.9-102.3)	0.88 (0.23-5.6)	0.54 (0.13)	13.5 (3.0)	21.9 (16.5-30.5)	5.8 (1.7)	3.3 (1.9)
	10	7.5 (3.6-21.4)‡	18.1 (8.6-51.5)‡	3.4 (0.83-13.7)‡	0.56 (0.3)	16.4 (12.4)	33.4 (19.3-73.0)	5.2 (1.6)	2.3 (1.7)
	23	NA	NA	ND	ND	ND	14.7 (10-33.3)	3.7 (1.5)	3.8 (2.5)

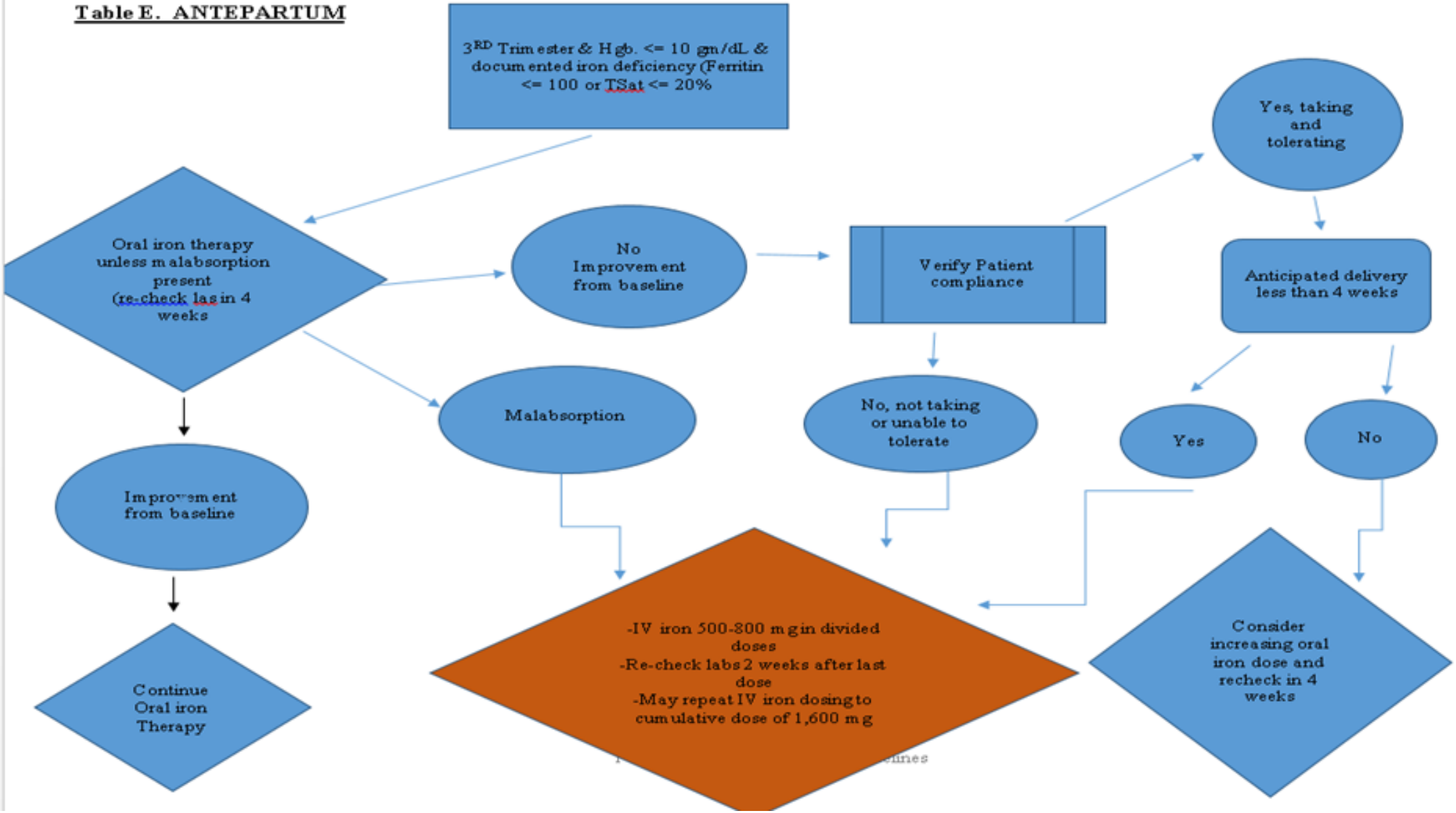
Blood Oct 2015, 126 (17) 1981-1989

Table C. ADULT
Epoetin Alfa (Procrit) Pre-surgical (OUTPATIENT)
(NOTE: Ferritin must be >= 100 & TSat >= 20%)



Tolich D "Guidelines and algorithms." Preoperative Anemia Management, Bethesda: AABB Press, 2019, 31-35. Print

Table E. ANTEPARTUM



Tolich D "Guidelines and algorithms." Preoperative Anemia Management, Bethesda: AABB Press, 2019, 31-35. Print

Key Points

- Starting oral iron as soon as anemia identified – saves $$ and easy fix except in heavy and constant blood loss
- Ideal time frame for treatment is at least six weeks – IV iron can take up to six weeks before maximum hemoglobin production realized
- Have seen an increase of up to a gram increase after 1-2 doses
- Optimizing iron stores also enhances post op recovery from intraoperative blood loss, so getting iron is a benefit whether given in enough time to see significant anemia correction or not
- For PSO to have maximum impact and value to the organization and patients, the workflow needs to be globally hardwired into the existing preoperative workflows.
- The blood management bandwidth and capture represents a very small and limited volume. For example in colorectal surgery, 35% of the patient population meet criteria based upon hemoglobin alone, another 20-30% are iron deficient w/o anemia.

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