


BMJ Open Nurses' understanding and management of iron deficiency in Australia: a cross-sectional, exploratory study

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ABSTRACT

Objectives To assess the experiences and knowledge of nurses in the area of iron deficiency.

Design A cross-sectional, exploratory study using online survey.

Setting Data were collected from nurses working at various primary, secondary and tertiary Australian health practices and organisations.

Participants Australian nurses currently in practice.

Method Australian nurses currently in practice were invited to complete an online survey about their work background, personal experiences with iron deficiency and iron-deficiency identification and treatment. The survey included a nine-item questionnaire to assess knowledge of iron-deficiency risk factors and biochemistry.

Results A total of 534 eligible nurses participated in the survey. Participants were more likely to be female, aged 55–64 years, and working in general practice. Just under half (45.1%) reported being diagnosed with iron deficiency themselves. Unusual fatigue or tiredness was the most frequent symptom that alerted nurses to potential iron deficiency in patients (reported by 91.9% of nurses). Nurses who had participated in formal training around iron deficiency in the last 5 years demonstrated a significantly higher knowledge score (4.2±2.1) compared with those who had not or were not sure about their formal training status (3.7±1.9, p=0.035). Knowledge around the understanding of functional iron deficiency was limited.

Conclusions Nurses report personal experiences of iron deficiency and show good knowledge of symptoms, demonstrating the potential for them to take a leading role in managing iron deficiency in patients. Educational programmes are required to address knowledge gaps and should be offered via various methods to accommodate a diverse nurse cohort. Our research highlights the potential for an expanded scope of practice for nurses in the primary care setting in the area of iron deficiency.

INTRODUCTION

Iron deficiency (ID) is a significant global health problem. It affects at least one-quarter of the world's population and is especially prevalent in young children and women of childbearing age.¹ Long-term deficiency can result in ID anaemia (IDA), which occurs when there is insufficient iron in the body to sustain normal red blood cell production.²

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This study was based on a large, national survey of nurses working across primary, secondary and tertiary health institutions in Australia.
- ⇒ Survey respondents were older than the national values for nurses' ages, which may make results less applicable to younger nurses.
- ⇒ The nature of online survey allows respondents to search for answers to knowledge questions, though an attempt to mitigate this was made by allowing anonymous survey completion and optional responses to questions.

The prevalence of anaemia in high-income regions such as Australia (also including the UK, the USA, Canada, Japan, Singapore and others) was estimated by the WHO in 2011 to be 11% of children aged under 5 years, 16% of non-pregnant women aged 15–49 years and 22% of pregnant women aged 15–49 years.³ The incidence of ID and IDA is likely to increase because of the ageing population and associated chronic conditions such as heart failure and renal failure.^{4–6} IDA has been recorded as the fifth-largest illness category for preventable hospitalisations in Western Australia,⁷ placing a large economic burden on the health system. There is also a financial cost associated with the loss of work productivity from populations susceptible to ID, especially women of childbearing age.⁸

ID and IDA are commonly associated with gastrointestinal (GI) malignancy. Approximately one-third of men and postmenopausal women with IDA have an associated pathological abnormality—predominantly of the GI tract⁹—further highlighting the importance of its early detection and investigation.

Primary care is an ideal setting for the diagnosis and management of ID cases.¹⁰ Primary care can include community health, maternity and pregnancy services, general practice, allied health services and pharmacy, and is generally the first point of contact patients

have with the health system. Within the primary care team, practice nurses are uniquely situated to identify potential cases of ID, counsel patients, administer treatment and provide referrals for further care where appropriate.¹¹ Nurses in primary care have a key role in coordinating and monitoring patient care and have been shown to spend twice as long with their patients compared with general practitioners.¹² Nurse-led patient care has been associated with lower cost and improved quality and efficiency of care in general¹³ and for ID and IDA.^{14 15}

Currently, in Australia, only nurse practitioners (NPs)—advanced registered nurses with a master's degree—have the authority to diagnose and treat ID.¹⁶ Expanding the registered nurse's scope of practice to this effect would require upskilling. To better position future educational programmes about ID for nurses, we aimed to assess the knowledge and current practices of nurses and midwives pertaining to ID through an online survey of currently practising nurses in Australia. Specifically, we aimed to investigate nurses' personal experiences with ID, and their knowledge of the causes, symptoms and treatment of ID.

METHODS

Study sample

Nurses were recruited through the database of Healthed, Australia. Healthed is an educational company that holds seminars around Australia that are attended by health professionals, including nurses (<https://www.healthed.com.au/>). Approximately 7000 Australian nurses were included on this database at the time of the survey. Only nurses who had previously provided their email addresses and given permission to be sent invitations to participate in activities such as future research were targeted. These nurses were emailed with an invitation to participate in the survey. The email included a brief summary of the project, an estimated time requirement and a link to the online questionnaire.

Inclusion criteria were currently working as a registered or enrolled nurse, midwife or clinical nurse in a health-care setting, over 18 years of age, ability to read and write in English and access to internet connection. Potential survey participants were provided with an online information letter that included details of the study.

Patient and public involvement

Neither patients nor the public were involved in the development, implementation or evaluation of this study.

Survey

The online survey was developed using Qualtrics survey software (Provo, Utah, USA). Content and face validity was assessed by medical doctors specialising in ID and IDA, and a pilot of the survey was conducted among five nurses working in general practice. Survey content was modified based on this feedback. The final version of the survey took approximately 10 min to complete and contained

questions about demographics and work, personal and workplace experiences with ID and IDA, and treatment and advice surrounding ID. The survey also included a set of nine knowledge questions about causes of ID and interpretation of iron studies, with possible scores ranging from 0 (no correct answers) to 9 (all correct answers). Of these nine questions, three were related to ID risk factors, three were on interpretation of iron studies and three assessed knowledge around understanding of facets of iron biochemistry. Participants were asked to select the correct answer from a set of multiple-choice answers, one of which was 'unsure'. All questions were optional to answer. Participants were given the opportunity to submit their email address if they wished to be considered for the prize draw (a gift voucher). Responses to the survey were separated from email addresses prior to analysis of data.

Data analysis

Subject demographics were reported with descriptive characteristics, with means and SD used for normally distributed results, and medians and IQRs used to report results that were not normally distributed. Knowledge questions were totalled to give an overall knowledge score. Analysis of variance was used to determine whether knowledge score differed by personal experience, training, or work setting. Significance was set at $p < 0.05$. For free-text responses, information was grouped into categories where deemed appropriate by the research team.

RESULTS

Subject characteristics

A total of 537 nurses participated in the survey. Of these, three were excluded as they were not currently working as a nurse: two were retired, the third was a student. Subject characteristics for the remaining 534 participating nurses are shown in [table 1](#).

Most respondents were females aged 55–64 years and were experienced registered nurses (over 10 years of practice). General practice was the most commonly reported main area of practice (27.9%), followed by community (17.4%, including pharmacy, blood donation, education and others) and hospital care (16.1%). Of the 534 eligible nurses, 15% (n=80) had completed formal training on ID within the past 5 years from a variety of sources including through work in-services, BloodSafe, Red Cross, Healthed and pharmaceutical hosted educational events.

Personal experience with ID

Almost all nurses reported having had their iron levels checked, with only 6% reporting they had never had their iron levels checked (n=33). Nurses most commonly had their iron levels checked on a yearly basis (39.9%, n=213), followed by every two to 2–3 years (19.1%, n=102), and twice a year or more (14%, n=75).

When asked about their own experiences with ID, 45.1% (n=241) reported being diagnosed with ID by a doctor. Of these nurses, heavy menstrual bleeding was noted as the

Table 1 Characteristics of the nurses participating in the survey (n=534)

Characteristic/response	Mean (SD) or median (IQR)/n (%)
Gender	
Female	501 (93.3)
Male	12 (2.2)
Prefer not to say	24 (4.5)
Age range (years)¶	
<35	52 (9.7)
35–44	67 (12.5)
45–54	169 (31.5)
55–64	198 (36.9)
65+	27 (5.0)
Type of nurse*	
Registered nurse	420 (78.7)
Plus midwife	149 (27.9)
Clinical nurse	58 (10.9)
Enrolled nurse	30 (5.6)
Maternal and/or child health nurse	15 (2.8)
Other†	35 (6.6)
Main area of practice (n=509)	
Hospital—acute care	72 (13.5)
Hospital outpatient care	14 (2.6)
General practice	149 (27.9)
Community‡	93 (17.4)
Child health nurse/school care	54 (10.1)
Specialist care§	6 (1.1)
Aged care	5 (0.9)
Years practising as a nurse	26.0±12.3
Completed formal training around iron deficiency within the past 5 years	80 (15)
*More than one selection was possible. †Other included lactation consultant, educator, immunisation nurse, nurse practitioner or mental health nurse. ‡Includes ambulance care, pharmacy, local government, red cross, education, mental health, correctional care. §Includes orthopaedics, anaesthetics, forensics. ¶Question was optional to answer	

most likely cause of the ID (46.5% of those who answered, n=74), followed by GI malabsorption (19.5%, including disease causes, for example, autoimmune, coeliac disease), pregnancy (13.2%) and low dietary intake of iron (11.9%). Other causes reported included blood donation (4.4%), bariatric surgery (1.9%) and postoperative blood loss (1.3%).

Nurses who reported being diagnosed with ID (n=241) were asked what sort of dietary changes or treatment they undertook to address their ID (more than one response was possible). Oral iron supplementation was the most frequent response (72.2%), followed by dietary changes

(30.3%), intravenous iron infusion (26.6%) and intramuscular iron injection (5.0%).

Identification and treatment of ID in practice

Unusual fatigue or tiredness was most commonly reported by nurses as the symptom that would alert them to the possibility of ID (reported by 91.9%). This was followed by shortness of breath (noted by 64.4%), a lack of concentration (63.5%) and low mood (52.2%).

Most nurses reported that they had recommended a blood test to someone they had thought may have ID in a professional capacity (73.2%, n=391) as well as to family or friends (68.2%, n=364). Very few said they had not been in that situation or that it would be outside their scope of practice (6.7%, n=36), while less than 1% of nurses said they would not recommend a blood test (0.6%, n=3). Those who worked in hospital settings were less likely to recommend a blood test compared with nurses working in other settings (p<0.01).

Nurses were asked to rank the treatments that would most likely be suggested for someone with a newly diagnosed ID, in priority order. Dietary changes was noted as the highest priority treatment by the majority of nurses (ranked first by 68.5%), followed by oral iron supplements (ranked second by 67.4%), intravenous iron infusion (ranked third by 41.8%) and intramuscular iron injection (ranked fourth by 46.8%).

When nurses were asked if they would recommend oral iron supplements to someone they think may have ID, responses were mixed. Some nurses said they would recommend oral supplements in a professional capacity as well as to family or friends (39.9%, n=213 for both categories), while others stated they would not recommend oral supplements (8.2%, n=44). One-quarter of nurses reported it would be outside their scope of practice (25.8%, n=138), with others stated they had not been in that situation (6.7%, n=36). Nurses working in midwifery were more likely to recommend iron supplements than those working in other settings (71.6% compared with 40.6% in general practice/specialist care, 32.2% in the community setting and 20.9% in hospital-based care, p<0.01).

Nurses were asked whether they had ever recommended oral supplements to someone who had not had a blood test to check their iron status and asked to give reasons if so (using a free-text response). A total of 14% (n=75) had recommended supplements without a blood test to confirm ID. Scenarios where nurses recommended supplements without laboratory confirmation of ID included women with heavy periods, significant blood loss (eg, postpartum haemorrhage), evident symptoms of ID (including very tired; weak and pale), previous blood tests showing ID or past history of ID, 'can't hurt and might help', being vegan or vegetarian, fear of needles, poor dietary intake and pregnancy. When nurses noted recommending a specific brand of oral supplement, it was based on inclusion of vitamin C, the dosage of iron provided, how well the iron is absorbed, tolerance or

side effects and cost. Around one-fifth of nurses (20.6%, n=110) recommended a dosage when suggesting oral iron supplements, generally as according to the instructions on the product.

Nurses demonstrated knowledge of the following potential adverse effects of oral iron supplements (multiple responses were possible, selected from a list): GI (eg, nausea, diarrhoea, constipation: 88.2%, n=471), drug interactions (27.9%, n=149), headache (20.6%, n=110) and rash (16.9%, n=90). An additional 5.1% (n=27) were not sure. When asked about barriers for patients starting or continuing to take prescribed iron supplements, the most common response was GI side effects (62.5%), particularly constipation. Other responses included patients not believing that they needed supplementation, cost, forgetting to take them, difficulties swallowing them and doubts over effectiveness.

When asked about intravenous iron infusions, 46.6% (n=249) of nurses reported administering one or more, with a frequency of less than once a month the most common response (22.8%, n=122). With respect to knowledge of potential adverse effects of iron infusion, nurses most commonly reported headache (52.8%, n=282), followed by rash (49.8%, n=266), GI effects (48.5%, n=259), pain (37.8%, n=202) and drug interaction (28.3%, n=151).

When asked about intramuscular iron injection, 43.1% (n=230) of nurses reported administering one or more, with a frequency of less than once a month the most common response (74.3%, n=168). The most common potential side effects noted by nurses were skin staining (67.6%, n=361), followed by GI effects (38.4%, n=205), rash (34.3%, n=183), headache (31.1%, n=166) and drug interactions (21.5%, n=115).

Knowledge around ID

The knowledge questions, answer options and participant responses are shown in table 2. Knowledge varied across the categories of questions. The majority of nurses (78%) were able to correctly identify the normal range for haemoglobin values for women, whereas less than one-fifth of nurses were able to correctly identify the transferrin saturation range that suggests functional ID (18% correct). For nurses who answered at least one of the knowledge questions, the mean score was 3.8±1.6 (n=497) correct out of a maximum possible score of 9.

There was no statistically significant difference in knowledge score between nurses who had been diagnosed with ID themselves (3.8±1.9) compared with those who had not (3.9±1.9, p=0.71). Conversely, nurses who had participated in formal training around ID in the last 5 years demonstrated a significantly higher knowledge score (4.2±2.1) compared with those who had not or were not sure (3.7±1.9, p=0.035). Nurses working in midwifery displayed the highest knowledge scores (4.7±1.7), followed by nurses working in general practice or specialist care (4.1±2.1), hospital settings (3.5±1.8) and community settings (3.4±2.1). There was a statistically

Table 2 Iron-deficiency knowledge questions and answers

Question and answers	% total (N)	% valid
Iron-deficiency is of particular concern in which of the following population groups? (can select more than one)		
Correctly answered - Children aged between 6 months and 2 years <u>AND</u> pregnant women*	19.1 (102)*	20.5
Infants under 6 months selected	30.5 (163)	32.8
Children aged between 6 months and 2 years selected	55.1 (294)	59.2
Middle-aged adults selected	38.0 (203)	40.8
Pregnant women selected	83.1 (444)	89.3
Not sure	5.2 (28)	5.6
Did not answer	6.9 (37)	n/a
What is most likely to be the cause of iron deficiency in an infant aged around 12 months?		
Correctly answered—low intake of iron rich foods	53.9 (288)*	57.9
Rapid growth	16.3 (87)	17.5
Insufficient/lack of breast feeding	6.4 (34)	6.8
Gastrointestinal blood loss	2.1 (11)	2.2
Malignancy/cancer	0.7 (4)	0.8
Not sure	12.0 (64)	12.9
Did not answer	6.9 (37)	n/a
Which of the following foods or beverages can impair iron absorption in the body?		
Correctly answered—milk	40.6 (217)*	43.7
Sugar	11.4 (61)	12.3
Fruit juice	8.8 (47)	9.5
Apples	0.4 (2)	0.4
Fish	0.4 (2)	0.4
Not sure	31.5 (168)	33.8
Did not answer	6.9 (37)	n/a
Which of the following represents a haemoglobin (Hb) level within the normal range for adult women?		
Correctly answered—130 g/L	67.0 (358)*	78.0
100 g/L	4.9 (26)	5.7
170 g/L	4.3 (23)	5.0
210 g/L	0.6 (3)	0.7
Not sure	9.2 (49)	10.7
Did not answer	14.0 (75)	n/a
For an adult, a serum ferritin level below which level is diagnostic of absolute iron deficiency?		
Correctly answered—30 µg/L	43.3 (231)*	50.3
50 µg/L	9.0 (48)	10.5
100 µg/L	4.1 (22)	4.8
150 µg/L	0.7 (4)	0.9
Not sure	28.8 (154)	33.6
Did not answer	14.0 (75)	n/a

Continued

Table 2 Continued

Question and answers	% total (N)	% valid
What transferrin saturation range suggests functional iron deficiency?		
Correctly answered—less than 20%	15.4 (82)*	17.9
Between 20% and 40%	9.2 (49)	10.7
Between 50% and 70%	2.6 (14)	3.1
Between 70% and 100%	1.1 (6)	1.3
Not sure	57.3 (306)	67.0
Did not answer	14.4 (77)	n/a
Does a low serum iron indicate iron deficiency?		
Correctly answered—no	22.5 (120)*	26.2
Yes	31.1 (166)	36.2
Not sure	32.2 (172)	37.6
Did not answer	14.2 (76)	n/a
Is it possible for a person to have iron deficiency with a normal haemoglobin level?		
Correctly answered—yes	63.1 (337)*	73.4
No	5.4 (29)	6.3
Not sure	17.4 (93)	20.3
Did not answer	14.0 (75)	n/a
Is it possible for a person to have iron deficiency with a normal serum ferritin level?		
Correctly answered—yes	19.9 (106)*	23.1
No	32.6 (174)	37.9
Not sure	33.5 (179)	39.0
Did not answer	14.0 (75)	n/a
The correct answer is highlighted with an asterisk and given first in each section, followed by the most popular answers. *Selected without selection of the other categories. n/a, not available.		

significant difference in knowledge scores between nurses working in midwifery compared with hospital and community settings (both $p < 0.001$), and between nurses working in general practice or specialist care and the community setting ($p = 0.007$).

Future ID education

Most nurses (79.2%) stated they would be interested in undertaking future training to learn more about ID and its treatment. When asked about their preferred format for education, responses were varied. Online self-directed learning was the most commonly selected option (47.4%), followed by online seminars (16.7%), face-to-face seminars (13.2%) and face-to-face interactive workshops (9.8%). Other options selected included no preference (6.0%), written information (5.5%) and other (1.1%), which included online lectures/packages including assessment and mixed delivery models.

DISCUSSION

Nurses are well placed to identify ID and discuss ID treatment with patients

The findings of this study suggest that nurses are well acquainted with ID symptomatology from both personal and professional experience. Almost half of the nurses surveyed reported being previously diagnosed with ID, most commonly due to heavy menstrual bleeding. Of these nurses, almost three-quarters treated with oral iron supplementation, with dietary change being the next most common treatment. Nearly all the nurses in our survey reported having their iron levels checked, most commonly once per year. This suggests ID is likely to be front of mind for nurses when working with patients. Nurses' personal experience with ID hold them in good stead to both identify ID and provide thorough, empathetic treatment.

Our results indicate that nurses recognise the common symptoms of ID, including unusual fatigue or tiredness, shortness of breath and a lack of concentration. Most nurses in our survey had recommended a blood test to someone they thought had ID based off these symptoms. In practice, this supports the role of nurses in the assessment of patients; nurses are likely to be able to accurately identify symptoms of ID if given the opportunity.

The nurse's role may also extend to discussing ID treatment with patients. Previous research suggests that nurses spend more time discussing treatments and specifically treatment application with patients than general practitioners in the primary care setting.¹² Nurses in our study accurately identified potential adverse effects of iron supplements, particularly those affecting the GI tract, including nausea, diarrhoea and constipation. GI symptoms were additionally reported as a major barrier of continuing treatment in ID patients. Improved patient education may help address this issue and presents an opportunity for nurses when discussing treatment options. Although iron is better absorbed on an empty stomach, consuming a small amount of food (ideally not foods high in calcium, oxalates or phytates, which can inhibit iron absorption) with supplements may help reduce the GI side effects. Patient education combined with ongoing monitoring of ID status may assist with other treatment barriers identified in this study, including patients forgetting to take their supplements and doubts over supplement effectiveness or necessity. Cost was also identified as a barrier to treatment, which has previously been reported in a systematic review of iron supplementation among women of reproductive age.¹⁷

Our findings suggest that nurses in hospital and general practice settings possess greater knowledge of ID and its treatment compared with nurses in other settings. This may be because they more frequently encounter patients with ID as well as undergo more relevant training. Nurses in our study who had participated in formal training around ID in the last 5 years demonstrated significantly higher knowledge scores than those who did not,

emphasising the importance of continuing professional development.

Potential areas for improvement

Our study highlighted several areas in which nurses may benefit from additional training to improve their ability to identify patients at risk of ID and help support patient treatment. These include:

Improved identification of specific at-risk groups

Although most nurses recognised pregnant women of being at high risk of ID, other high-risk groups were less likely to be identified, such as babies transitioning from breastmilk/formula to solids. Iron stores in this age group can be depleted in the absence of a diet including iron-rich food. Late introduction of solids, or replacement of solids by breastmilk or formula, is a common cause of ID in this group.¹⁸ Enhanced knowledge of groups at high risk of ID could assist with better screening and identification of patients for further assessment.

Improved knowledge of ID-related biochemistry

The results of our survey highlighted that nurses' knowledge of the physiological function of iron could be improved. This is particularly important if nurses are to be placed in the position of diagnosing and managing ID cases in Australia. Knowledge around functional ID, for example, is important and will become more common as the population ages. Functional ID occurs when iron cannot be mobilised for red blood cell production, despite adequate iron stores. This impeded utilisation of iron is commonly associated with chronic inflammatory conditions such as heart and renal failure.¹⁹ It is identified by interpreting the results of the iron studies in the context of the clinical circumstances of a patient. Only about one-quarter of nurses correctly answered the question about whether a low serum iron indicates ID. In most cases, low serum ferritin, not iron, is diagnostic for ID.⁶ However, it would be prudent for nurses to also be aware that more complex patients may still be functionally iron deficient with serum ferritin within normal range if they have comorbidities that put them in an inflammatory state. For these cases, transferrin saturation should be used.²⁰

Some nurses may also benefit from continuing professional development in ID-related biochemistry. Although most nurses who answered our question on the haemoglobin reference value for ID diagnosis in women were correct, over 30% of study participants either answered the question incorrectly or did not answer the question at all. This is still, however, a considerably better result than demonstrated by nurses in a similar study, where only about one quarter of respondents correctly identified the haemoglobin values diagnostic for ID.²¹

Improved knowledge of dietary factors affecting iron absorption

Similarly, knowledge of how dietary factors can impact iron absorption may improve assessment of patients who are at risk of ID. Less than half of the nurses surveyed

recognised that consuming milk around the same time as ingesting iron-containing foods could impair intestinal absorption of that iron.²² Further, almost 1 in 10 nurses indicated that fruit juice is an inhibitor of iron absorption. This is concerning as fruit juice is generally high in ascorbic acid (vitamin C), which enhances the intestinal absorption of non-heme iron.²³ Nurses' ability to question and interpret a patient's dietary intake may result in more comprehensive ID treatment options, including the addition of a dietitian to the treatment team.

Improved knowledge of ID treatment recommendations

Nurses in our survey reported that dietary changes were most often their highest priority for treatment of patients with ID. Although nurses were more likely to prioritise diet changes as first-line therapy for patients with ID, nurses with ID themselves were considerably more likely to choose oral supplements over diet. Oral supplements are normally recommended as the first line of treatment, as they more quickly replenish iron stores than dietary intake of iron.²⁴ Dietary change is recommended as a secondary treatment, as this can maintain boosted iron levels in the long term.

Many nurses in our survey reported administering an intramuscular iron injection to a patient on at least one occasion. Although we did not gather data on how recently these injections occurred, intramuscular iron injections have not been recommended for treatment of ID for at least 10 years.¹⁹ Despite intramuscular iron showing efficacy in treating ID, it is now discouraged due to the associated pain, risk of permanent skin staining and showing no more safety than intravenous infusion.¹⁹

The importance of blood test to confirm ID prior to treatment

In our survey, 14% of nurses had suggested oral supplements to someone who had not had a blood test for ID. This is contrary to the recommendation that patients only be treated with iron in the presence of confirmed ID.²⁵ Genetic predisposition to iron overload is sufficiently common in Australia to make iron therapy potentially dangerous without laboratory confirmation of ID.²⁶ Even at normal intakes, up to 0.5% of the Caucasian population has hereditary haemochromatosis and are particularly susceptible to iron overload.²⁷ Furthermore, pretreatment serum ferritin levels need to be ascertained to determine duration of and response to iron therapy.

Our survey suggests that nurses may be using their clinical judgement to identify and treat ID in at-risk groups in the absence of confirmatory pathology. These groups include pregnant and postpartum mothers, women with heavy periods, patients with history of ID or ID-related symptoms, and vegans and vegetarians. Further education for nurses on the importance of ID diagnosis via blood test and the potential dangers of iron overdose is indicated. Nurses in our study noted that some patients refuse blood tests for ID on the basis of needle phobia, which is a barrier that will need to be addressed to allow proper identification and treatment of ID. Techniques

such as exposure therapy have been shown to be effective in reducing needle fear.²⁸

Expanding the scope of practice for primary care nurses in relation to ID

Our results indicate that registered nurses may be an effective avenue for managing ID in primary care settings. A nurse-led IDA clinic established in Hampshire, England, showed great efficacy in assessing referred patients for IDA and initiating further investigation where necessary, which reduced patient waiting times for diagnosis and treatment.¹⁴ Nurses elicited a structured medical history and performed a physical examination of patients and were deemed to be proficient in safely managing IDA cases, including those involving GI malignancies. A similar IDA service established in a district general hospital in Poole, England, also demonstrated the capability of nurses in managing ID cases in a timely, safe and effective manner.¹⁵

As highlighted in Surgenor *et al*,¹⁵ ID tends to present fairly homogeneously and can be managed successfully in the majority of cases with a straightforward algorithm. The nurses in our study already have a mostly good understanding of the aetiologies and treatment of ID and should be capable of safely managing cases with some upskilling in deficient areas of knowledge.

Strengths and limitations

A strength of this study is that it was based on a large, national survey of nurses. Our sample of nurses was 93% female, similar to the 89% female statistic reported by the Australian Institute for Health and Welfare in their 2015 survey.²⁹ Nurses participating in our survey tended to be older than the national values, with 36.7% in the 55–64 year age group compared with 21.8% nationally, followed by 31.5% in the 45–54 age group (26.0% nationally).²⁹ This limits generalisation of our results to younger nurses, who may have had more recent formal education. A further limitation is that the nature of the online survey allows participants to look up answers online, although we attempted to mitigate this in our study design by allowing anonymous and optional completion of questions.

CONCLUSION

The effectiveness of NPs and midwives in primary care has been long-established.³⁰ Our research highlights the potential for an expanded scope of practice for nurses in the primary care setting for patients with ID. Our findings show that nurses are already engaging with patients regarding ID, generally have a good understanding of ID and its management, and most nurses in our survey indicated an interest in upskilling in the area. Professional education has been recognised as being key to maintaining the important role nurses play in healthcare,³¹ and in this paper, we have identified some key areas for future continuing education in the area of ID. This may

be particularly important for nurses working outside the hospital or general practitioner setting.

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Contributors PHJ, RM and TAO'S were involved in the study design and survey design, TAO'S analysed the data, PHJ, RM and TAO'S interpreted the findings, NT conducted a literature review to inform the manuscript, TAO'S and NC drafted the manuscript. All authors critically reviewed the manuscript and approved the final version submitted for publication. TAO'S is responsible for the overall content as the guarantor.

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Competing interests RM is CEO of Healthed which receives funding from multiple sources including the pharmaceutical industry, however, no funds were received directly or indirectly for this study. The authors confirm there are no other conflicts of interest.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval This study involves human participants and was approved by Edith Cowan University Human Research Ethics Committee (22407). Participants gave informed consent to participate in the study before taking part.

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Data availability statement Data are available on reasonable request.

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