# Innovazione terapeutica nella carenza di FE nello scompenso cardiaco : implicazioni cliniche nella gestione del pz fragile

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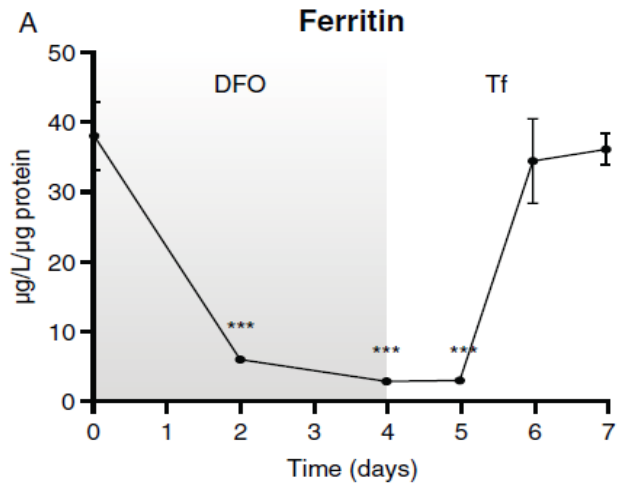
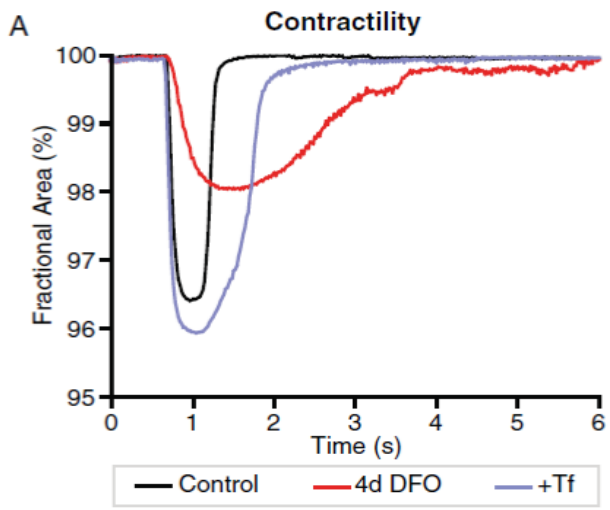
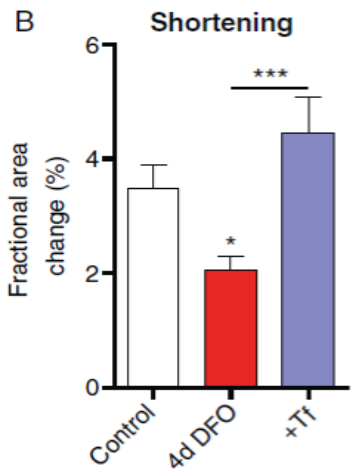
Roma, 25 giugno 2026

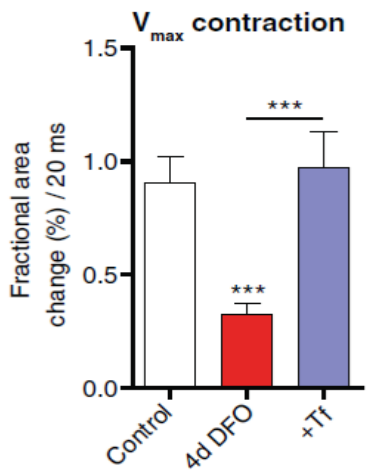
# Declaration of potential conflict of interests

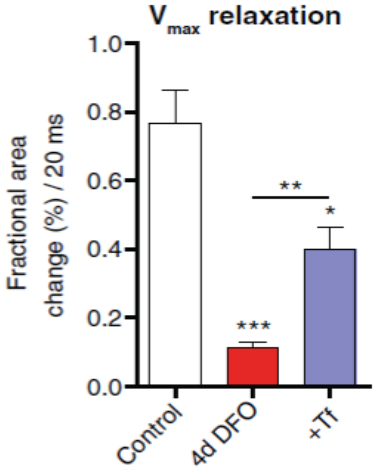
| Type of job or financial support | Research Institution / Company |
|---|---|
| Salary<br>Ordinary funds<br>Position in Public Committees | IRCCS San Raffaele Roma<br>Univesrsità Telematica San Raffaele , uniroma5<br><br>Italian Ministry of health |
| Support , Consultancy | Novartis, Bayer, Boheringher, Servier, MSD, Bruno , Amgen; Vifor ; Menarini; Astra |
| Conflict for this presentation | none |



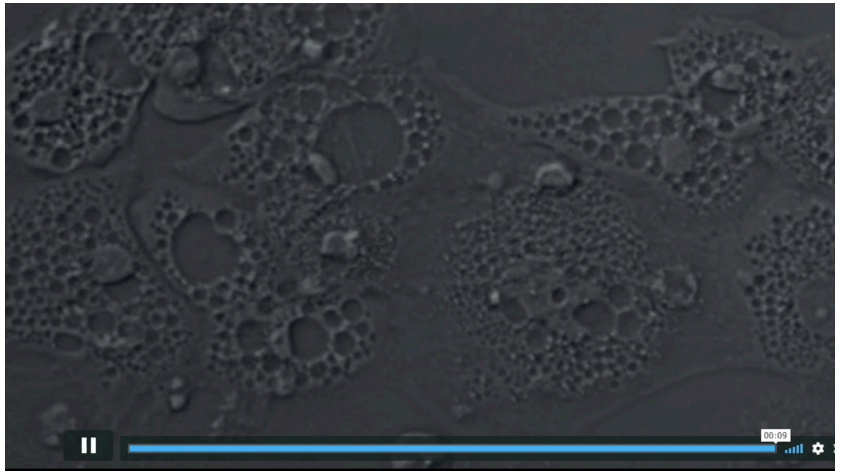



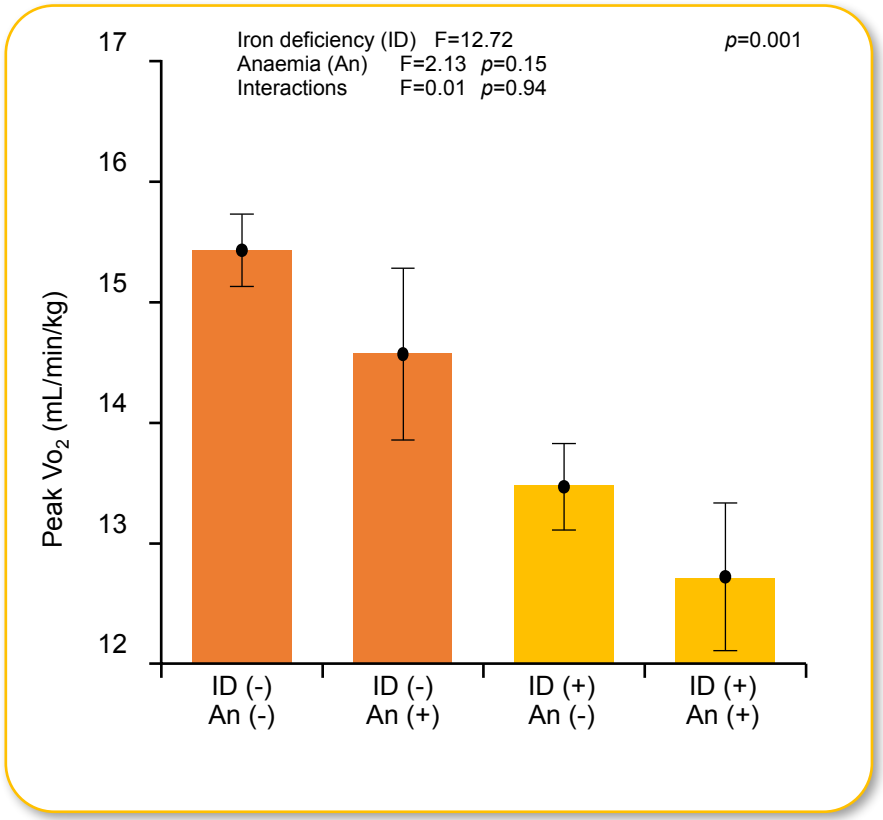

Baseline

4dDFO

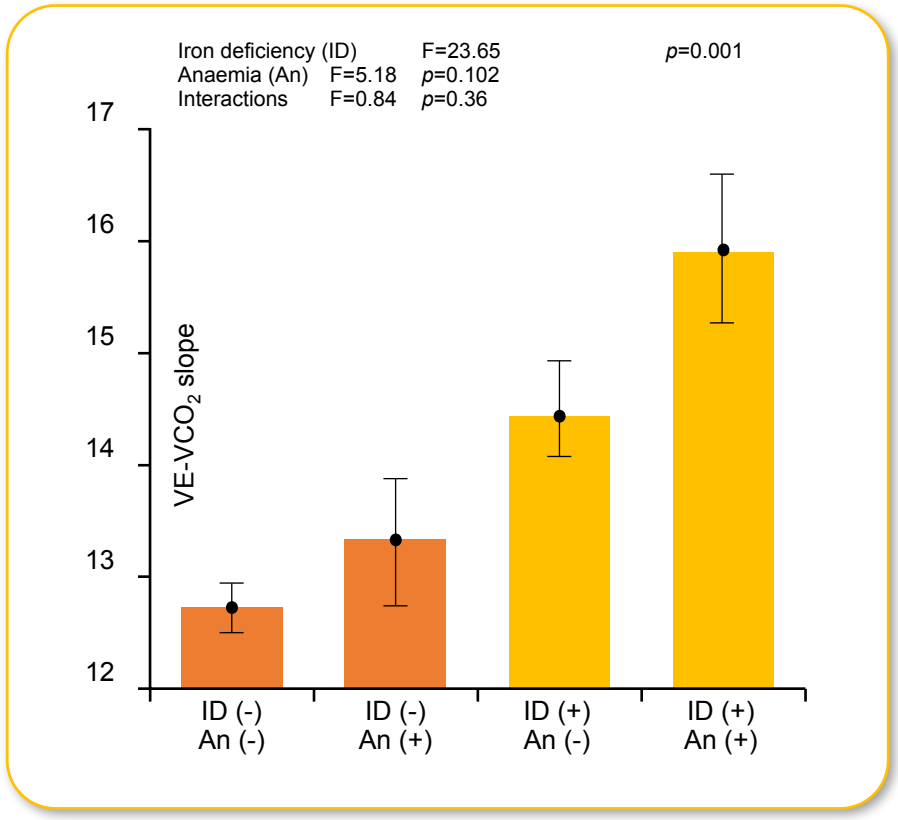


Hoes et al. Eur J Heart Fail 2018.

## Consumo di ossigeno di picco($VO_2$)



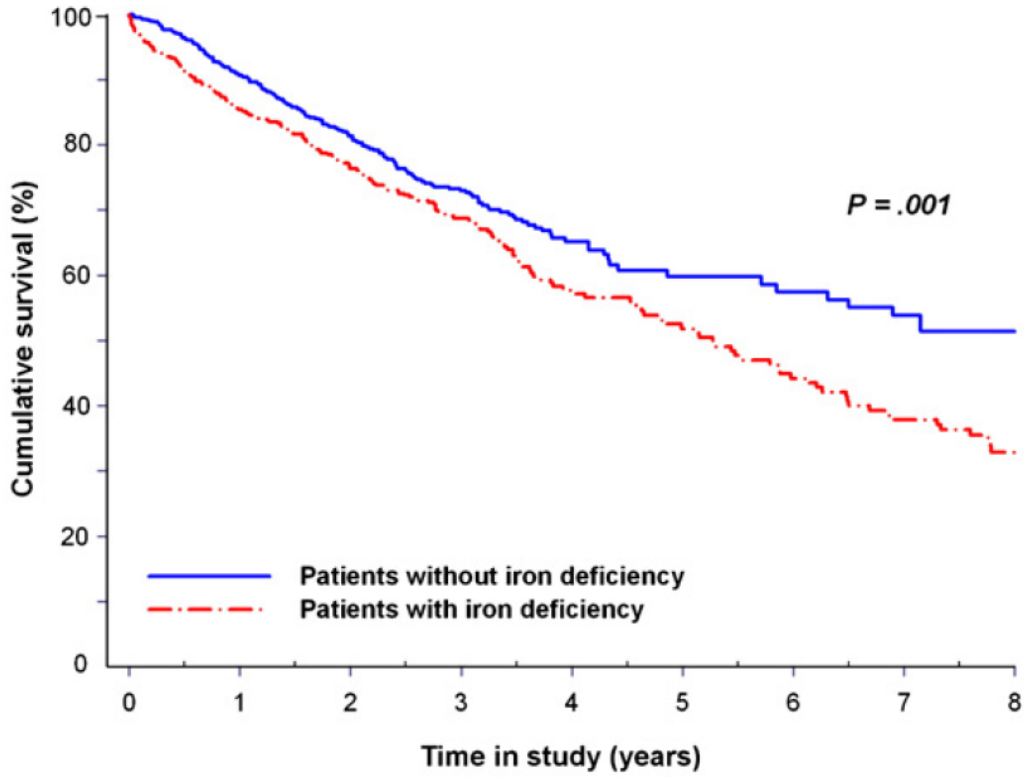

## pendenza VE/VCO2 (pendenza della retta di regressione che mette in relazione la ventilazione con la produzione di CO2)

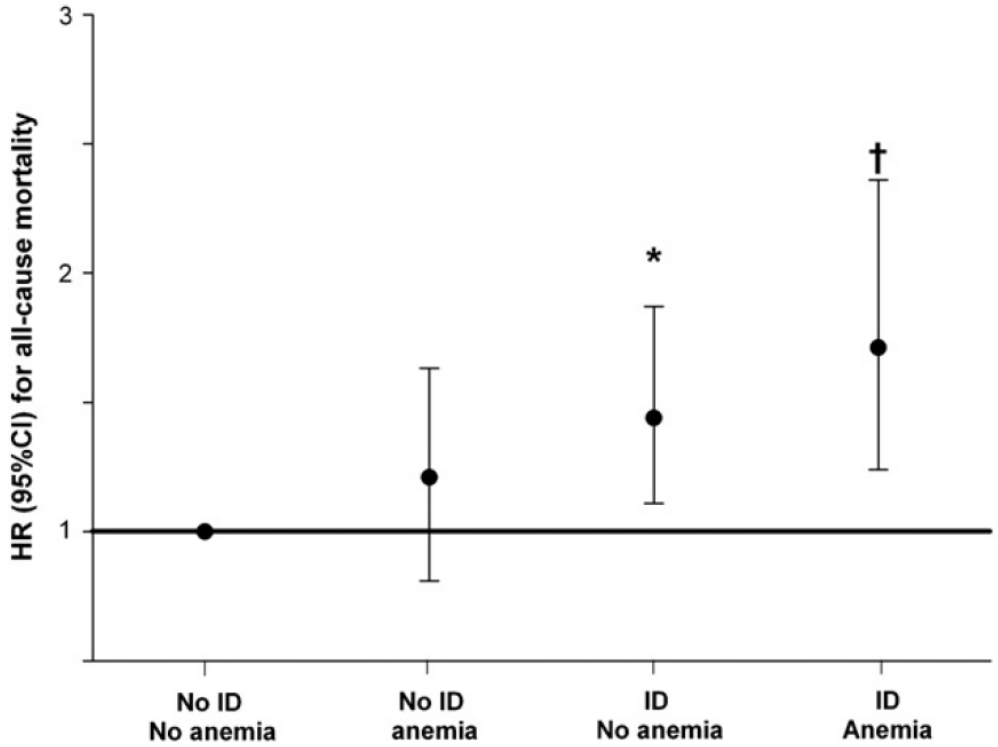




1. Jankowska EA et al. *J Card Fail*. 2011;17:899-906.
2. van Veldhuisen, DJ et al. *Nat. Rev. Cardiol*. 2011;8:485–493

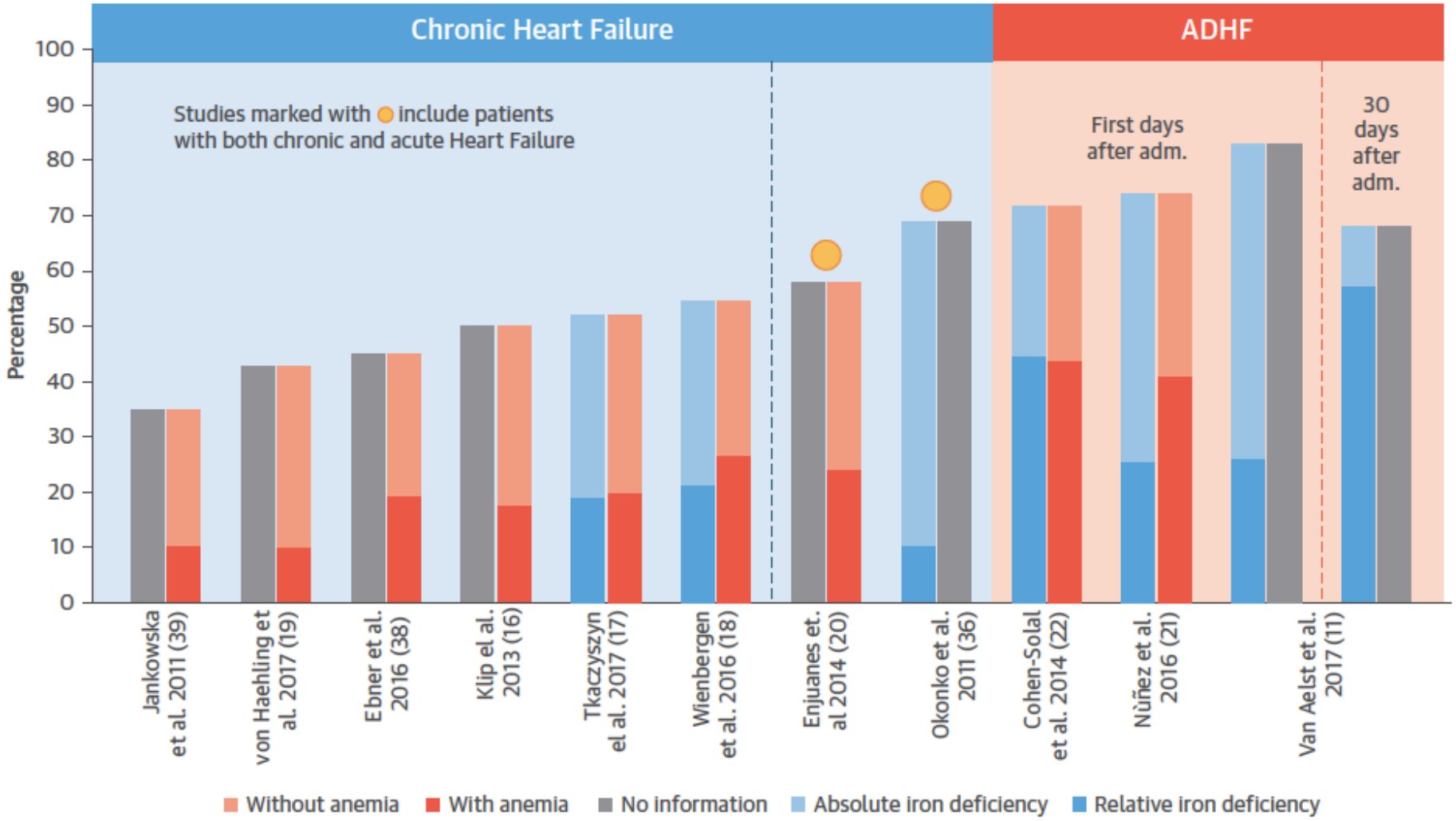
# Iron deficiency and outcome





1. Klip IT et al. *Am Heart J.* 2013;165:575–582.
2. Jankowska EA et al. *European Heart Journal* 2010; 31, 1872–1880

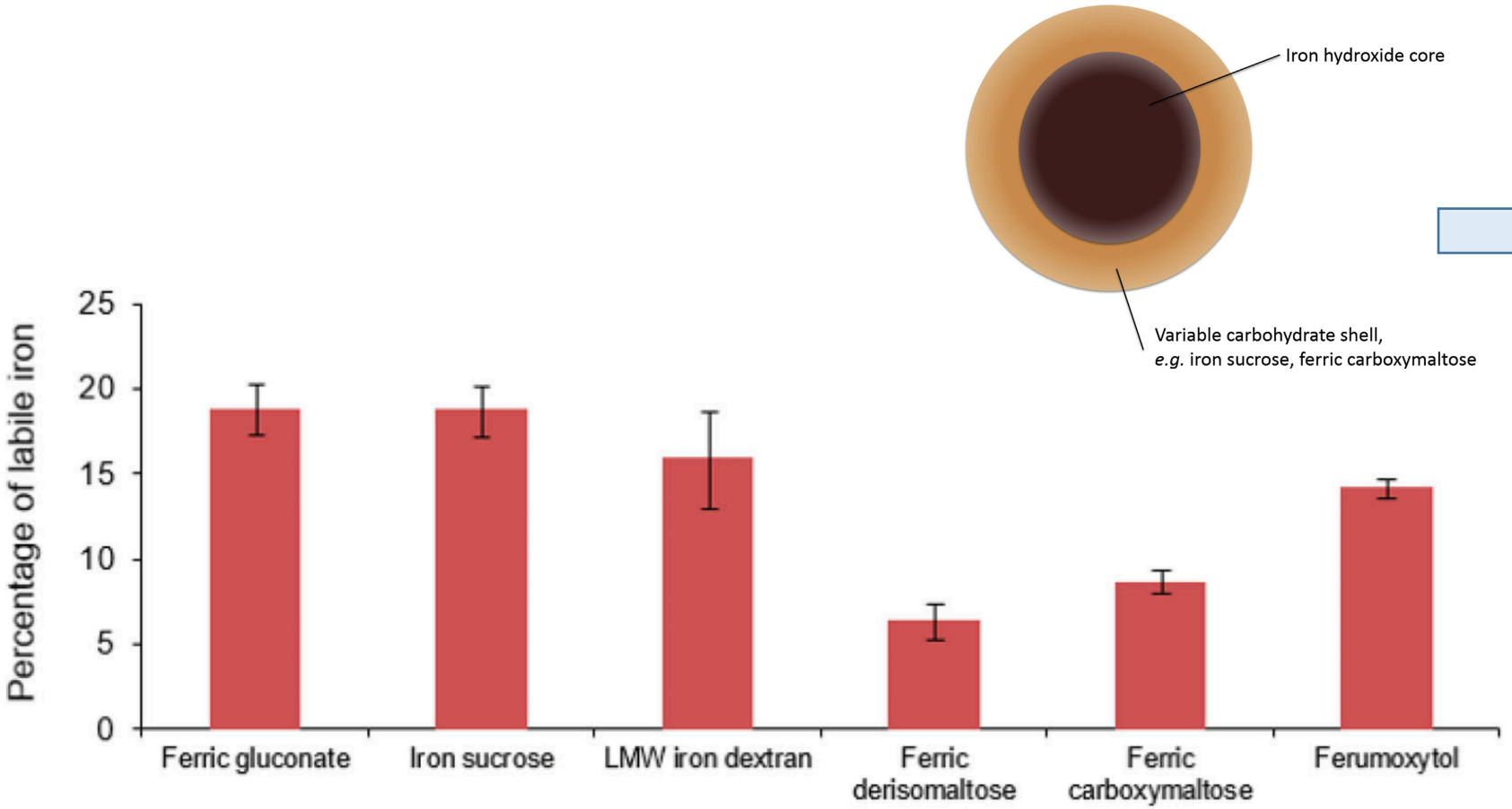



Rocha et al. J Am Coll Cardiol. 2018;71:782-793.

# Background HF medical therapy

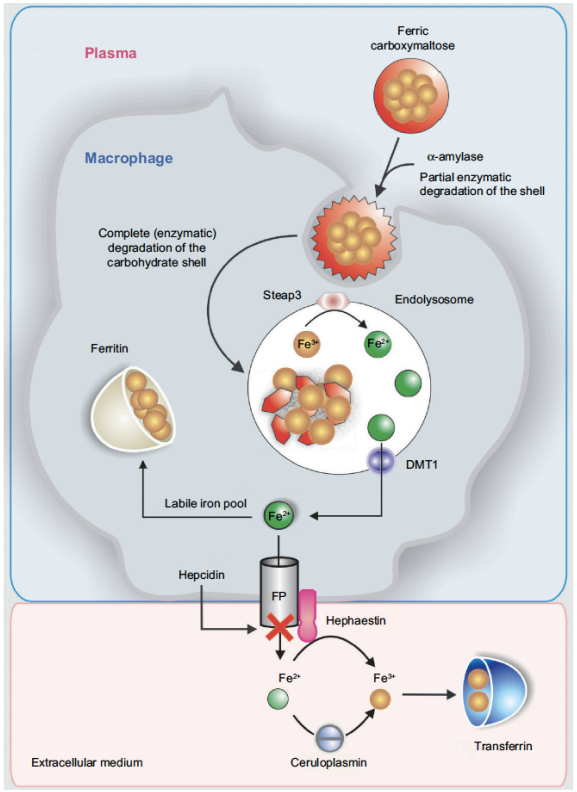
| | HFrEF | HFmrEF | HFpEF |
|---|---|---|---|
| *Background HF medical therapy* | | | |
| B-blockers | 632 (91) | 213 (87) | 151 (75) |
| ACEi/ARB | 125 (18) | 82 (34) | 100 (50) |
| ARNI | 430 (61.8) | 132 (54.5) | 35 (17.6) |
| • <50% | 45.2% | 37.1% | 37.1% |
| • 50 to <100% | 30.4% | 37.9% | 34.3% |
| • ≥ 100% | 24.4% | 25% | 28.6% |
| MRA | 507 (72.7) | 164 (67.5) | 107 (53.5) |
| • <50% | 55.9% | 67.7% | 57.1% |
| • 50 to <100% | 35.8% | 27.4% | 38.1% |
| • ≥ 100% | 8.3% | 4.9% | 4.8% |
| SGLT2i | 455 (65.3) | 139 (57.2) | 67 (33.5) |
| • Dapagliflozin, % | 72.2 | 82.0 | 65.7 |
| • Empagliflozin, % | 27.8 | 18.0 | 34.3 |
| Diuretics | 493 (71.1) | 138 (57.5) | 143 (71.5) |
| IV iron in the last 6 months | 21 ( 3.1) | 6 ( 2.5) | 6 ( 3.1) |
| Potassium binders | 20 ( 2.9) | 7 ( 2.9) | 1 ( 0.5) |
| Ivabradine | 48 ( 7.0) | 16 ( 6.7) | 3 ( 1.5) |

Data are presented as n (%)







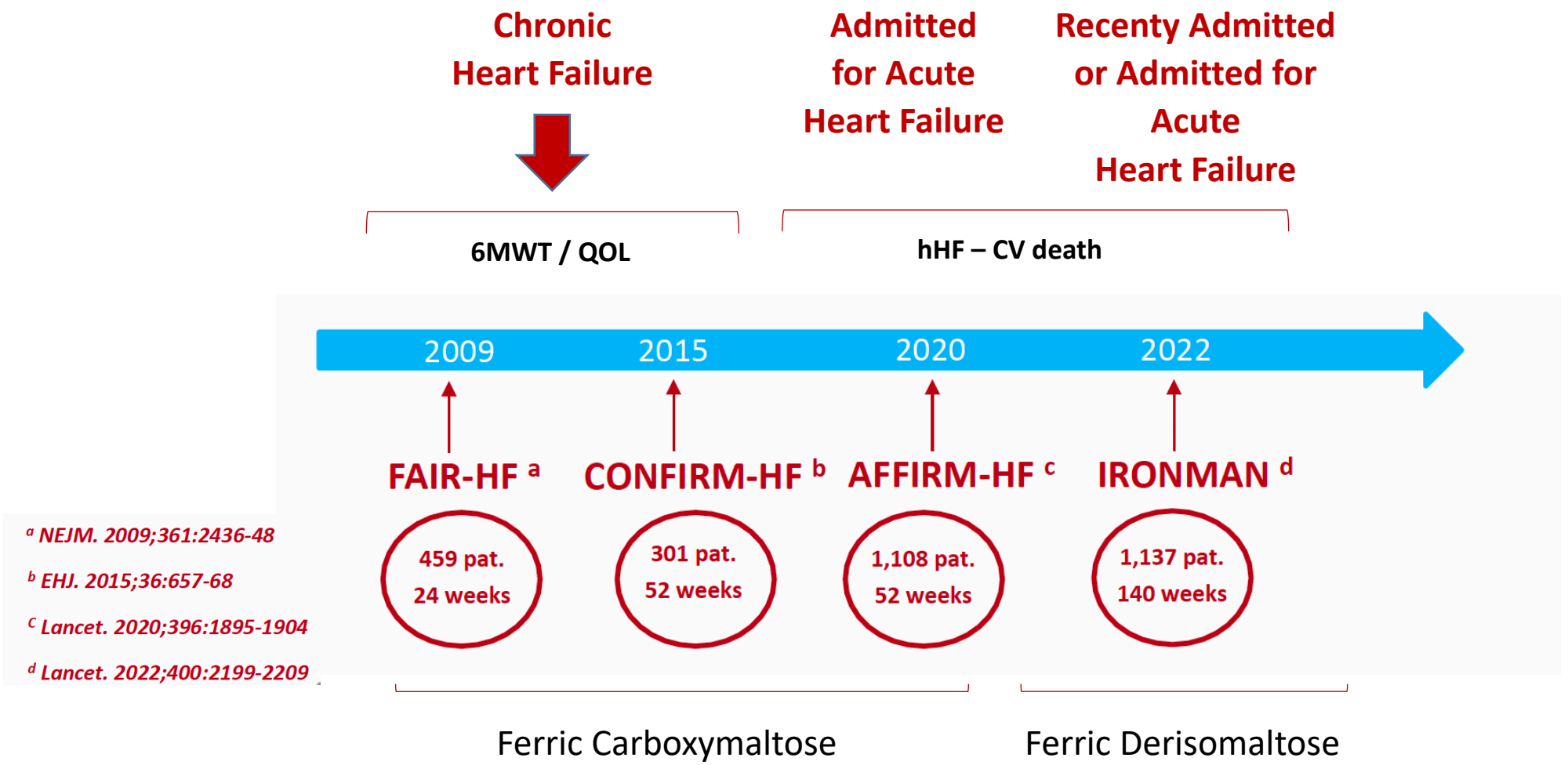



Am J Hematol. 2021;96:727–734.

von Haehling, S. et al. J Am Coll Cardiol HF. 2019;7(1):36–46

Tobbli and Angerosa. Drug Design, Development and Therapy 2014:8 2475–2491.

# RCT with i.v. iron therapy in HFrEF trials




[a] *NEJM. 2009;361:2436-48*

[b] *EHJ. 2015;36:657-68*

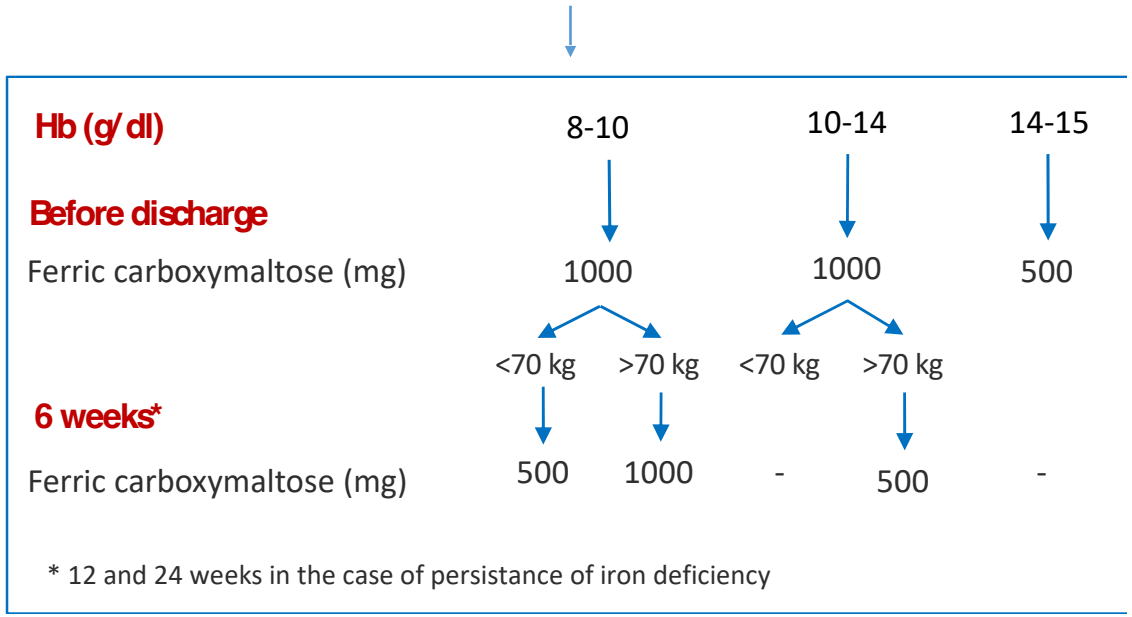
[C] *Lancet. 2020;396:1895-1904*

[d] *Lancet. 2022;400:2199-2209*

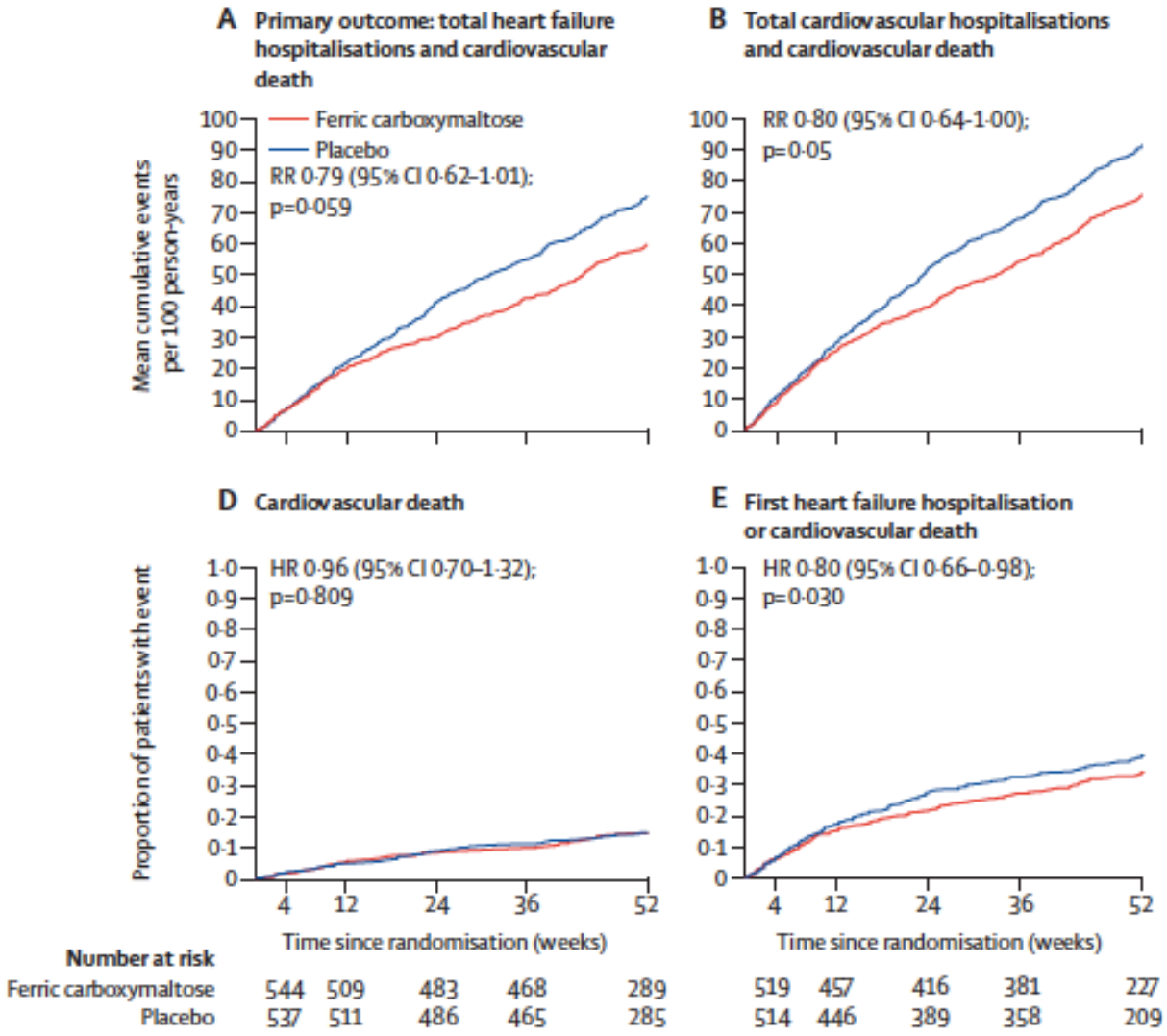
# AFFIRM-AHF

- Hospitalised for acute heart failure
- LVEF ≤50%
- **Iron deficiency**

  (Ferritin <100 µg/L, or 100–299 µg/L with transferrin saturation <20%)



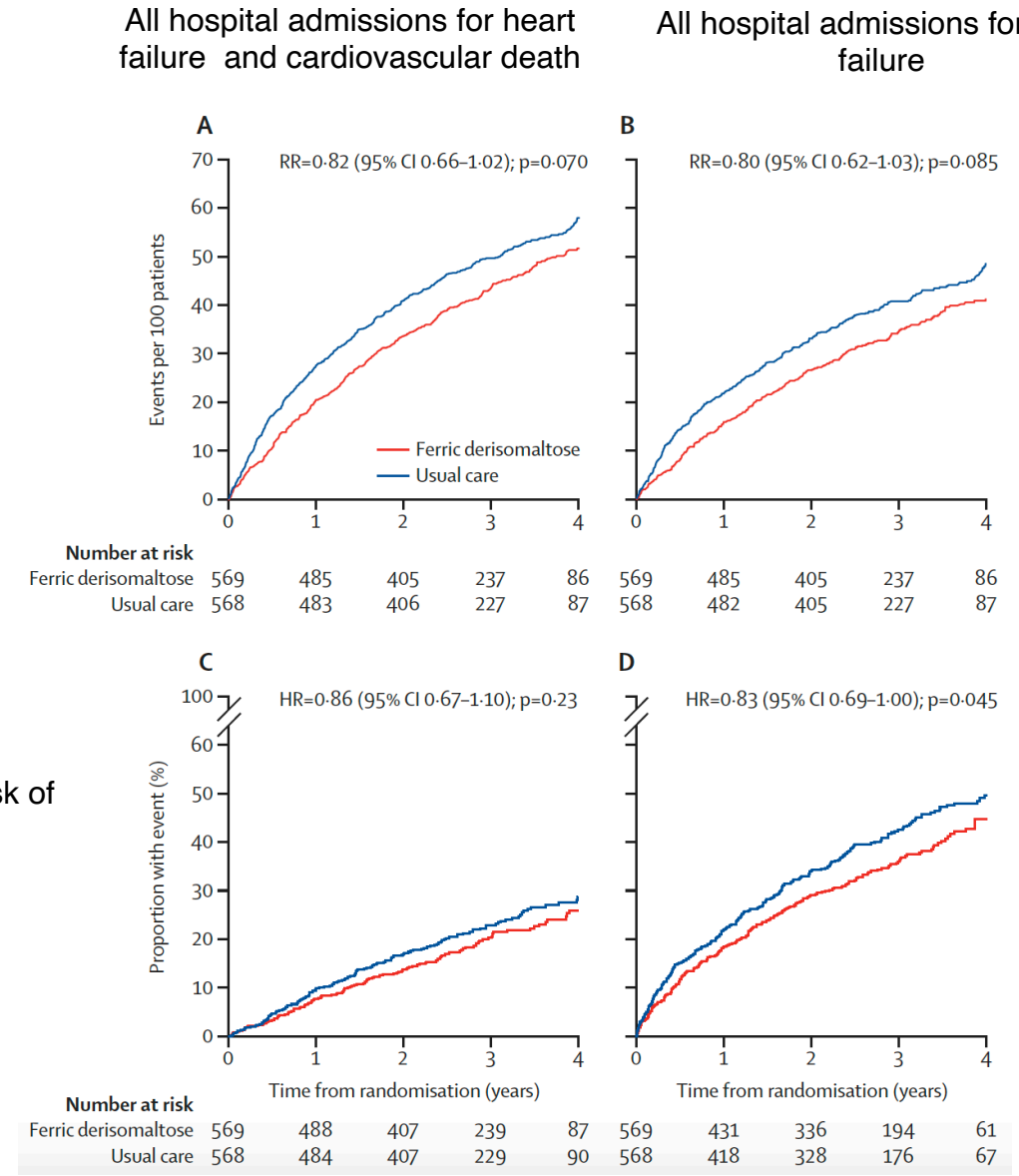

* 12 and 24 weeks in the case of persistance of iron deficiency




Ponikowki P et al. 2020; 396: 1895-1904

# IRONMAN

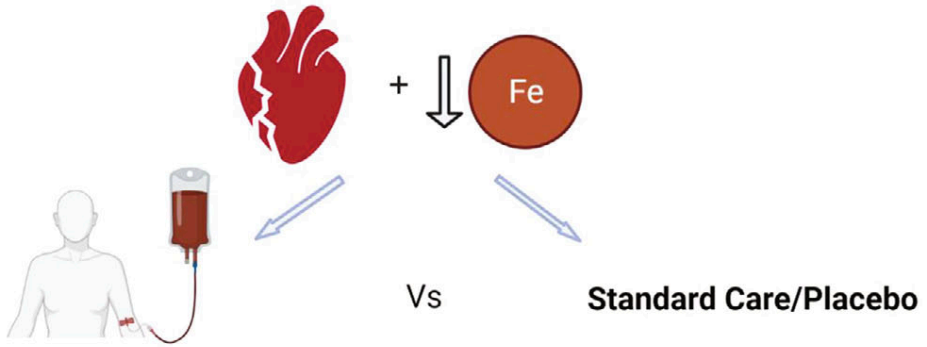
- New or established HF
- Serum ferritin <100 µg/L or transferrin saturation <20%
- LVEF<45%
- Current or recent (within 6 months) HF admission or high NT-proBNP




Both C and D show cumulative incidence functions, correcting for the competing risk of non-cardiovascular death.

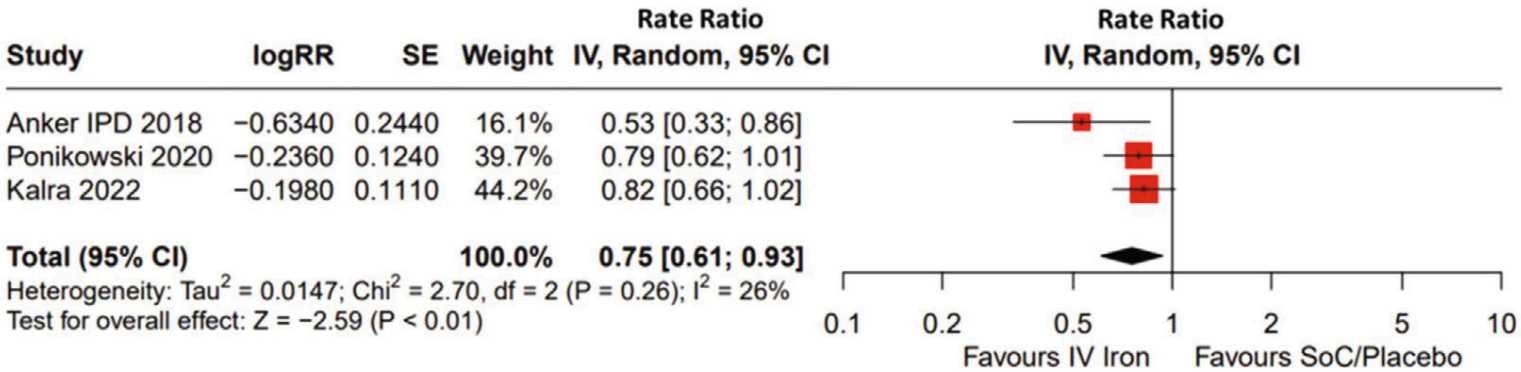
Karla PR et al. Lancet 2022; 400: 2199–209

**10 RCTs, including AFFIRM-AHF and IRONMAN**
**>3000 patients with HF and ID**
**IV iron: ↓ HHF and CVM by 25% vs standard care/placebo**




**RR 0.67 (0.47-0.97)** ↓   &   ↓ ? **OR 0.86 (0.70-1.05)**

↓ **RR 0.75 (0.61-0.93)** ↓

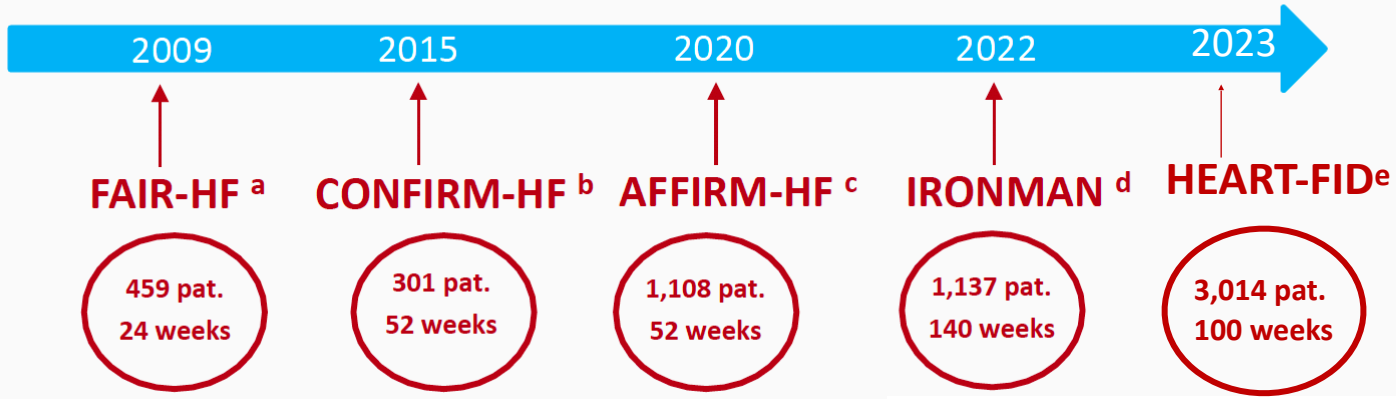



Graham et al. European Journal of Heart Failure 2023;25:528–537

# 2023 ESC Update on the 2021 Heart Failure 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 |
| Intravenous iron supplementation with ferric carboxymaltose or ferric derisomaltose should be considered in symptomatic patients with HFrEF and HFmrEF, and iron deficiency, to reduce the risk of HF hospitalization.[c] [12,41,43–46] | IIa | A |

# RCT with i.v. iron therapy in HFrEF trials




[a] *NEJM. 2009;361:2436-48*

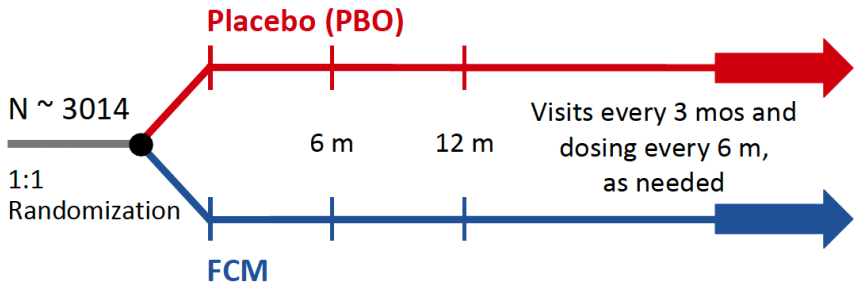
[b] *EHJ. 2015;36:657-68*

[C] *Lancet. 2020;396:1895-1904*

[d] *Lancet. 2022;400:2199-2209*

[e] N Engl J Med 2023;389:975-86.

**Chronic HFrEF (EF ≤40%) with Iron Deficiency***




| FCM Dosing (every 6 m based on labs†) | |
|---|---|
| <50 kg | ≥50kg |
| Two doses of **15 mg/kg** separated by 7 days | Two doses of **750 mg** separated by 7 days |

†Once iron replete, transition to placebo; blinding maintained

**Primary Endpoint:**

Hierarchical Composite:

All-cause mortality (12 m)

HF hospitalizations (12 m)

Change in 6-MWD (6 m)

**Top Secondary Endpoint:**

CV death or HF hospitalization

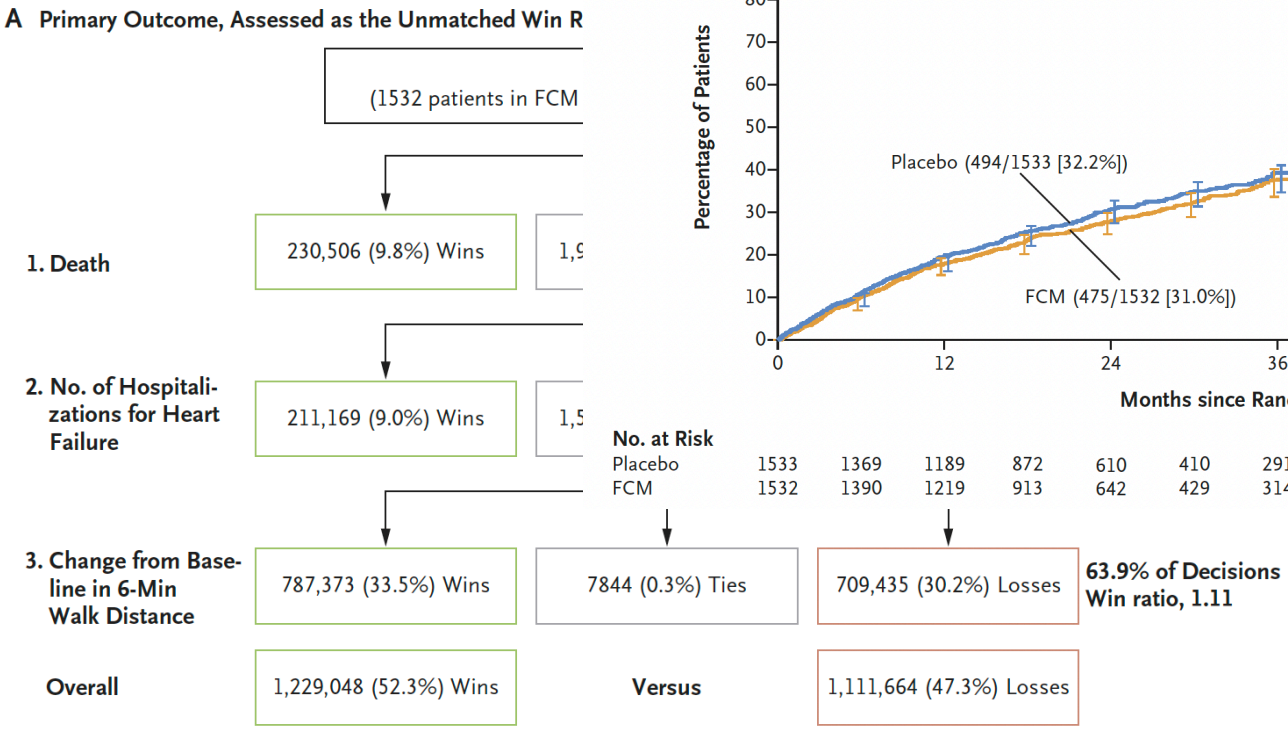
**Key Inclusion Criteria:**

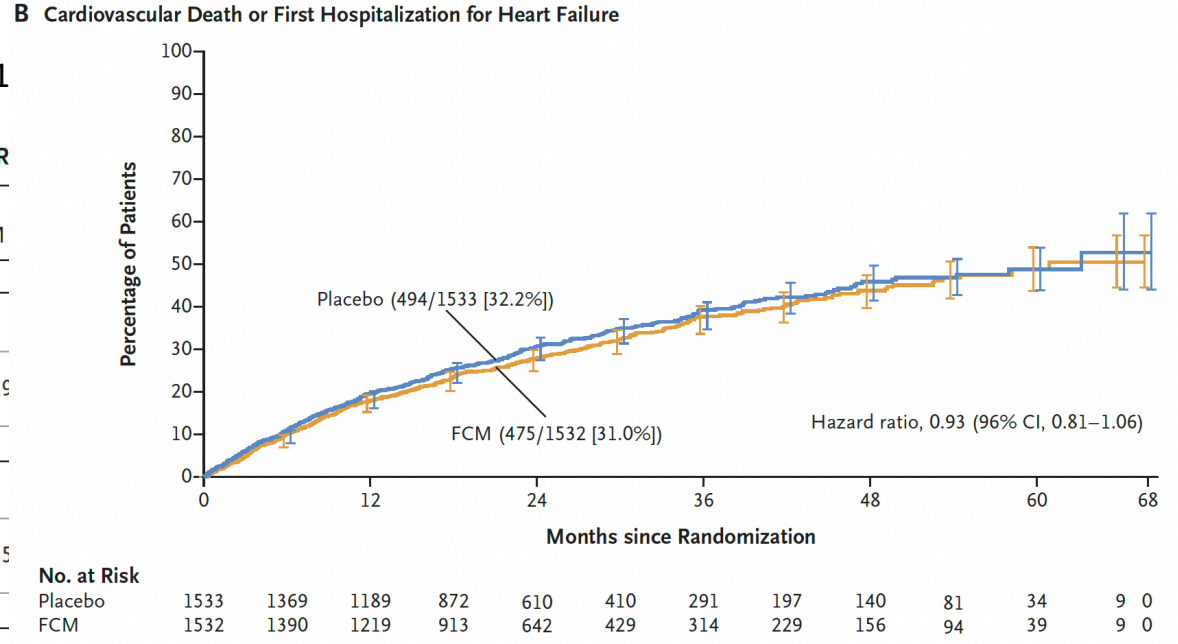
- *Iron deficiency
  - – Ferritin <100 ng/mL or
  - – 100-300 ng/mL + TSAT <20%
- HF hosp (12 m) or ↑ NT-proBNP (90 d) [>600 pg/mL (NSR) or >1000 pg/mL (AF)]

# HEART-FID

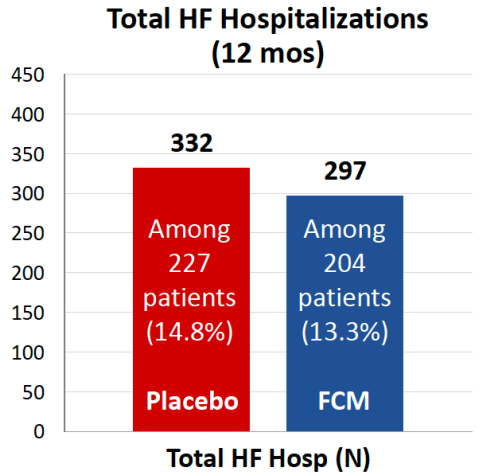
Unmatched win ratio (based on the first imputed data set)=
(total wins)/(total losses)=1,229,048/1,111,664=1.11 (99% CI, 0.99-1.23)

Overall unmatched win ratio, 1

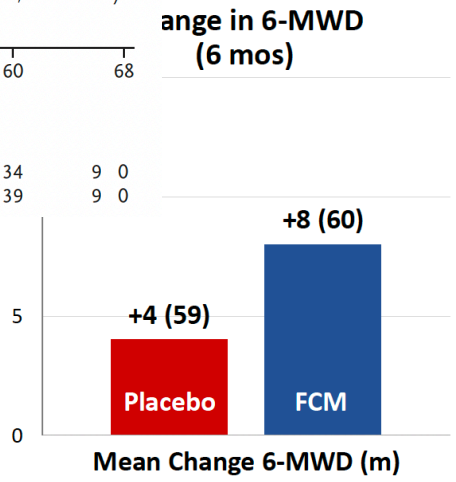







270 fewer HF hospitalization days



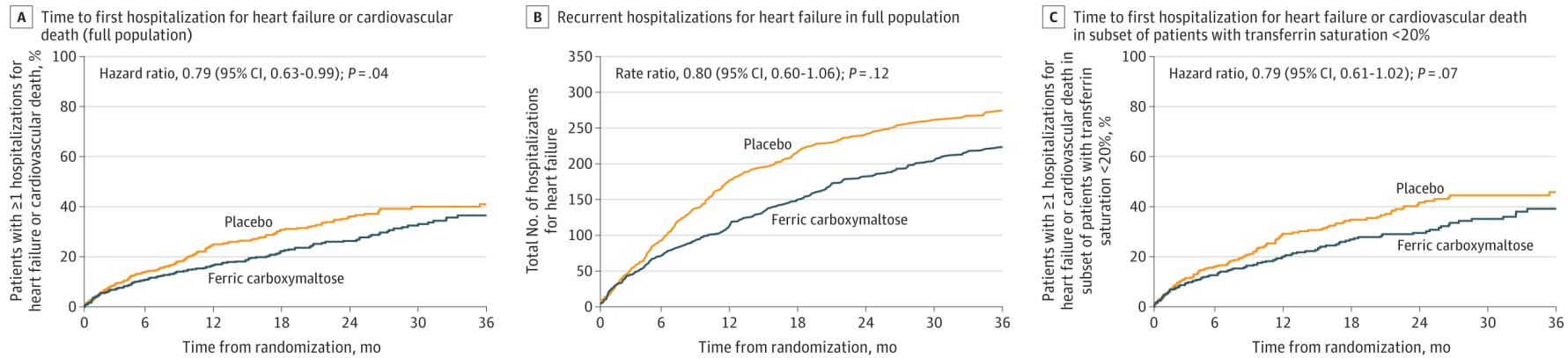

+4 meter benefit

N Engl J Med 2023;389:975-86.

JAMA | Original Investigation

# Intravenous Ferric Carboxymaltose in Heart Failure With Iron Deficiency
## The FAIR-HF2 DZHK05 Randomized Clinical Trial

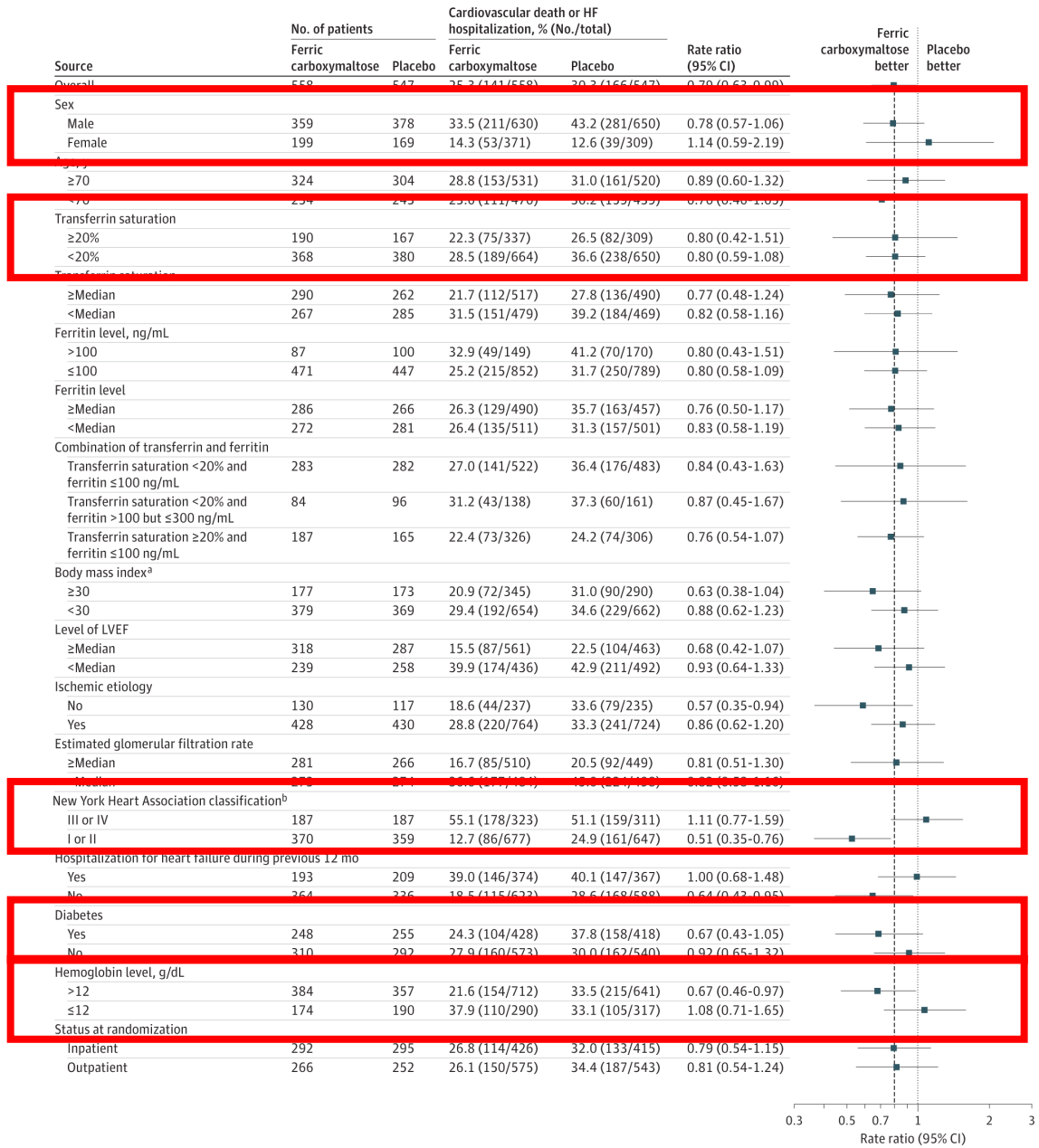
Stefan D. Anker, MD, PhD; Tim Friede, PhD; Javed Butler, MD, MPH; Khawaja M. Talha, MBBS; Marius Placzek, PhD; Monika Diek, MA; Anna Nosko, PhD; Adriane Stas, BA; Stefan Kluge, MD; Dominik Jarczak, MD; Geraldine deHeer, MD; Meike Rybczynski, MD; Antoni Bayés-Genis, MD, PhD; Michael Böhm, MD; Andrew J. S. Coats, MD; Frank Edelmann, MD; Gerasimos Filippatos, MD; Gerd Hasenfuß, MD; Wilhelm Haverkamp, MD; Mitja Lainscak, MD, PhD; Ulf Landmesser, MD; Iain C. Macdougall, MD; Bela Merkely, MD, PhD, DSc; Burkert M. Pieske, MD; Fausto J. Pinto, MD, PhD; Tienush Rassaf, MD; Jennifer K. Visser-Rogers, PhD; Giuseppe Rosano, PhD; Maurizio Volterrani, MD; Stephan von Haehling, MD, PhD; Markus S. Anker, MD; Wolfram Doehner, MD, PhD; Hüseyin Ince, MD; Friedrich Koehler, MD; Gianluigi Savarese, MD; Muhammad Shahzeb Khan, MD, MSc; Ursula Rauch-Kröhnert, MD; Tommaso Gori, MD; Teresa Trenkwalder, MD; Ibrahim Akin, MD; Christina Paitazoglou, MD; Iwona Kobielusz-Gembala, MD; Luca Kuthi, MD; Norbert Frey, MD; Manuela Licka, MD; Stefan Kääb, MD; Karl-Ludwig Laugwitz, MD; Piotr Ponikowski, MD, PhD; Mahir Karakas, MD, PhD, MBA




| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. at risk | | | | | | | | | | | | | | | | | | | | | | | | |
| Placebo | 547 | 384 | 272 | 194 | 140 | 84 | 63 | 547 | 431 | 324 | 250 | 193 | 130 | 98 | 380 | 249 | 171 | 126 | 86 | 60 | 44 | | | |
| Ferric carboxymaltose | 558 | 416 | 317 | 223 | 173 | 110 | 75 | 558 | 454 | 361 | 273 | 213 | 145 | 103 | 368 | 269 | 197 | 144 | 118 | 76 | 50 | | | |
| No. of events | | | | | | | | | | | | | | | | | | | | | | | | |
| Placebo | 1 | 72 | 43 | 19 | 12 | 7 | 1 | 0 | 102 | 79 | 40 | 21 | 19 | 13 | 1 | 57 | 34 | 12 | 11 | 4 | 1 | | | |
| Ferric carboxymaltose | 0 | 61 | 23 | 18 | 10 | 13 | 5 | 0 | 78 | 41 | 32 | 31 | 25 | 16 | 0 | 48 | 18 | 15 | 4 | 8 | 4 | | | |
| No. censored | | | | | | | | | | | | | | | | | | | | | | | | |
| Placebo | 3 | 87 | 69 | 59 | 42 | 49 | 20 | 3 | 95 | 82 | 63 | 45 | 56 | 26 | 3 | 70 | 44 | 33 | 29 | 22 | 15 | | | |
| Ferric carboxymaltose | 2 | 79 | 76 | 76 | 40 | 50 | 30 | 2 | 86 | 79 | 77 | 51 | 54 | 35 | 2 | 58 | 45 | 38 | 22 | 34 | 22 | | | |

JAMA. Published online March 30, 2025. doi:10.1001/jama.2025.3833

# Intravenous Ferric Carboxymaltose in Heart Failure With Iron Deficiency



| Source | No. of patients: Ferric carboxymaltose | No. of patients: Placebo | Cardiovascular death or HF hospitalization, % (No./total): Ferric carboxymaltose | Cardiovascular death or HF hospitalization, % (No./total): Placebo | Rate ratio (95% CI) |
|---|---|---|---|---|---|
| Overall | 558 | 547 | 25.3 (141/558) | 30.3 (166/547) | 0.79 (0.63-0.99) |
| Sex | | | | | |
| Male | 359 | 378 | 33.5 (211/630) | 43.2 (281/650) | 0.78 (0.57-1.06) |
| Female | 199 | 169 | 14.3 (53/371) | 12.6 (39/309) | 1.14 (0.59-2.19) |
| Age, y | | | | | |
| ≥70 | 324 | 304 | 28.8 (153/531) | 31.0 (161/520) | 0.89 (0.60-1.32) |
| <70 | 234 | 243 | 21.8 (111/476) | 30.2 (139/459) | 0.70 (0.48-1.03) |
| Transferrin saturation | | | | | |
| ≥20% | 190 | 167 | 22.3 (75/337) | 26.5 (82/309) | 0.80 (0.42-1.51) |
| <20% | 368 | 380 | 28.5 (189/664) | 36.6 (238/650) | 0.80 (0.59-1.08) |
| Transferrin saturation | | | | | |
| ≥Median | 290 | 262 | 21.7 (112/517) | 27.8 (136/490) | 0.77 (0.48-1.24) |
| <Median | 267 | 285 | 31.5 (151/479) | 39.2 (184/469) | 0.82 (0.58-1.16) |
| Ferritin level, ng/mL | | | | | |
| >100 | 87 | 100 | 32.9 (49/149) | 41.2 (70/170) | 0.80 (0.43-1.51) |
| ≤100 | 471 | 447 | 25.2 (215/852) | 31.7 (250/789) | 0.80 (0.58-1.09) |
| Ferritin level | | | | | |
| ≥Median | 286 | 266 | 26.3 (129/490) | 35.7 (163/457) | 0.76 (0.50-1.17) |
| <Median | 272 | 281 | 26.4 (135/511) | 31.3 (157/501) | 0.83 (0.58-1.19) |
| Combination of transferrin and ferritin | | | | | |
| Transferrin saturation <20% and ferritin ≤100 ng/mL | 283 | 282 | 27.0 (141/522) | 36.4 (176/483) | 0.84 (0.43-1.63) |
| Transferrin saturation <20% and ferritin >100 but ≤300 ng/mL | 84 | 96 | 31.2 (43/138) | 37.3 (60/161) | 0.87 (0.45-1.67) |
| Transferrin saturation ≥20% and ferritin ≤100 ng/mL | 187 | 165 | 22.4 (73/326) | 24.2 (74/306) | 0.76 (0.54-1.07) |
| Body mass index[a] | | | | | |
| ≥30 | 177 | 173 | 20.9 (72/345) | 31.0 (90/290) | 0.63 (0.38-1.04) |
| <30 | 379 | 369 | 29.4 (192/654) | 34.6 (229/662) | 0.88 (0.62-1.23) |
| Level of LVEF | | | | | |
| ≥Median | 318 | 287 | 15.5 (87/561) | 22.5 (104/463) | 0.68 (0.42-1.07) |
| <Median | 239 | 258 | 39.9 (174/436) | 42.9 (211/492) | 0.93 (0.64-1.33) |
| Ischemic etiology | | | | | |
| No | 130 | 117 | 18.6 (44/237) | 33.6 (79/235) | 0.57 (0.35-0.94) |
| Yes | 428 | 430 | 28.8 (220/764) | 33.3 (241/724) | 0.86 (0.62-1.20) |
| Estimated glomerular filtration rate | | | | | |
| ≥Median | 281 | 266 | 16.7 (85/510) | 20.5 (92/449) | 0.81 (0.51-1.30) |
| <Median | 275 | 281 | 33.8 (177/524) | 42.0 (224/533) | 0.82 (0.68-1.00) |
| New York Heart Association classification[b] | | | | | |
| III or IV | 187 | 187 | 55.1 (178/323) | 51.1 (159/311) | 1.11 (0.77-1.59) |
| I or II | 370 | 359 | 12.7 (86/677) | 24.9 (161/647) | 0.51 (0.35-0.76) |
| Hospitalization for heart failure during previous 12 mo | | | | | |
| Yes | 193 | 209 | 39.0 (146/374) | 40.1 (147/367) | 1.00 (0.68-1.48) |
| No | 364 | 336 | 18.5 (115/623) | 28.6 (168/588) | 0.64 (0.43-0.95) |
| Diabetes | | | | | |
| Yes | 248 | 255 | 24.3 (104/428) | 37.8 (158/418) | 0.67 (0.43-1.05) |
| No | 310 | 292 | 27.9 (160/573) | 30.0 (162/540) | 0.92 (0.65-1.32) |
| Hemoglobin level, g/dL | | | | | |
| >12 | 384 | 357 | 21.6 (154/712) | 33.5 (215/641) | 0.67 (0.46-0.97) |
| ≤12 | 174 | 190 | 37.9 (110/290) | 33.1 (105/317) | 1.08 (0.71-1.65) |
| Status at randomization | | | | | |
| Inpatient | 292 | 295 | 26.8 (114/426) | 32.0 (133/415) | 0.79 (0.54-1.15) |
| Outpatient | 266 | 252 | 26.1 (150/575) | 34.4 (187/543) | 0.81 (0.54-1.24) |

nature medicine

Article

https://doi.org/10.1038/s41591-025-03671-1

# Systematic review and meta-analysis of intravenous iron therapy for patients with heart failure and iron deficiency

Received: 8 February 2025

Accepted: 20 March 2025

Published online: 30 March 2025

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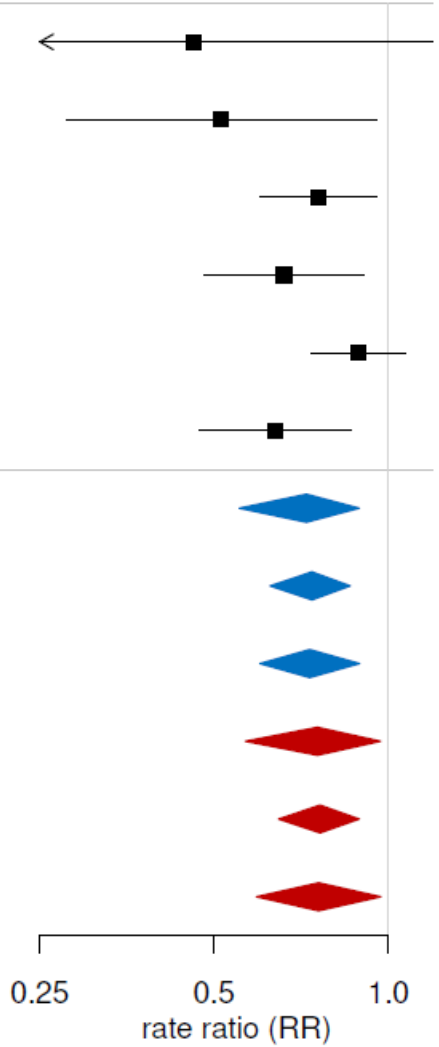
Uncertainty remains about the effect of intravenous (i.v.) iron on outcomes for heart failure (HF) with iron deficiency. In the present study, we summarize the efficacy and safety of i.v. iron from six trials (FAIR-HF, CONFIRM-HF, AFFIRM-AHF, IRONMAN, HEART-FID and FAIR-HF2), including 7,175 patients. In comparison to prior analyses, this meta-analysis added new data from FAIR-HF2, used a harmonized and robust Bayesian approach and included individual participant data from five trials. Patients assigned

# effect of i.v. iron on the composite endpoint of total (first and recurrent) HF hospitalizations and cardiovascular mortality for the first 12 months of follow-up

| study | iv iron n/N | control n/N | RR | 95% CI |
|---|---|---|---|---|
| FAIR-HF | 13/305 | 13/154 | 0.46 | [0.18, 1.19] |
| CONFIRM-HF | 22/150 | 44/151 | 0.51 | [0.28, 0.95] |
| AFFIRM-AHF | 293/558 | 372/550 | 0.76 | [0.60, 0.96] |
| IRONMAN | 97/527 | 149/536 | 0.66 | [0.48, 0.91] |
| HEART-FID | 394/1532 | 447/1533 | 0.89 | [0.74, 1.07] |
| FAIR-HF2 | 141/558 | 216/547 | 0.64 | [0.47, 0.86] |
| **overall (6 studies >200 patients, HN(0.5))** | | | **0.72** | **[0.55, 0.89]** |
| *overall (6 studies, HN(0.1))* | | | *0.74* | *[0.62, 0.86]* |
| *overall (6 studies, KnHa)* | | | *0.73* | *[0.60, 0.89]* |
| *overall (4 studies >1000 patients, HN(0.5))* | | | 0.75 | [0.57, 0.97] |
| *overall (4 studies, HN(0.1))* | | | *0.76* | *[0.65, 0.89]* |
| *overall (4 studies, KnHa)* | | | *0.76* | *[0.59, 0.97]* |



# La correzione per os della carenza marziale

JAMA | Original Investigation

## Effect of Oral Iron Repletion on Exercise Capacity in Patients With Heart Failure With Reduced Ejection Fraction and Iron Deficiency

### The IRONOUT HF Randomized Clinical Trial

Gregory D. Lewis, MD; Rajeev Malhotra, MD; Adrian F. Hernandez, MD, MHS; Steven E. McNulty, MS; Andrew Smith, MD; G. Michael Felker, MD, MHS; W. H. Wilson Tang, MD; Shane J. LaRue, MD; Margaret M. Redfield, MD; Marc J. Semigran, MD; Michael M. Givertz, MD; Peter Van Buren, MD; David Whellan, MD; Kevin J. Anstrom, PhD; Monica R. Shah, MD, MHS; Patrice Desvigne-Nickens, MD; Javed Butler, MD; Eugene Braunwald, MD; for the NHLBI Heart Failure Clinical Research Network

Table 2. Primary, Secondary, and Safety End Points

| | Median (IQR) | | | | | |
|---|---|---|---|---|---|---|
| | Week-16 Values[a] | | Change From Baseline to Week 16 | | Difference in Change From Baseline (95% CI) | *P* Value |
| | Oral Iron | Placebo | Oral Iron | Placebo | | |
| **Primary End Point** | | | | | | |
| Peak $\dot{V}O_2$ at 16 wk, mL/min | 1218 (892 to 1500) | 1187 (902 to 1425) | 23 (−84 to 142) | −2 (−110 to 104) | 21 (−34 to 76) | .46 |
| Ppeak $\dot{V}O_2$ at 16 wk, mL/kg/min | 13.5 (11.7 to 16.3) | 13.0 (10.2 to 15.9) | 0.20 (−1.1 to 1.6) | 0.01 (−1.1 to 0.9) | 0.30 (−0.27 to 0.87) | .30 |
| **Secondary End Points** | | | | | | |
| 6-Min walk distance at 8 wk, m | 380 (322 to 467) | 376 (286 to 448) | 15 (−17 to 55) | 21 (−24 to 56) | −1 (−24 to 23) | .95 |
| 6-Min walk distance at 16 wk, m | 366 (315 to 456) | 397 (299 to 472) | 19 (−19 to 51) | 32 (−12 to 66) | −13 (−32 to 6) | .19 |
| Mean response time ($O_2$ uptake kinetics), s | 52 (46 to 61) | 47 (40 to 58) | 2.5 (−7 to 9) | 1 (−10 to 6) | 3 (−2 to 8) | .19 |
| Ventilatory efficiency ($V_E/V_{CO2}$ slope) | 34.8 (29.9 to 41.1) | 33.5 (29.4 to 38.9) | −0.3 (−3.0 to 2.1) | −0.3 (−4.6 to 2.8) | 0.8 (−0.3 to 2.6) | .35 |
| NT-proBNP, pg/mL | 889 (376 to 2373) | 1085 (447 to 2582) | 4 (−342 to 288) | −37 (−412 to 363) | 159 (−280 to 599) | .48 |
| KCCQ clinical summary score at 8 wk[b] | 81.3 (70.8 to 91.7) | 75.0 (58.9 to 87.5) | 5.2 (−2.1 to 12.5) | 1.0 (−7.3 to 8.3) | 3.4 (−0.4 to 7.2) | .08 |
| KCCQ clinical summary score at 16 wk[b] | 80.7 (67.7 to 91.6) | 77.1 (65.1 to 89.6) | 3.1 (−4.2 to 13.5) | 3.0 (−4.2 to 10.4) | 1.0 (−2.4 to 4.4) | .57 |

## Advantages

-cheap

-easy to administer

## Disadvantages

-poorly absorbed (max 5 mg/day)

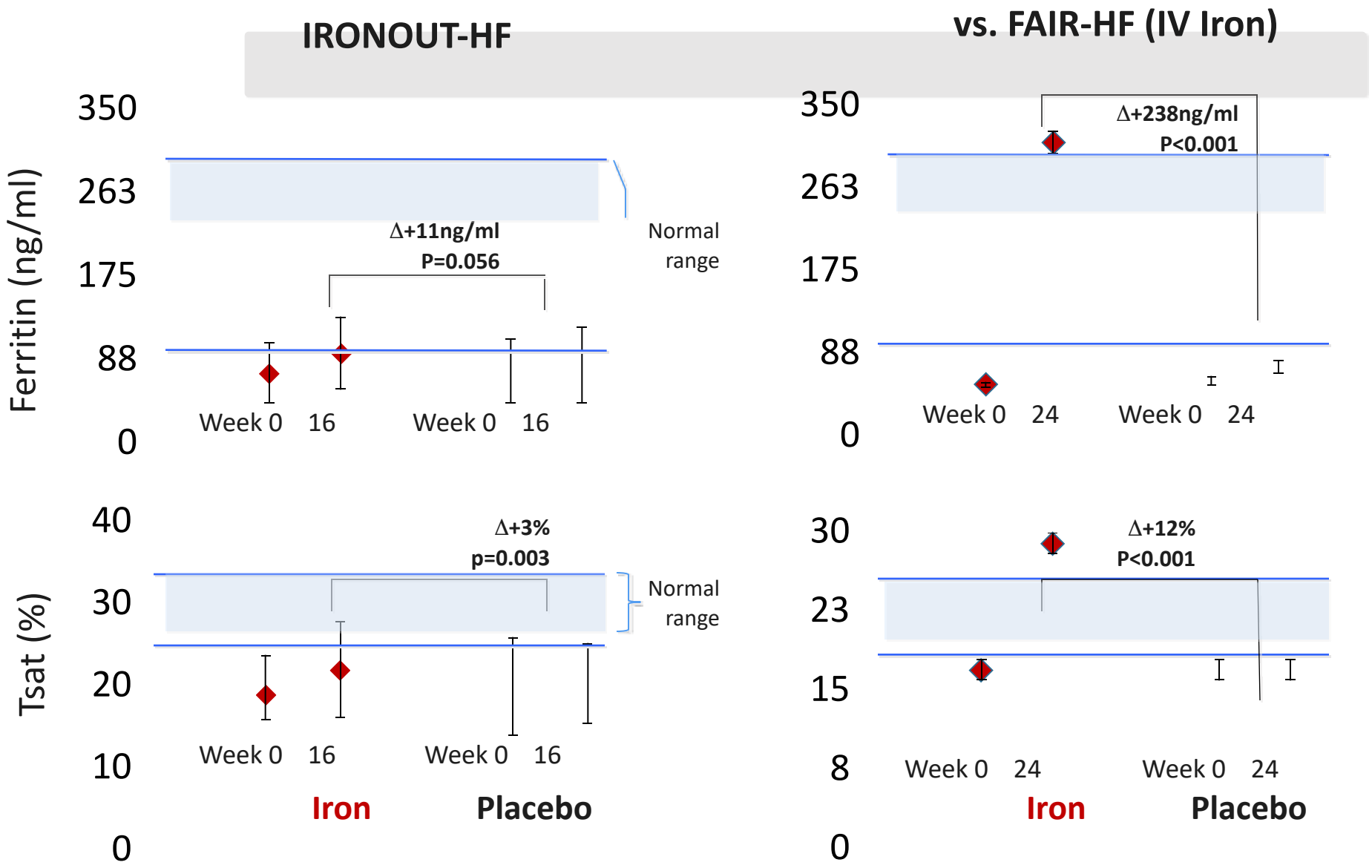
-GI side-effects common

-compliance often poor

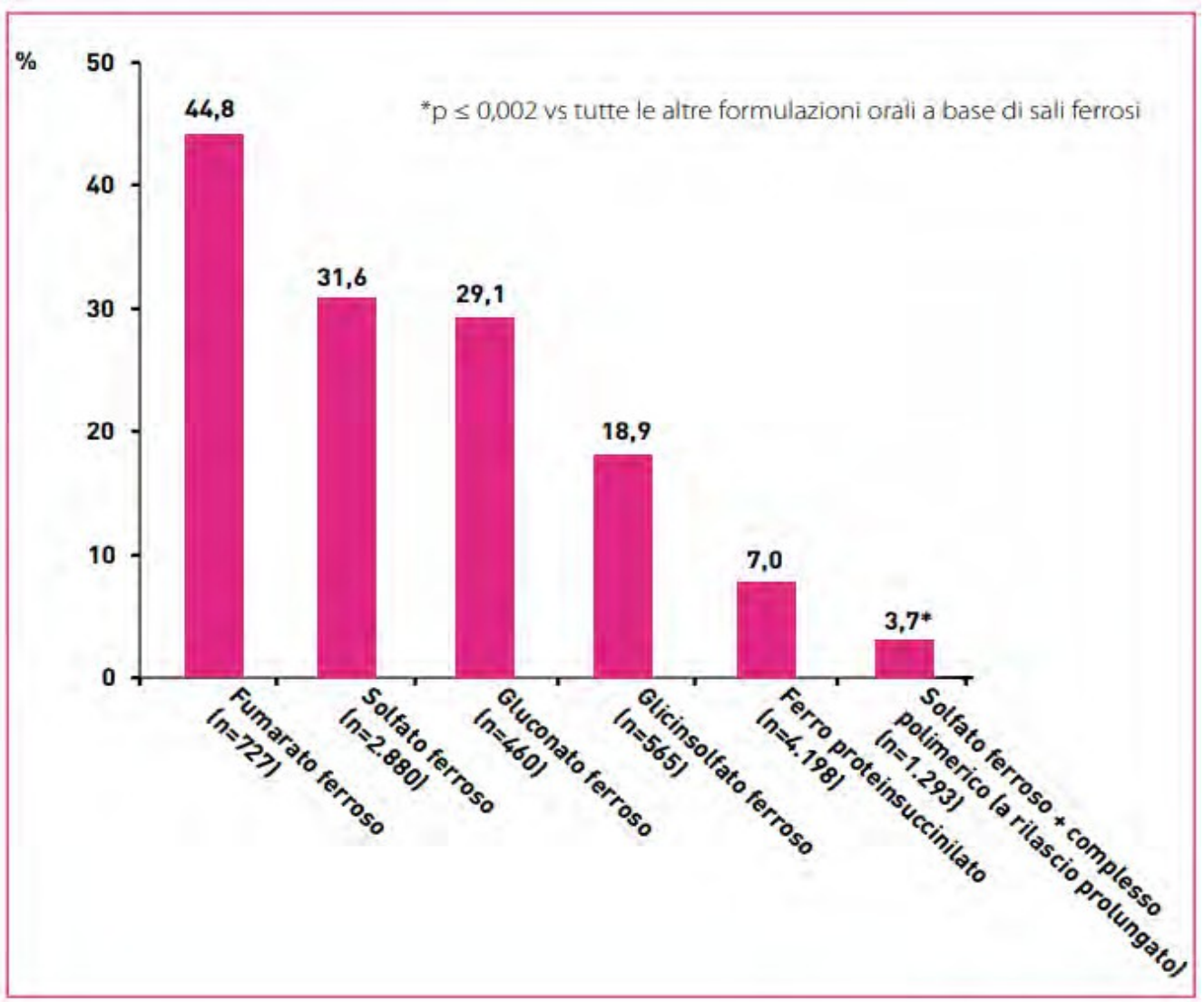
-absorption limited by Ferritin elevated

-Absorption reduded in inflammation

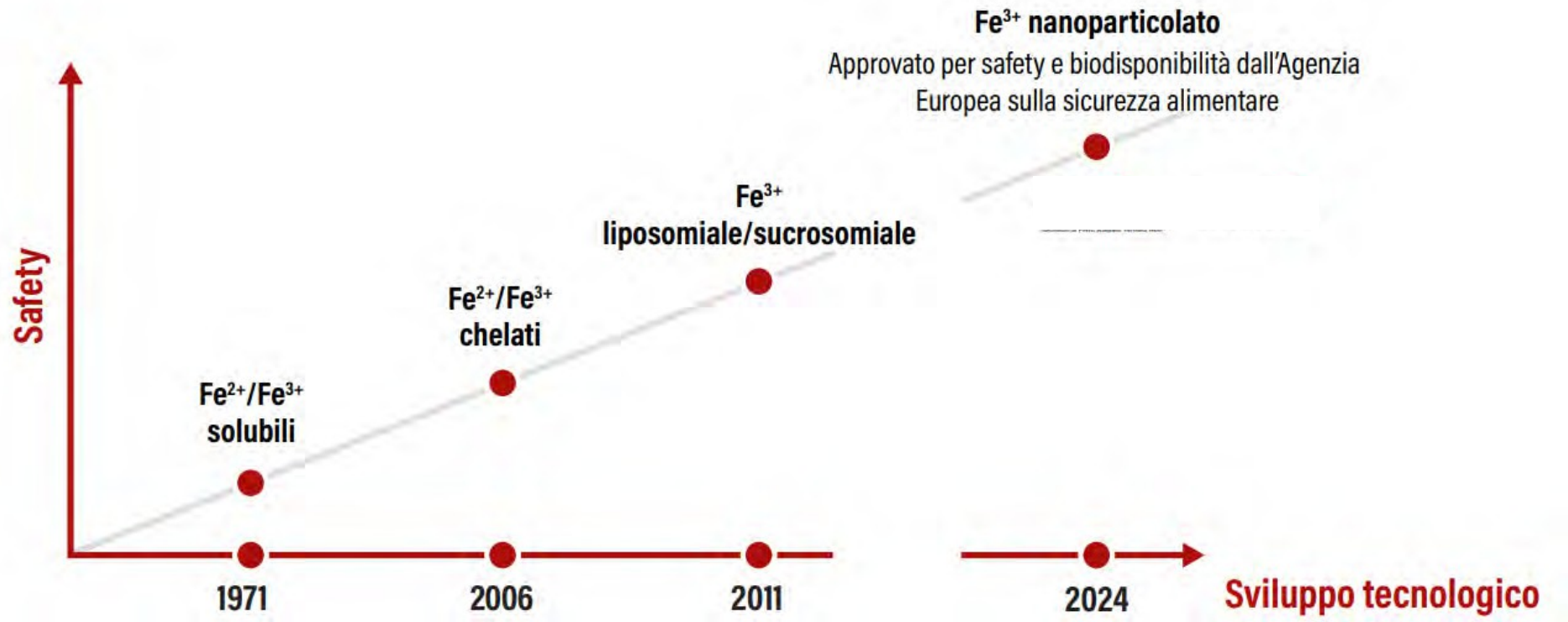
# Results: Δ Iron Studies

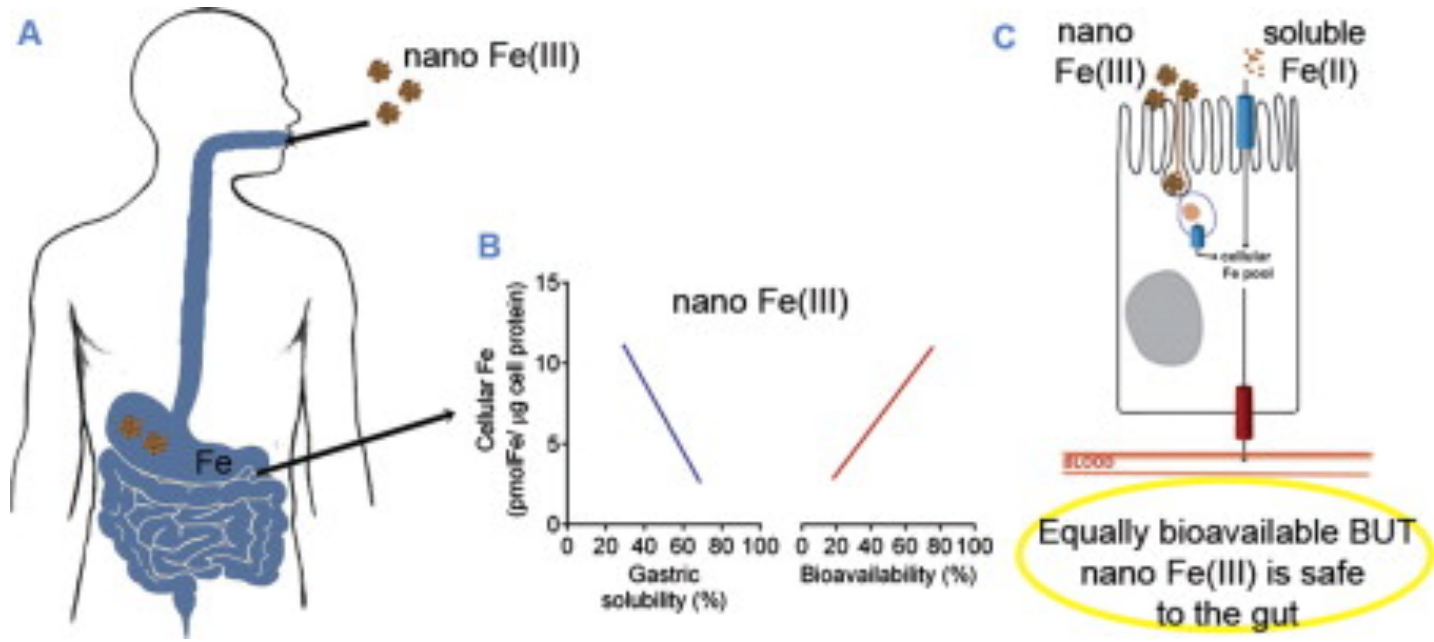


# EVENTI AVVERSI GASTROINTESTINALI



# L'EVOLUZIONE TECNOLGICA DELLA SAFETY DEL FERRO



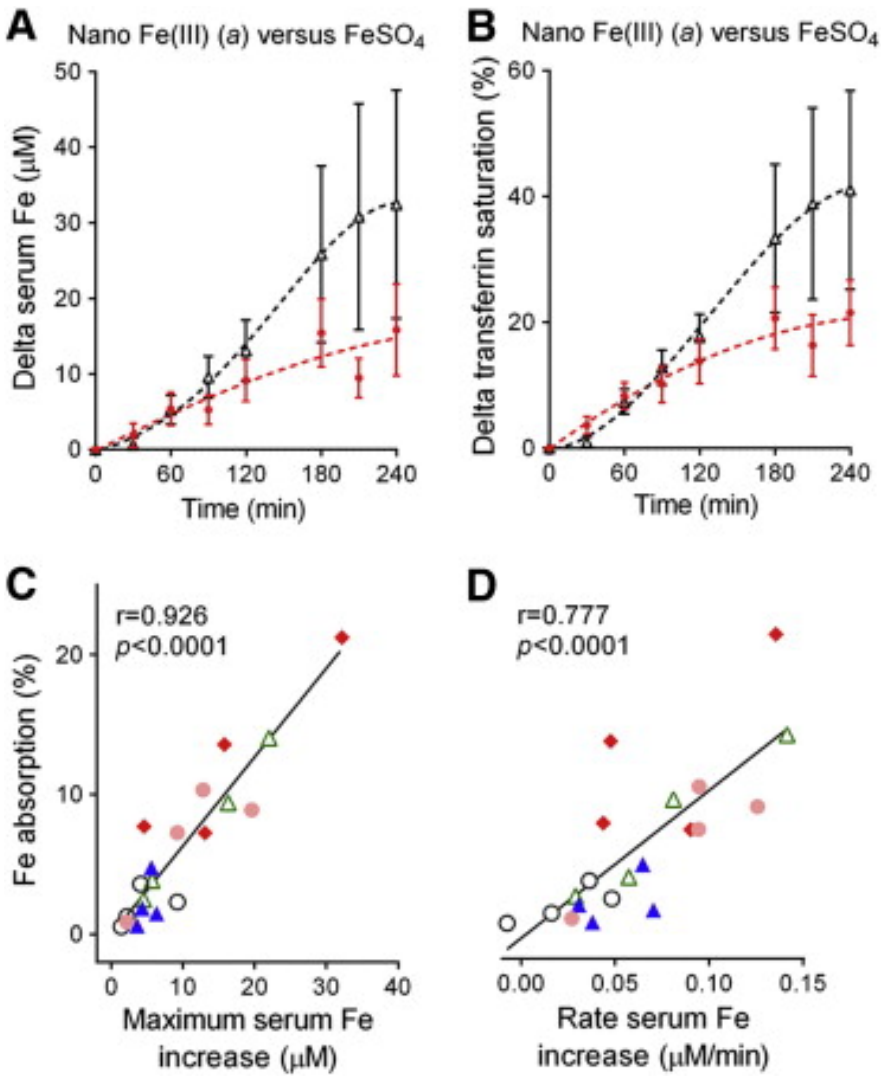

A
nano Fe(III)
Fe
B
nano Fe(III)
Cellular Fe
(pmol Fe/ µg cell protein)
15
10
5
0
0 20 40 60 80 100
Gastric
solubility (%)
0 20 40 60 80 100
Bioavailability (%)
C
nano
Fe(III)
soluble
Fe(II)
cellular
Fe pool
blood
Equally bioavailable BUT
nano Fe(III) is safe
to the gut

# Idrossido di Ferro Adipato Tartrato

- nuova entità chimica di ferro,
  - simile per assorbimento e distribuzione alla ferritina naturale

- Sottoforma di nanoparticelle, con struttura destabilizzata amorfa
  - è altamente biodisponibile

**Serum iron absorption following ingestion of a single-dose of the different Fe in iron-deficient women.**

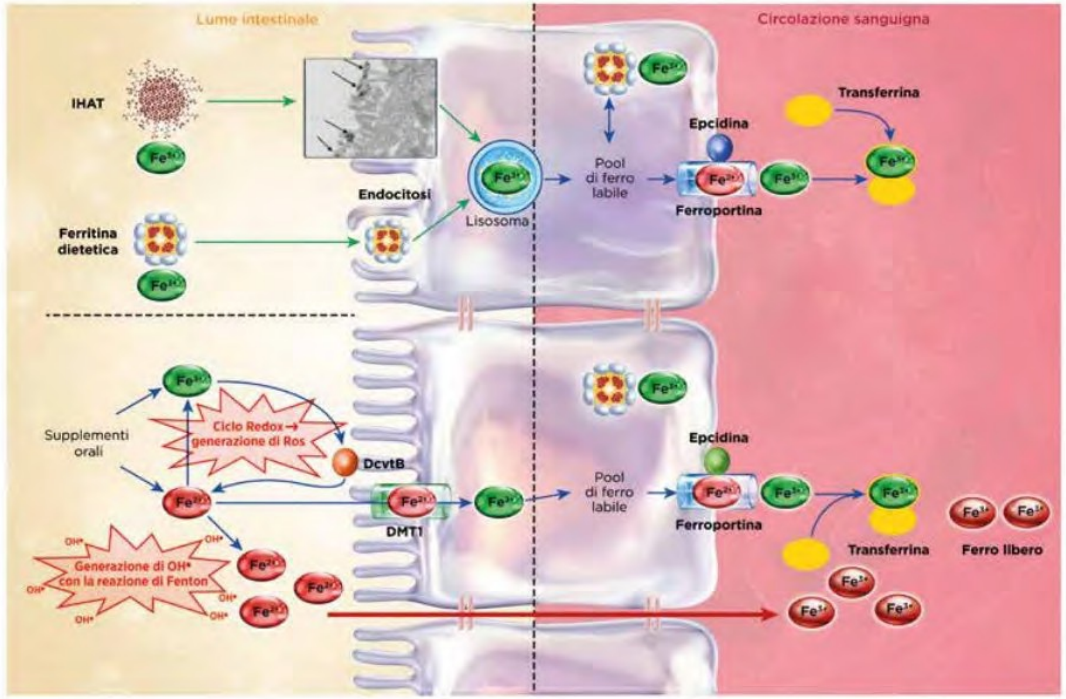


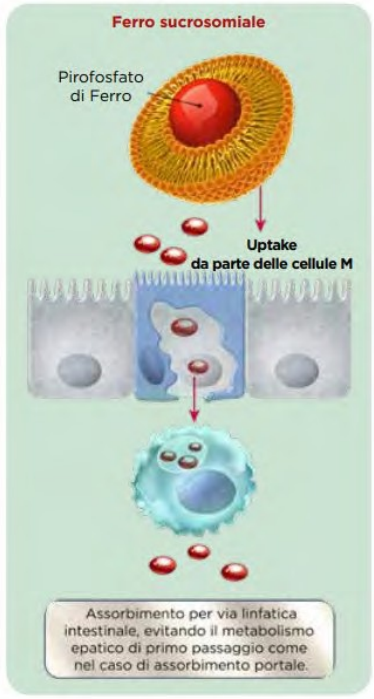
# IHAT E ATTIVITA' OSSIDO-RIDUTTIVA

- Fe inorganico solubile [Fe(II) o Fe(III)] nell'ambiente intestinale alcalino perde parte della solubilità,
  - precipitando in situ a formare nanoparticelle di Fe(III) idrossido, contenute in un rivestimento mucinico (ferritina modificata)
- La continua conversione tra Fe(III) ferrico e Fe(II) ferroso nel lume intestinale, prima dell'assorbimento di Fe(II) nelle cellule intestinali, determina gastrolesività, oltre a modificare la flora intestinale
  - soppressione di *Lactobacillus, Bifidobacteria, Enterobacteriaceae*, con rischio potenziale di sviluppo di batteri patogeni
- IHAT viene assorbito esclusivamente con meccanismo endocitosico
  - senza determinare danni ossido-riduttivi alla mucosa intestinale

# ASSORBIMENTO ENDOCITOSICO DI IHAT

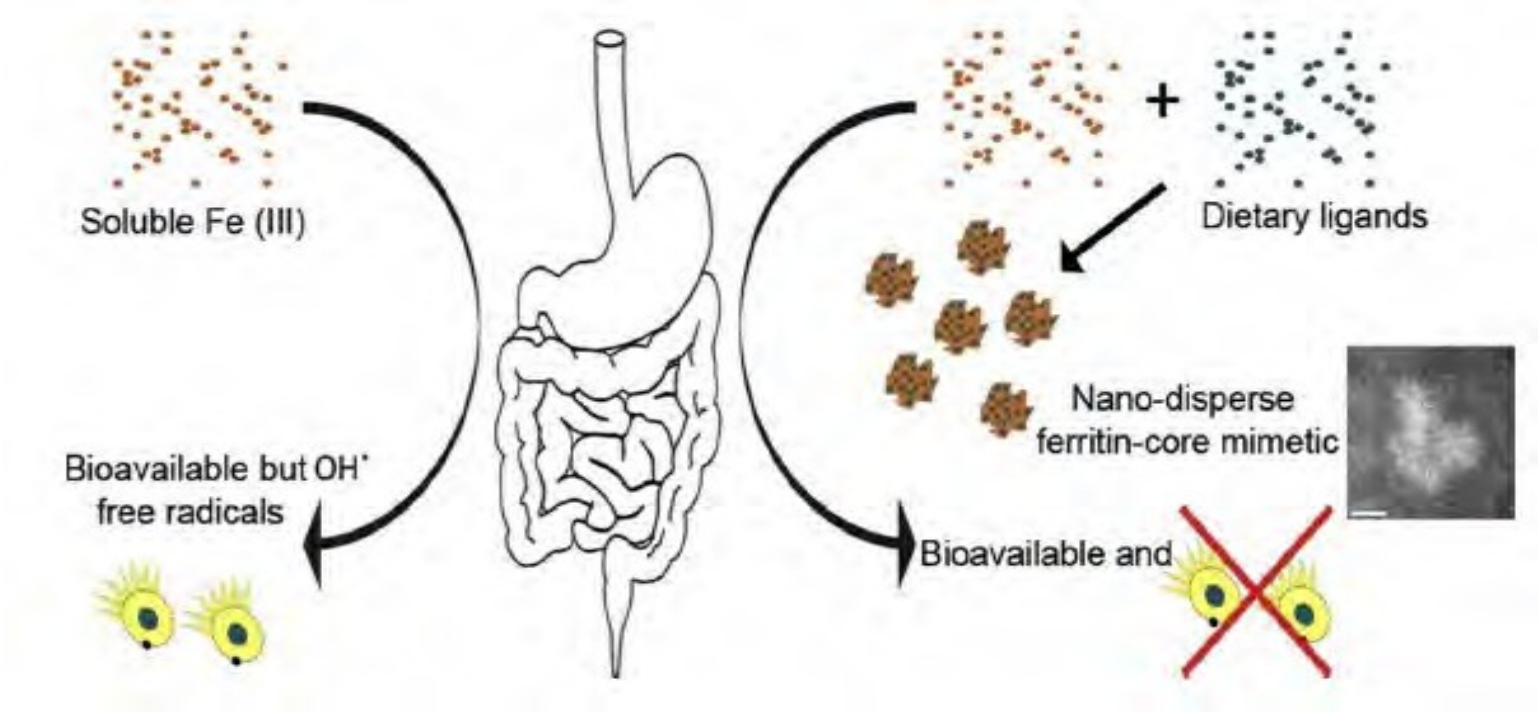
Idrossido di Ferro Adipato Tartrato™ è assorbito lentamente per endocitosi[6], mantenendo il livello di saturazione di ferritina <40% ed evitando la presenza in circolo di ferro in forma libera e quindi citotossico



# IHAT NON OSSIDO-RIDUTTIVO E BIODISPONIBILE

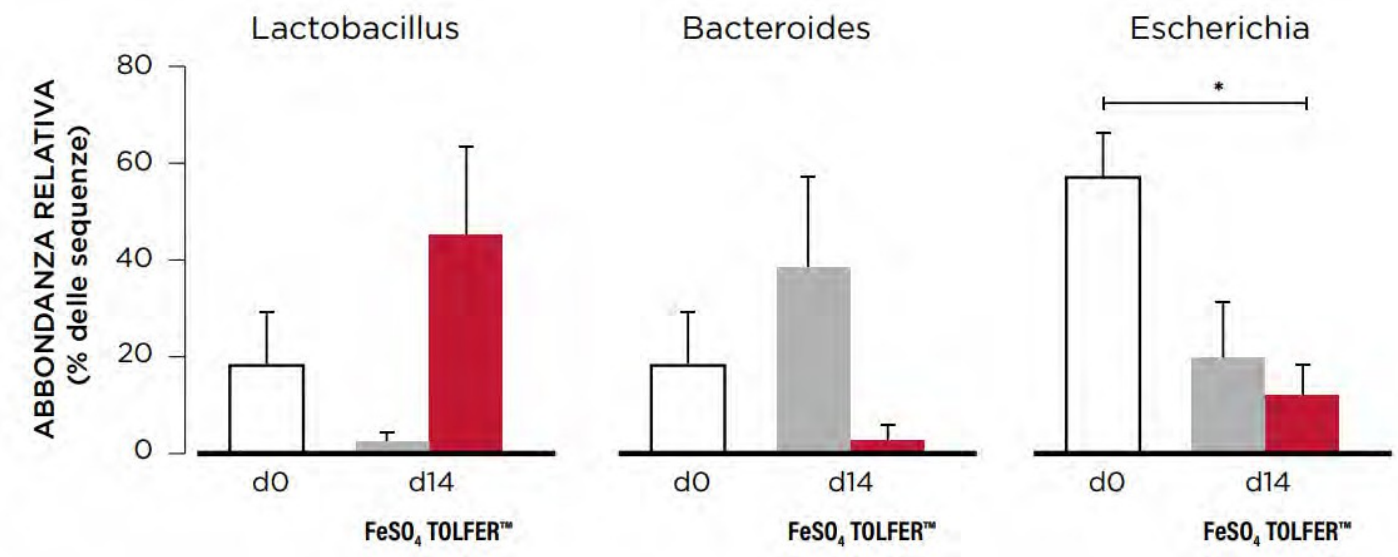
IHAT è $Fe^{3+}$ nanoparticolato, con un core ferritina-mimetico, che lo rende biodisponibile, senza liberare radicali liberi



# IHAT E MICROBIOMA

IHAT, vs ferro solfato, non determinando stress ossidativo, non altera il microbioma:

- aumenta la proporzione di *Lactobacillus spp.*
- riduce il rischio potenziale di sviluppo di *Bacteroides spp. e* di *Escherichia*



# Conclusioni

- La carenza marziale è frequente e influenza prognosi e qualità di vita
- Terapia EV è efficace, ma poco diffusa : somministarzione intraospedaliera
- Considerare la supplementazione orale per mantenimento
- Innovatività nelle formulazioni per os

# Nuova sinergia nel paziente con deficit di Fe

| | |
|---|---|
| Paziente Acuto/Riacutizzato → | Ferrocarbossimaltosio |
| Paziente Cronico → | terapia a lungo termine → IHAT |