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Improving Post-Discharge Iron Monitoring in Heart Failure Patients Treated with IV Iron

A Closed-Loop Retrospective Audit

Dr Christos Charalambous, Dr Nuala Pepper, Dr Chara Rossou

Supervisors: Dr Andrews, Dr Dhar

Background

- Functional iron is important for haemoglobin and myoglobin synthesis
- Intracellular iron is important for energy production and metabolic pathways
- Correction of iron in HF patients can improve metabolic function of mitochondrial-rich organs, leading to better clinical outcomes
- Oral iron therapy is not effective in iron deficiency patients with HFrEF

Literature Review

FAIR-HF Trial	COMFIRM-HF	AFFIRM –AHMF	IRONMAN
• 459 patients • Significantly improved Patient global assessment and NYHA Functional class in treatment group after 24 weeks • **Improvements in quality of life** were seen within 4 weeks and persisted for at least 24 weeks. Benefit was observed whether or not patients had anaemia	• 304 patients • Significant Improvement in **6-meter walking distance** in treatment group • Benefit in Patient Global Assessment from week 12 • Single dose at day 0 with further dosing at week 6 based on screening Hb with redosing at weeks 12, 24 and 36 weeks	• 1108 patients • Significant **reduction in total heart failure hospitalisation** or **cardiovascular mortality** in treatment group • Second 'repletion dose' was delivered at week 6. Further doses given at weeks 12 and 24 if the patient remained iron deficient	• 70 UK hospitals, 1869 patients • Reduced **recurrent hospitalisation and cardiovascular death** in Treatment groups • Fewer serious adverse cardiac events

ESC Guidelines

- Iron Deficiency Anaemia in Heart Failure Definition
  - Haemoglobin <150mg
  - ferritin <100µg/L, or
  - TSAT <20% (when ferritin is 100–299µg/L)
- Patients with symptomatic heart failure (with reduced or mildly reduced LVEF) should have their iron status checked periodically
- Reassess iron parameters at 4 weeks - 4 months post IV iron infusion
- Routine screening for iron deficiency in all patients with heart failure irrespective of LVEF is suggested, although treatment is recommended only for those with reduced LVEF

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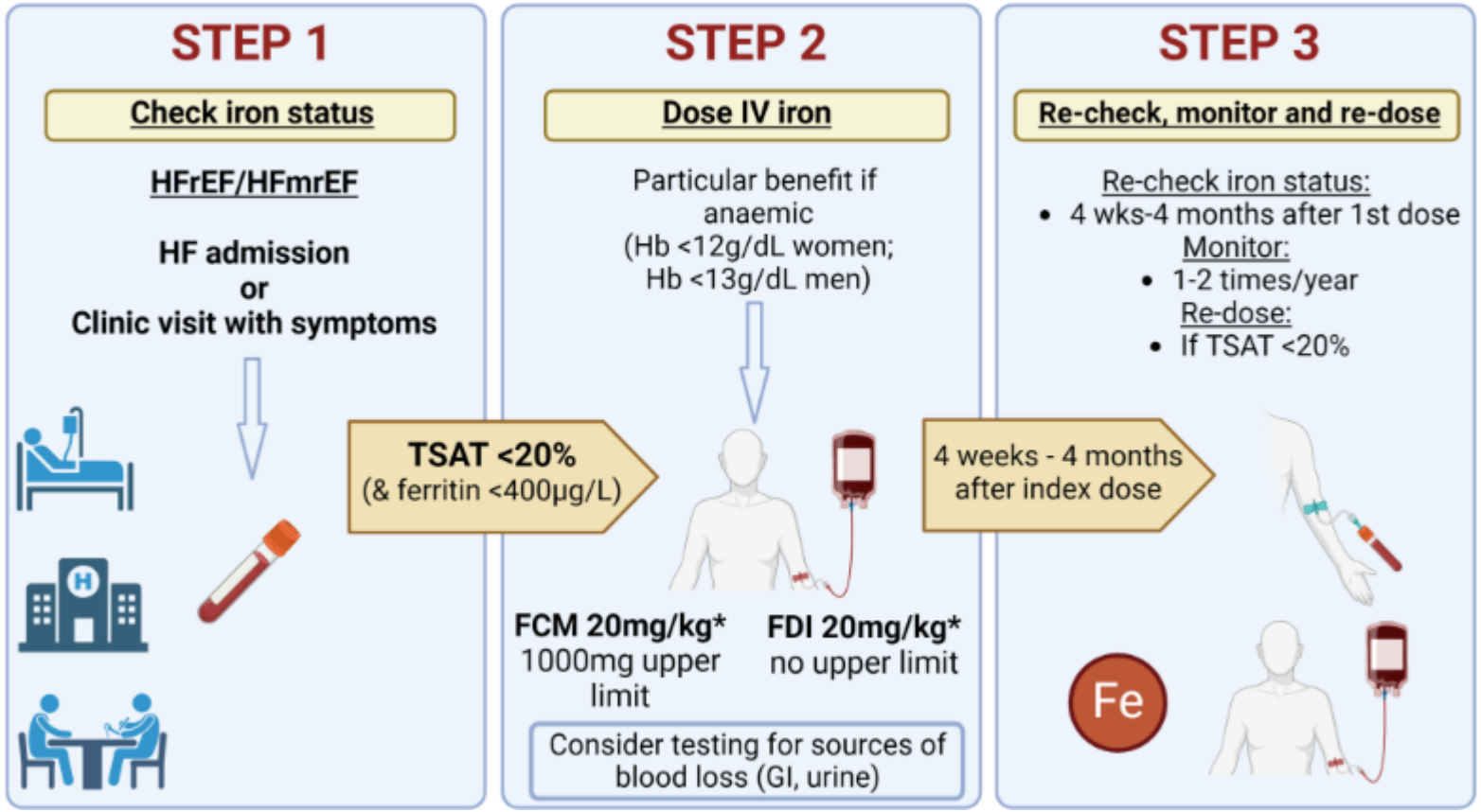
ESC Guidelines

Recommendations	Class[a]	Level[b]
Intravenous iron supplementation is recommended in symptomatic patients with HFrEF and HFmrEF, and iron deficiency, to alleviate HF symptoms and improve quality of life.[c] 12,41,47–49	I	A

Recommendations	Class[a]	Level[b]
It is recommended that all patients with HF be periodically screened for anaemia and iron deficiency with a full blood count, serum ferritin concentration, and TSAT.	I	C

Intravenous iron supplementation with ferric carboxymaltose should be considered in symptomatic HF patients recently hospitalized for HF and with LVEF ≤50% and iron deficiency, defined as serum ferritin <100 ng/mL or serum ferritin 100–299 ng/mL with TSAT <20%, to reduce the risk of HF hospitalization.	IIa

Graham et al. Review of ESC Guidelines



Issue

Iron deficiency common in heart failure

Structured post-infusion monitoring often lacking

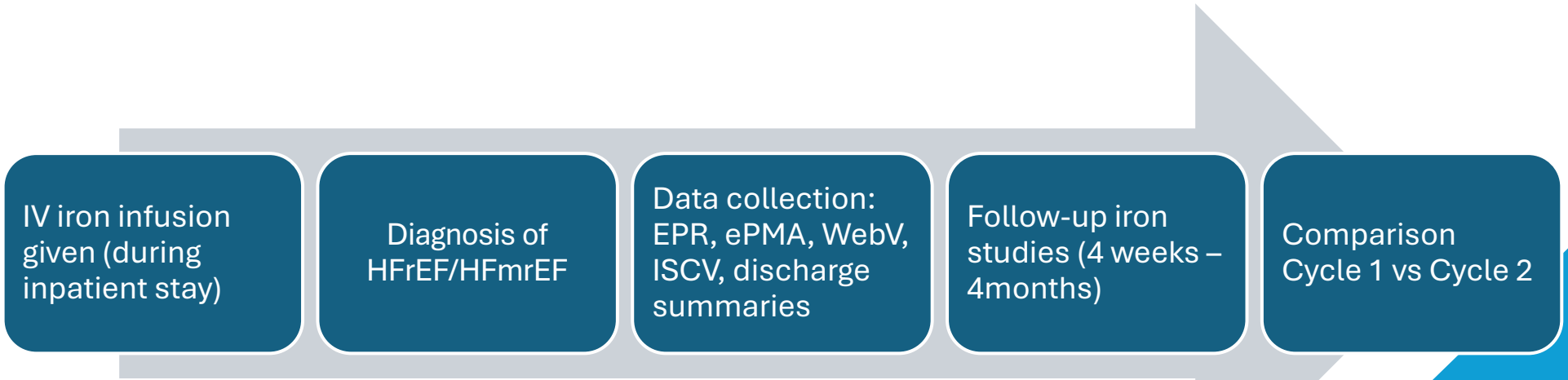
Risk of suboptimal management and rehospitalisation

Aims and Objectives

- To determine whether patients with HFrEF/HFmrEF, who have received an IV Iron infusion during an admission period:
    1. have follow up plans on discharge
    2. have serum iron levels re-assessed in the Community 4 weeks – 4 months post-discharge
- Improve compliance with ESC guidance and optimise outcomes

Methods

- 1st Cycle: Retrospective analysis between 1st August 2023 to 31st July 2024
- 2nd Cycle: Retrospective analysis between 1st March 2025 to 15th June 2025
- Inclusion Criteria: HFrEF / HFmrEF patients receiving IV iron



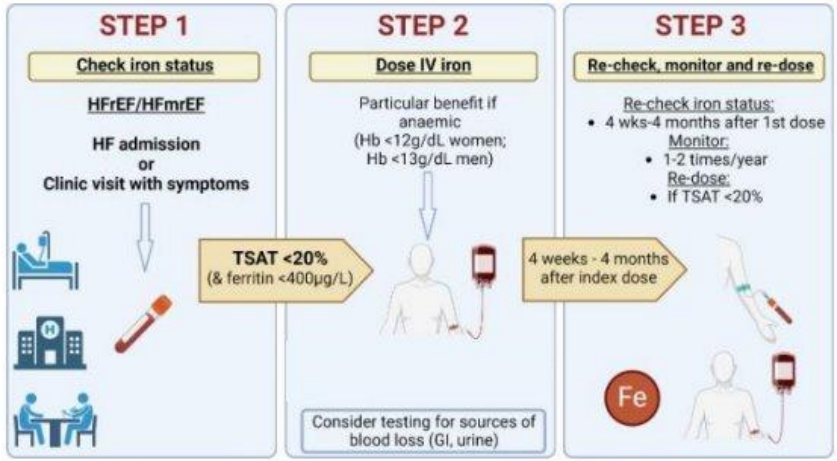
IV Iron Follow-Up in Heart Failure Patients

Iron Deficiency Anaemia in Heart Failure Definition:

- Haemoglobin **<150mg**
- Ferritin **<100µg/L**, or
- TSAT **<20%** (when ferritin is 100–299µg/L)

European Society of Cardiology (ESC) Guidelines 2021:

- For patients with heart failure with reduced ejection fraction (HFrEF), re-check Iron Levels 4 weeks - 4 months after inpatient IV Iron infusion.
- Iron deficiency in patients with HFrEF is independently associated with reduced exercise capacity, recurrent HF hospitalisations, as well as high cardiovascular and all-cause mortality.
- Intravenous iron is safe, improves symptoms and quality of life and reduces cardiovascular and heart failure hospitalisations in patients with HFrEF/HFmrEF



Simple steps to follow:

1. **Refer** patients with decompensated heart failure and symptomatic iron deficiency to the **Community Heart Failure Team**
2. On the **eDD/Discharge Summary**, ask GPs to **repeat iron levels, ferritin and transferrin saturation within 4 months**

Resources:

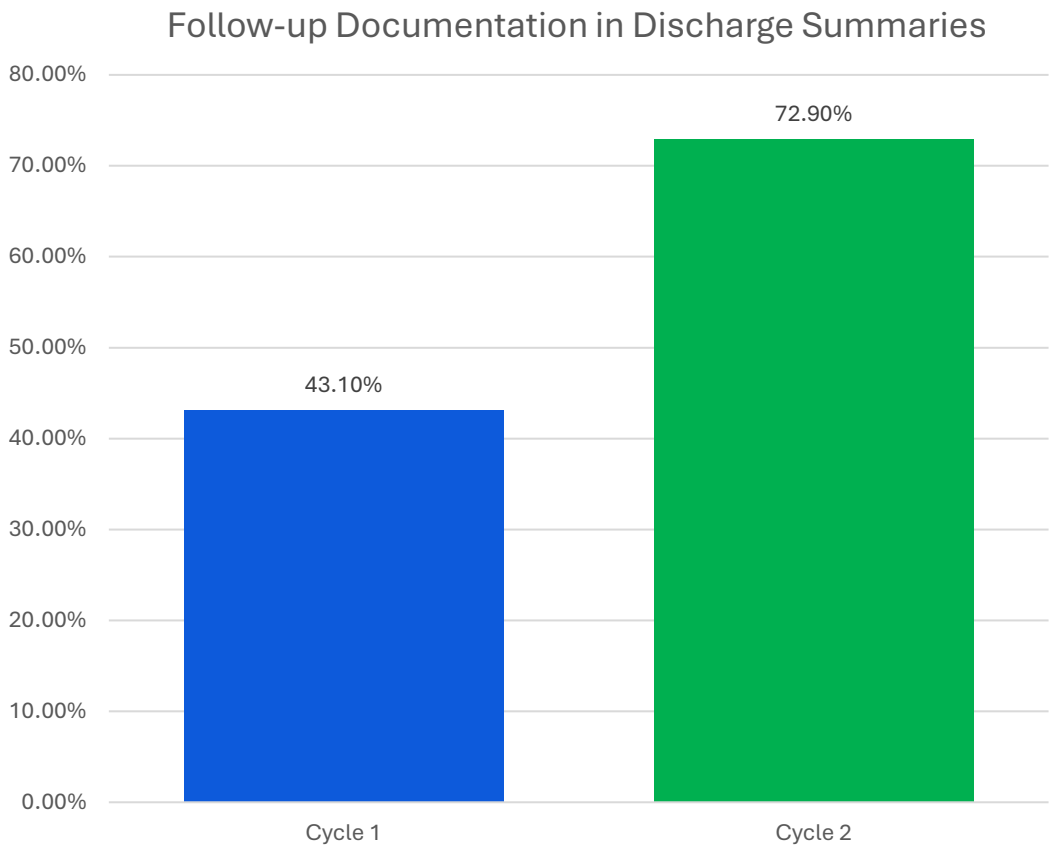
1. Graham, F.J. *et al.* (2024) 'Treating iron deficiency in patients with heart failure: What, why, when, how, where and who', *Heart*, 110(20), pp. 1201–1207. doi:10.1136/heartjnl-2022-322030.2..
2. McDonagh, T.A. *et al.* (2021) '2021 ESC guidelines for the diagnosis and treatment of acute and chronic heart failure', *European Heart Journal*, 42(36), pp. 3599–3726.

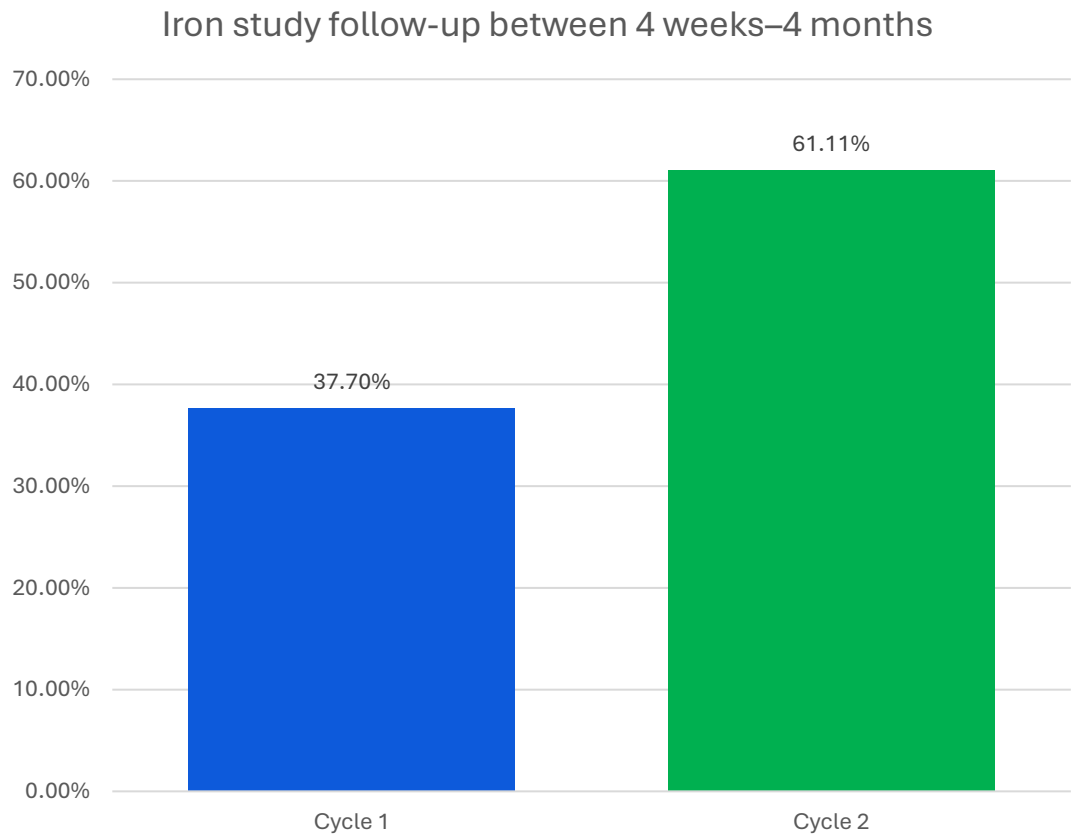
Results of Second Cycle

- 75 vs 48 eligible HFrEF/HFmrEF patients received IV iron
- Follow-up discharge plans regarding further investigation/management of iron deficiency anaemia:
  - **72.92% vs 43.08% (*p*=0.003)**
- Repeat iron levels within a 4 week – 4 month period post-discharge:
  - **61.11% vs 37.70% (*p*=0.043)**

Conclusion: There has been a statistically significant improvement in making follow-up plans and repeating iron studies post-infusion of IV iron

Results


Follow-up Documentation in Discharge Summaries
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
43.10%
72.90%
Cycle 1
Cycle 2


Iron study follow-up between 4 weeks–4 months
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
37.70%
61.11%
Cycle 1
Cycle 2

Recommendation Plan

- Update local clinical guidelines
- Discharge summaries - explicitly write IV iron was given as an inpatient and iron studies to be repeated within 4 months
- Community HF nurse referral on discharge (decompensated HF and/or symptomatic iron deficiency)
- New Posters on all Medical wards
- Distribute email to doctors about IV iron importance and iron status monitoring
- Raise awareness to Cardiology junior team during the weekly Cardiology teaching
- Email GPs and Community HF Nurses to put them on-board with the importance of Iron level monitoring in HFrEF/HFmrEF patients, offering suggestions such as:
  - Alerts in electronic medical records - to ensure iron studies are ordered at follow-up
  - GP Training - the importance of treating iron deficiency in HF and the need for regular reviews

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Improving Post-Discharge Iron Monitoring in Heart Failure Patients Treated with IV Iron: A Closed-Loop Retrospective Audit

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BACKGROUND

Iron Deficiency Anaemia in Heart Failure:
- Haemoglobin <150mg
- Ferritin <100µg/L, or
- TSAT <20% (when ferritin is 100–299µg/L)

Patients with HFrEF/HFmrEF should have reassessment of iron parameters at 4 weeks - 4 months post IV iron infusion. However, structured post-infusion monitoring is often lacking, increasing the risk of suboptimal management and rehospitalisation.

AIMS AND OBJECTIVES

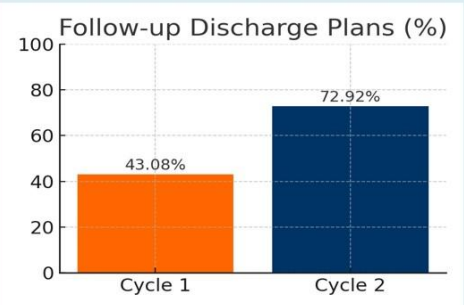
AIM: To ensure patients with HFrEF/HFmrEF receiving IV iron during admission have appropriate follow-up and monitoring in line with ESC guidance, to optimise outcomes.

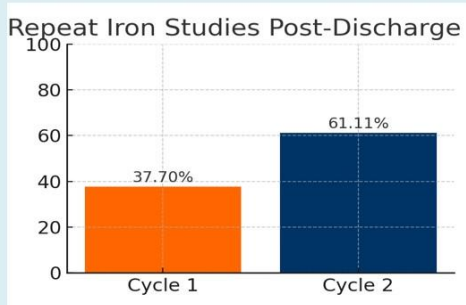
OBJECTIVES:
1. Determine if follow-up plans are documented on discharge.
2. Assess whether serum iron is re-checked in the community 4 weeks–4 months post-discharge.
3. Evaluate compliance with ESC recommendations.

PRIMARY RECOMMENDATIONS:

1. **Refer** patients with decompensated heart failure and symptomatic iron deficiency to the **Community Heart Failure Team**
2. On the **eDD/Discharge Summary**, ask GPs to **repeat iron levels, ferritin and transferrin saturation within 4 months**

CYCLE 2 RESULTS AFTER IMPLEMENTATION OF RECOMMENDATIONS





CONCLUSION AND SECONDARY RECOMMENDATIONS:

This was a *statistically significant* improvement in making follow-up plans and repeating iron studies

Further recommendations:
- Sustained implementation remains necessary
- Continue to explicitly document administration of IV iron in discharge summaries + the need for repeat iron studies at 4 weeks – 4 months after the infusion
- Continue to refer to Community HF nursing team on discharge in cases of decompensated iron deficiency and symptomatic anaemia
- Update local clinical guidelines
- Collaboration across secondary and primary care is key - engage GPs with EMR alerts & training on HF iron deficiency monitoring

Resources:
1. Graham, F.J. *et al.* (2024) 'Treating iron deficiency in patients with heart failure: What, why, when, how, where and who', *Heart*, 110(20), pp. 1201–1207. doi:10.1136/heartjnl-2022-322030.2..
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Improving Post-Discharge Iron Monitoring in Heart Failure Patients Treated with IV Iron: Recommendations for GPs

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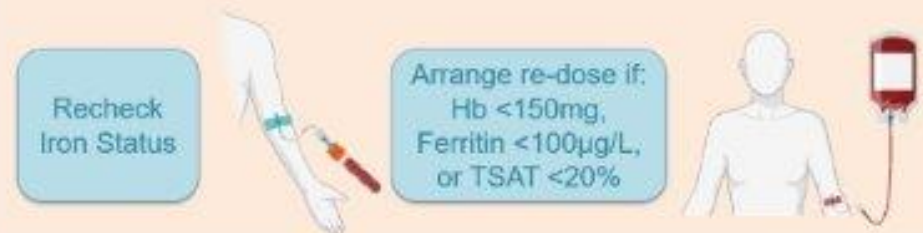
EUROPEAN SOCIETY OF CARDIOLOGY (ESC) GUIDELINES 2021:

Iron Deficiency Anaemia in Heart Failure:
- Haemoglobin <150mg
- Ferritin <100µg/L, or
- TSAT <20% (when ferritin is 100–299µg/L)
- Iron deficiency in patients with heart failure with reduced ejection fraction (HFrEF; EF<55%) is independently associated with reduced exercise capacity, recurrent HF hospitalisations, as well as high cardiovascular and all-cause mortality.
- Correction of iron with intravenous infusion is safe, improves symptoms and quality of life, reducing cardiovascular and heart failure hospitalisations in HFrEF patients
- Patients with HFrEF should have periodic iron checks, including reassessment of iron parameters at 4 weeks - 4 months post inpatient IV iron infusion

PILGRIM HOSPITAL AUDIT RESULTS:

Conclusion:
Despite the improvement after the first cycle, structured post-infusion monitoring is often lacking, increasing the risk of suboptimal management and rehospitalisation.

4 weeks – 4 months after 1st intravenous iron infusion:



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1. Graham, F.J. *et al.* (2024) 'Treating iron deficiency in patients with heart failure: What, why, when, how, where and who', *Heart*, 110(20), pp. 1201–1207. doi:10.1136/heartjnl-2022-322030.2..
2. McDonagh, T.A. *et al.* (2021) '2021 ESC guidelines for the diagnosis and treatment of acute and chronic heart failure', *Eu- ropean Heart Journal*, 42(36), pp. 3599–3726. doi:10.1093/eurheartj/ehab368.

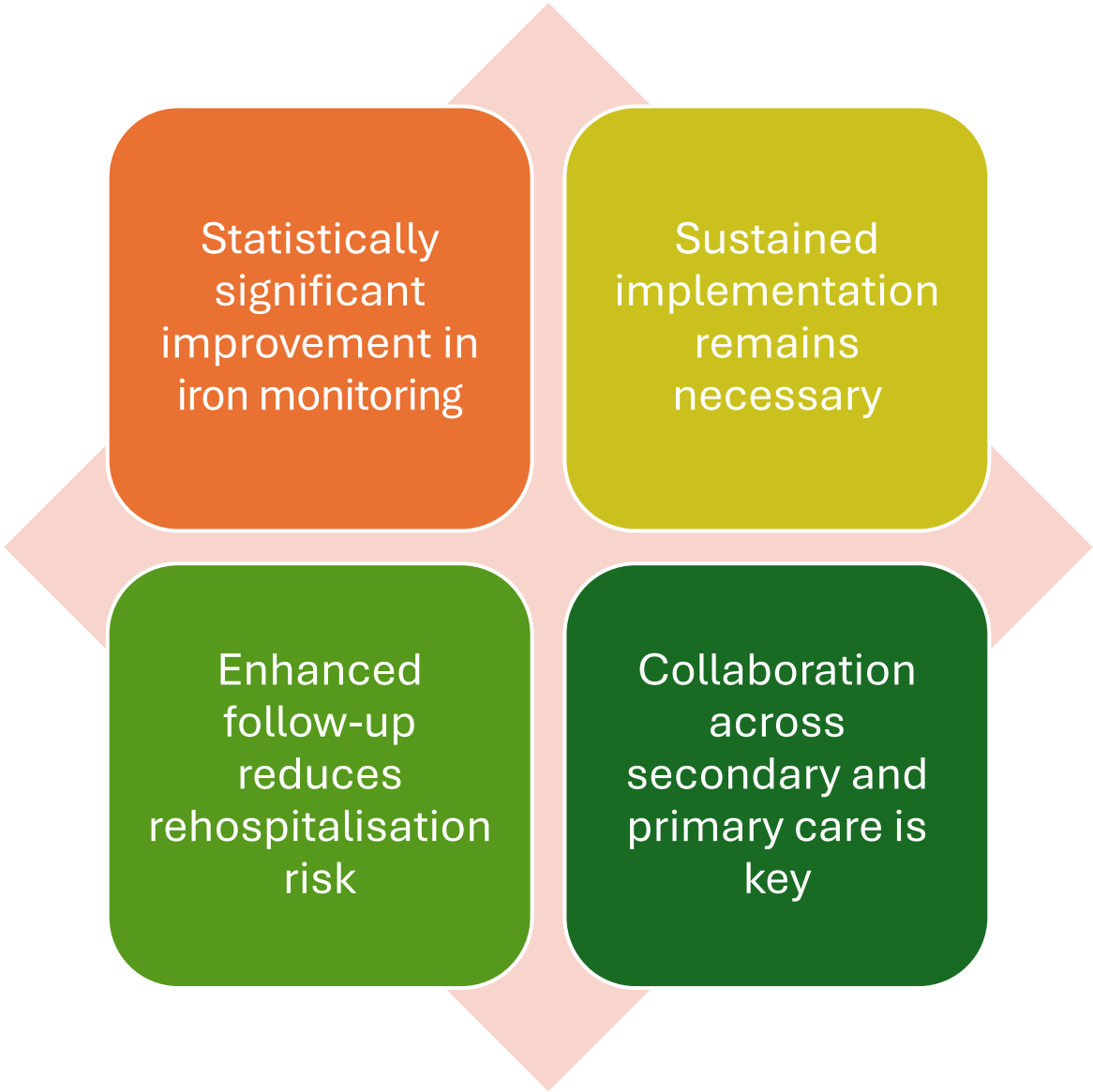
Limitations

- Fewer patients were included in Cycle 2 compared to Cycle 1
- Due to time constraints, there has not been a 4-month period for all patients. Only a total of 36 were used in the second statistic.
- Patients who have passed away within 4 months since being discharged were included in the audit (if their iron studies were not done, they were not included in the second statistic as there was no time to complete the follow-up)
- Patients who have passed away during the admission were not included in the audit
- Some patients had repeat iron studies in subsequent admissions, rather than the community, which may have skewed results
- 16% of patients went for repeat iron infusion in SDEC after discharge, however SDEC did not follow up. Therefore, only 56.25% had plan for HF nurse review or instructions for GP to chase Hb/Iron levels

Future Work

- Re-audit (Cycle 3) in 4-5 months
- Explore action on repeated iron studies
- Explore planning following second infusion in SDEC
- Evaluate outcomes of iron infusions
- Collaborate with GPs to improve compliance
- Possible changes to the guidelines
  - Activated inflammatory pathways increase ferritin synthesis, thereby increasing serum ferritin. Upregulated intracellular ferritin may trap iron reducing bioavailability.
  - Given that most iron transported in the blood is bound to transferrin, assessment of readily available markers such as TSAT and serum iron may be more useful for identifying iron deficiency and, more importantly, patients who benefit from iron supplementation

Conclusion


Statistically significant improvement in iron monitoring
Sustained implementation remains necessary
Enhanced follow-up reduces rehospitalisation risk
Collaboration across secondary and primary care is key

Summary – Key Findings and Impact

- Iron deficiency is common in HFrEF/HFmrEF and impacts outcomes
- Audit demonstrated significant improvement in follow-up monitoring (Cycle 2 vs Cycle 1)
- Documentation of discharge plans ↑ from 43% to 73%
- Repeat iron studies ↑ from 38% to 61%
- Implementation of recommendations enhanced compliance with ESC guidance
- Sustained practice change may reduce re-hospitalisation and improve quality of life

Resources

1. Graham, F.J., Guha, K., Cleland, J.G. and Kalra, P.R. (2024) ‘Treating iron deficiency in patients with heart failure: What, why, when, how, where and who’, *Heart*, 110(20), pp. 1201–1207. doi:10.1136/heartjnl-2022-322030.

2. Ponikowski, P., Kirwan, B.A., Anker, S.D., McDonagh, T., Dorobantu, M., Drozdz, J., Fabien, V., Filippatos, G., Gohring, U.M., Keren, A., Khintibidze, I., Kragten, H., Martinez, F.A., Metra, M., Milicic, D., Nicolau, J.C., Ohlsson, M., Parkhomenko, A., Pascual-Figal ,D.A., Ruschitzka, F., Sim, D., Skouri, H., van der Meer, P., Lewis, B.S., Comin-Colet, J., von Haehling, S., Cohen-Solal, A., Danchin, N., Doehner, W., Dargie, H.J., Motro, M., Butler, J., Friede, T., Jensen, K.H., Pocock, S. and Jankowska, E.A. (2020) AFFIRM-AHF Investigators. Ferric carboxymaltose for iron deficiency at discharge after acute heart failure: a multicentre, double-blind, randomised, controlled trial. The Lancet, 396:18951904.

3. Kalra, P.R., Cleland, J.G.F., Petrie, M.C., Thomson, E.A., Kalra, P.A., Squire, I.B., Ahmed, F.Z., Al-Mohammad, A., Cowburn, P.J., Foley, P.W.X., Graham, F.J., Japp, A.G., Lane, R.E., Lang, N.N., Ludman, A.J., Macdougall, I.C., Pellicori, P., Ray, R., Robertson, M., Seed, A. and Ford, I.; IRONMAN Study Group (2022) Intravenous ferric derisomaltose in patients with heart failure and iron deficiency in the UK (IRONMAN): an investigatorinitiated, prospective, randomised, open-label, blinded-endpoint trial. The Lancet, 400:2199–209.

4. Ponikowski, P., van Veldhuisen, D.J., Comin-Colet, J., Ertl, G., Komajda, M., Mareev, V., McDonagh, T., Parkhomenko, A., Tavazzi, L., Levesque, V., Mori, C., Roubert, B., Filippatos, G., Ruschitzka, F. and Anker, S.D.; CONFIRM-HF Investigators (2015) Beneficial effects of long-term intravenous iron therapy with ferric carboxymaltose in patients with symptomatic heart failure and iron deficiency. Eur Heart J, 36:657–68

5. Anker, S.D., Comin Colet, J., Filippatos, G., Willenheimer, R., Dickstein, K., Drexler, H., Luscher, T.F., Bart, B., Banasiak, W., Niegowska, J., Kirwan, B.A., Mori, C., von Eisenhart Rothe, B., Pocock, S.J., Poole-Wilson, P.A., Ponikowski, P. (2009) FAIR-HF Trial Investigators. Ferric carboxymaltose in patients with heart failure and iron deficiency. N Engl J Med,361:24362448.

6. McDonagh, T.A., Metra, M., Adamo, M., Gardner, R.S., Baumbach, A., Böhm, M., Burri, H., Butler, J., Čelutkienė, J., Chioncel, O., Cleland, J.G.F., Coats, A.J.S., Crespo-Leiro, M.G., Farmakis, D., Gilard, M., Heymans, S., Hoes, A.W., Jaarsma, T., Jankowska, E.A., Lainscak, M., Lam, C.S.P., Lyon, A.R., McMurray, J.J.V., Mebazaa, A., Mindham, R., Muneretto, C., Piepoli, F.M., Price, S., Rosano, G.M.C., Ruschitzka, F. and Skibelund A.K.; ESC Scientific Document Group. 2021 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure. European Heart Journal, 42(36), pp. 3599-3726. doi: 10.1093/eurheartj/ehab368. Erratum in: Eur Heart J. 2021 Dec 21;42(48):4901. doi: 10.1093/eurheartj/ehab670. PMID: 34447992

Thank you!

Questions?