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Education in practice

Nurse-led approach to standardising the management of iron-deficiency anaemia, achieving the 2-week cancer pathway targets and reducing hospital admissions: practicalities and learnings from a success story

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Received 24 July 2023

Accepted 30 October 2023

Published Online First

20 November 2023

ABSTRACT

The most significant and common cause of anaemia is iron deficiency, which occurs when iron absorption cannot meet the body's demands due to growth, pregnancy, poor nutrition, malabsorption or blood loss. It is estimated that in the UK 11% of the adult population have iron-deficiency anaemia (IDA) and investigation is essential to exclude significant pathology as the underlying cause. It has been shown that IDA is responsible for 57 000 hospital admissions in the UK, and at least 10% of gastroenterology referrals per annum.

IDA is a major red flag symptom for gastrointestinal cancer. At the Royal Liverpool University Hospital, a dedicated nurse-led IDA service was developed in 2005 to help alleviate the clinical pressures created by the two week suspected cancer referral pathway. With the success of this service, investigation and management of IDA has been extended to referrals from accident and emergency, with the aim of reducing hospital admissions and to investigating and optimising iron replacement therapy in preoperative patients.

Delivering this as a nurse consultant-led service was proposed by the gastroenterology medical team who felt that, as a clinical problem with well established, published investigative algorithms, IDA would be suitable for management in a dedicated nurse-led clinic. This article will focus on the strategies employed to achieve sufficient resources and clinic capacity to run this service effectively, develop strong nurse education and training, and the development of agreed investigation

pathways. A robust results review process, with rapid management of abnormal results, was established with timely discharge for those patients with normal results. Optimisation of iron replacement therapy and verification of sustained haematological response was prioritised as this was identified as being poorly managed across all specialties. A process for ongoing audit of results was included to show the success of the service and highlight areas for redesign. Here, we demonstrate the effectiveness of our nurse-led IDA service and suggest it as the basis for other IDA services in the UK and beyond.

BACKGROUND

The 2-week wait (2ww) suspected cancer referral pathway was introduced in 2000 with the aim of improving approaches to cancer diagnosis, treatment and management.¹ However, achieving the targets proved a logistical challenge to all cancer groups, who had been under pressure to meet the 93% target for specialist review within 14 days of patients referred on this pathway and the 62-day target to first treatment for those with proven cancer. These pressures have been compounded by the more recent introduction of the Faster Diagnosis Standard (FDS) which sets a maximum 28 days for communication to the patient of a cancer diagnosis or of cancer exclusion.²

Nurse-led services emerged in the 1980s, expanding into traditionally medical areas of patient management.



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To cite: Reid P, Patterson K, McCulloch E, *et al.* *Frontline Gastroenterology* 2024;**15**:162–169.

Nurses managing their own patient cohort with advanced clinical decision-making, escalated in the 1990s often in response to push factors such as service pressures, limited resources and funding constraints.³ The benefits of a nurse-led service are documented as improving patient experience, easing pressure on medical staff and ensuring continuity of care.⁴

The Royal Liverpool University Hospital iron-deficiency anaemia service

At the Royal Liverpool University Hospital, the nurse-led iron-deficiency anaemia (IDA) service was set up in 2005, initially, to manage 2ww suspected cancer referrals.

While auditing the current practice for IDA management within the Trust, it transpired that referrals for this condition were made to many specialties but with no standardised investigation or emphasis on optimising iron replacement therapy (IRT), a problem that has been reflected in the work of other Trusts during their development of other IDA services.⁵

By empowering clinical nurse specialists to take an autonomous role in management of this cohort of patients, the service has helped alleviate the burden of the 2ww colorectal referral pathway and consistently achieve the cancer targets, and building on the success of this, the service has been extended to referral from other specialties to standardise investigation and management of iron deficiency.

The process of setting up this service has provided a design model for developing nurse-led services that could be replicated in other healthcare areas. The initial design of the service is summarised in [figure 1](#), incorporates all the fundamental features required to ensure the service is robust and safe. There were some crucial foundation blocks needed before the service could be fully established:

Initial assessment of demand and triage

The purpose of the stand-alone IDA service was to relieve pressure on the 2ww colorectal clinics. In preparation for service setup, an audit of referrals was undertaken to ascertain potential demand, which then helped plan for adequate staffing, sufficient clinics and resources to make the 2ww IDA targets achievable.

An unexpected outcome of this audit was that a considerable proportion of referrals for IDA were inappropriate or incomplete. Audit identified three categories of anaemia being referred through this pathway:

- Confirmed IDA.
- Anaemia with no current blood results to confirm or refute iron deficiency.
- Anaemia with no evidence of iron deficiency.

Without a vetting process these patients were all booked into a 2ww colorectal clinic which created potential delays to the 14-day target for those with proven IDA, wasted 14-day target time while awaiting blood results to prove IDA and delayed referral to an appropriate clinic for those with anaemia but without iron deficiency. This audit showed that, in the absence of a robust vetting process, up to 38% of clinic capacity was wasted with inappropriate referrals.

Following the introduction of a referral vetting process, a follow-up audit of the rejected non-IDA referrals was undertaken. This showed that of those patients that went on to have further investigation in this Trust, there were, reassuringly, no gastrointestinal (GI) cancers identified; however, significant findings such as lung, haematological and urology cancers were reported. These audit outcomes reassured local general practitioners (GPs) that the control of referrals through vetting and rejection of inappropriate referrals, was a safe and positive process.

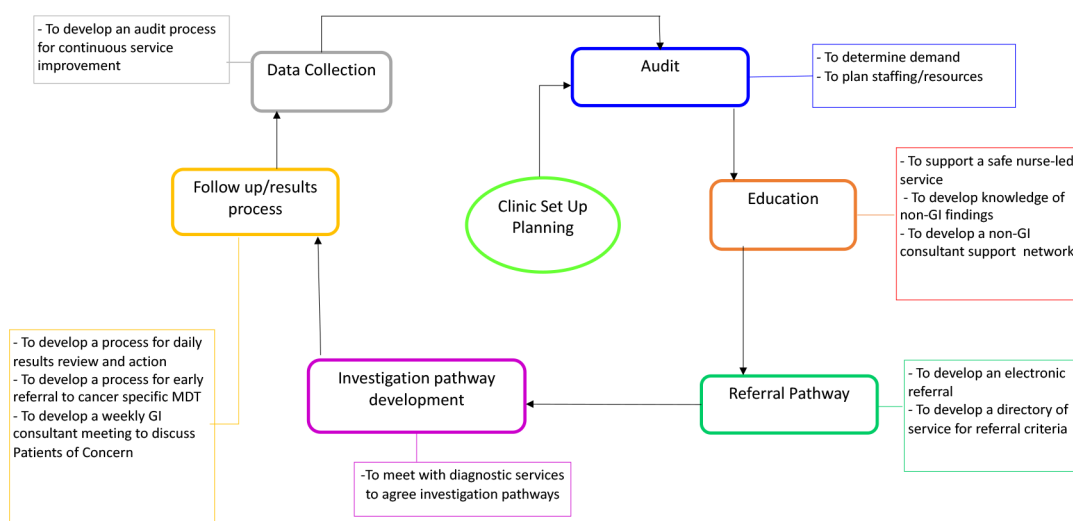


Figure 1 Design model for the nurse-led service setup, which the Liverpool IDA service was developed from (GI, gastrointestinal). IDA, iron-deficiency anaemia; MDT, multi-disciplinary team.

Box 1 Prerequisite clinical skills required for autonomous nurse-led iron-deficiency anaemia working

Continuing Professional Development clinical examination level 7 (postgraduate).

Continuing Professional Development clinical diagnostics level 7 (postgraduate).

Clinical Professional Development independent and supplementary prescribing level 7 (postgraduate).

Ionising radiation (medical exposure) regulations (IR(ME) R).

Interpretation of blood results.

Education of staff

Although the investigation process for IDA is standardised,⁶ the biggest challenge was acquiring the depth of knowledge to make this a truly autonomous nurse-led service. As summarised in [box 1](#), completion of courses/training supported the nursing team to make clinical decisions, decide on appropriate investigations, manage abnormal findings, make referral/treatment decisions with underpinning knowledge while being independent of the need for constant medical advice. The training and education of the nursing team involves:

- ▶ The basics of blood result interpretation and this course was funded by the National Health Service (NHS) Trust and delivered by M&K Update.⁷
- ▶ Completion of University accredited modules to develop:
 - Clinical examination skills.⁸
 - Clinical diagnostic skills to provide essential knowledge for interpretation of physiological and clinical data.⁹
- ▶ Ionising radiation (medical exposure) regulation (IR(ME) R) training is delivered locally, to support the education of healthcare professionals who request imaging. This course ensures that the IDA nursing team can request radiological investigations independently. Completion of this course is a mandatory requirement before diagnostic imaging can be requested by non-medical staff. Requesting of diagnostic imaging is controlled by a Trust approved protocol specific to the specialty.
- ▶ Completion of a non-medical prescribing course is recommended but not mandatory.¹⁰ A NHS Trust approved personal prescribing formulary allows the non-medical prescribers to support the medical day ward in the prescribing of iron infusions, which speeds up the admission process for patients requiring parenteral iron supplementation.

Although these qualifications are not a prerequisite for application for an IDA specialist nurse role, all successful candidates must complete these modules while in post.

When the IDA clinic was fully operational, it quickly became apparent that not all pathology identified during IDA investigations was confined to the GI tract.

CT imaging as a diagnostic tool was agreed as part of the investigation pathway, and therefore, incidental non-GI pathology was reported more frequently than anticipated. Consequently, it was essential to seek further education to determine which non-GI findings necessitated additional investigation or referral and the degree of urgency to be applied.

This education was provided by a support network of non-GI consultants from multiple specialties, including but not exclusively: respiratory, endocrinology, haematology and urology. Typically, these non-GI colleagues provide rapid email support—advising on pathology management queries within 24 hours.

All information provided in these education sessions relating to GI and non-GI findings, including pre-referral investigations/bloods, referral urgency and treatment has been saved in an electronic document so to be a continual reference source. This management guide provides information for the IDA team on the vetting process, patient assessment, investigation pathways and management of findings including malignant tumours, preneoplasia and benign findings requiring surveillance, referral or GP management.

Continuing a safe and credible service is managed by formal, informal and self-directed education as a continual process and by ensuring correct staffing levels. Currently, the service runs with five trained staff: one Band 8B; two Band 8A's one Band 7 and one Band 6.

The Band 6 post is a whole time equivalent (WTE) working solely within IDA. The other staff have other roles including small bowel capsule service, irritable bowel service and 2-week suspected upper GI (UGI) cancer. Involvement in the set up and delivery of other services has provided the specialist nurse team with a broad underpinning knowledge which contributes to service provision, benefiting both the patient and the Trust. Encouraging the specialist nurse team to work across other services has been shown to be motivating and a positive factor in staff retention. Once broken down the number of hours dedicated to IDA service delivery is equal to 3.5 WTE.

Referral development and vetting process

The IDA service was conceived to operate independently from an existing 2ww colorectal pathway, and via a novel electronic referral method for GPs. The referral audit identified an unexpectedly large number of non-iron deficient patients necessitating the development of a prereferral 'directory of service (DoS)' containing detailed mandatory criteria for referral and setting out those haematology and biochemistry results required for case vetting. It is the responsibility of the GP to ensure that patients referred to the IDA service have proven iron deficiency, therefore, incomplete referrals and those in whom there was no evidence of iron-deficiency are returned to the referring GP and

DIFFERENTIATING IRON DEFICIENCY ANAEMIA AND ANAEMIA OF CHRONIC DISEASE

This chart is intended to help distinguish **Iron Deficiency Anaemia (IDA)** from **Anaemia of Chronic Disease (AoCD)** and so enable prompt referral of your patient to the most appropriate specialty for assessment and management.

The blood tests required to help with differentiation can be found on the GP ICE page under a bundle called 'Suspected Iron Deficiency Anaemia'. Patients with confirmed IDA should have a gastrointestinal cause excluded by referral to the Iron Deficiency Anaemia 2 Week Rule Clinic via the e-referral booking system.

Management of AoCD and appropriate referral will depend on the causative factor. Please consider if there is an obvious cause and refer to the relevant team for management. (See below for guidance)

Investigation	Iron Deficiency Anaemia	Anaemia of Chronic Disease	Possible causes of IDA:
Haemoglobin: Male: 140-180 g/L Female: 120-160 g/L	Low	Low	<ul style="list-style-type: none"> Gastrointestinal blood loss e.g. Colorectal/gastric cancer, angiodysplasia Malabsorption e.g. Coeliac disease, bariatric surgery, small bowel resection Menorrhagia
Mean Cell Volume: 80-100 fL	Low to normal	Low to normal	<p>If your patient has Iron Deficiency Anaemia they should be referred to the IDA service</p> <p>Possible causes of AoCD</p> <ul style="list-style-type: none"> Does the patient have an acute or chronic infection? e.g. Chest infection, infected leg ulcers Does the patient have a known malignancy requiring specialist follow up? Does the patient have an autoimmune condition requiring specialist review? e.g. Rheumatoid arthritis, Inflammatory Bowel Disease, Vasculitis, Systemic lupus erythematosus Does the patient have chronic kidney disease?
Ferritin: Male: 30-400 ug/L Female: 13-150 ug/L	Low	Normal to raised	<p>If your patient fits any of the above criteria they should be referred for appropriate specialist management of their AoCD.</p> <p>If they have AoCD with no obvious causative factor then please refer to the Haematology team for assessment.</p>
Serum Iron: 5.8-34.5 umol/L	Low to normal	Low to normal	
TIBC: 50-90 umol/L	Raised to normal	Low to normal	
Transferrin: 2.00-3.60 g/L	Raised to normal	Low to normal	
% Iron Saturation: 16-50%	Low	Low	

Figure 2 Differentiating IDA and AoCD. TIBC, total iron binding capacity.

not processed through IDA clinic to prevent inappropriate use of clinic appointments.

A guide to identifying IDA versus anaemia of chronic disease, with suggestions for further management of non-iron deficiency, was developed in conjunction with the haematology team and made available to all GPs (figure 2).

Vetting of referrals is undertaken daily with the aim of booking patients into IDA clinic as early as possible within the 14-day target and ensuring that all clinic capacity is used only for patients with proven IDA.

During the COVID-19 pandemic when most clinics moved to telephone assessment, the DoS was altered to request completion and recording of abdominal and digital rectal examination with urinalysis to exclude microscopic haematuria, at GP consultation. Telephone clinics have continued postpandemic and the success of this change has enabled the patients to be vetted to telephone or face to face consultations providing flexibility of service delivery.

Investigation pathway development

During the planning phase of IDA service development, it was important to spend time forging links with diagnostic services such as endoscopy, radiology and histopathology, to establish IDA as a new 2ww service, negotiate investigation pathways that would increase service efficiency and reduce the risk of adverse events, while ensuring the same level of care for all IDA patients. In addition, close working with stakeholders and compliance with agreed investigation pathways has also reduced the likelihood of rejected referrals, so avoiding delays in the investigation pathway.

A vital part of these negotiations included an agreement to have a named lead for the IDA service—in this case, the consultant nurse for gastroenterology. This continues to ensure that electronic results are easier to filter by clinician for daily review and prompt action.

The agreed investigation process has been outlined as a clear and easy-to-follow pathway to guide the team on the most appropriate tests but is not a replacement for clinical judgement (figure 3).

Results review, referral and discharge

A structured system for diligent review of investigation results is essential to achieving the 28-day FDS and for referring new cancer findings to the appropriate multidisciplinary team (MDT) with the aim of achieving the 62-day target for first cancer treatment.

An electronic results review, undertaken daily, has been built into the IDA specialist nurses timetable to ensure urgent action of abnormal findings, and filing of reports so all results are seen and acted on appropriately. The IDA team has been supported by the more recent appointment of an Early Diagnosis Support Worker who, in conjunction with the nursing team, manages the 2ww IDA Patient Tracking List (PTL) by removing patients from the Somerset Cancer Register,¹¹ a digital platform designed for healthcare professionals to manage cancer patient care, who, following investigation, have no evidence of cancer or transferring patients with proven cancer on to a site-specific cancer MDT. Once a week the IDA team conduct a short PTL meeting to discuss patients who are delayed on the pathway, identify and rectify, if possible, the reason for potential pathway breaches.

Despite all the extra training and the utilisation of an email clinical support network, there are still occasional findings that require additional discussion at medical consultant level, for management advice and further education. In this situation there are two further avenues of support:

- For radiological findings requiring advice, there is a regular weekly radiology meeting, specific to gastroenterology, where advice can be sought from the team

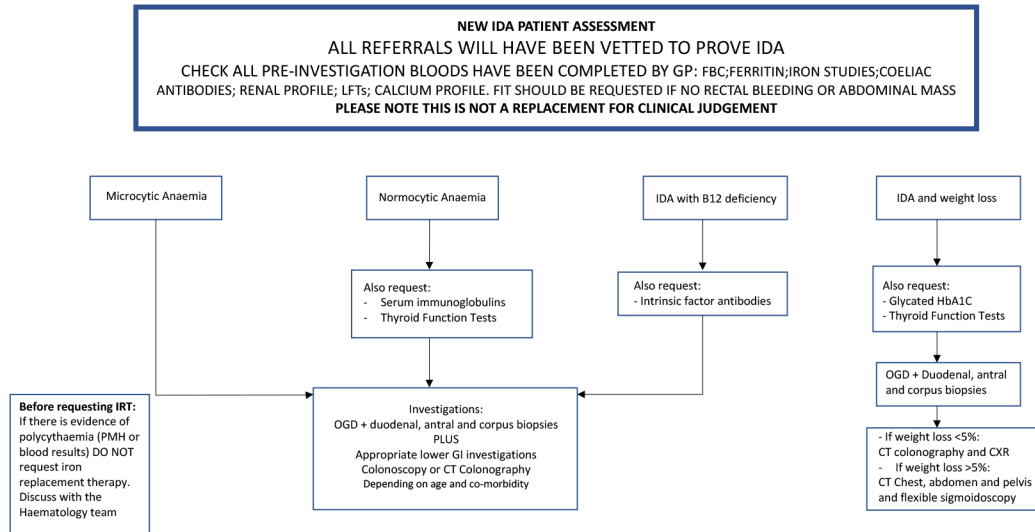


Figure 3 New IDA patient assessment pathway. FBC, full blood count; FIT, faecal immunochemical Test; GI, gastrointestinal; HbA1c, haemoglobin A1C; IDA, iron-deficiency anaemia; LFTs, liver function tests; OGD, oesophagogastrroduodenoscopy; PMH, past medical history.

which includes a radiologist, gastroenterologists and GI surgeons.

- ii. For other unusual findings, a weekly Microsoft TEAMS meeting with our named gastroenterology consultant has been established, where we can discuss and receive advice on management of patients of concern.

All patients undergoing endoscopic investigation of IDA are told on the day of endoscopic procedure that there is no macroscopic evidence of malignancy and because of the combined efforts of the IDA team to assess patients within 7 days of referral and the protected 2ww endoscopy appointments most patients undergoing bidirectional endoscopy are meeting the 28-day FDS. Allowing for routine biopsies to be reported, discharge is planned for approximately 6 weeks after initial clinic appointment. This is a virtual clinic with results sent to GP and patient via discharge letter. The results of all investigations are recorded, with advice to the GP concerning IRT and appropriate follow-up to ensure continued treatment response.

Iron replacement therapy

IRT has been found to be suboptimal, incomplete and even neglected as an essential component in the management of IDA across all specialties. IRT, with the aim of replenishing iron stores and normalising haemoglobin level, should be given in parallel with investigation of the causative factor. IRT aims to improve the many symptoms of IDA which can include shortness of breath on exertion, tiredness, lethargy, headache, palpitations and chest pain, all of which can impact quality of life, morbidity and prognosis in chronic conditions.¹²

The route of iron replacement is guided by the underlying cause of the IDA. Initial management of IDA should be with oral iron once daily, (eg, ferrous sulfate 200mg tablets)⁶ and patient advice about an

iron rich diet (eg, red meat, leafy green vegetables, liver, salmon). If IRT has not been started at referral, supplementation is recommended to the GP in the initial clinic consultation letter. The route of administration is changed to parenteral administration if the patient is intolerant or non-compliant with oral iron, or if they have had previous surgery that would prevent absorption of iron from the GI tract such as bariatric surgery or small bowel resection. In addition, patients with a GI cancer proven at investigation are treated with intravenous iron, in preparation for surgical management, as it is reported that preoperative IDA treated before surgery, leads to reduced blood transfusion, length of hospital stay, postoperative complications and reduced hospital costs.¹³ Intravenous iron is requested electronically at the time of clinic assessment or if investigations identify a malignancy, with the first dose given on the medical day ward within 7 days.

Post-therapy bloods, full blood count, ferritin and iron studies, are requested by the IDA team, 4 weeks after the commencement of IRT, to check response to treatment. If the response to treatment is not as expected, a phone call is made to the patient to ascertain how long they have been on IRT, check compliance with medication and consider alternative therapy with intravenous iron and review the need for further investigation.

If parenteral iron is requested, the formulation administered at this Trust is ferric carboxymaltose (Ferinject), which has a common side effect of hypophosphataemia that may be mild, moderate or severe and may be asymptomatic. For patients treated with intravenous iron, a calcium profile is also requested at follow-up blood tests, and low phosphate levels are managed with oral supplementation or intravenously in the event of severe hypophosphataemia. Phosphate

supplementation is prescribed by the IDA team with repeat bloods to check adequate response. Treatment is repeated, as per Trust policy, until phosphate levels are normalised.

Due to the interconnection between phosphate and vitamin D metabolism, vitamin D levels (25 hydroxyvitamin D) are checked if hypophosphataemia is identified, with replacement requested from the GP if the results confirm vitamin D insufficiency.

On discharge a request is made in the GP letter for repeat bloods at regular intervals: 3 monthly for 12 months and then every 6 months for the next 2–3 years⁶ to show continued response to treatment.

Ongoing audit

The IDA service has been audited annually since its inception. The January to December 2022 audit identified 1957 IDA referrals across the three routes of referral (1) GP 2ww patients, (2) tertiary referral patients and (3) preoperative assessment patients. The breakdown of the referrals includes:

- ▶ A total of 1445 GP 2ww referrals, only 1252 were accepted as proven IDA (70.9%).
- ▶ A total of 341 tertiary referrals (19.3%).
- ▶ A total of 171 preoperative assessment referrals (9.6%).

In total, 1764 referrals were accepted and 1536 (87%) patients were investigated for IDA as 228 (12.9%) of these patients were not investigated due to missing at least two consecutive clinic appointments or to a pragmatic approach to management taken in view of advanced age and significant comorbidities.

Of the IDA patients investigated, 109 (7.1%) patients had a cancer diagnosis. Of these cancer diagnoses, the most frequent cancers found were GI cancers: 59 (54.1%) colorectal cancers followed by UGI (oesophagogastric) cancers 17 (15.6%). In fact,

G-related cancers accounted for 84 (77.1%) of all the cancers diagnosed, illustrating how well placed an IDA service sits within a GI service (figure 4). Twenty-three (21.1%, 23/109) non-GI cancers were also diagnosed, the most common diagnosis being myeloma/monoclonal gammopathy of unknown significance in 9 patients (8.3%). Two (1.8%) diagnoses of cancer of unknown primary were made (figure 4).

In those with IDA, 155 (10.7%, 155/1445) patients were identified with precancerous conditions suitable for entry into surveillance programmes with the aim of reducing cancer development in the future—the most common being Barrett's oesophagus/atrophic gastritis with intestinal metaplasia (64/155, 41.3%) (figure 5).

Future audits

Given the success of the IDA service in preventing admission to hospital for GI investigation of IDA, we are currently auditing the cost savings by outpatient investigation versus inpatient investigation. In addition, an audit of time from referral to discharge is being undertaken with a view to introducing a straight to test process for appropriate patients, if this can speed up the diagnostic process.

Based on the findings of the report undertaken by the Poole IDA team, referencing their 15-year experience of a dedicated IDA service¹⁴ which highlighted the challenges of IDA to endoscopy workload, the risk/benefit ratio of those with significant comorbidities and the prevalence of recurrent IDA, we also plan to specifically audit these issues within our service. This will be achieved by redesign of the current IDA specific patient electronic notes form for ease and accuracy of data collection.

In addition, we plan to do a retrospective audit following up the 5-year outcomes of asymptomatic

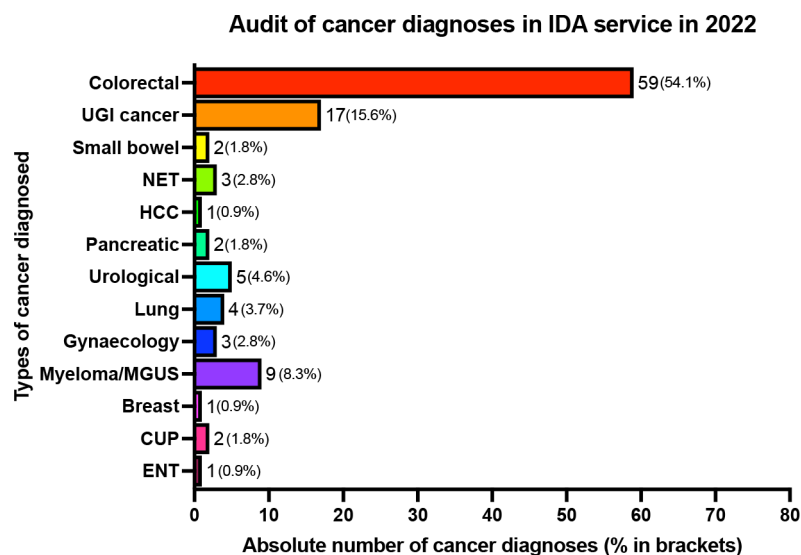


Figure 4 IDA service cancer outcomes 2022. CUP, carcinoma of unknown primary; ENT, ear, nose and throat cancer; HCC, hepatocellular carcinoma; IDA, iron-deficiency anaemia; MGUS, monoclonal gammopathy of unknown significance; NET, neuroendocrine tumours; UGI cancer, upper GI cancer (oesophageal and gastric).

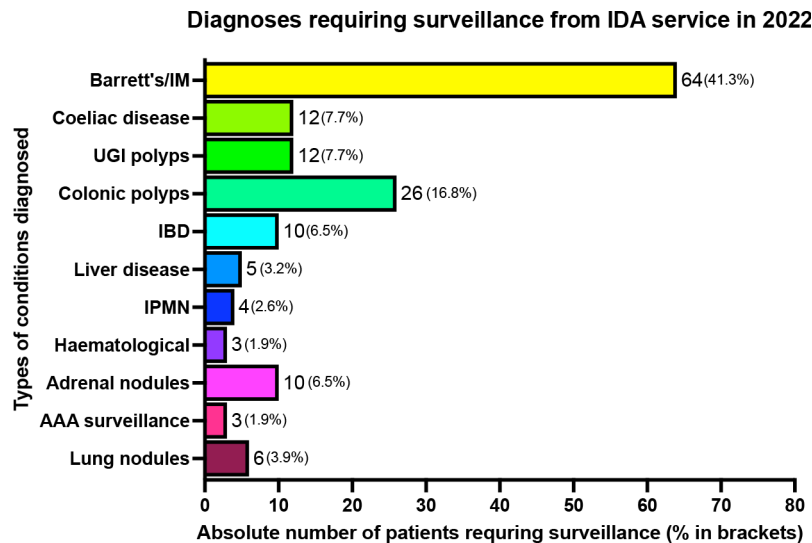


Figure 5 IDA service finding 2022 requiring continued surveillance. AAA, abdominal aortic aneurysm; Barrett's, Barrett's oesophagus; IBD, inflammatory bowel disease; IDA, iron-deficiency anaemia; IM, intestinal metaplasia; IPMN, intraductal papillary mucinous neoplasm; UGI polyps, upper GI polyps (gastric and duodenal).

IDA patients with negative index investigations, to hopefully demonstrate the safety and efficacy of this nurse-led service. This study will mirror the work undertaken previously in Hereford by Townsend *et al.*¹⁵

Service improvement

As the IDA service developed, there have been two major opportunities to add IDA secondary care referrals to this clinic to improve patient outcomes.

The first change came in 2010 in response to a general Trust-wide request to all care groups, to identify ways of reducing in-patient admissions. A clinical audit request identified that patients admitted with IDA as a first diagnosis, spent between 8 and 11.5 days in hospital, primarily waiting for investigation. Following consultation with the emergency care consultant team, it was agreed that patients admitted to the accident and emergency department with IDA would be assessed and stabilised with transfusion and/or iron supplementation by the emergency care team and discharged home with urgent referral to the IDA service. The IDA service agreed to review and investigate these patients on the 2ww pathway. The only IDA patients, therefore, being admitted to hospital after this service change, being those with overt blood loss or haemodynamic instability requiring immediate intervention.

The second development came in 2021 when the IDA service was approached by the anaesthetics team to discuss the guideline for management of anaemia in the perioperative pathway.¹³ This guideline identified that anaemia is associated with a 20% increase in postoperative complications and that preoperative management of IDA can improve the postoperative outcomes. We collaboratively developed an electronic

referral for patients with IDA identified at preoperative assessment, whereby the IDA team requests preoperative iron infusion for those patients whose surgery cannot be delayed. If surgery is able to be postponed, then IDA clinic review and GI investigations prior to surgery are arranged to exclude a GI cause of the iron deficiency and optimise iron replacement before surgery. At 12-month audit, the cancer pick-up rate in this cohort of patients was 3% (5/171).

CONCLUSIONS

The nurse consultant-led IDA service at the Royal Liverpool University Hospital has proved to be successful in managing this cohort of patients safely and efficiently. The service has standardised investigation of IDA, is complying with cancer targets and ensures optimisation of IRT. It is well situated in a GI department, which rapid diagnosis of predominant GI-related cancers with IDA. However, prioritisation and referral of non-GI incidental findings has also been successfully managed with ongoing staff education and with the development of a consultant email support network.

Continual audit of the service outcomes confirms the efficiency of the service, provides information to support service development and the need for additional resources. Audit has also identified key areas where the IDA service can support the postoperative outcomes of patients with iron deficiency and reduce hospital admission for many IDA patients, which, along with cancer outcomes objectives, is a Trust-wide agenda.

Success of the service can be, in part, attributed to designing and following a model for nurse-led service setup, a process which can be applied to the

development of any nurse-led service, not just limited to IDA. Our experience is certainly a model other health providers could emulate in their own institutions and organisations.

Contributors PR and PJS devised the original idea for the manuscript. PR wrote the initial draft of the manuscript with PJS critically revising the manuscript and creating Figures 4 and 5. All authors approved the final manuscript for submission.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests PJS has served as a speaker and advisory board member from Celltrion, AbbVie, Takeda, Janssen, Dr Falk, Tillotts, Ferring, Galapagos, Eli Lilly and BMS. PJS is the Deputy Editor of *Frontline Gastroenterology* but has had no role in the editorial review of this paper. PJS is an Honorary Consultant Gastroenterologist at the Royal Liverpool Hospital. AM has served as a speaker and advisory board member for Dr Falk. TS, PR, KP, EM, LW, AM and WK declare no conflicts of interest.

Patient consent for publication Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

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