Improving the investigation and targeted treatment of anaemia in Marie Curie Hospice Liverpool: a quality improvement project

Tom Steele

ABSTRACT

BACKGROUND: Guidelines recommend performing haematinic investigations (B12, folate, iron status) in patients receiving blood transfusions in hospices and prescribing replacement if indicated. Baseline data showed this was not done at Marie Curie Hospice, Liverpool.
AIM: To improve the assessment for and provision of alternative therapies for anaemia at Marie Curie Hospice Liverpool.
METHODS: The project period was August 2018-July 2019. Quality Improvement methodology was used with drivers for change identified and five defined PDSA cycles completed focusing on facilitating investigations, interpreting and responding to results and staff education. Continual data collection from electronic notes and laboratory records was performed and analysed through the project.
RESULTS: From a low baseline, improvements in the rate of checking haematinics in both those receiving blood transfusion and with haemoglobin <100g/L were achieved and sustained for the final 6-months of the project, although standards were not consistently met. Results led to 27 patients receiving targeted therapy for anaemia during the project.
CONCLUSIONS: This quality improvement project led to significant improvement in the investigation of anaemia in the hospice with targeted therapies prescribed as a result, potentially improving symptoms of anaemia and avoiding blood transfusions. Work on long-term sustainability is ongoing.

BACKGROUND

Anaemia is common in hospice populations, affecting 77% of men and 68% of women receiving palliative care[1]. Red blood cell transfusion is commonly performed, however evidence on how to best target this intervention is lacking[2]. Furthermore, transfusion carries significant risks, including transfusion related lung injury and circulatory overload, whilst red blood cells are a limited and costly resource[2,3].

The national comparative audit of blood transfusion practice in hospices, published in 2018, highlighted these limitations and recommended more thorough investigation of anaemia in palliative care settings[4]. This is reflected in regional NICE accredited guidance[5]. Specifically, checking for B12, folate and iron deficiency and consideration of replacement alongside or instead of blood transfusion is suggested[4].

In the national audit, only a small number of patients were investigated in this way, and although it appeared a significant proportion of these may have benefitted from iron, B12 or folic acid replacement, this was only prescribed in a very small number of cases. The need for improvement in Marie Curie Hospice Liverpool was identified after localised reports of data submitted to the national audit revealed no patients receiving blood transfusions had iron status, B12 or folate checked.

In addition to reducing the burden of blood transfusions, using targeted therapies (if indicated) could enable treatment of symptomatic anaemia not at transfusion thresholds. The potential for this to improve symptoms is supported by the strong association of haemoglobin with quality of life and improvements in quality of life observed with amelioration of even mild anaemia in cancer patients[6,7].

AIM AND OBJECTIVES

The overall aim of the project was to improve the assessment for and provision of non-transfusion therapies for anaemia at Marie Curie Hospice, Liverpool. Three SMART objectives were developed:

- Increase the proportion of patients receiving blood transfusions having haematinic investigations (iron status, B12 and folate) performed to >95% by July 2019 from the baseline of 0%.

- Increase the proportion of patients with moderate to severe anaemia (Hb <100g/L) having haematinic investigations performed to over 80% by July 2019.

- For all patients in whom non-transfusion therapies are indicated (definite iron, folate or B12 deficiency) to have documentation of them being considered and, if appropriate, prescribed during the project.

METHODS

Quality improvement approach and changes implemented
An approach of continuous improvement was used with ongoing staff engagement and education. A driver diagram was developed at the start of the project (fig 1) which outlined working areas to achieve the objectives. Several plan, do, study, act (PDSA) cycles of change were completed in response to continually measured data and staff feedback:

PDSA cycle 1: Baseline data showing poor performance was presented and views of medical staff explored in July 2018. This highlighted a lack of awareness and knowledge on how to check haematinic investigations. The local laboratory was contacted, requirements for the investigations confirmed and the possibility of these being “added on” to existing samples agreed. This led to development of a guide of points to check haematinics, distributed in September 2018 (fig 2), with accompanying education given to medical staff. Feedback was positive, an improvement in rates of checking haematinics was observed and the guide remained in use.

PDSA cycle 2: Challenges were raised by staff about interpretating results and appropriate replacement therapies, particularly iron. Data from August to October confirmed that non-transfusion therapies were not being prescribed. A literature review was performed and a flowchart to interpreting iron parameters in malignancy, based on European guidelines, distributed in November 2018 (Fig 3) with accompanying education[8]. Feedback from this was positive and it remained in use, confirmed by increasing use of alternative therapies.

PDSA cycle 3:
Despite improvements, only 50-60% of those receiving blood transfusions were having haematinics checked in October-December 2018. A section for haematinic results was developed and embedded in the electronic blood transfusion proforma as a prompt for checking at the point of cross-match or cannulation and trigger a response to results. Standards for this measure were met in January and February 2019 and this has remained in use with small adaptations made.

PDSA cycle 4:
A fall in the proportion of patients receiving blood transfusions who had haematinics checked was observed in March 2019. This coincided with a marked increase in external referrals to the ambulatory blood transfusion service. A process was developed for the doctor reviewing the referral to identify if haematinics were needed and communicate this to staff taking the cross-match sample. Improvement was seen and the process was embedded in the ambulatory blood transfusion service SOP.

PDSA cycle 5:
In response to intravenous iron being indicated (a novel intervention at the hospice) an evidence-based protocol and SOP was developed to support safe and consistent use on the inpatient unit and as ambulatory procedure in the day therapy unit. This was ratified in June 2019.

Measurement
Continuous data collection was carried out throughout the project period, August 2018 to July 2019, with retrospective review of laboratory records and patient notes on a month-by-month basis. All blood transfusions, both inpatient and from the ambulatory service were assessed. In addition, all full blood counts completed by the hospice were identified on the electronic laboratory record and reviewed, with repeat sampling in the same patient excluded if performed within 6 weeks. Haematinic investigations were included if performed with in the six weeks prior or two weeks following the transfusion/full blood count. Iron status was defined as checked if a decision could be made in accordance with the interpretation guide (fig 3).

RESULTS

Blood transfusions
72 blood transfusions were performed (excluding repeats in the same patient within 2 weeks). 11/25 (44%) had iron status checked in the first 6 months increasing to 41/47 (86%) patients in the final 6 months. For B12/folate it was 8/25 (32%) and 37/47 (79%), respectively. Fig 4 shows the rates on a month-by-month basis. The standard of >95% was met for two months, January and February 2019. There were significantly more external referrals to the hospice ambulatory blood transfusion service from March 2019 onwards.

Moderate-severe anaemia (Hb <100)
In all, haemoglobin (Hb) was checked in 271 patients across the hospice (excluding repeats within 6 weeks), 106 (39.1%) had Hb <100g/L. An improvement was seen over the project

period in assessments of both iron status and B12/folate (fig 5), however, the standard was only met in one month for iron status (April) and B12/folate (July).

Response to results
Results of investigations performed across all patients (duplicates excluded) during the project and responses to them are shown in table 1. Overall, 45 patients would have potentially benefitted from targeted anaemia treatment: iron replacement 28/112 (25%), folic acid 14/84 (16.7%) and vitamin B12 3/84 (3.6%). 27 patients received targeted therapy (oral iron 5, IV iron 11, folic acid 9, vitamin B12 2) and an additional 8 had reasons for not treating documented. An improvement was observed in response to abnormal results (replacement prescribed or documentation otherwise) through the project from 12/20 (60%) in the first 6 months to 23/25 (92%) in the last 6 months.

DISCUSSION AND REFLECTION

This project has led to significant improvements in investigating and targeting treatment of anaemia in a hospice setting, both in patients receiving blood transfusion and across all those with moderate to severe anaemia. It demonstrates this approach is feasible in a hospice setting and the positive effect of changes focused on educating and facilitating staff to arrange the investigations and respond to results. Improvements in rates of investigation were seen in the first 6-months then largely stable, whereas the greatest improvements in prescription of non-transfusion therapies was in the last 6-months, reflecting the focus of education and change cycles through the project. Most importantly, these investigations led to a change in management in 27 cases.

Despite improvements, the proposed standards were not consistently met. The standard of >95% of those receiving transfusions being investigated was ambitious from a baseline of zero, however performance in January and February suggest this is achievable. An expanding ambulatory transfusion service during 2019 provided challenges in sustaining this. We also aimed to improve investigation of patients with symptomatic anaemia not necessarily receiving blood transfusion. Unfortunately, contribution of anaemia to symptoms could not be reliably established from clinical records. A proxy measure of Hb <100g/L was used and a lower standard set at 80%, which was a challenge to meet, however we cannot be certain how this reflects performance against symptom burden of anaemia.

An innovation during the project was the use of intravenous iron. This was used within the routine recommendation of iron deficiency when oral preparations are ineffective, not tolerated or contra-indicated. In the past, high rates of anaphylaxis have restricted the use of intravenous iron, however there is robust evidence on the safety of the latest generation of preparations[9]. We used Iron(III) isomaltoside (Monofer) without complication, underpinned by a policy developed during the project. Further research is required to determine optimum patient selection for this intervention.

There was concern the project would lead to repeat blood testing, an invasive procedure. In reality this was not experienced, possibly due haematinics being checked proactively in known anaemia or with cross-match sampling and the ability to add on the tests. There were

fewer checks of B12/folate overall, which may be due to a shorter window to add on, or less awareness.

A major challenge was the interpretation of iron status in our population. Due to the chronic inflammatory state in malignancy and other chronic illnesses, a low ferritin, the standard definition used in general populations is not reliable[10]. European cancer guidelines support using a higher threshold of ferritin for the diagnosis of iron deficiency, if there is other supporting evidence, which guided intervention in our project, however, this remains an area of debate[8].

The cost of testing and resulting interventions is also a concern. Ultimately, the purpose of this work is to lead to improvement in outcomes for patients, particularly improve symptoms and quality of life, and reduce blood transfusions or potentially other costly interventions. Concluding the efficacy or cost effectiveness of the approach is beyond the scope of this work, however we did observe encouraging results in patients treated with targeted interventions, particularly avoidance of transfusion and reduction of transfusion dependence. Further work is needed to confirm this and establish optimum targeting of these investigations and treatment.

CONCLUSION

This quality improvement project has led to improved investigation of anaemia in patients receiving blood transfusions and with Hb <100g/L at Marie Curie Hospice Liverpool, sustained over a year. Importantly, this has led to significant use of non-transfusion therapies, with potential benefit on symptom management and transfusion dependence. An action plan is in place to achieve sustainability, including the process being embedded within ambulatory blood transfusion service and anaemia education incorporated into regular medical teaching.

ACKNOWLEDGEMENTS

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FIGURES AND TABLES

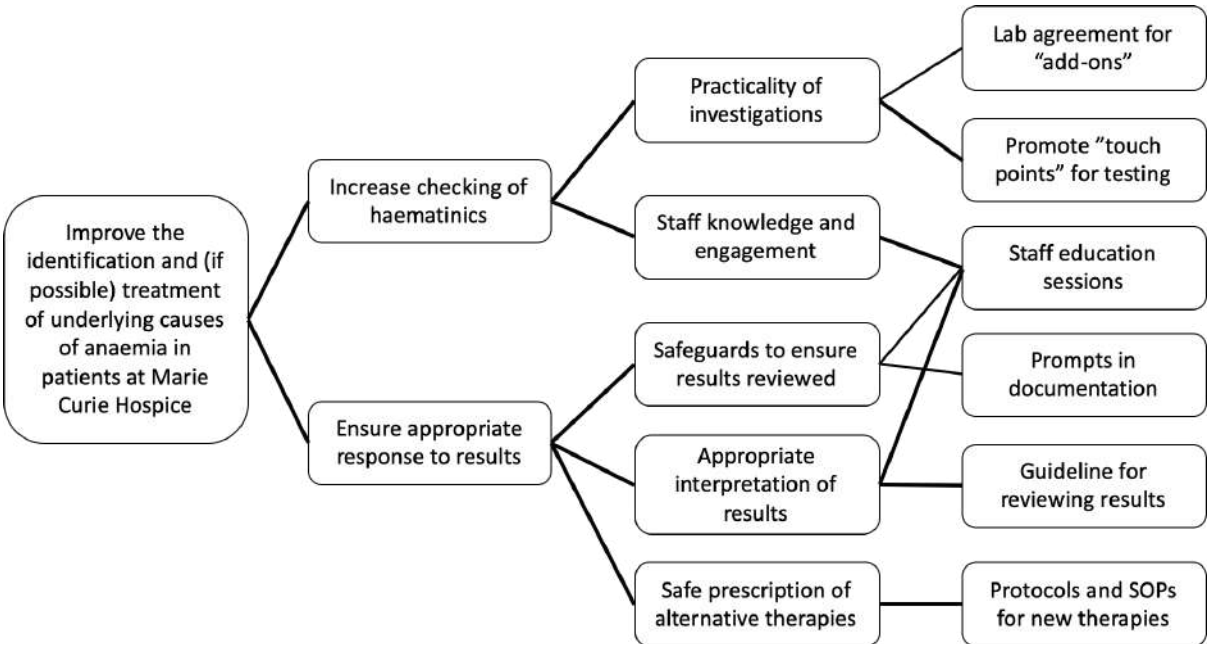

Fig 1: Project driver diagram.

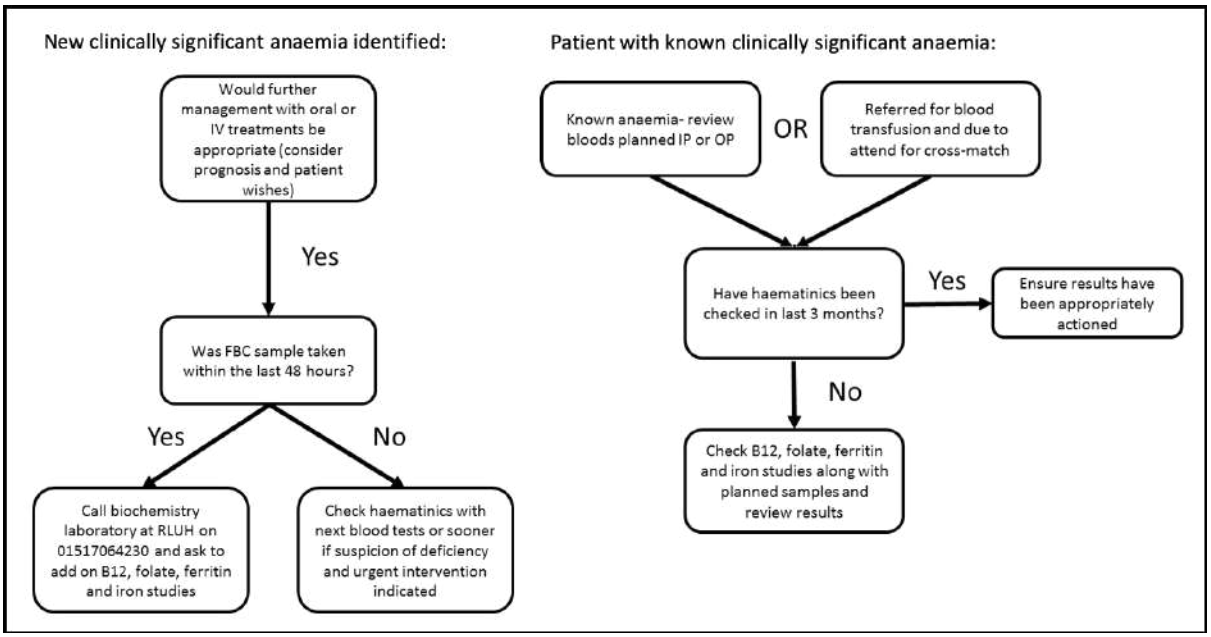

Fig 2: Guide to ordering haematinic investigations distributed in the hospice (distributed as part of PDSA cycle 1).

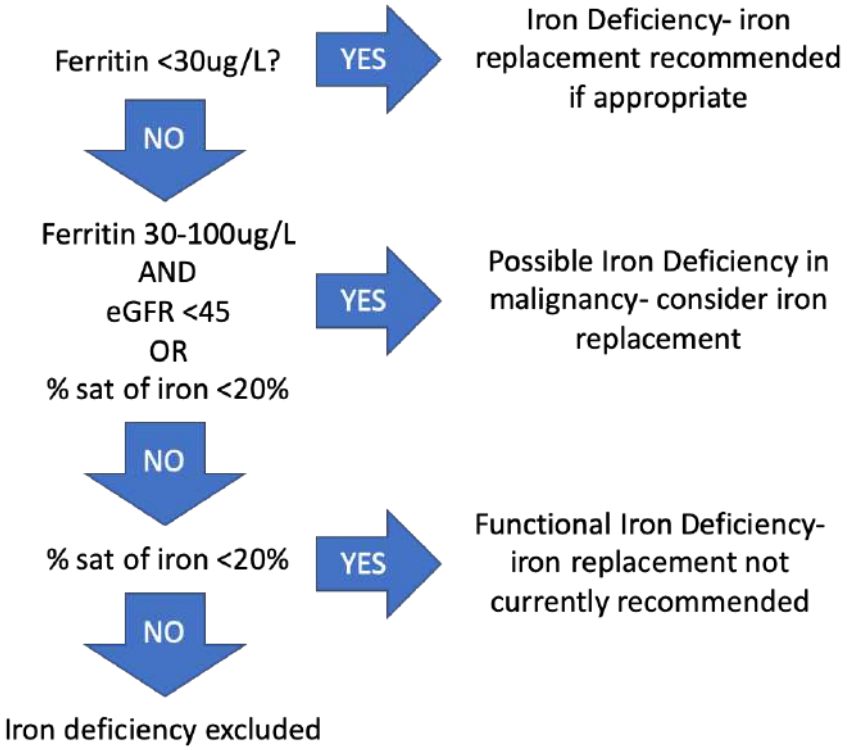

Fig 3: Guide to interpreting ferritin and iron studies in malignancy (distributed during PDSA cycle 2), based on European Cancer Guidelines[8].

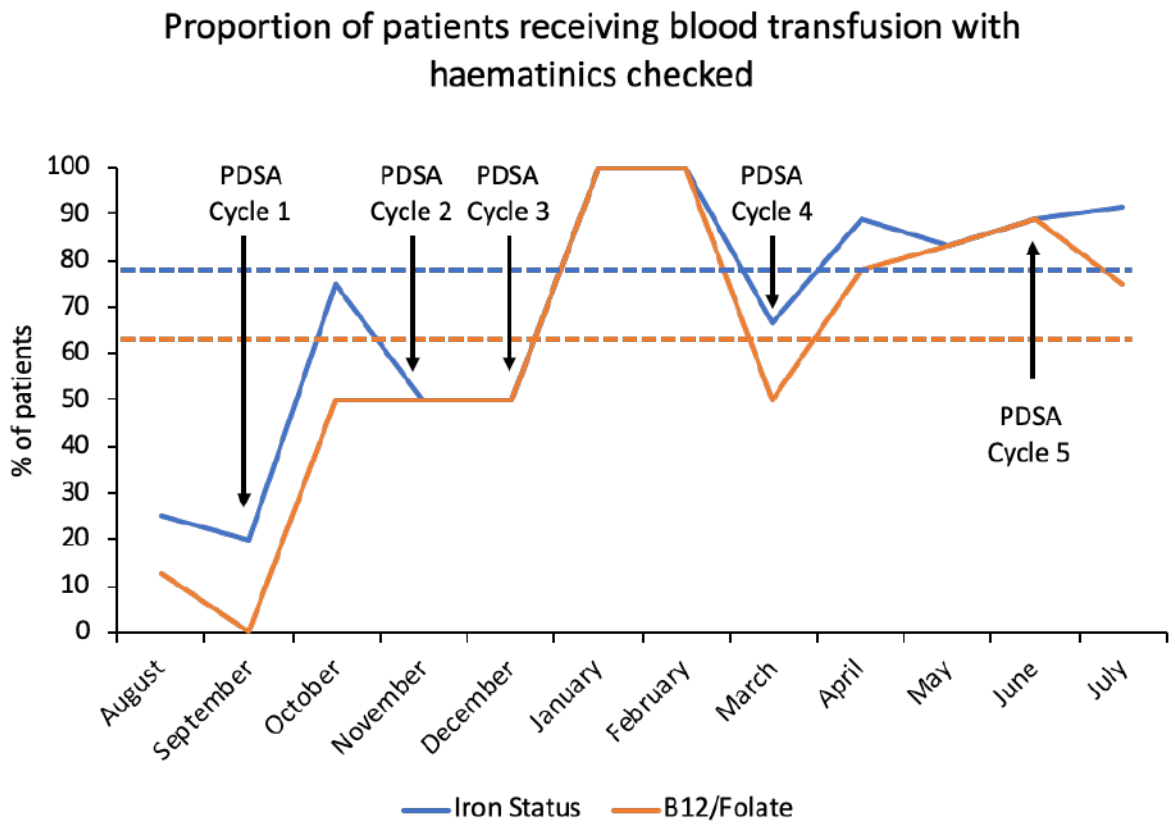

Fig 4: Run chart showing rates of investigating anaemia amongst patients receiving blood transfusions through the project period. Blue line: iron status. Orange line: B12/folate. Dashed line represents median rates across project period. Approximate point of starting PDSA cycles marked.

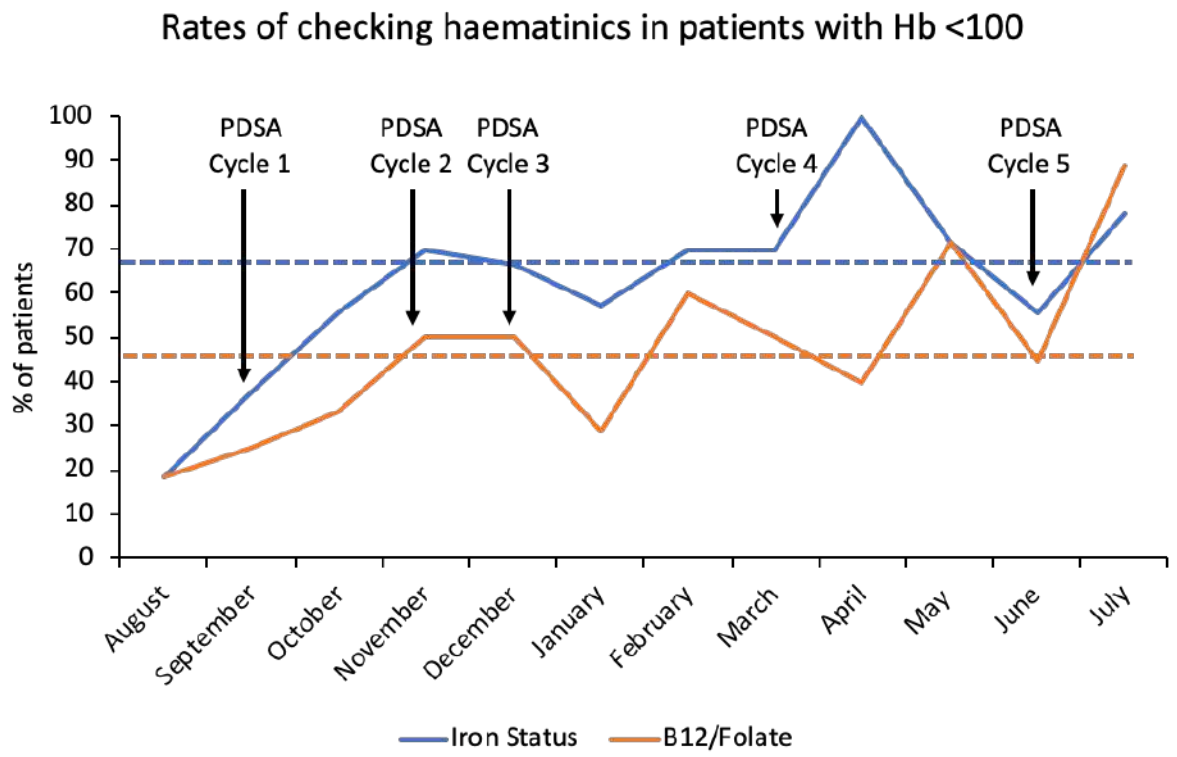

Fig 5: Run chart showing rates of investigating anaemia amongst patients with a haemoglobin <100g/L through the project period. Blue line: iron status. Orange line: B12/folate. Dashed line represents median rates across project period. Approximate point of starting PDSA cycles marked.

Finding	Frequency	Response
Low folate (<3.5ug/L)	14/84 (16.7%)	Oral folic acid: 9/14 (64.3%) Documented decision to not replace: 2/14 (14.3%)
Low Vitamin B12 (<200ng/L)	3/84 (3.6%)	IM hydroxacobalamin: 2/3 (66.7%) Documented decision to not replace: 0/3 (0%)
Classic iron deficiency (ferritin <30ug/L)	13/112 (11.6%)	Oral iron: 2/13 (15.4%) IV iron: 6/13 (46.2%) Documented decision to not replace: 2/13 (15.4%)
Iron deficiency in cancer[8] (Ferritin 30-100ug/L WITH either eGFR <45 or Transferrin Saturation <20%)	15/112 (13.4%)	Oral iron: 3/15 (20%) IV iron: 5/15 (33.3%) Documented decision to not replace: 4/15 (26.7%)

Table 1: Results of haematinic investigations performed during the project and resulting actions.