



## Examination of the rate of hypochromic red blood cells for monitoring iron-deficiency in haemodialyzed patients

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### Background

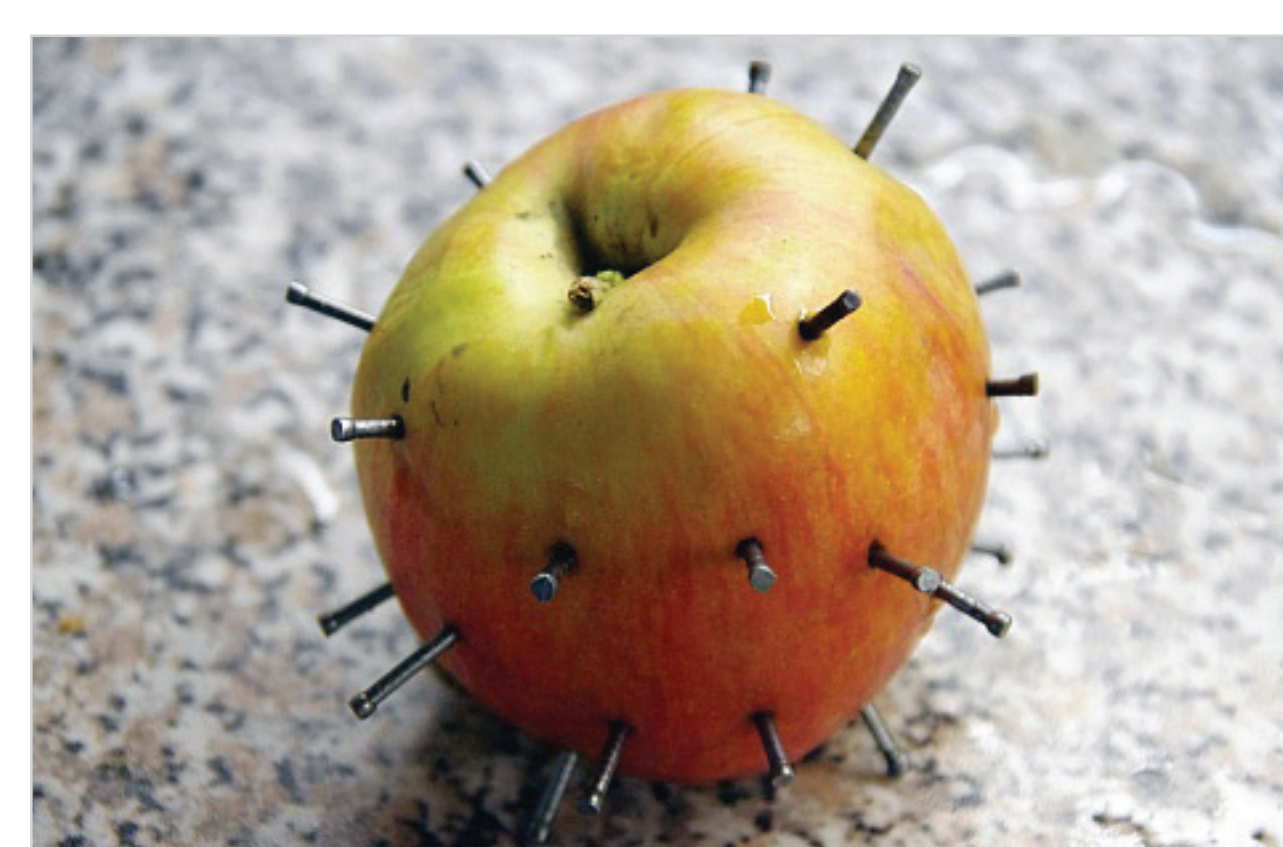
It is essential to monitor iron-deficiency in renal anaemic patients. The medical protocols proposed to measure transferrin saturation and serum ferritin levels.

### Objectives

We have presumed that the hypochromic red blood cell rate (hRBCr) is a sufficient method for defining the measure of patients' iron-deficiency (ID).

### Monitoring of the iron deficiency

- **Serum ferritin**
  - The serum ferritin level is an indication of iron stores.
  - Its level is affected by inflammation hepatic and malignant diseases.
  - One must interrupt the administration of i.v. iron two weeks before its checking.
  - The cost of serum ferritin level's check is relatively high.
- **Transferrin saturation (TSAT)**
  - It means the immediate iron availability for red blood cells (RBC) production is best assessed by measuring total serum iron and total iron-binding capacity (ratio of them in percentages).
- **Red blood cells haemoglobin concentration**
  - RBCs in renal failure are typically normocytic and normochromic. Microcytic changes or hypochromia suggest the presence of iron deficiency.
  - Percentage of hypochromic red cells is a simple lab test.
- **Other "iron" tests**
  - reticulocyt haemoglobin content
  - soluble transferrin receptor
  - serum transferrin level
  - hepcidin



### Method

We measured hRBCr on a monthly basis in dialysis patients. The rate of hRBC >10% is absolute ID, between 5-10% is relative ID, and <5% ID excludes ID.

We analyzed our dialysis patients' haematology parameters, erythropoietin (EPO) and iron doses and the haemoglobin (Hgb) target achievement rate.

### Patients

We treated 284 patients in 2011, 271 in 2012, 279 in 2013 and 281 in 2014 in chronic haemodialysis program. The mean age of them was 65,4; 65,8; 62,5; 62,6 years respectively. The monthly average chronic haemodialyzed patient's number was 184 (2011), 170 (2012), 173 (2013) and 178 (2014).

The rate of patients who received EPO was 97% (2011), 89% (2012), 84% (2013) and 86% (2014).

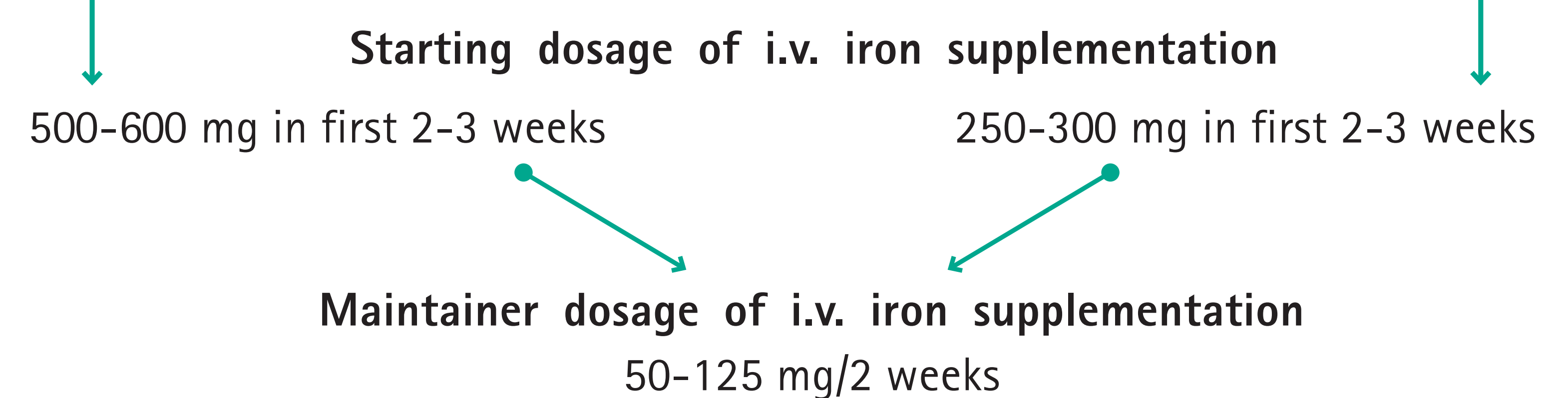
### Types of iron deficiency

#### Absolute iron deficiency

- serum ferritin < 100 µg/L
- TSAT < 20%
- hRBCr > 10%

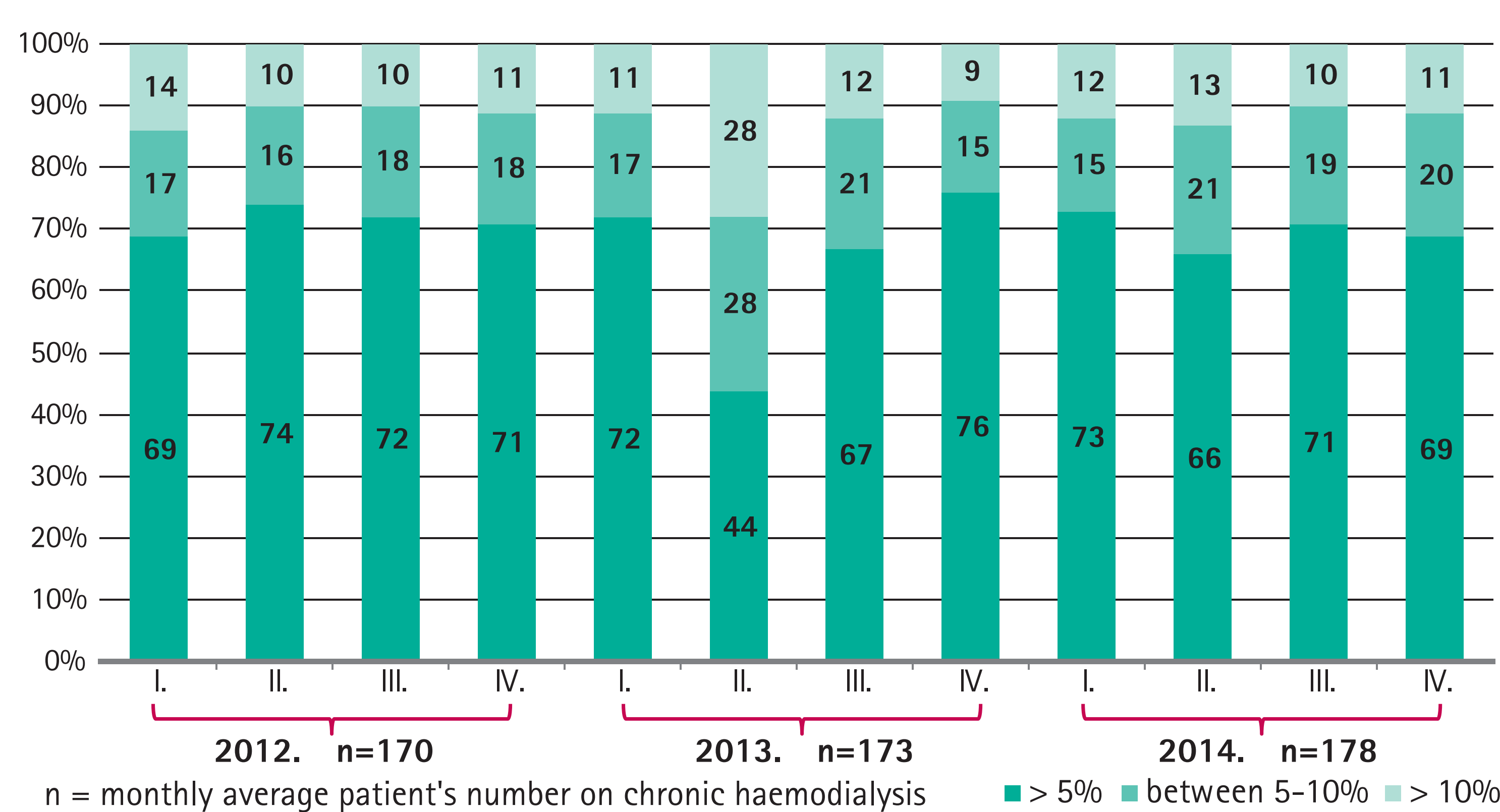
#### Functional iron deficiency

- serum ferritin > 100 µg/L
- TSAT < 20%
- hRBCr between 5-10%



### Results

#### The rate of hypochromic red blood cell in our patients on chronic haemodialysis program between 2012-2014, quarterly



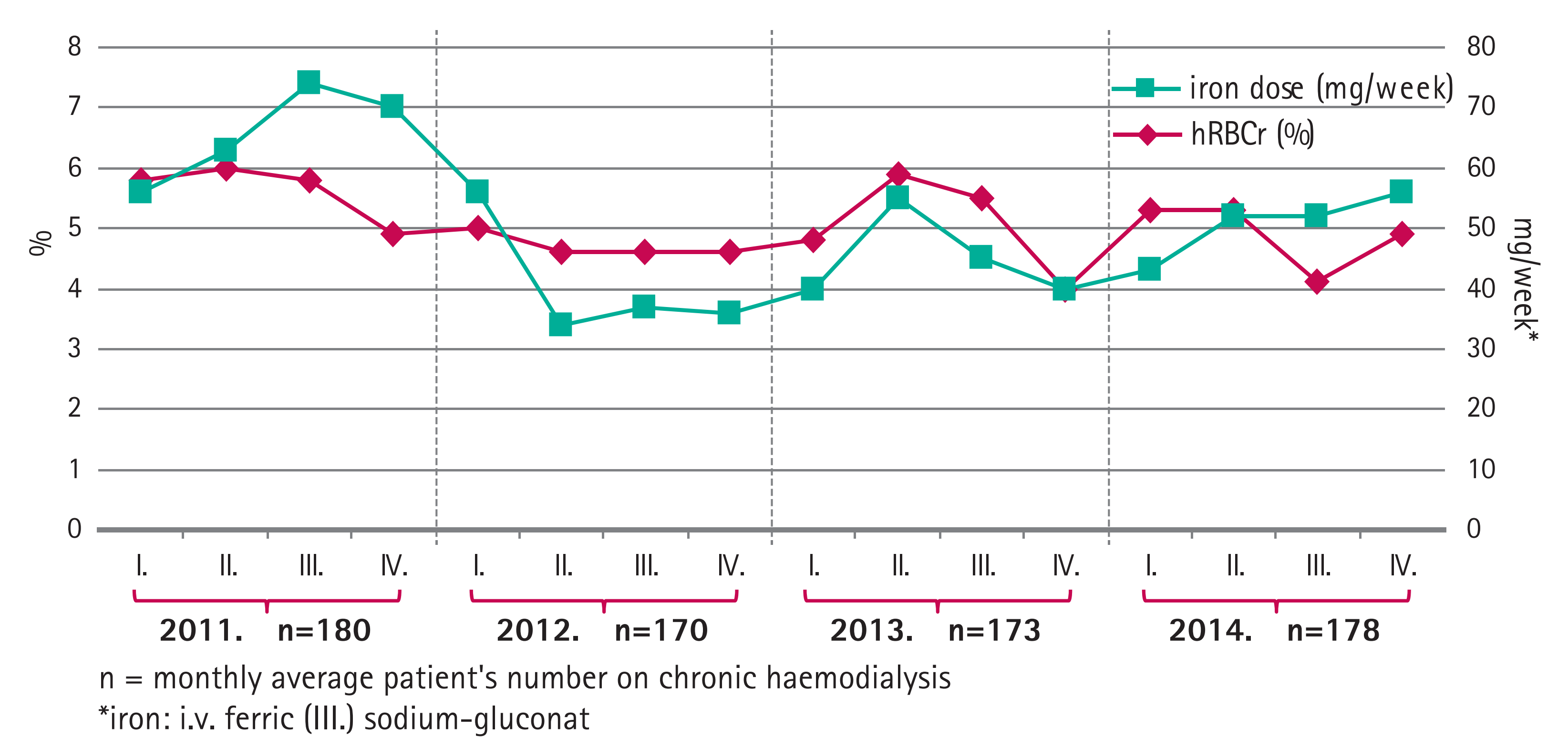
#### The mean of hypochromic red blood cell rate, intravenous iron dosage, the rate of reached target haemoglobin level (%) and erythropoietin dose in our dialysis centre between 2011-2014

Year	hRBCr %	iron dose mg/week	reached target Hgb %	EPO dose IE/kg/week
2011.	5.6	65.73	83.7	86.5
2012.	4.7	40.51	57.2	59.8
2013.	5.1	45.13	73.1	58.7
2014.	4.9	50.73	88.3	52.3

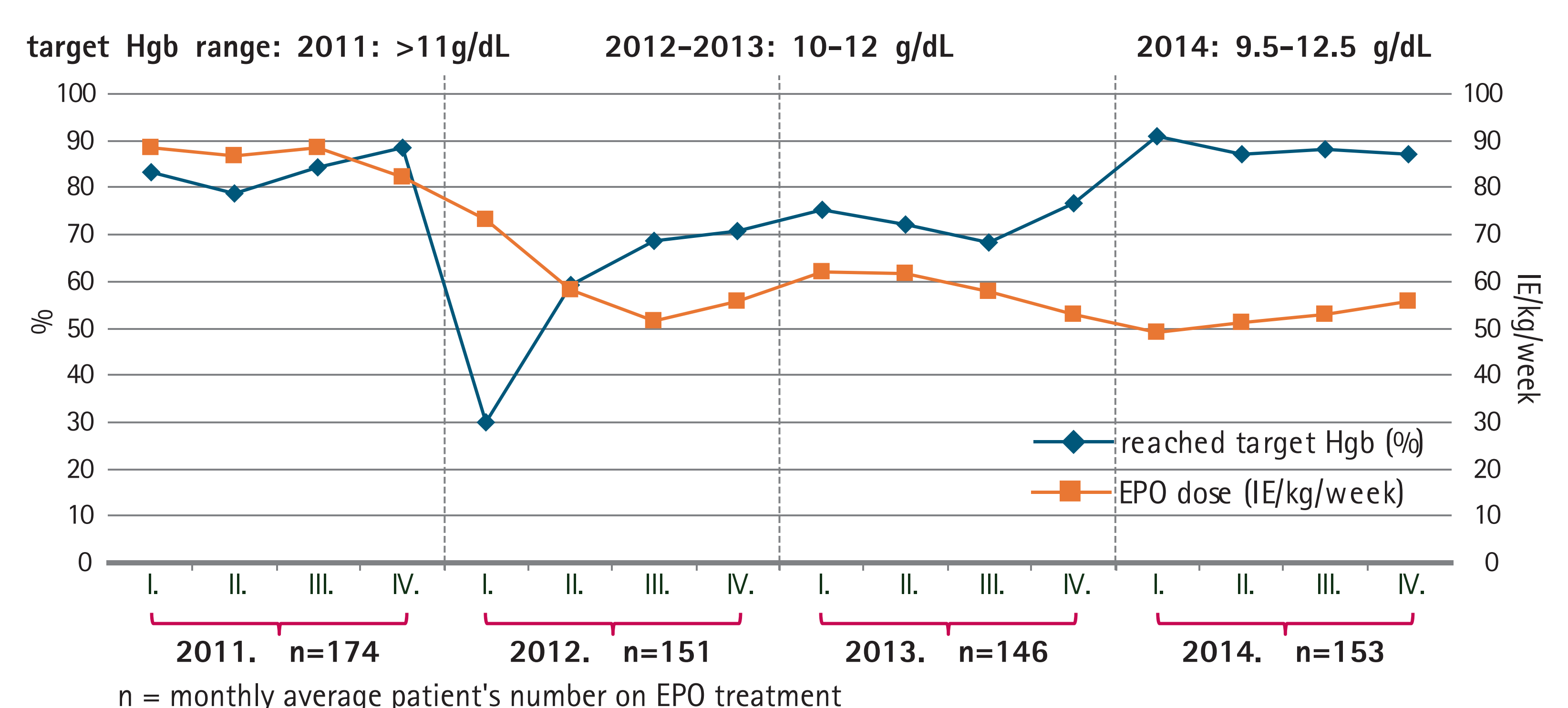
iron: i.v. ferric (III.) sodium-gluconat

target Hgb: 2011: >11 g/dL, 2012-2013: 10-12 g/dL, 2014: 9.5-12.5 g/dL

#### The mean hypochromic red blood cell rate and average iron dose between 2011-2014 quarterly



#### The reach of the mean target haemoglobin level and an average erythropoietin dose between 2011-2014, quarterly



### Conclusions

Our experience verifies that hRBCr is an appropriate method for the identification of iron deficiency. It is a simple, cost effective and reliable labor tool. In the last 4 years we could control the iron status of our patients refining their iron need while also significantly decreasing the EPO dosage.

