IV iron in the orthogeriatric setting

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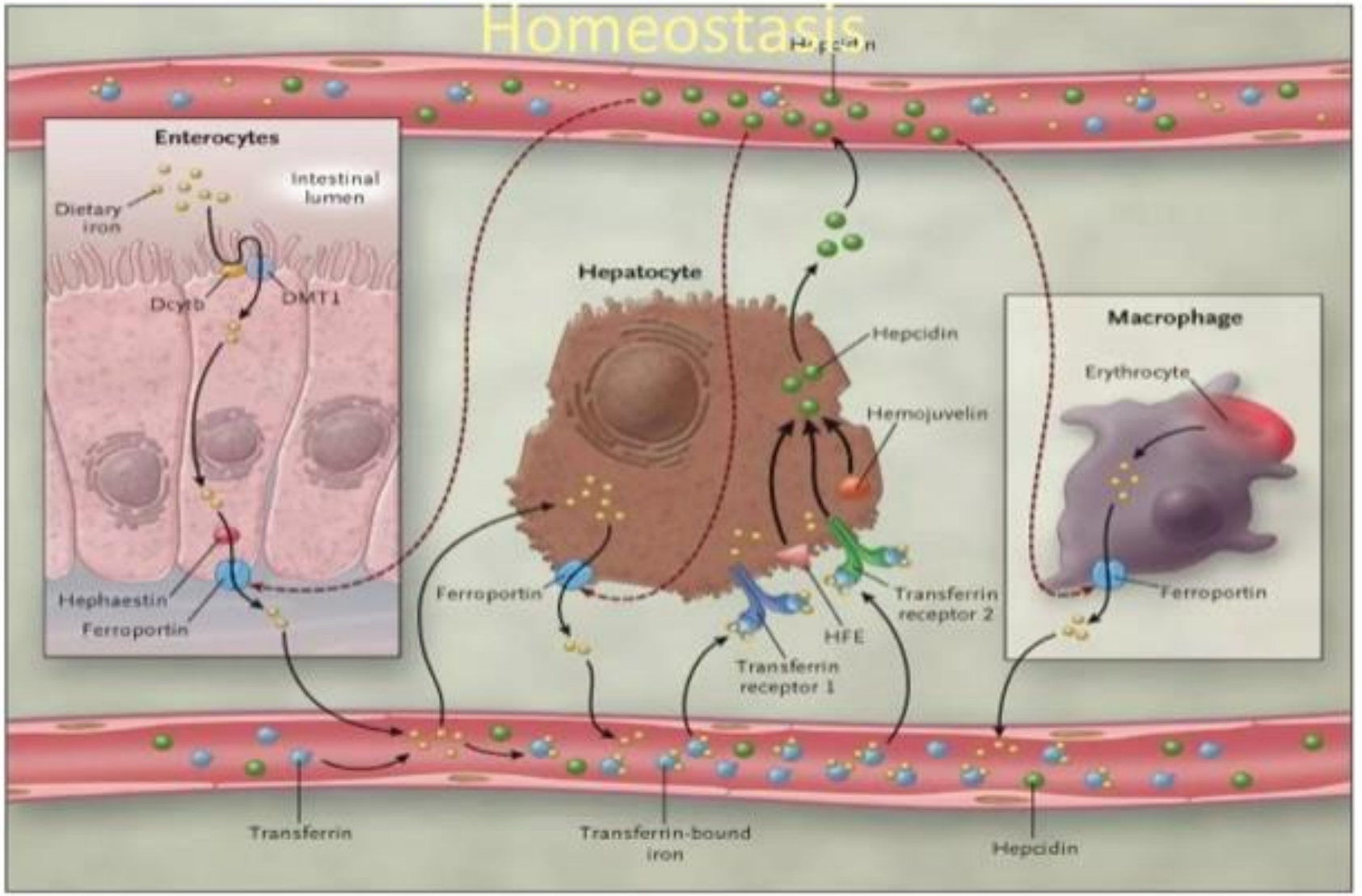
Declarations for Dr Diana Choo

I have no financial interests or relationships to disclose with regard to the subject matter of this presentation.

Topics discussed

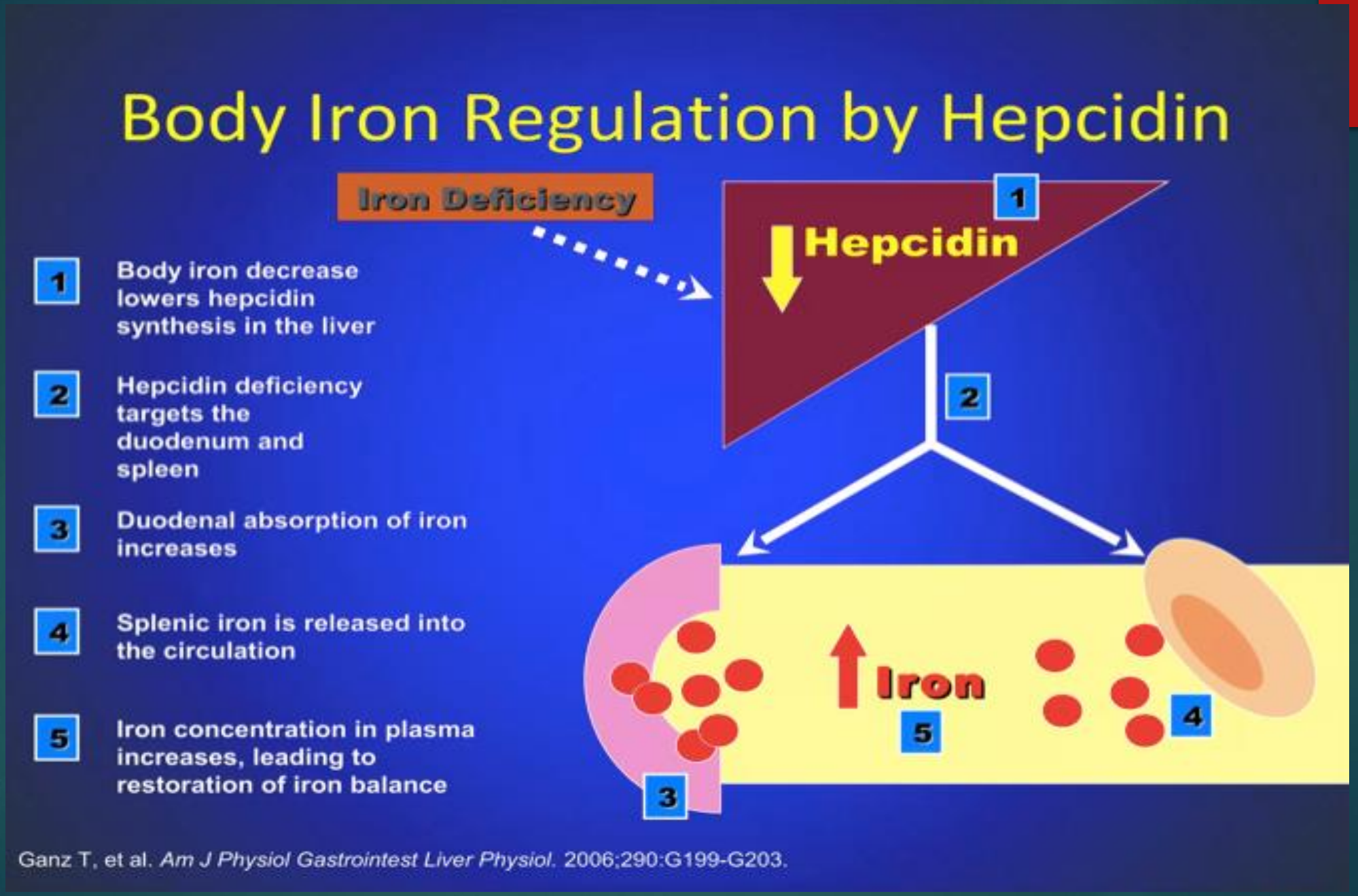
- Iron metabolism
- Anaemia
- Iron deficiency anaemia causes, definition, measurement
- Trials of perioperative iv iron use in hip fracture
- Audit of iv fe administration in fractures unit Ulster Hospital

Interplay of Key Proteins in Iron Homeostasis



Fleming RE, Bacon BR. N Engl J Med 2005;352:1741-1744.

Body Iron Regulation by Hepcidin



Ganz T, et al. *Am J Physiol Gastrointest Liver Physiol.* 2006;290:G199-G203.

Definition of anaemia- WHO

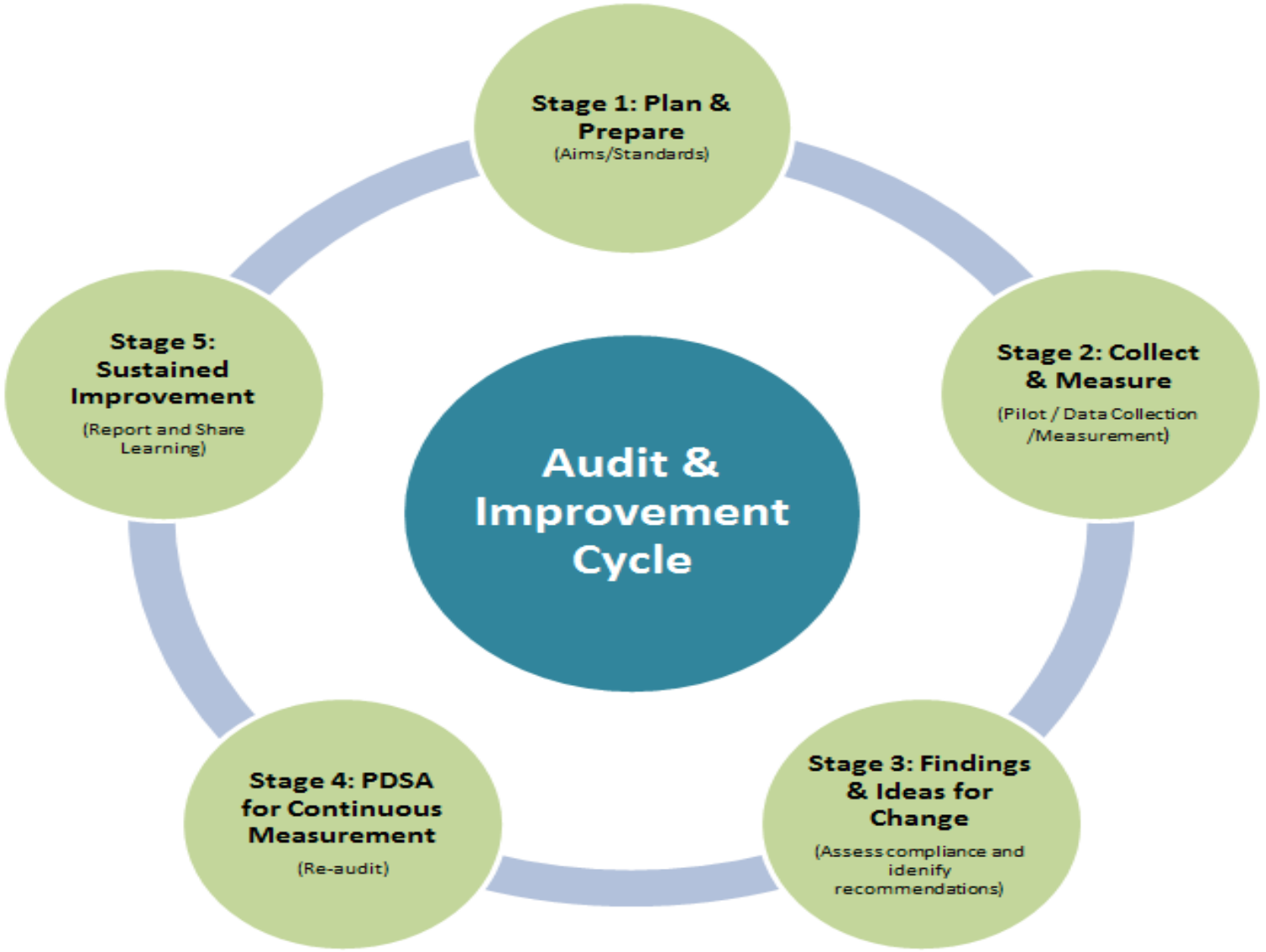
- In men Hb <130g/L
- In women Hb<120 g/L

Causes of iron deficiency anaemia in the perioperative patient

1. Iron poor diet
2. Malabsorption-coeliac, IBD
3. Anaemia of chronic inflammatory disease
4. Blood loss
5. inflammation
6. Increased iron needs
7. Infections malaria, parasitic infections, tuberculosis, HIV
8. Inherited red blood cell disorders

Measurement of iron deficiency

- Low haematocrit
- Anaemia
- Serum ferritin <100-300 µg/l
- TSAT <20% -
- Ferritin is acute phase reactant
- use limited in alcoholism, inflammation, hepatitis, metabolic syndromes


Stage 1: Plan & Prepare
(Aims/Standards)
Stage 2: Collect & Measure
(Pilot / Data Collection /Measurement)
Stage 3: Findings & Ideas for Change
(Assess compliance and idenify recommendations)
Stage 4: PDSA for Continuous Measurement
(Re-audit)
Stage 5: Sustained Improvement
(Report and Share Learning)
Audit & Improvement Cycle

Standards/Current guidelines or recommendations for perioperative IV iron in fractures

- No hospital protocols locally in NI or in UK
- No specific orthogeriatric protocols with regards to iv fe administration in hip fracture cohort

2014 pooled analysis observational data 2547 patients- IV fe admin in major orthopaedic surgery(Muñoz)

- 2 iv formulations used- 1142 received iron sucrose(IS) pre and postop, 45 ferric carboxymaltose on first post op morning, 351 received ISucrose plus rHuEPO,
- 1009 received neither EPO or IV iron
- 84% of hip fracture patients presenting with Hb<100g/l received periop transfusion regardless of the treatment group.
- Transfusion rate reduced from 36.9% to 24.2% in IV fe group
- Reduced blood transfusion rates and length of stay without increasing postoperative infection, morbidity or mortality

A randomized trials in hip fracture surgery UK in 2019 evaluated iv iron using 600 mg iron sucrose on blood transfusion. Age and Ageing Sept 2019, Moppett et al

80 randomized controlled trial patients-iron grp 39, control 41

3 doses of 200 mg iron sucrose (venofer) over 30 mins on 3 separate days.

Transfusion guidance-symptomatic anaemia Hb<100g l^{-1} , asymptomatic anaemia Hb<80g l^{-1}

- Statistically significant increase in reticulocyte count in iron group(89.4 vs 72.2 x10^9 , no differences in final Hb or transfusion requirements in the first week, no difference in functional and safety outcomes. Effect too small and too late to affect transfusion rates.
- Excluded liver disease, severe infection, concomitant oral fe and clopidogrel

Association between iv fe and short term mortality risk in older patients undergoing hip fracture surgery; a Danish observational study 2021- J Orth surg and research

- Primary outcome was 30 day mortality post surgery
- 210 patients
- 4 groups: no treatment(n=52), blood transfusion(n=38), IV monofer(now ferric derisomaltose)(n=80) on D3, blood transfusion and IV monofer(n=40)
- 8.1% died within 30d of surgery
- Patients w IV monofer had highest Hb 11 +-0.97g/dl, patients without treatment had lowest Hb 10.15 +-1.13g/dl
- Reduced 30-d mortality compared with no treatment p0.04
- No significant differences in Hb levels between D14 and 30

HiFIT study 2023, IV FDI and TXA combined or alone for reducing blood transfusion Lasocki et al

- Multicentre 2x2 randomized trial 413 patients hip fracture surgery(51-104y)
- preop Hb 95-130g/l; 25% received blood transfusion preop. 69% met WHO definition of anaemia before surgery
- Randomised to 1 of 4 treatment arms: FDI plus TXA, FDI plus placebo, TXA plus placebo, or double placebo.
- Off-licence use of iv fe as recruitment not based on fe deficiency.
- Dosing was 20 mg/kg of ferric derisomaltose/FDI treatment
- Proportion receiving RBC transfusion: 15%, 26%, 27%, 30% respectively.
- FDI plus TXA had significantly higher postoperative Hb at day 30

The clinical benefits and cost effectiveness and safety of haematopoietic interventions for patients with anaemia following major emergency surgery: a phase IV, multi-site, multi-arm randomised controlled trial: Peri-op Iron and Erythropoietin (EPO) Intervention Study (POP-I)

Final Version 2.0
19-Feb-2024-Jan-2024

Short title:	Perioperative Iron and EPO Intervention Study
Acronym:	POP-I
EudraCT number:	*N/A*
Trial Registration:	www.clinicaltrials.gov reference
ISRCTN:	TBC
CTA reference:	*insert when obtained*
IRAS Project ID:	1007432
Trial Sponsor:	University of Nottingham

Aim and objectives:

- to improve knowledge and information of extent of IV Iron use within department
- patient eligibility criteria used for IV iron
- potential goal of producing standardised guidance for IV Iron administration for hip fracture patients.

Methodology and sample size

- Retrospective study of patients admitted with fractures to Ulster Hospital over 3 months between 1 Jan -31 March 2024.
- Met with audit facilitators in July 2024 to pull data and plan.
- Enlisted help from colleagues for data collection using excel spreadsheet end of September 2024.
- 91 patients analysed- 57 female, 34 male
- 63% female, 37% male

Criteria for IV iron administration

- Tsat <20%
- Hb < 100g/L for women and 110g/L for men.
- CRP<100

Dose and Choice of IV iron administration

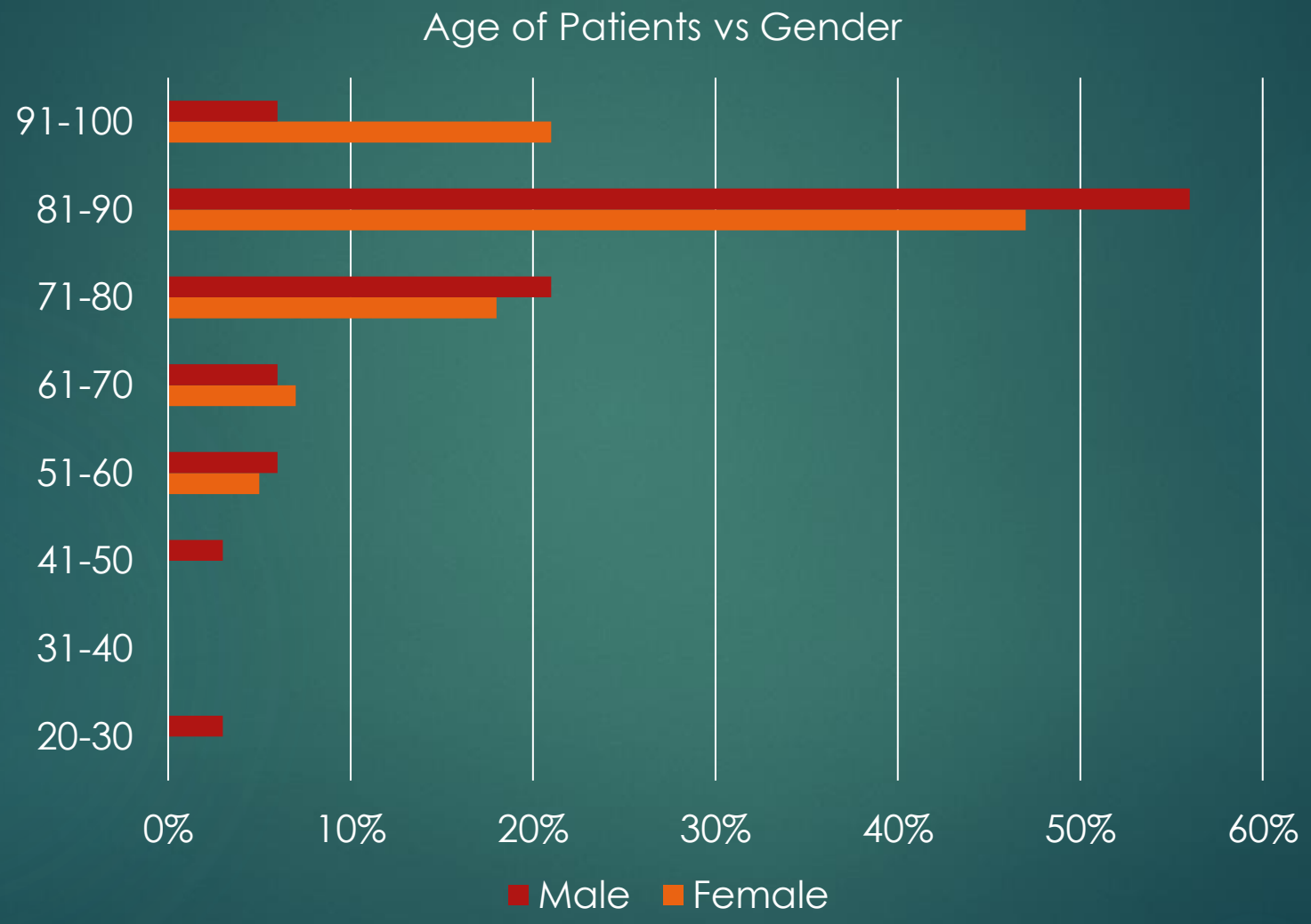
- A dose of 20 mg/kg of iv iron was given with rounding up or down to the nearest 500 mg depending on Hb level and tsat levels.
- Only IV ferric carboxymaltose and IV ferric derisomaltose used for those who required >1g replacement based on the formula above.
- IV ferric derisomaltose was used in patients whose PO4 levels were <1
- other iron preparations eg iron sucrose/venofer - maximum dose 200 mg- cosmofer/irondextran higher risk of SE

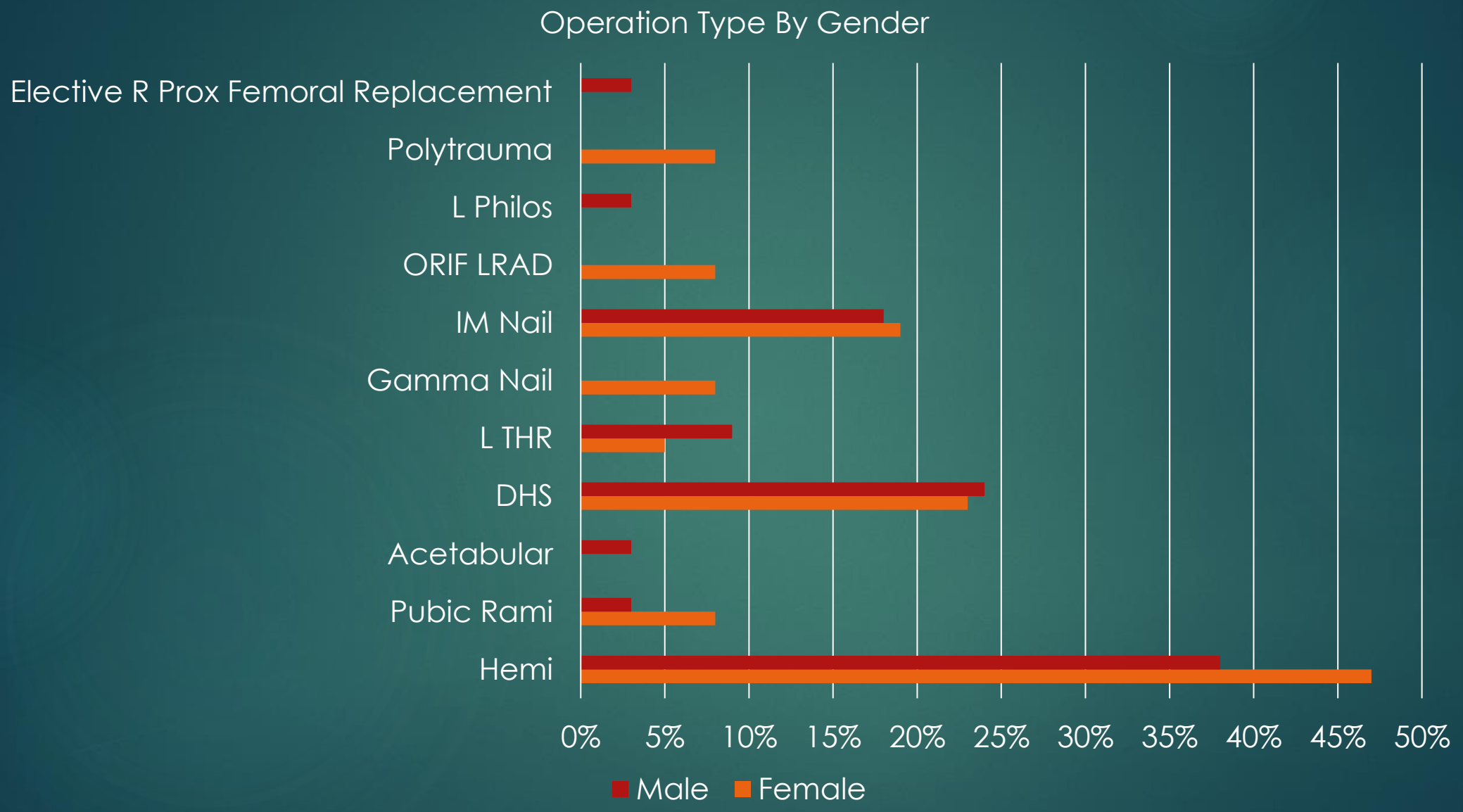
Analysis of data

Of the 91 patients, the average age within the sample was 81.

Age range	Female (57)	Male (34)
20-30	n/a	3%
31-40	n/a	n/a
41-50	n/a	3%
51-60	5%	6%
61-70	7%	6%
71-80	18%	21%
81-90	**47%**	**56%**
91-100	21%	6%

	%
Female	63%
Male	37%


Age of Patients vs Gender
91-100
81-90
71-80
61-70
51-60
41-50
31-40
20-30
0%
10%
20%
30%
40%
50%
60%
Male
Female


Operation Type By Gender
Elective R Prox Femoral Replacement
Polytrauma
L Philos
ORIF LRAD
IM Nail
Gamma Nail
L THR
DHS
Acetabular
Pubic Rami
Hemi
0%
5%
10%
15%
20%
25%
30%
35%
40%
45%
50%
Male
Female

Pre-operative Hb and anaemia rates

- The average Hb within females was 117g/L and males was 121g/L.
- On average 60% of the total sample had pre-operative anaemia.
- Looking at each gender individually, 50% women & 70% males had preop anaemia as per WHO definitions.

Diagnosis of iron deficiency ie tsat<20

- Iron studies checked in 88% ie 79/90
- iron deficient (ie Tsat <20%) in 91% ie 72/90
- 100% males were iron deficient, 70% had IDA
- 88% of females were iron deficient, 48% had IDA
- High prevalence of iron deficiency esp. in males

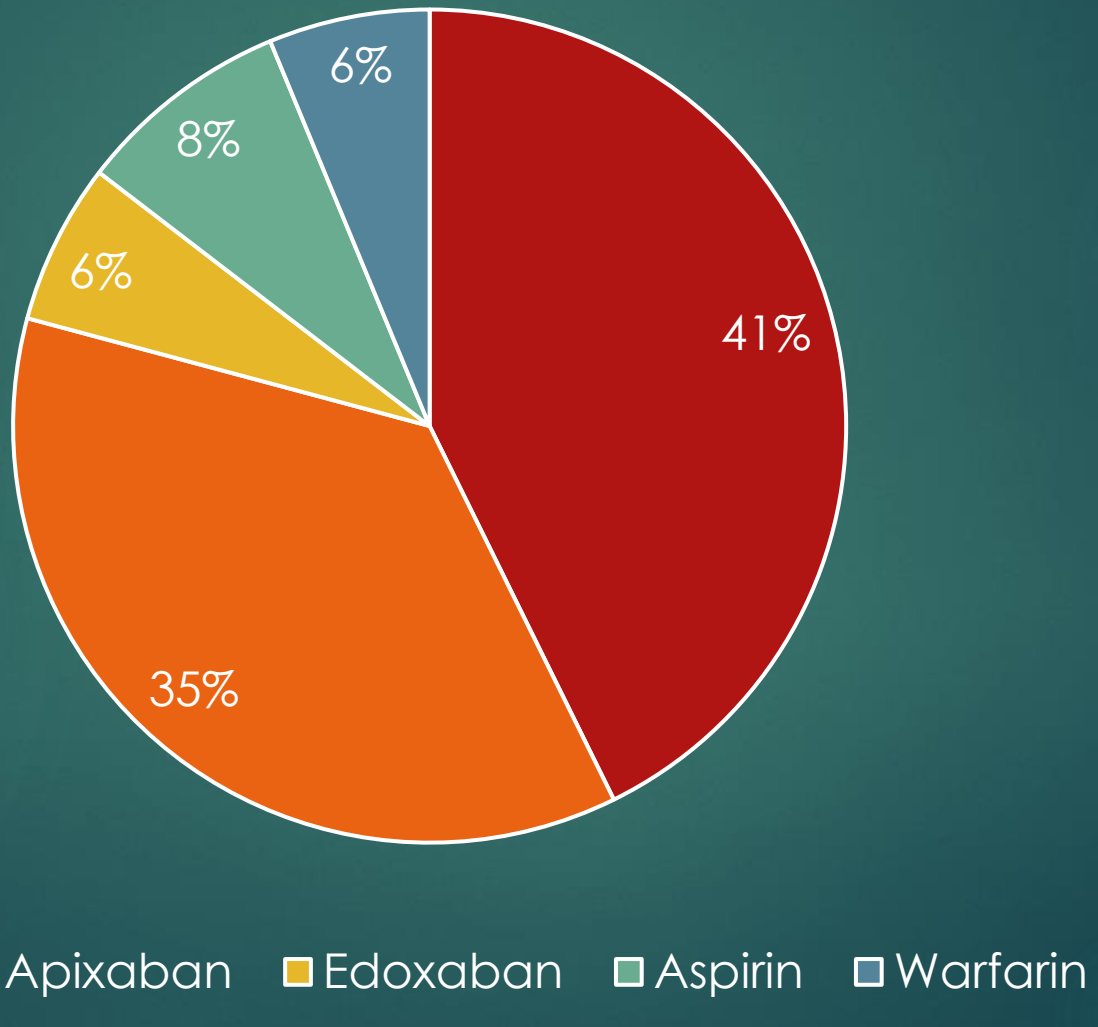
iv iron infusion rate

- 36% (32/90) received IV iron
- 37% (12/32)of iv iron cohort also had blood transfusion.

Blood transfusion rate

- 19% (17/90) had blood transfusion
- 16% 14/90 were transfused preop or on D0 to Hb >100g/L
- 41%(7/17) had more than 1u transfused preop
- 29% (5/17) were transfused pre and postop
- 6% (1/17) was transfused postop only
- Postop transfusion was generally as per current blood transfusion guidelines ie Hb <70g/L without CV disease and <80g/L in those with CV disease.

Patients Prescibed Anti-Coagulant



Conclusions

- Although 60% anaemic at presentation, most people ie 91% were iron deficient,
- The transfusion rate in this audit compared to other studies was 19%. (1g IV TXA at induction of anaesthesia).
- This compares to 15% in HIFIT group with IV fe and IV/topical TXA, 24% in Munoz IV fe group.
- The same % of patients on anticoags in transfused and non transfused group

Recommendations

- Formalise guidelines for perioperative iv iron administration for SE trust

Next steps

- Await results of POP-I study