JGH Open An open access journal of gastroenterology and hepatology
Open Access
JGHF Journal of Gastroenterology and Hepatology Foundation
doi:10.1002/jgh3.13115

ORIGINAL ARTICLE

Gastric intestinal metaplasia: Prevalence in a large Australian center and nationwide survey of endoscopic practice

Imogen Hartley, Declan Connoley, Nikhita Sane, Ryan Hirsch, Dilini Abeywickrama, Nicholle Sim, Vinny Ea, Robert Azzopardi, Ian Simpson, Sally Bell and Simon Hew

Gastroenterology Department, Monash Health, Melbourne, Victoria, Australia

Key words
atrophic gastritis, gastric adenocarcinoma, gastric intestinal metaplasia.

Accepted for publication 12 June 2024.

Correspondence
Imogen Hartley, Gastroenterology Department, Monash Health, Melbourne, 246 Clayton Rd, Clayton Vic 3168, Australia.
Email: drimogenhartley@gmail.com

Declaration of conflict of interest: The authors declare that they have no competing interests.
Author contribution: Imogen Hartley and Simon Hew contributed to the concept and study design. Imogen Hartley, Declan Connoley, Nikhita Sane, Ryan Hirsch, Dilini Abeywickrama, Nicholle Sim, Vinny Ea, Robert Azzopardi, and Ian Simpson contributed to the acquisition of data. Imogen Hartley, Declan Connoley, and Simon Hew contributed to the analysis and interpretation of data. Imogen Hartley drafted the manuscript. Imogen Hartley, Simon Hew, and Sally Bell revised the manuscript.

Abstract

Background and Aim: Atrophic gastritis (AG) and gastric intestinal metaplasia (GIM) are early changes in the stepwise progression to gastric adenocarcinoma. There is heterogeneity in international guidelines regarding the endoscopic diagnosis and surveillance of AG and GIM. This study aims to determine the prevalence of GIM in an Australian center and assess the approach of Australian endoscopists for these two conditions.
Methods: We conducted a single-center retrospective study of adult patients between January 2015 and December 2020 diagnosed with GIM on gastric biopsy following upper gastric endoscopy. A web-based, 25-question, investigator-designed, multiple-choice survey was distributed among all registered endoscopists in Australia.
Results: The overall prevalence of GIM within a single Australian center was 11.7% over 5 years. Of the 1026 patients identified, only 58.7% underwent mapping biopsies using the modified Sydney protocol. Among the cohort, 1.6% had low-grade dysplasia, 0.9% had high-grade dysplasia, and 1.8% had malignancy on initial gastroscopy. Two hundred and sixty-seven (7.2%) endoscopists completed the survey, 44.2% indicated they would perform mapping for all patients, and 36% only for high-risk patients. Only 1.5% ($n = 4$) of respondents were able to correctly identify all six endoscopic photos of GIM/AG.
Conclusion: This study demonstrates that in a large tertiary center, GIM is a prevalent endoscopic finding, but the associated rates of dysplasia and cancer were low. Additionally, among a small proportion of surveyed Australian endoscopists, there is notable variability in the endoscopic approach for AG and GIM and significant knowledge gaps. More training is required to increase the recognition of GIM and compliance with histological mapping.

Introduction

Worldwide, gastric adenocarcinoma (GA) is a common and deadly form of cancer, ranking as the third leading cause of cancer-related death and the fifth most common malignancy.[1] GA is believed to develop through the oncogenic pathway known as the Correa cascade, a process often driven by *Helicobacter pylori* infection. It begins with chronic gastritis and inflammation, progresses to atrophic gastritis (AG) characterized by the loss of structured glandular cells, and then leads to gastric intestinal metaplasia (GIM), marked by cell intestinalization. If this process continues, dysplasia occurs, potentially resulting in adenocarcinoma.[2]

While GIM is a recognized precancerous lesion, there are limited data on the incidence of GIM, particularly within the Australian population. Among studies of Western countries, prevalence varies widely, with rates reported from 2.5 to 19%.[3–6] An American study of 2179 consecutive patients undergoing routine upper endoscopy who were recruited to undergo gastric mapping biopsy over 5 and half years found the prevalence of GIM to be 19.0%.[3] Unsurprisingly, this study had a high prevalence as all included patients underwent extensive gastric mapping biopsy. Conversely, a retrospective American study over 5 years and 2 months, assessing patients incidentally diagnosed with GIM on gastroscopy performed without extensive biopsies, found a prevalence of 2.5%.[4] In an Australian population, there is very limited evidence assessing the prevalence of GIM, with three small studies demonstrating rates between 11.3 and 43%.[3,5,6] This wide variation in the reported prevalence is reflective of the wide variation in study design, such as incidence among symptomatic *versus* nonsymptomatic patients and routine biopsy *versus* mapping biopsies.

Due to the high mortality rate of GA, partially attributed to late stage diagnosis, there is significant interest in identifying and managing precancerous lesions to intervene early and improve overall prognosis. As such, countries with high rates of gastric cancer and mortality such as China, South Korea, and Japan have implemented surveillance programs, which have allowed earlier detection of gastric cancer and subsequent reduce mortality.[7–10] However, in countries like Australia, where GA represents only 1.5% of new cancer cases and 2.4% of cancer-related deaths, there are currently no surveillance programs in place.[11] There is likely heterogeneity in the management practices of AG and GIM among treating physicians in Australia. This in part may be due to the fact there are no current specific Australian guidelines for the assessment and management of AG or GIM. This is despite the fact that other Western countries with similarly lower rates of gastric cancer have published guidelines, that is, European Society of Gastrointestinal Endoscopy, British Society of Gastroenterology, and American Gastroenterology Society guidelines.[12–14]

Given the lack of Australian data regarding prevalence and local guidelines to address the management of these condition, this study aims to assess the prevalence of GIM in a tertiary Australian hospital cohort over a five-year period. Additionally, it aims to describe the current practices among gastroenterologists regarding the follow-up and management of patients following the detection of AG and GIM. We hypothesize that despite the GIM being a relatively common endoscopic finding, there is significant variability in practice among Australian endoscopists for follow-up and management.

Methods

Retrospective audit. We conducted a retrospective audit of adult patients (aged 18 and older) undergoing upper endoscopy at a single Australian tertiary center between 1 January 2015, and 31 December 2020. We identified cases of GIM by searching the histology database for intestinal metaplasia: using dtSearch Desktop. The results were then manually filtered to identify cases of confirmed GIM taken during upper gastrointestinal endoscopy. Cases were confirmed based on histological evidence from one or more gastric biopsies showing conclusive findings of GIM. Nongastric biopsies were excluded from the analysis. The total number of gastroscopies performed during the study period was determined by searching The International Classification of Disease 10th Revision Procedure Coding System (ICD-10-PCS). The first gastroscopy within the study period that demonstrated histological evidence of GIM on biopsy was considered the index gastroscopy. Patients diagnosed with GIM prior to the specified time period were excluded from the study. Patients were defined as receiving follow-up if they were reviewed in a gastroenterology or surgical clinic (upper gastrointestinal, general surgical or colorectal clinic) following their index gastroscopy.

Using a standardized data collection form, we retrieved patient data from their electronic medical records. At the time of the index endoscopic evaluation, we recorded the following details: age, sex, family history of gastric cancer, country of birth, and smoking status. We also documented the following endoscopic details: indication for the procedure, number and location of biopsies, macroscopic findings of GIM/gastric atrophy, timing of subsequent surveillance for GIM (patients undergoing gastroscopy for indications other than GIM surveillance were excluded if GIM was not also being reassessed), use of the modified Sydney protocol for surveillance (minimum of five biopsies including two from the antrum at the lesser and greater curvature, two from the body at the lesser and greater curvature, and one from the incisura), evidence of *H. pylori* infection on biopsy, evidence of dysplasia or malignancy on histology, and information about subsequent follow-up and surveillance procedures.[15]

Survey. We distributed a web-based survey (see Appendix I) among all registered endoscopists affiliated with the Conjoint Committee for the Recognition of Training in Gastrointestinal Endoscopy (CCRTGE) in Australia, the national body for endoscopic certification. The survey consisted of 25 multiple-choice questions designed by the investigators, who have a special interest in GIM and AG. The survey was validated by two general gastroenterologists to ensure the survey was appropriate for a general endoscopy audience. It assessed the demographics of the endoscopists, their initial approach to AG and GIM, and their surveillance strategies. Additionally, the survey included a six-image quiz to evaluate the participants' ability to identify AG and GIM based on endoscopic appearance. The still images were obtained from high-definition upper endoscopy video recordings using an Olympus EVIS EXERA III (GIF-HQ190) gastroscope (Olympus, Tokyo, Japan). These images were chosen by one of the authors (SH) from biopsy-proven areas of AG and GIM. The endoscopic images demonstrated established features of GIM including tubulovillous structures and light blue crests and the presence of white opaque substance on Narrow Band and for AG, flattening of mucosal folds, and visibility of subepithelial vessels.

Statistical analysis. All statistical analyses were performed using the SPSS IBM software package. Descriptive statistics were used to summarize binary and continuous variables, presented as incidence frequencies (%) and mean ± standard deviation (or median [and range] values). Chi-square analysis was employed to assess differences between patients with dysplasia and those without dysplasia who underwent surveillance. A *P*-value less than 0.05 was considered statistically significant.

The project was reviewed by the appropriate local ethics committee.

Results

Retrospective review of Australian Center. Over the 5-year study period, a total of 10 475 upper endoscopic procedures were performed. A total of 1225 procedures in 1072 patients showed histological evidence of GIM on gastric biopsy, giving an overall prevalence of GIM of 11.7%, of whom 559 patients were males (52%) (Table 1). The median age of patients at diagnosis with GIM was 67 years (interquartile range 22 years). The majority of patients were born in Australia/New Zealand ($n = 319$, 56%), followed by European countries ($n = 396$, 36.3%), and then Asian countries ($n = 282$, 26.3%). The most common indication for upper endoscopy was iron deficiency anemia, accounting for 26.7% ($n = 287$) of cases,

Table 1 Demographic and indication for index gastroscopy

	Overall ($n = 1072$)
Mean age	65 (SD 15.71)
Gender	
Female	519
Country of origin	
Australia/New Zealand	319 (56%)
European	389 (36.3%)
Asia	282 (26.3%)
Africa	42 (3.9%)
Other	34 (3.1%)
Unknown	7 (0.7%)
FHMX of gastric Ca	
First-degree relative	23 (2.1%)
Non-first-degree relative	8 (0.7%)
No	59 (5.5%)
Unknown	939 (91.6%)
Indication for endoscopy	
Iron deficiency anemia	287 (26.7%)
Dyspepsia/GORD	209 (19.5%)
GI bleeding	151 (14.1%)
Abdominal pain	138 (12.9%)
Dysphagia	85 (7.9%)
Loss of weight	75 (7%)
Variceal screening	60 (5.6%)
Nausea/vomiting	42 (3.9%)
Other	239 (22.3%)
H. pylori on initial scope	
Present on biopsy	225 (23.8%)

FMHx, Family medical history; GI, gastrointestinal; GORD, Gastro-oesophageal reflux disease; SD, standard deviation.

followed by dyspepsia/gastro-esophageal reflux disease at 19.5% ($n = 209$) and suspected upper gastrointestinal bleeding at 14.1% ($n = 150$). The majority of endoscopic reports, 93.8% ($n = 1005$), did not mention macroscopic evidence of AG or intestinal metaplasia. 3.4% ($n = 36$) of reports noted evidence of intestinal metaplasia, 2.2% ($n = 24$) mentioned AG, and 0.7% ($n = 7$) noted both.

During the index gastroscopy, 23.8% ($n = 255$) of patients with GIM had concurrent evidence of active *H. pylori* infection. There was no significant correlation between *H. pylori* infection and the presence of dysplasia on the index endoscopy ($P = 0.657$). 95.7% ($n = 1026$) showed no evidence of dysplasia, while 3.7% ($n = 46$) exhibited dysplasia or malignancy. Among those with dysplasia on index gastroscopy, 1.6% ($n = 17$) had low-grade dysplasia, 0.9% ($n = 10$) had high-grade dysplasia, and 1.8% ($n = 19$) had evidence of malignancy (Fig. 1). There was limited documentation regarding family history of gastric cancer among patients, 91.6% of patients having no documentation. Of those who had history documented, 2.1% of those with no dysplasia had a family history of gastric cancer, 3.7% of patients with dysplasia, and 0% of patients with adenocarcinoma.

Of the 461 patients with AG/GIM who underwent follow-up at our center, 146 (32%) were recommended to undergo subsequent gastroscopy. Of these, 123 patients had completed their gastroscopy during the study period. 68.7% ($n = 317$) did not receive a recommendation for endoscopic follow-up for their GIM, although 17.5% ($n = 77$) underwent repeat scopes for other indications, such as esophageal variceal surveillance. Follow-up data were unavailable for 612 patients, mainly due to patients being discharged back to their primary care or referring doctor.

Among the patients who underwent follow-up gastroscopy, 58.7% ($n = 71$) had mapping biopsies using the modified Sydney protocol, with the most common interval being 1 year following the initial GIM diagnosis (33.9%). Of the 146 patients recommended for subsequent gastroscopy, 64 (44%) were recommended to undergo ongoing surveillance gastroscopies for their GIM (Fig. 2). The majority of these patients were recommended to have follow-ups at a 2-year interval (41.5%), followed by 3 years (28.8%). Patients with dysplastic changes at the index gastroscopy were more likely to be recommended for subsequent surveillance gastroscopy ($P = 0.006$) compared with those without dysplasia ($P = 0.397$). On follow-up gastroscopy, 10.3% ($n = 15/146$) of patients had dysplastic changes, of whom 6.8% ($n = 10/146$) had dysplasia on initial scope. Four percent (4/146) of patients developed gastric cancer on follow-up, of whom 1.3% ($n = 2/146$) already had high-grade changes on initial scope, 1 had low-grade changes, and 1 had no evidence of dysplasia on initial scope.

Survey of endoscopists. The survey on AG/GIM was sent to 3700 CCRTGE certified endoscopists, of whom 7.2% ($n = 267$) completed the survey (Table 2). The majority of participants were male (68.2%) and college-certified gastroenterologists (74.5%). The majority of endoscopists were consultants (80.1%) with over 10 years of experience (52.4%), performing more than 250 gastroscopies per year (53.6%). Only 18% had subspecialty training in interventional endoscopy.

When asked about performing mapping biopsies once AG/GIM was detected, 44.2% of endoscopists indicated they would do it for all patients, while 36% would only do it for high-risk patients (i.e. extensive GIM, personal risk factors of gastric cancer). Among those performing mapping biopsies, 74.9% indicated they would take biopsies in locations consistent with the modified Sydney protocol (body, antrum, and incisura); this included 100% of the surveyed fellows, 75% of surveyed consultants, and 75% of surveyed registrars. The majority of endoscopists mentioned they would recommend a subsequent gastroscopy for mapping following the index procedure at 1 year (33.7%). Regarding surveillance, 33.7% of endoscopists said they would routinely perform it for all patients with GIM, while 61.4% would only do it for high-risk patients. The most commonly recommended surveillance interval was 3 years (47.9%), followed by 2 years (32.2%).

While 85% of respondents acknowledged the absence of Australian guidelines on AG and GIM, 27% did not follow any of the existing international guidelines. Among those who followed guidelines, the two most popular ones were The American Gastroenterological Society (AGA) (39.8%) and The British Society of Gastroenterology (BSG) (25%). Seventeen percent of respondents stated that they followed Australian guidelines, of whom none formally exist. When shown a set of six endoscopic photos and asked to identify GIM, AG, and normal gastric

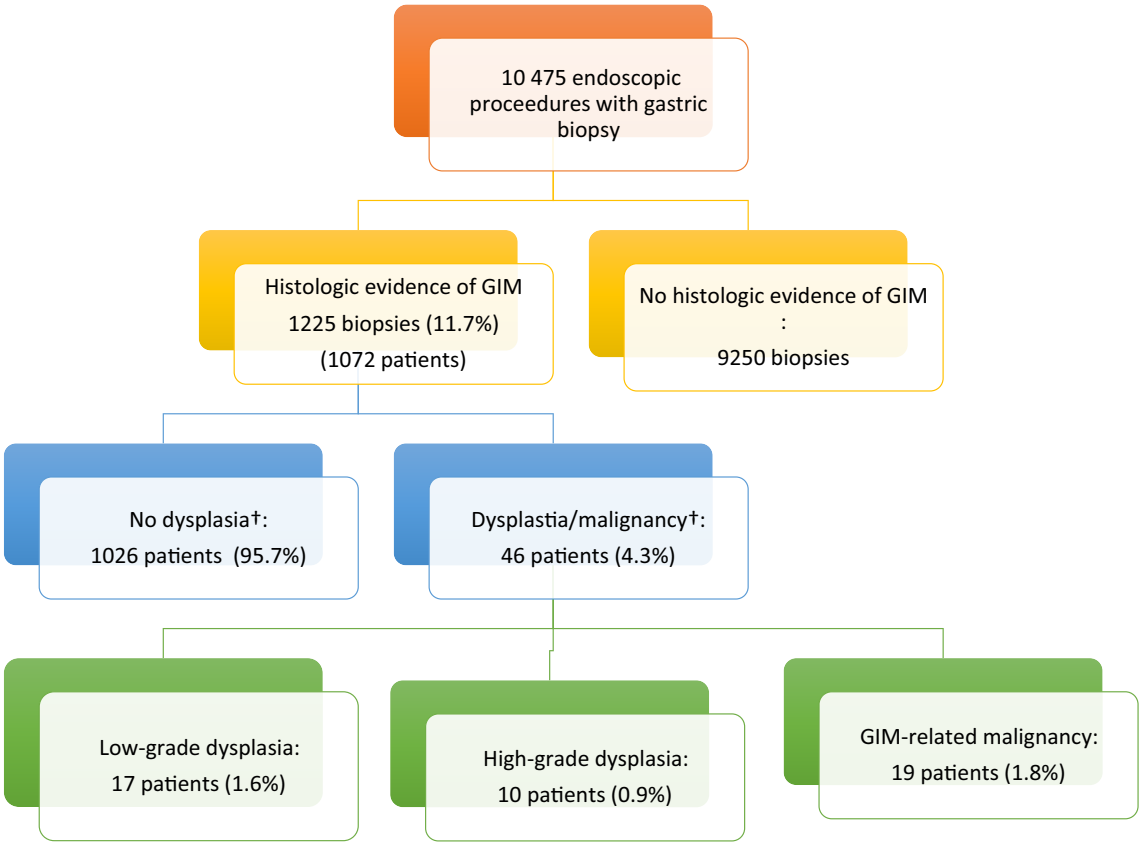


Figure 1 Gastric intestinal metaplasia (GIM) prevalence on index gastroscopy. †Findings on initial endoscopy.

mucosa, only 4 (1.5%) respondents correctly identified all six images, while 43.1% identified two or fewer images correctly (Fig. 3). College-certified endoscopists performed better than trainees (38.8% *vs* 18.9%, $P = 0.006$) in correctly identifying endoscopic photos, as did those who performed more than 250 gastroscopies per year compared with those who performed fewer (46.8% *vs* 24.5%, $P = 0.035$).

Discussion

This study aimed to assess the prevalence of GIM in a tertiary Australian hospital cohort over a 5-year period and examine the current practices of gastroenterologists regarding the management of these conditions. The results of the study shed light on the prevalence of GIM and the variability in management approaches.

The findings of our study revealed a prevalence of GIM of 11.7% among patients who underwent gastric biopsies over a 5-year study period. However, the rates of associated dysplasia and malignancy were low. This is comparable to a recent letter to the editor, which reported a similar prevalence rate of GIM (11.3%) in a cohort of 959 patients from an Australian center.[5] Similarly, a prospective Australian study that enrolled 262 patients with dyspepsia undergoing gastroscopy with biopsies taken using the modified Sydney protocol found that GIM was present in 16.5% of patients.[5] However, our results may have underestimated the prevalence of GIM within a population of patients undergoing upper GI endoscopy, as not all patients undergoing endoscopy will have undergone gastric biopsy or will have received targeted/mapping biopsies. The difference that routine biopsy may have on the prevalence of GIM is reflected in a New Zealand study of patients attending gastroscopy for dyspepsia, where extensive biopsy protocols were used, and a much higher incidence of GIM (43%) was reported.[3] The higher incidence in the New Zealand study can be attributed to the inclusion of extensive biopsy protocols, unlike our study where a significant number of patients did not undergo mapping or extensive biopsies during the initial gastroscopy. Additionally, the ethnic profile of our study cohort differed from the New Zealand study, with the latter including a significant proportion of Maori and Pacific Islanders who have a higher incidence of GIM and are at greater risk of developing gastric cancer.[16,17] An additional factor that may have led to an underdiagnoses of GIM on gastroscopy is the ability and knowledge of endoscopist to recognize the endoscopic findings of GIM/AG. It was clear in our retrospective cohort that it is not commonly documented as a finding (3.4%) despite the prevalence on biopsy. Additionally, our survey highlights endoscopists' difficulty in making an endoscopic diagnosis of AG/GIM, with only 1.6% of endoscopists correctly identifying all endoscopic images of GIM/AG.

The study findings further support our hypothesis that, despite GIM being a common finding on gastric biopsy, there is

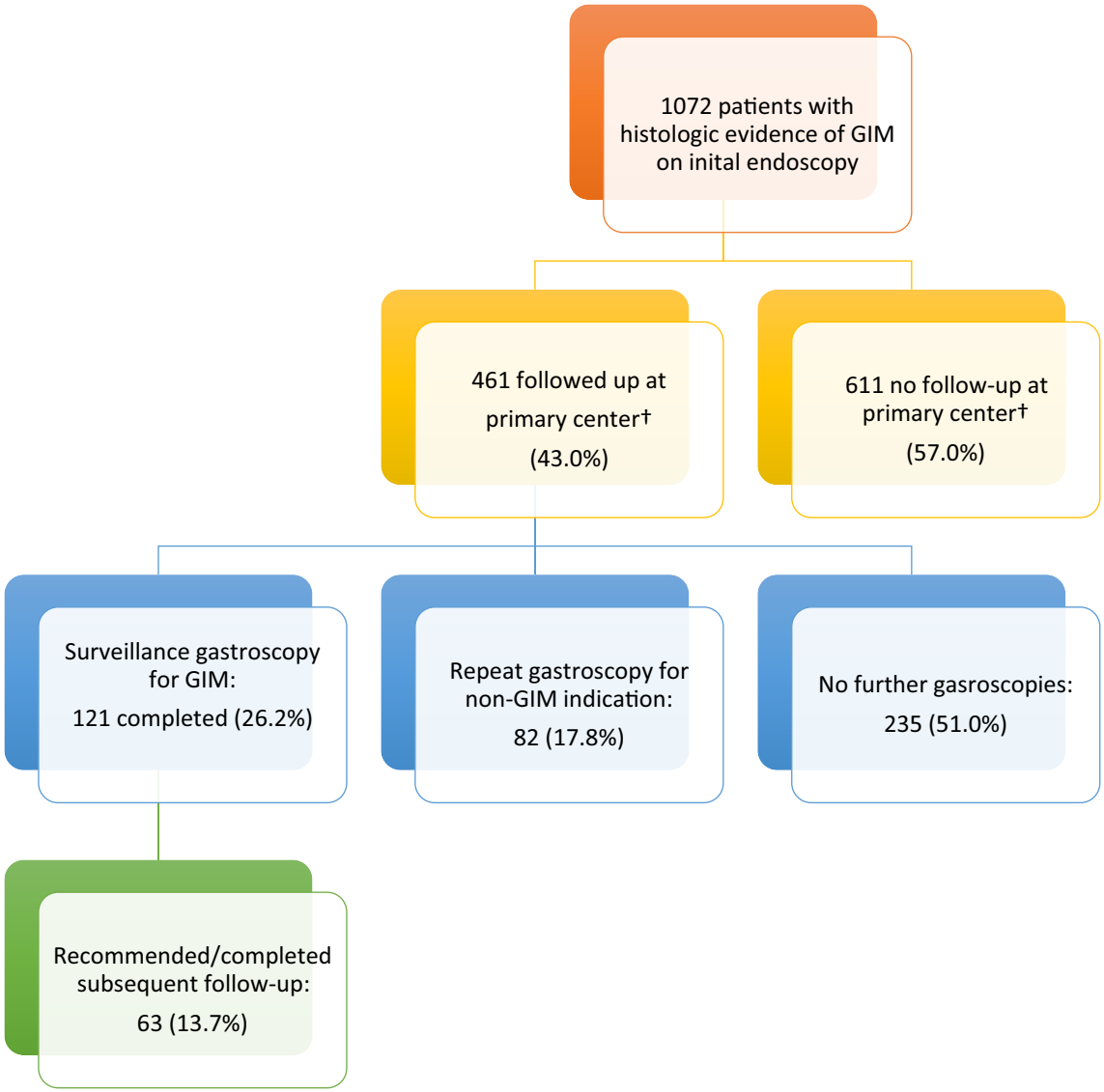


Figure 2 Follow-up of gastric intestinal metaplasia (GIM) and surveillance. †Follow-up defined as review in gastroenterology/surgical (upper GI/colorectal/general surgical) clinic.

variability in practice among Australian endoscopists when it comes to follow-up and management. Among the cohort of surveyed Australian endoscopists, there was significant variability in the endoscopic approach for AG and GIM. While most endoscopists performed mapping biopsies upon detecting AG/GIM, a significant proportion did not adhere to the modified Sydney protocol for biopsy locations. This inconsistency was also reflected in our retrospective cohort study, where GIM was often not evaluated further with endoscopic mapping or considered for subsequent surveillance. However, it must be noted that the follow-up data for our cohort were limited, as a large proportion of patients were not reviewed at our center following a GIM diagnosis. The majority of endoscopists surveyed correctly acknowledged the lack of Australian guidelines, and the majority reported they followed AGA or BSG guidelines. Given that the United States of America and the United Kingdom are both counties with low incidence of gastric cancer and the lack of Australian-specific guidelines, this approach seems prudent. However, the responses to the survey regarding need for mapping biopsy, location of biopsies, and surveillance were not reflective of the recommendations by these guidelines. For instances, despite both guidelines recommending all patients should not undergo routine surveillance for GIM/AG, 33.7% of respondents indicated that they would perform in all patients rather than ongoing for a surveillance based on patients' risk and benefit profile. These inconsistencies in practice highlight the need for standardized biopsy protocols to ensure accurate diagnosis and appropriate surveillance.

The low recognition of endoscopic images depicting GIM, AG, and normal gastric mucosa in our survey indicates the

Table 2 Summary of survey results

Survey question	Survey response
Gender, *n* (%)	
Female	78 (29.2%)
Male	182 (68.2%)
Non-binary	2 (0.7%)
Rather not say	5 (1.9%)
Stage in training, *n* (%)	
Consultant	214 (80.1%)
Fellow	29 (10.9%)
Registrar	24 (9%)
Specialty, *n* (%)	
Gastroenterology	199 (74.5%)
General surgery	33 (12.4%)
Upper GI surgery	21 (7.9%)
Colorectal surgery	9 (3.4%)
Other	5 (1.9%)
Estimated case number of gastroscopies performed per year? *n* (%)	
<100	31 (11.6%)
100–250	93 (34.5%)
250–500	75 (28.1%)
500–750	41 (15.4%)
750+	27 (10.1%)
Do you routinely perform mapping for patients following finding of AG or GIM after incidental finding on gastroscopy?, *n* (%)	
Yes, all patients	44.2% (118)
Yes, but only higher risk patients	36% (96)
No	19.9% (53)
Do you routinely perform surveillance gastroscopy following finding of GIM/AG?, *n* (%)	
Yes everyone	90 (33.7%)
Yes, only risk factors	164 (61.4%)
No	13 (4.9%)
If you perform surveillance following finding of GIM/AG (assuming no dysplasia) when do you do this?, *n* (%)	
6 months	2 (0.7%)
Yearly	19 (7.1%)
Every 2 years	86 (32.2%)
Every 3 years	128 (47.9%)
Every 5 years	16 (6%)
Never	2 (0.7%)
Do you follow any guidelines?, *n* (%)	
American Gastroenterological Association	78 (39.8%)
British Society of Gastroenterology	49 (25%)
American Society of Gastrointestinal Endoscopy	38 (19.4%)
Gastroenterological Society of Australia	17 (8.7%)
Korean Society of Gastrointestinal Endoscopy	0 (0%)
Japan gastroenterological endoscopy society	13 (6.6%)
China (Upper Gastrointestinal Cancer Early Detection program)	1 (0.5%)
No response	71 (26.9%)
Number of photos correctly identified out of 6 photos demonstrating AG or GIM or normal mucosa, *n* (%)	
0/6	5 (1.9%)
1/6	46 (17.2%)
2/6	64 (24.0%)
3/6	59 (22.1%)
4/6	50 (18.7%)
5/6	39 (14.6%)
6/6	4 (1.5%)

AG, atrophic gastritis; GI, gastrointestinal; GIM, gastric intestinal metaplasia.

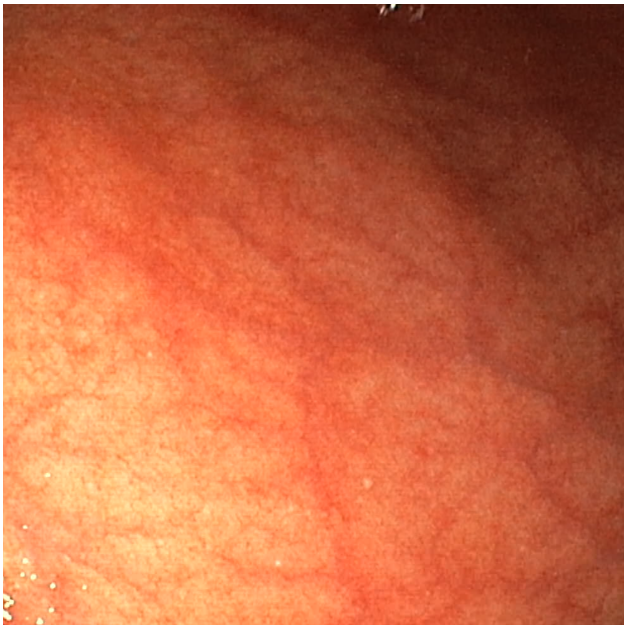


Figure 3 Example of quiz image: For this image, 45.7% of respondents were unable to correctly identify this as atrophic gastritis.

potential need for enhanced training and education in this area. Our survey highlighted that certified endoscopist performing high-volume gastroscopy were able to more accurately identify changes consistent with GIM/AG. Increasing awareness and improving proficiency in recognizing these endoscopic features will aid in early detection and accurate diagnosis of GIM. An interesting future study would be to assess the impact of an education program dedicated to the endoscopic recognition of AG and intestinal metaplasia and the subsequent detection rates of these conditions. The images included in the study were chosen to represent findings that endoscopists should be familiar with to identify GIM/AG.

There are several limitations to consider in this study. First, the inherent limitations of a retrospective study may introduce selection bias and limit the availability of complete follow-up data. Second, the study was conducted at a single center, which may affect the generalizability of the findings to the broader Australian population. Third, the small number of survey respondents only reflects a minority of currently practicing Australian endoscopists.

Despite these limitations, our study contributes to the current limited pool of evidence regarding the prevalence of this condition among an Australian population. It demonstrates that

GIM is a common histological finding and, as a precursor lesion to GA, emphasizes the importance of identifying and appropriately managing this condition. The lack of consensus and standardized approaches observed in our study could potentially lead to suboptimal patient care and missed opportunities for early intervention. Future efforts to establish clear Australian guidelines on AG/GIM based on robust evidence are required. In addition, highlighting the appearance and appropriate mapping strategy for GIM in endoscopic training and at national meetings may improve adherence to guidelines.

Data availability statement. The data underlying this article are available in the article.

References

1 World Health Organisation. *GLOBOCAN 2020: The Global Cancer Observatory 2020*. Cited 10 May 2024. Available from URL: https://gco.iarc.fr/today/data/factsheets/populations/900-world-fact-sheets.pdf.
2 Correa P. A human model of gastric carcinogenesis. *Cancer Res.* 1988; **48**: 3554–60.
3 Fraser AG, Peng SL, Jass JR. Intestinal metaplasia subtypes and *Helicobacter pylori* infection: a comparison of ethnic groups in New Zealand. *J. Gastroenterol. Hepatol.* 1998; **13**: 560–5.
4 Parbhu SK, Shah SC, Sossenheimer MJ, Fang JC, Peterson KA, Gawron AJ. Index diagnoses of gastric intestinal metaplasia in the United States: patient characteristics, endoscopic findings, and clinical practice patterns at a large tertiary care center. *Therap. Adv. Gastroenterol.* 2022; **15**: 17562848221117640.
5 Clayton-Chubb D, Buckle A, Tandiari T, Hoskin P, Nicoll AJ. Prevalence of gastric intestinal metaplasia in a single-centre multicultural Australian cohort. *Intern. Med. J.* 2023; **53**: 296–7.
6 Xia HH, Kalantar JS, Talley NJ *et al*. Antral-type mucosa in the gastric incisura, body, and fundus (antralization): a link between *Helicobacter pylori* infection and intestinal metaplasia? *Am. J. Gastroenterol.* 2000; **95**: 114–21.
7 Shao L, Li P, Ye J *et al*. Risk of gastric cancer among patients with gastric intestinal metaplasia. *Int. J. Cancer*. 2018; **143**: 1671–7.
8 Spence AD, Cardwell CR, McMenamin ÚC *et al*. Adenocarcinoma risk in gastric atrophy and intestinal metaplasia: a systematic review. *BMC Gastroenterol.* 2017; **17**: 157.
9 Chen R, Liu Y, Song G *et al*. Effectiveness of one-time endoscopic screening programme in prevention of upper gastrointestinal cancer in China: a multicentre population-based cohort study. *Gut.* 2021; **70**: 251–60.
10 Hamashima C, Shibuya D, Yamazaki H *et al*. The Japanese guidelines for gastric cancer screening. *Jpn. J. Clin. Oncol.* 2008; **38**: 259–67.
11 AIHW. Cancer Data in Australia 2020 Web Report and Supplementary Data Tables. Cited 10 May 2024. Available from URL: https://www.canceraustralia.gov.au/affected-cancer/cancer-types/stomach-cancer/stomach-cancer-statistics.
12 Banks M, Graham D, Jansen M *et al*. British Society of Gastroenterology guidelines on the diagnosis and management of patients at risk of gastric adenocarcinoma. *Gut*. 2019; **68**: 1545–75.
13 Gupta S, Li D, el Serag HB *et al*. AGA clinical practice guidelines on management of gastric intestinal metaplasia. *Gastroenterology*. 2020; **158**: 693–702.
14 Dinis-Ribeiro M, European Society of Gastrointestinal Endoscopy, European Helicobacter Study Group, European Society of Pathology, Sociedade Portuguesa de Endoscopia Digestiva. Management of precancerous conditions and lesions in the stomach (MAPS): guideline from the European Society of Gastrointestinal Endoscopy (ESGE), European Helicobacter Study Group (EHSG), European Society of Pathology (ESP), and the Sociedade Portuguesa de Endoscopia Digestiva (SPED). *Endoscopy*. 2012; **44**: 74–94.
15 Dixon MF, Genta RM, Yardley JH, Correa P. Classification and grading of gastritis. The updated Sydney System. International Workshop on the Histopathology of Gastritis, Houston 1994. *Am. J. Surg. Pathol.* 1996; **20**: 1161–81.
16 Tukuitonga CF, Solomon N, Stewart A. Incidence of cancer among Pacific Island people in New Zealand. *N. Z. Med. J.* 1992; **105**: 463–6.
17 Dockerty JD, Marshall S, Fraser J, Pearce N. Stomach cancer in New Zealand: time trends, ethnic group differences and a cancer registry-based case-control study. *Int. J. Epidemiol.* 1991; **20**: 45–53.

APPENDIX

Survey: Atrophic gastritis (AG) and gastric intestinal (GIM) metaplasia survey

A. Basic demographics.

A1. -Gender—how do you identify? (Multiple choice [MC])
- Female
- Male
- Non-binary
- Rather not say

A2. Age (MC)
- 20–30
- 31–40
- 41–50
- 51–60
- 61–70
- 71 and over

A3. Stage in training
- Registrar
- Fellow
- Consultant

A4. Type of specialty
- Gastroenterology
- General surgery
- Upper GI Surgery
- Colorectal surgery
- Other

A5. Practice type
- Full time
- Part-time
- Causal

A6. Practice location
- Private
- Public
- Both

A7. Number of years performing gastroscopy
- <3
- 3–5
- 5–10
- 10+

A8. Estimated case number of gastroscopy performed per year
- <100
- 100–250
- 250–500
- 500–750
- 750+

A9. Interventional endoscopy subspecialty training (i.e., completed a specific interventional endoscopy fellowship)
- Yes
- No

B. Current practice

B1. Do you routinely perform mapping or patients following finding of atrophic gastritis or intestinal metaplasia after incidental finding on gastroscopy
- Yes, all patients
- Yes, but only patient at higher risk of developing gastric cancer
- No

B2. How do you examine for gastric intestinal metaplasia and atrophic gastritis? (Can choose more than one option)
- White light
- NBI
- Dye chromoendoscopy
- Magnification
- NA—no mapping

B3. Where do you take biopsies from on mapping?
- Antrum or body
- Antrum and body
- Antrum, body, incisura
- NA—no mapping

B4. When would do a repeat gastroscopy for mapping following the index gastroscopy?
- Immediately
- 6 months
- 1 year
- 2 years
- Never

B5. Do you routinely perform SURVEILLANCE gastroscopy following finding of GIM/GA?
- Yes everyone
- Yes, only if there is extensive IM found or for patients with increased risk of gastric cancer
- No

B6. If you perform surveillance following a finding of GIM/AG, (assuming there is no dysplasia found) when do you do this?
- 6 monthly
- Yearly
- Every 2 years
- Every 3 years
- Every 5 years
- Never

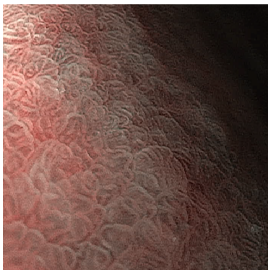
C. General knowledge regarding AG/GIM

C1. True or false: there are Australian guidelines for GIM/GA
- True
- False

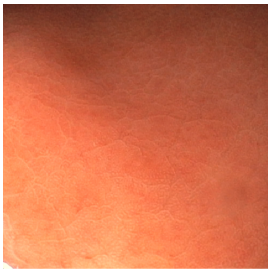
C2. Do you follow any guidelines in the management of GIM/GA?
- American Gastroenterological Association (AGA)
- British Society of Gastroenterology (BSG)
- Australian Guidelines
- American Society of Gastrointestinal Endoscopy (ASGE)
- Korean Guidelines
- Japanese Guidelines
- Chinese Guidelines

C3. Which of the following are risk factors for gastric cancer? (you can choose more than one option)
- Patients with family history of gastric cancer, that is, first-degree relative
- Incomplete GIM
- Extensive GIM
- Ethnicity, that is, immigrants from high incident countries/ethnic minorities
- Persistent *H. pylori* infection

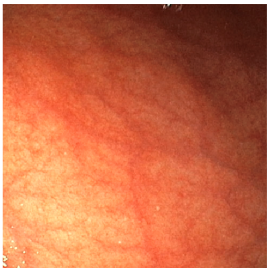
C4. What does this show?
- Atrophic gastritis
- Intestinal metaplasia
- Normal mucosa



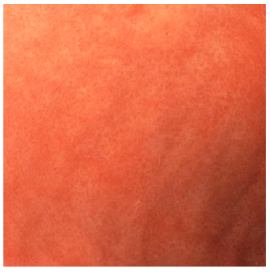
C5. What does this show?
- Atrophic gastritis
- Intestinal metaplasia
- Normal mucosa



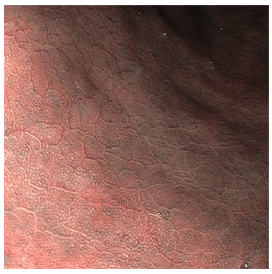
C6. What does this show?
- Atrophic gastritis
- Intestinal metaplasia
- Normal mucosa



C7. What does this show?
- Atrophic gastritis
- Intestinal metaplasia
- Normal mucosa



C8. What does this show?
- Atrophic gastritis
- Intestinal metaplasia
- Normal mucosa



C9. What does this show?
- Atrophic gastritis
- Intestinal metaplasia
- Normal mucosa