Kyoto global consensus report on *Helicobacter pylori* gastritis

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**ABSTRACT**

**Objective** To present results of the Kyoto Global Consensus Meeting, which was convened to develop a global consensus on (1) classification of chronic gastritis and duodenitis, (2) clinical distinction of dyspepsia caused by *Helicobacter pylori* from functional dyspepsia, (3) appropriate diagnostic assessment of gastritis and (4) when, whom and how to treat *H. pylori* gastritis.

**Design** Twenty-three clinical questions addressing the above-mentioned four domains were drafted for which expert panels were asked to formulate relevant statements. A Delphi method using an anonymous electronic system was adopted to develop the consensus, the level of which was predefined as ≥80%. Final modifications of clinical questions and consensus were achieved at the face-to-face meeting in Kyoto.

**Results** All 24 statements for 22 clinical questions after extensive modifications and omission of one clinical question were achieved with a consensus level of ≥80%. To better organise classification of gastritis and duodenitis based on aetiology, a new classification of gastritis and duodenitis is recommended for the 11th international classification. A new category of *H. pylori*-associated dyspepsia together with a diagnostic algorithm was proposed. The adoption of grading systems for gastric cancer risk stratification, and modern image-enhancing endoscopy for the diagnosis of gastritis, were recommended. Treatment to eradicate *H. pylori* infection before preneoplastic changes develop, if feasible, was recommended to minimise the risk of more serious complications of the infection.

**Conclusions** A global consensus for gastritis was developed for the first time, which will be the basis for an international classification system and for further research on the subject.

**INTRODUCTION**

For decades endoscopic ‘gastritis,’ gastric erosions and even histological findings of gastric inflammation have failed to attract much attention from clinicians as the majority of patients with these findings remain asymptomatic. Although gastritis is often used to describe dyspeptic symptoms, the presence of such symptoms correlates poorly with histological or endoscopic gastritis. Although the term ‘gastritis’ is still used as a concept to explain dyspeptic symptoms, gastritis as a term refers to gastric inflammation, often accompanying structural mucosal changes.

This gastric inflammation (gastritis) has long been associated with peptic ulcer, gastric cancer and pernicious anaemia, but the cause or causes of gastritis remain poorly understood. The discovery that *Helicobacter pylori* (*H. pylori*) was a cause of gastritis’ focused attention on the aetiolo, natural history and prognosis of gastritis.

Worldwide the most common cause of chronic gastritis is infection with *H. pylori*. *H. pylori* causes progressive damage to the gastric mucosa and is now accepted as playing a causative role in a number of important diseases, including duodenal ulcer disease, gastric ulcer disease, gastric adenocarcinoma and gastric mucosa-associated lymphoid tissue (MALT) lymphoma. Indeed, *H. pylori*-induced gastritis is considered as the most important risk factor for peptic ulcer and its complications as well as for gastric cancer.

The current International Statistical Classification of Diseases and Related Health Problems (ICD-10), issued in 1989 by the International Conference for the Tenth Revision of the ICD was endorsed by WHO at the 43rd general assembly in 1990 and has been used for disease statistics since 1994 among member countries of WHO. In the ICD-10, all the digestive diseases are classified under K code with different two-digit numbers. However, *H. pylori* was not integrated into gastritis classification in the gastritis section (K29) of ICD-10, even though *H. pylori* gastritis is the predominant type of gastritis and clinically by far the most relevant because of its predisposing role of severe gastroduodenal complications. Moreover, the current ICD-10 classification of gastritis is not organised according to aetiology but is merely a mixture of phenotype and aetiology and also includes duodenitis (box 1). Therefore, a revision of the gastritis and duodenitis classification based on all the possible aetiologies was proposed after the working group meeting for the ICD-11 revision held in Tokyo in 2010 and submitted as the ICD11 β foundation component. However, in the ICD11 β foundation classification (box 2), the original plan was changed. In an attempt to gather broader opinions on the rationale of the new classification system originally proposed to ICD-11, we devoted one section to this important issue at this meeting.

As stated above, if *H. pylori* gastritis is categorised as an infectious disease, the inclusion of *H. pylori* gastritis-associated dyspeptic symptoms as a ‘functional disease’ entity poses a special challenge, despite it being implicated in the pathogenesis of functional dyspepsia (FD) symptoms. Despite the definition given by Rome III, a conceptual ambiguity on how to deal with *H. pylori* gastritis-associated...
Dyspeptic symptoms in the context of the clinical assessment of FD still remain.\textsuperscript{5 10–12} Accordingly, guidelines and meta-analyses that included dyspepsia associated with \textit{H. pylori} under the umbrella of ‘functional dyspepsia’\textsuperscript{5 10–12} would require reconsideration in accordance with advances made in the area of \textit{H. pylori} gastritis.

Third, there has been significant technical progress in diagnostic tools for GI diseases. Advanced endoscopy with image-enhanced modalities and magnification allows diagnosis of gastritis with a high degree of accuracy, even before histological confirmation.\textsuperscript{13–15} Furthermore, non-invasive diagnostic tests such as the \textsuperscript{13}C-urea breath test, faecal antigen test and serological parameters serve as surrogate markers of gastritis severity.\textsuperscript{5} Classification systems for grading gastritis such as the Operative Link for Gastritis Assessment (OLGA) and Operative Link for Gastric Intestinal Metaplasia (OLGIM) have also been proposed,\textsuperscript{16–18} in addition to the internationally accepted Sydney System.\textsuperscript{19,20} and their utility needs to be evaluated and agreed upon.

In 2013, the Japanese government insurance policy approved eradication therapy for \textit{H. pylori}-positive gastritis after endoscopic examination, to exclude more serious diseases such as ulcer and cancer, in line with the Japanese guidelines for \textit{H. pylori} management.\textsuperscript{11} However, no global consensus has been published on when to recommend eradication therapy for \textit{H. pylori} gastritis and how to follow up after eradication.

Since the global awareness of gastritis is still confounded by a number of controversial issues as described above, a meeting was set up in Kyoto to achieve global consensus on \textit{H. pylori} gastritis; to attempt conceptual changes in gastritis classification in general; to agree diagnosis and management strategies with special reference to FD and cancer prevention.
Please note that this classification is continuously updated and hence is subject to change. This classification is not authorised by WHO.

### 2A Classification of gastritis at the foundation layer of ICD11 β

<table>
<thead>
<tr>
<th>Helicobacter pylori-induced gastritis</th>
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<tbody>
<tr>
<td>Drug-induced gastritis</td>
</tr>
<tr>
<td>Autoimmune gastritis</td>
</tr>
<tr>
<td>Stress-induced gastritis</td>
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</tbody>
</table>

#### Special forms of gastritis

- Allergic gastritis
- Gastritis due to biliary reflux
- Lymphocytic gastritis
- Ménétrier disease
- Eosinophilic gastritis

#### Infectious gastritis

- Gastric phlegmone
- Bacterial gastritis
  - *H. pylori*-induced gastritis
  - Enterococcal gastritis
  - Mycobacterial gastritis
    - Tuberculous gastritis
    - Non-tuberculous mycobacterial gastritis
      - *Mycobacterium avium*-intracellulare gastritis
    - Gastritis due to other specified non-tuberculous mycobacteria
- Secondary syphilitic gastritis

- Viral gastritis
  - Cytophagaloviral gastritis
  - Enteroviral gastritis

- Fungal gastritis
  - Gastritis due to mucormycosis
  - Gastric candidiasis
  - Gastric histoplasmosis

- Parasitic gastritis
  - Gastric anisakiasis
  - Cryptosporidium gastritis
  - Gastric *strongyloides stercoralis*

#### Gastritis due to other diseases classified elsewhere

- Gastritis due to Crohn’s disease
- Gastritis due to sarcoidosis
- Gastritis due to vasculitis

### 2B Classification of duodenitis at the foundation layer

<table>
<thead>
<tr>
<th>Helicobacter pylori-induced duodenitis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stress-induced duodenitis</td>
</tr>
</tbody>
</table>

#### Duodenitis due to external causes

- Alcoholic duodenitis
- Chemical duodenitis
- Radiation duodenitis
- Duodenitis due to other external causes
- Drug-induced duodenitis

#### Special forms of duodenitis

- Allergic duodenitis
- Eosinophilic duodenitis
- Lymphocytic duodenitis

#### Infectious duodenitis

- Duodenal phlegmone
- Bacterial duodenitis
  - Mycobacterial duodenitis
    - Non-tuberculous mycobacterial duodenitis
    - Tuberculous duodenitis
- Duodenitis due to Whipple’s disease

- Fungal duodenitis
- Duodenal candidiasis
- Parasitic duodenitis
  - Ancylostomiasis duodenitis
  - Duodenal anisakiasis
  - Duodenitis due to *Giardia lamblia*
  - Strongyloides duodenitis

- Viral duodenitis
  - Cytomagroviral duodenitis
  - Herpetic duodenitis

#### Duodenitis due to other diseases, classified elsewhere

- Duodenitis due to coeliac disease
- Duodenitis due to Crohn’s disease
- Duodenitis due to sarcoidosis
- Duodenitis due to vasculitis
- Duodenitis due to IgA vasculitis
- Duodenitis due to Whipple’s disease

#### Duodenitis of unknown aetiology with specific endoscopic or pathological features

- Acute haemorrhagic duodenitis
- Granulomatous duodenitis

For management of conflict of interest (COI), each member was asked to present COI status according to the JSGE guidelines. If a relevant COI had existed, that person would have been asked not to vote, in accordance with the recent consensus, but no such case was encountered. The majority of the funding was provided by JSGE with a hand-reach support from industries, which were otherwise not involved in the planning, organisation or manuscript writing and did not join in the discussions.

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Process and results
At the first round of voting 16 CQs achieved the predefined consensus level of ≥80%. Six statements failed to reach consensus and each section met to modify their assigned statements based on the comments and opinions received. This led to some questions being split into two or being combined, resulting in 24 CQs, including 25 statements which were subjected to the second round of voting within their assigned group. The results of the second round of voting were disclosed on the first day of the face-to-face meeting in Kyoto. At this stage, all statements except one had achieved consensus. To facilitate further discussion in the break-out sessions, preliminary plenary voting was done to enable the respective section members to consider the opinions of all group members.

On the second day, the finalised CQs and accompanying statements were presented for plenary voting. If consensus levels were not reached, open discussions ensued to modify the statements, followed by voting. All the finalised CQs and statements are shown in the four consensus sections. Levels of recommendation and evidence are shown together with the voting results. For CQ1 to CQ8A, 39 members voted, while 38 voted for CQ8B to CQ14A and 37 voted for CQ14B to CQ23. During the plenary voting, one subdivided CQ (CQ19) was recombined, while another CQ (CQ21) was deleted because of redundancy, resulting in 22 CQs and 24 statements. All voting during the plenary session was done anonymously by an electronic voting system with key pads distributed to each faculty member. The five faculty members who missed the plenary voting session were asked to vote later for the finalised CQs and statements without knowledge of the plenary voting results. Their voting results were almost identical with the plenary voting results. They agreed on all the CQs with the only exception being CQ11, showing 80% (one out of five) agreement. Since there was no inconsistency between the plenary voting and voting by the absentees, combining the two sets of results did not influence the outcome. The entire consensus results are shown below.

CONSENSUS STATEMENT
Section 1. Classification of gastritis in relation to ICD-11
CQ1. Is the current ICD-10 classification for gastritis appropriate?
Statement 1
The current ICD-10 classification for gastritis is obsolete in view of the discovery of H. pylori.
Grade of recommendation: strong
Evidence level: high
Consensus level: 100%

Comment
The ICD-10 classification of gastritis was formulated in 1989 and is still in effect in most countries. At the time of formulation, the ICD-10 classification of gastritis and duodenitis (K29) was rudimentary as it was based on macroscopic and histomorphological criteria; the only aetiological factor assigned was alcohol (box 1). The histological classification of gastritis considered mainly aspects of atrophy and autoimmunity. 1

The discovery of H. pylori had not been taken into account, possibly because even though release came after the discovery of Campylobacter pylori (H. pylori), the role of H. pylori in disease was still controversial. The recognition of H. pylori infection as the primary cause of chronic gastritis proved to be a breakthrough that reopened the chapter on gastritis and its role in disease. 2 24 25 At present, no classification of gastritis would be complete without including H. pylori as the aetiological cause.

CQ2. Is the proposed ICD-11 classification for gastritis appropriate?
Statement 2
The newly proposed classification of gastritis in the ICD11 β version is an improvement because it is based on aetiological factors.
Grade of recommendation: strong
Evidence level: moderate
Consensus level: 100%

Comment
Although the ICD-10 has been updated regularly to accommodate new diseases and concepts, WHO recognised the necessity of overall systematic changes in the ICD and decided to revise the current ICD-10 to ICD-11 in 2007. As the intermediate process for this revision, the ICD11 β version was formulated with input from various scientific advisory groups. This version was open to the public so that opinions from various interest groups and a broader range of medical specialists could be reflected before compiling the ICD-11. ICD11 β foundation component consists of the core of the ICD-11 classification from which mortality and morbidity classifications will derive. However, it remains a draft and can be changed from time to time before finalisation of ICD-11 (for more details, please visit http://www.who.int/classifications/icd/revision/betaexpectations/en/).

In the ICD11 β foundation component of the gastritis section, classification of gastritis was principally based on aetiological factors with consideration of their specific pathophysiological principles (box 2). Accordingly, H. pylori gastritis is categorised as a specific nosological entity.

The assessment of gastritis based on histopathological criteria was completely changed after recognition of H. pylori as the most common cause of chronic gastritis. The Sydney System was developed as a consequence and has been integrated into clinical practice. The Sydney classification of gastritis combined histological parameters of activity, chronicity, atrophy, intestinal metaplasia, topographical distribution and aetiopathogenic information for reporting the pathology of gastritis in endoscopic biopsies. 19 20

As described above, classification of gastritis in the foundation component of ICD11 β version is principally based on causative factors, in order to cover the three most important and best defined categories of gastritis—namely, (a) H. pylori-induced, (b) drug-induced and (c) autoimmune gastritis. A specific diagnosis among these different categories of gastritis is required to direct specific management and treatment strategies. The diagnosis of H. pylori-induced gastritis has major implications for life-long healthcare. H. pylori gastritis may cause dyspeptic symptoms 26 27 and result in gastroduodenal pathologies, including peptic ulcer disease (PUD) and gastric cancer. The recognised role of H. pylori as a carcinogen makes eradication of H. pylori infection the preferred strategy for the prevention of gastric cancer. 5 11 12 28 There is more to learn about aetiologies other than H. pylori in gastritis and this is dealt with as ‘H. pylori-negative or idiopathic gastritis’. 29

The proposed aetiology-based classification for gastritis in the foundation component of ICD11 β version was further refined by this consensus meeting (box 3). Clinical validation is needed to further define and confirm the usefulness of the new classification.

Furthermore, duodenitis, which was in the gastritis section in ICD-10, is now categorised in an independent section in the
Box 3  Aetiology-based classification of gastritis (3A) and duodenitis (3B). A proposal according to the consensus at the Kyoto consensus conference

3A Proposed classification of gastritis in the Kyoto consensus conference

Autoimmune gastritis
Infectious gastritis

- Helicobacter pylori-induced gastritis
- Bacterial gastritis other than H. pylori
- Enterococcus gastritis
- Mycobacteria gastritis
- Secondary syphilitic gastritis
- Gastric phlegmone
- Viral gastritis
- Entero viral gastritis
- Cytomegalovirus gastritis
- Fungal gastritis
- Gastritis due to mucormycosis
- Gastric candidiasis
- Gastric histoplasmosis
- Parasitic gastritis
- Cryptosporidium gastritis
- Gastric strongyloides stercoralis
- Gastric anisakiasis

Gastritis due to external causes

- Drug-induced gastritis
- Alcoholic gastritis
- Radiation gastritis
- Chemical gastritis
- Gastritis due to duodenal reflux
- Gastritis due to other specified external cause

Gastritis due to specified causes

- Lymphocytic gastritis
- Menetrier disease
- Allergic gastritis
- Eosinophilic gastritis

Gastritis due to other diseases classified elsewhere

- Gastritis due to sarcoidosis
- Gastritis due to vasculitis
- Gastritis due to Crohn’s disease

3B Proposed classification of duodenitis in the Kyoto consensus conference

Infectious duodenitis

- H. pylori-induced duodenitis
- Bacterial duodenitis other than H. pylori
- Mycobacterial duodenitis
- Duodenitis due to Tropheryma whipplei (Whipple’s disease)
- Duodenal phlegmone
- Fungal duodenitis
- Duodenal candidiasis
- Parasitic duodenitis
- Ancylostomiasis (hookworm) duodenitis
- Duodenal anisakiasis
- Duodenitis due to Giardia lamblia
- Strongyloides duodenitis
- Viral duodenitis
- Cytomegaloviral duodenitis
- Herpetic duodenitis

Duodenitis due to external causes

- Alcoholic duodenitis
- Chemical duodenitis
- Radiation duodenitis
- Duodenitis due to other external causes
- Drug-induced duodenitis

Duodenitis due to specified causes

- Allergic duodenitis
- Eosinophilic duodenitis
- Lymphocytic duodenitis

Duodenitis due to other diseases classified elsewhere

- Duodenitis due to Crohn’s disease
- Duodenitis due to sarcoidosis
- Duodenitis due to vasculitis
- Duodenitis due to Henoch–Schönlein purpura
- Duodenitis due to coeliac disease

Guidelines

foundation component. It should be noted that the Joint Linearisation of Mortality and Morbidity of ICD11 β version is now publicly available (see online supplementary table S3) and differs significantly from the foundation component (box 2) or aetiology-based classification proposed in this paper (box 3). This linearisation did not adopt the principle of aetiology-based classification, thus requiring further revision.

CQ3. Is it necessary to categorise gastritis according to gastric subsite?

Statement 3

It is useful to categorise H. pylori-induced gastritis according to gastric subsites, because the risks of gastric cancer and peptic ulcer are affected by the patterns of gastritis.

Grade of recommendation: strong
Evidence level: high
Consensus level: 97.4%

Comment

The categorisation of H. pylori gastritis according to gastritis subsites together with the assessment of gastritis severity allows prediction of an individual’s risk of developing severe gastrointestinal complications and, in particular, gastric cancer.36–32

Depending on the gastric subsites involved, gastric function and, in particular, gastric acid secretion may be profoundly affected, resulting in gastric acid hypersecretion, hyposecretion or even achlorhydria.33–35

Subsite characterisation of gastritis is also critically important for identifying those patients who remain at high risk after H. pylori eradication and thus are candidates for regular endoscopic and histological follow-up.36 Patients with severe atrophic gastritis (with or without intestinal metaplasia) in the corpus or with severe corpus predominant gastritis are those at highest risk for progression to gastric cancer of the intestinal type31 37 and for diffuse-type gastric cancer. In diffuse-type gastric cancer the prevalence of antral atrophic gastritis is almost identical to that seen in the intestinal type but is slightly less with corpus atrophic gastritis than with intestinal type gastric cancer.38

CQ4. Is it necessary to categorise gastritis according to histology (severity) and/or endoscopy?

Statement 4

It is advisable to categorise gastritis according to histology, because the risk of development of gastric cancer in H. pylori
gastritis varies according to the extent and severity of inflammation and atrophy.

Grade of recommendation: strong
Evidence level: high
Consensus level: 100%

Comment
The updated Sydney System has been globally implemented into clinical practice and requires proper assessment of all the relevant characteristics of *H. pylori* gastritis including atrophy and intestinal metaplasia at different gastric subsites.

Categorising gastritis is clinically relevant because the ‘phenotype’ of *H. pylori* gastritis determines the risk of progression to gastroduodenal complications.

Severity and extent of atrophic gastritis and intestinal metaplasia are well established as indicators of the increased risk for developing gastric cancer. Similarly, severe *H. pylori*-induced corpus gastritis is associated with an increased risk for gastric cancer. New staging systems for the characterisation of gastritis have been introduced to stratify the gastric cancer risk. They are used in clinical practice and are either based on the severity of atrophy in various gastric subsites (OLGA) or on intestinal metaplasia (OLGIM). Both systems, discussed further in section 3, are reported to have a positive impact on patient management.

CQ5. How should we classify gastric erosions in the context of chronic gastritis?

Statement 5
Gastric erosions should be reported separately from gastritis. The natural history and clinical significance of gastroduodenal erosions depend on aetiology and need further clarification.

Grade of recommendation: strong
Evidence level: low
Consensus level: 100%

Comment
Gastric erosions are defined as superficial mucosal breaks with a diameter of ≤3 mm or <5 mm. This small size makes it less likely to confound erosions with peptic ulcers which, by definition, penetrate the muscularis mucosae.

Gastric erosions can be detected in the context of *H. pylori* infection but are more frequently caused by intake of mucosal damaging drugs—in particular, aspirin and non-steroidal anti-inflammatory drugs (NSAIDs).

Furthermore, several different morphological forms were noted after eradication of *H. pylori* as (a) flat, (b) raised, (c) haemorrhagic and (d) appearing as bleeding spots with localisation in the antrum in the absence of drugs, possibly owing to hyperacidity after eradication therapy.

From a clinical perspective, the most relevant aspect of erosions is that patients taking NSAIDs and having numerous erosions in the stomach are at increased risk of developing ulcers subsequently.

Few studies on the clinical significance or natural history of gastric or duodenal erosions have been reported. Thus, it is important to conduct a prospective research in which erosions in the stomach and duodenum are separately reported in conjunction with the category of gastritis, which is needed to better understand the natural history of gastric erosions and their potential to progress to ulceration and bleeding. Validated scores for reporting erosions for research purposes should be used.

CQ6. Is *H. pylori* gastritis an infectious disease irrespective of symptom and complications?

Statement 6
*H. pylori* gastritis should be defined as an infectious disease, even when patients have no symptoms and irrespective of complications such as peptic ulcers and gastric cancer.

Grade of recommendation: strong
Evidence level: high
Consensus level: 100%

Comment
*H. pylori* gastritis is an infectious disease and leads to chronic active gastritis of varying severity in virtually all infected subjects.

There is a significant variability in the interindividual expressions of gastric mucosal structural damage and accordingly the associated physiological perturbations also vary.

*H. pylori* gastritis may remain clinically unapparent or evolve into severe complications. The rate of progression is unpredictable. The most severe clinical expression is gastric cancer, which is often incurable by the time of diagnosis.

Cure of *H. pylori* infection leads to healing of the inflamed gastric mucosa, which may return to normal. *H. pylori* eradication may improve or resolve dyspeptic symptoms and usually cures PUD. *H. pylori* gastritis is a disease which can be cured and thus prevent severe complications. If *H. pylori* gastritis has progressed to more severe forms of gastritis, including atrophic gastritis with or without intestinal metaplasia, or severe corpus predominant gastritis, the risk of gastric cancer is increased and eradication of the infection at this stage needs to be integrated with a follow-up strategy.

Section 2 Dyspepsia associated with *H. pylori* infection

CQ7. Does *H. pylori* gastritis cause dyspepsia?

Statement 7
*H. pylori* gastritis is the cause of dyspepsia in a subset of patients.

Grade of recommendation: strong
Evidence level: high
Consensus level: 100%

Comment
A large number of observations support the conclusion that *H. pylori* infection may be a cause of symptoms in a proportion of patients presenting with dyspepsia. First, acute iatrogenic or self-administered infection with *H. pylori* can induce acute dyspeptic symptoms. However, while persistent colonisation virtually always leads to chronic gastritis, in the majority of individuals severe dyspeptic symptoms are transient. Second, most but not all, epidemiological studies show associations between *H. pylori* infection and (uninvestigated) dyspeptic symptoms. The most convincing evidence can be derived from *H. pylori* eradication studies in infected patients with uninvestigated or FD. In these studies, eradication is associated with a small but statistically significant benefit for symptom control over no eradication; the estimated number needed to treat is 14 and in a more recent study the number was 8. At present there are no criteria to predict whether a patient with dyspeptic symptoms will respond to eradication therapy or not. Therefore, the only way in clinical practice is to eradicate the *H. pylori* infection and see whether symptoms resolve or whether additional treatments will be required. The symptomatic gain takes at least 6 months to become significant over no eradication and this has been attributed to the time it takes for gastritis to recover.
CQ8. Should we categorise *H. pylori*-associated dyspepsia as a specific entity?

**Statement 8A**

In *H. pylori*-infected patients with dyspepsia, symptoms can be attributed to *H. pylori* gastritis if successful eradication therapy is followed by sustained symptom remission.

- Grade of recommendation: strong
- Evidence level: high
- Consensus level: 97.4%

**Statement 8B**

*H. pylori*-associated dyspepsia (as in statement 8A) is a distinct entity.

- Grade of recommendation: strong
- Evidence level: moderate
- Consensus level: 92.1%

**Comment**

Based on the Rome III consensus,

FD is defined as “the presence of chronic dyspeptic symptoms (postprandial fullness, early satiation, epigastric pain or burning) without evidence of structural disease (including at upper endoscopy) that is likely to explain the symptoms” (Figure 1). This group was contrasted with those in whom chronic dyspeptic symptoms have an identified organic or metabolic cause, where elimination of that cause or improvement of the disease leads to resolution or improvement of symptoms.

The Rome III consensus mentions a subset of patients with *H. pylori* gastritis as representative of organic dyspepsia if they respond to eradication. Patients with *H. pylori* gastritis in whom symptoms persist despite eradication therapy eliminating the infection were identified as having FD. As mentioned above, eradication therapy studies showed that a subset of *H. pylori*-infected patients with FD derive symptomatic benefit from eradication, with a delay of at least 6 months from cure of the infection.

Based on these considerations, sustained symptom control after successful eradication identifies *H. pylori* as the organic cause of the symptoms in these patients and provides the rationale to consider *H. pylori*-associated dyspepsia as a separate clinical entity. *H. pylori*-infected patients with chronic dyspeptic symptoms and negative endoscopy are now treated and labelled depending on their treatment response as outlined in Figure 1.

CQ9. Is eradication of *H. pylori* infection first-line treatment for improving dyspeptic symptoms?

**Statement 9**

Eradication of *H. pylori* is first-line treatment for *H. pylori*-infected dyspeptic patients.

- Grade of recommendation: strong
- Evidence level: high
- Consensus level: 94.7%

**Comment**

As is apparent from statement 8, there is a group of patients with FD for whom *H. pylori* is considered the cause of their symptoms, and this can be established if eradication is associated with sustained symptom benefit. This scenario is the only one where patients with chronic dyspeptic symptoms and a negative endoscopy can be ‘cured’, albeit with some delay after successful eradication therapy. Moreover, very few effective alternative therapeutic approaches have been proved to have substantial and sustained benefit in FD. Finally, eradication therapy is a short treatment, with acceptable cost–benefit for controlling dyspeptic symptoms, and with other potential benefits for prevention of peptic ulcer and gastric cancer.

Based on these considerations, eradication therapy can be proposed as first-line treatment for *H. pylori*-infected dyspeptic patients, which is in line with a recent management algorithm by the Rome foundation.

CQ10. How effective is *H. pylori* eradication on dyspeptic symptoms—in the short and long term—and how does it compare with other treatments (such as proton pump inhibitors (PPIs))?

**Statement 10**

In *H. pylori*-infected dyspeptic patients, eradication therapy for dyspeptic symptoms is better than placebo and is the preferred option.

- Grade of recommendation: strong
- Evidence level: high
- Consensus level: 97.4%

**Comment**

Eradication therapy studies have confirmed that a subset of *H. pylori*-infected patients with FD is relieved of dyspeptic symptoms by eradication therapy. To date, only a limited number of studies have directly compared eradication therapy with other treatments that are used for FD, such as PPIs or prokinetic therapy. Hence, although the symptomatic gain takes at least 6 months, eradication is the preferred treatment. Future trials should compare eradication with treatment modalities other than placebo in *H. pylori*-infected patients with chronic dyspeptic symptoms and a negative endoscopy.

CQ11. Should patients who remain dyspeptic after successful *H. pylori* eradication be considered to have FD?

**Statement 11**

In some patients with symptomatic relief after eradication therapy, dyspeptic symptoms persist despite eradication therapy. Patients with *H. pylori* gastritis as representative of organic dyspepsia if they respond to eradication. Patients with *H. pylori* gastritis in whom symptoms persist despite eradication therapy eliminating the infection were identified as having FD. As mentioned above, eradication therapy studies showed that a subset of *H. pylori*-infected patients with FD derive symptomatic benefit from eradication, with a delay of at least 6 months from cure of the infection.

Based on these considerations, sustained symptom control after successful eradication identifies *H. pylori* as the organic cause of the symptoms in these patients and provides the rationale to consider *H. pylori*-associated dyspepsia as a separate clinical entity. *H. pylori*-infected patients with chronic dyspeptic symptoms and negative endoscopy are now treated and labelled depending on their treatment response as outlined in Figure 1.
Patients who remain symptomatic after successful H. pylori eradication should be considered to have FD.

Grade of recommendation: weak
Evidence level: moderate
Consensus level: 97.4%

Comment
As indicated in statements 8A and 8B and in agreement with the Rome III criteria,96 2 H. pylori infected dyspeptic patients with negative endoscopy who experience sustained symptom control are labelled as having H. pylori-associated dyspepsia. Conversely, when symptoms do not benefit in the long term from successful eradication, this indicates that H. pylori gastritis did not cause the symptoms in these patients. Consequently, they can keep the label ‘functional dyspepsia’ (figure 1).

Section 3 Diagnosis of gastritis
CQ12. Is it possible to make a diagnosis of atrophy and/or intestinal metaplasia by endoscopy?

Statement 12
Atrophic mucosa and intestinal metaplasia can be accurately detected by image-enhanced endoscopy, after appropriate training.

Grade of recommendation: strong
Evidence level: high
Consensus level: 84.2%

Comment
Conventional endoscopy is, in most hands, an inadequate tool for diagnosing atrophy and intestinal metaplasia and therefore it remains mandatory that a biopsy is carried out, allowing histomorphological assessment of the gastric mucosa according to the Sydney classification.19 20 However, image-enhanced endoscopy has improved the accuracy and reproducibility of endoscopic diagnosis of premalignant gastric lesions. This includes chromoendoscopy,65 high-resolution magnification endoscopy66 67 and image-enhanced endoscopy combined with magnification,15 68–72 (figure 2). These methods are now routinely available in Japan and will be increasingly used worldwide. Adequate evaluation of the stomach mucosa with each of these methods requires appropriate training66 and offers the advantage of targeted biopsies.

CQ13. Is the updated Sydney System appropriate for histological diagnosis of gastritis?

Statement 13
Accurate histological assessment of gastritis requires biopsy sampling of both antrum and corpus.

Grade of recommendation: strong
Evidence level: high
Consensus level: 92.1%

Comment
Premalignant lesions of the stomach may be unevenly distributed. Therefore, accurate histological assessment of gastritis requires biopsy sampling of both antrum and corpus. This may facilitate the classification and grading of preneoplastic gastric lesions.73 Various studies have shown that more extensive biopsy sampling increases the diagnostic yield for identifying patients with premalignant lesions and provides a better overview of the severity and distribution of these lesions.74–76 This also has practical limitations, which led to the updated Sydney System. This provides guidance on the methods of sampling and the histopathological grading of individual abnormalities—in particular, inflammation, gland loss and metaplasia.20 The Sydney System recommends routine

![Figure 2](image-url)
sampling of five gastric biopsy specimens: antrum greater and lesser curvature, incisura and corpus greater and lesser curvature. Specimens need to be put into separate vials and grouped for each site or lesion. The system is widely used; the most common modification being to leave out the separate incisura sample. It is of key importance that separate specimens are obtained from endoscopically visible lesions. The accuracy of image-enhanced endoscopy in trained hands further increases the yield of targeted biopsies.

CQ14. Are grading systems such as OLGA and OLGIM useful for risk stratification?

Statement 14A
Gastric cancer risk correlates with the severity and extent of atrophic gastritis.

- Grade of recommendation: strong
- Evidence level: high
- Consensus level: 94.7%

Statement 14B
Histological staging systems such as OLGA and OLGIM are useful for risk stratification.

- Grade of recommendation: strong
- Evidence level: low
- Consensus level: 97.3%

Comment
Most gastric cancers are triggered by longstanding gastritis, primarily due to Helicobacter pylori infection. This can occur via a multistep pathway of precancerous lesions—in particular, atrophic gastritis, intestinal metaplasia and dysplasia/intraepithelial neoplasia. Various studies confirm an increased gastric cancer risk in patients with premalignant gastric lesions. For instance, a nationwide study from the Netherlands including approximately 98,000 patients with premalignant gastric lesions reported, on average, a 2–3% gastric cancer risk over 10 years. This risk varied with the baseline stage of premalignant lesions, being 0.8%, 1.8%, 3.9% and 32.7% for patients with atrophic gastritis, intestinal metaplasia, mild-to-moderate dysplasia and severe dysplasia, respectively.

These data confirmed the association between presence of premalignant gastric lesions and development of gastric cancer, yet also showed that the risk for developing gastric cancer in an individual with premalignant lesions is nevertheless small (2–6 per 1000 people per year). This necessitates the use of risk stratification methods.

Gastric biopsy sampling can be used to provide the most important information for risk classification. This led to the OLGA staging system. This histological staging system grades patients with gastritis into stages with corresponding gastric cancer risk. Further studies showed that this staging system provides relevant clinical information. Based on the high prevalence of atrophic gastritis in at-risk populations and the limited reproducibility and high interobserver variability in histological diagnosis of atrophic gastritis, a further proposal was made for the OLGIM system based on diagnosis and distribution of intestinal metaplasia.

The interobserver reproducibility was improved for intestinal metaplasia compared with atrophic gastritis, and the correlation between the severities of gastritis remained at least as strong. Subsequent studies with both the OLGA and OLGIM systems showed a higher gastric cancer risk in patients in stage III or IV of OLGA or OLGIM. As a result, upper gastrointestinal surveillance endoscopy should be offered to patients in these subcategories.

CQ15. Are serological tests (pepsinogen I, II, H. pylori antibody) useful for risk stratification?

Statement 15
Sero logical tests (pepsinogen I and II and H. pylori antibody) are useful for identifying individuals at increased risk for gastric cancer.

- Grade of recommendation: strong
- Evidence level: high
- Consensus level: 91.9%

Comment
Serological tests for the diagnosis of chronic gastritis and gastric atrophy have been in use for more than 25 years. These include H. pylori serology (crude antigen with or without additional determination of anti-CagA antibodies) for the diagnosis of gastritis, and serum pepsinogen I and II and gastrin for the diagnosis of gland loss resulting in hypochlorhydria. These tests are usually applied in panels of multiple tests and have been shown to be a useful non-invasive diagnostic tool in an individual patient, and as a population screening and surveillance tool.

A Japanese cohort of 9293 screenees underwent serological assessment by means of H. pylori serology and pepsinogen I and II measurement. The annual progression to gastric cancer was very low in subjects with normal pepsinogens, irrespective of H. pylori status. The annual progression to gastric cancer was substantially higher (3.5–6 per 1000 per year) in individuals with low serum pepsinogen levels, compatible with presence of atrophic gastritis. In the latter group, the incidence of gastric cancer was higher among those with negative H. pylori serology than among those with positive H. pylori serology, which is indicative of progressive and widespread atrophy and metaplasia impairing further H. pylori colonisation. Similar findings were obtained in other studies.

CQ16. When is it appropriate to search and screen for H. pylori gastritis?

Statement 16
Depending on the epidemiological context, it is appropriate to search and screen for H. pylori gastritis at an age before development of atrophic gastritis and intestinal metaplasia.

- Grade of recommendation: strong
- Evidence level: moderate
- Consensus level: 97.3%

Comment
Helicobacter pylori infection is mainly acquired in childhood, up to the age of 12 years, in developed countries mostly by intrafamilial transmission. The bacterium and associated gastritis persist lifelong, unless treated by eradication therapy, or unless end-stage widespread atrophic gastritis and intestinal metaplasia occur. The risk for gastric cancer depends on the grade of gastric atrophy and intestinal metaplasia.

H. pylori eradication can reduce the risk for cancer, but this effect is largely confined to patients without atrophy and metaplasia. In patients with these lesions, H. pylori eradication reduces gastritis, but may not stop further progression to cancer. As a result, cancer can occur more than 10 years after H. pylori eradication treatment.
Section 4 Management of gastritis

CQ17. Should all H. pylori-positive individuals receive eradication therapy?

Statement 17

H. pylori infected individuals should be offered eradication therapy, unless there are competing considerations.

- Grade of recommendation strong
- Evidence level: high
- Consensus level: 100%

Comment

H. pylori is a major human pathogen that causes chronic and progressive gastric mucosal damage and is aetiologically related to peptic ulcer, gastric cancer and gastric atrophy. It is also closely associated with gastric MALT lymphoma, dyspepsia, hyperplastic gastric polyps and idiopathic thrombocytopenic purpura.12-14 H. pylori-positive individuals are also the major reservoir for transmission of the infection.

The decision to eradicate a chronic infection in a society should be based on quantitative data regarding the outcome of untreated infections. H. pylori causes a chronic infection, similar, for example, to asymptomatic syphilis or tuberculosis, and the final outcome for any individual cannot be predicted.105 H. pylori infection differs from many other chronic infectious diseases because it is always transmissible, thus putting others at risk. Because the gastric damage is progressive, the lack of an obvious clinical manifestation at diagnosis has no predictive value for life-time risk to an individual patient, their family or to the community. Benefits of H. pylori eradication for an individual depend in part on the degree and extent of damage that has already occurred and the reversibility of that damage. Potential benefits of eradication include stopping the progression of mucosal damage, stabilisation or reduction in risk of developing gastric cancer, resolution of mucosal inflammation, stabilisation or improvement of gastric mucosal function, return of the normal mechanisms governing acid secretion, cure of H. pylori-related PUD, reduction in risk of gastrointestinal complications of NSAID therapy and prevention of future development of H. pylori-related peptic ulcer.2 5 11 28 46 47 106-113

For society, the benefits include reduction of the reservoir of infected individuals capable of transmitting the infection to others, and avoidance of the costs associated with diagnosis, management and outcomes of H. pylori-related diseases that are prevented. Thus, H. pylori-infected patients should be offered eradication therapy unless there are competing considerations such as comorbidities, re-infection rates in their communities, competing health priorities of society and financial cost. It has to be remembered, however, that there are concerns about the negative impact of eradication therapies on human health, such as increase in allergy or obesity and perturbation of microbiota.116 117

CQ18. What is the optimal timing for H. pylori eradication in asymptomatic subjects?

Statement 18

The maximum benefit of H. pylori eradication is obtained if it is done while the mucosal damage is still non-atrophic.

- Grade of recommendation: strong
- Evidence level: high
- Consensus level: 100%

Comment

H. pylori eradication always confers a benefit by halting progression of gastric mucosal damage, reducing the reservoir of infected individuals and reducing or preventing H. pylori-associated diseases. The maximum benefit of eradication for an individual is obtained if eradication is done while the H. pylori-induced mucosal damage has not progressed beyond the non-atrophic stage. This population is found in countries where gastric cancer is still prevalent and is concentrated in the younger generation. H. pylori eradication of adolescents and young adults has an additional advantage of reducing or preventing transmission of the infection to their children.

As noted above (Section 3), the risk for development of gastric cancer correlates with the extent and severity of atrophic gastritis. It is impossible to define the risk for an individual based on age. Cancer risk in any population relates to the rate of progression of gastric mucosal damage, which is high in populations at high risk of cancer and low in H. pylori-infected populations with a low cancer risk. Thus, while it is possible to identify an average age at which the transition from non-atrophic to atrophic phenotype occurs for any population, one should expect that any age group will contain individuals with a wide range of damage, ranging from uninfected (normal) to advanced atrophy. This emphasises the need for risk stratification based on objective parameters including a validated histological staging system rather than on age, to identify whether eradication treatment is needed or whether the patient might require surveillance.

The incidence of gastric cancer increases with age, which is a surrogate marker for the time required for progression of atrophic gastritis. When atrophic gastritis becomes extensive and severe, the risk increases exponentially. Cancer is the culmination of a multistep process of genetic instability, with cancer cells possessing mutations in coding regions, somatic gene rearrangements and epigenetic changes such as methylation. Current data are consistent with the notion that H. pylori eradication halts the progression of damage and reduces or eliminates the H. pylori-associated events that increase genetic instability in the gastric mucosa. These include infection-associated DNA double-strand breaks,118 impaired DNA mismatch repair,119 aberrant activation-induced cytidine deaminase expression, which induces nucleotide alterations involved in DNA mutations,120 aberrant methylation in a number of gene promoters in the gastric mucosa, including cell growth-related genes, DNA-repair genes, tumour-suppressor genes, the cell adherence gene E-cadherin and CpG islands of microRNA genes121-123 and aberrant microRNA expression.124 H. pylori infection also causes an inflammatory response with mucosal infiltration of acute and chronic inflammatory cells. Cancer risk is increased in relation to the ability of the infecting strain to cause inflammation (eg, those possessing the Cag pathogenicity island). However, all strains cause inflammation, and gastric cancer is associated with infections lacking putative virulence factors. Thus all H. pylori infections should be considered pathogenic and should be eradicated.

Because of the damage and premalignant changes, H. pylori eradication cannot ‘reset the clock’ to zero (ie, no risk) but can stop the progression of risk and stabilise or decrease the subsequent risk.

CQ19. Do we need to adopt eradication regimens according to the geographical area?

Statement 19

Eradication regimens should be based on the best locally effective regimen, ideally using individual susceptibility testing or community antibiotic susceptibility, or antibiotic consumption data and clinical outcome data. The agents available differ in
changes. As noted in Section 3, risk can be stratified or reduction of risk in those with established atrophic prevention for those with non-atrophic gastritis to stabilisation at the time of eradication and ranges from essentially complete cancer depends on the severity and extent of atrophic damage before they become invasive. There may be also a role for cancer immunotherapy to treat premalignant lesions and halt their progression to more advanced lesions.

Eradication of H. pylori reduces the risk of gastric cancer. The degree of risk reduction depends on the presence, severity and extent of atrophic damage at the time of eradication.
Grade of recommendation: strong
Evidence level: high
Consensus level: 100%

Comment
H. pylori infection is the most important cause of gastric cancer as it is estimated that 89% of non-cardia gastric cancer, representing 78% of all cases of gastric cancer, can be attributed to chronic H. pylori infection. Prevention of H. pylori infections removes the primary cause of gastric cancer and will thus reduce the incidence of gastric cancer in that population. The effectiveness of H. pylori eradication for prevention of gastric cancer depends on the severity and extent of atrophic damage at the time of eradication and ranges from essentially complete prevention for those with non-atrophic gastritis to stabilisation or reduction of risk in those with established atrophic changes. As noted in Section 3, risk can be stratified using a variety of approaches, such as one of the validated histological stratification systems (eg, OLGA or OLGIM), and H. pylori eradication can stabilise risk and halt the progression of risk. Prevention of acquisition of H. pylori infections and eradication of the infection before the development of atrophic changes are forms of primary prevention. Secondary prevention involves identification and surveillance of those at risk in order to remove intraepithelial lesions and early gastric cancer(s) before they become invasive. There may be also a role for cancer immunotherapy to treat premalignant lesions and halt their progression to more advanced lesions.

CQ21. Should the outcome of eradication therapy always be assessed (ie, test for cure)? Statement 21
The outcome of eradication therapy should always be assessed, preferably non-invasively.
Grade of recommendation: strong
Evidence level: high
Consensus level: 100%

Comment
Failure of eradication is common and allows the mucosal damage to progress, and so eradication should always be confirmed, preferably using a non-invasive test such as a urea breath test or a validated monoclonal-based stool antigen test. For patients requiring endoscopic follow-up, such as after endoscopic removal of a gastric adenoma, histological assessment can be used. Confirmation of cure also provides an early warning system for the increasing antibiotic resistance in a population that will manifest as increasing rates of treatment failure.

CQ22. Which patients need long-term follow-up after eradication? Statement 22
H. pylori eradication may not completely eliminate the risk of gastric cancer. Patients who remain at risk, as defined by the extent and severity of atrophy, should be offered endoscopic and histological surveillance.
Grade of recommendation: strong
Evidence level: high
Consensus level: 97.3%

Comment
Long-term follow-up such as regular endoscopic surveillance should be based on estimating the risk of developing gastric cancer after H. pylori eradication (ie, risk stratification). Cancer risk correlates with the extent and severity of atrophic gastritis and risk stratification should be confirmed using a validated histological risk scoring systems such as OLGA or OLGIM. In areas with proven expertise in endoscopic scoring, a system such as that of Kimura and Takemoto can be used initially, although histological confirmation is still recommended. Patients whose H. pylori infection was diagnosed non-invasively (eg, urea breath test or stool antigen) should be considered for histological assessment. These patients should include those within the age range in which atrophic changes are common in that population and those with a history of gastric ulcer as well as those with a pretreatment serum pepsinogen I of ≤70 ng/mL and a pepsinogen I:II ratio ≤3. All those at especially high risk, including those at risk for intraepithelial neoplasia (dysplasia) or early gastric cancer, are candidates for regular endoscopic surveillance.

DISCUSSION
The global consensus meeting on H. pylori gastritis has set a new landmark for gastritis, which has continued to be an ill-conceived clinical entity placed between a histological picture and upper abdominal symptoms. In spite of the fact that gastritis had been long recognised as an important clinical entity, generations of gastroenterologists have neglected the importance of treatment of this nosological entity. Rudolf Schindler described chronic gastritis as a serious disease and a precursor of gastric cancer and considered their relationship as being of outstanding importance in the fight against gastric cancer.

The discovery of H. pylori has revolutionised the pre-existing concepts of gastritis by assigning a specific aetiology to this entity underlying PUD and gastric cancer. The majority of these serious conditions are manifestations developed on the background of chronic gastritis caused by a unique infectious agent, H. pylori. For PUD, guidelines unanimously recommend eradication as the primary treatment for those with positive H. pylori tests. However, there has been no consensus on how and when to manage individuals with H. pylori gastritis itself, which is crucial to the efficiency of gastric cancer prevention because most patients with chronic gastritis may remain asymptomatic until the appearance of severe complications. Furthermore, both gastritis and duodenitis were recognised as important causes of upper gastrointestinal bleeding,
these conditions now that anti-thrombotic therapies are increasingly being used.

To further compromise the concept of gastritis as a significant clinical entity, the term ‘gastritis’ has historically, but wrongly, been used as a substitute for a clinical diagnosis of FD. Historical studies, however, failed to demonstrate a significant association between histological findings of gastritis and the dyspeptic symptom complex.\(^1\)\(^2\) Hence, a potential pathogenic role for \textit{H. pylori} in causing dyspeptic symptoms was initially considered doubtful and its eradication in FD controversial.\(^3\)\(^4\) Meta-analysis of a large number of controlled trials with longer follow-up confirmed that eradication of \textit{H. pylori} in patients with FD conveys a small but statistically significant benefit.\(^5\) Consequently, dyspepsia attributable to \textit{H. pylori} gastritis involves an underlying organic cause and should be excluded from the FD category. Additionally, ‘dyspeptic’ patients should not automatically be labelled as having ‘gastritis’ without any histological confirmation.

Diagnostic assessment of gastritis has been advanced by the recent introduction of high-resolution endoscopy with image-enhanced modalities, and magnification is now used routinely in major hospitals in Japan. This endoscopic technology allows the identification of mucosal changes (for targeted biopsies) more precisely, leading to more accurate evaluation of cancer risks such as preneoplastic changes. Wider use of this new endoscopic system outside Japan may be limited at present.

The Kyoto consensus meeting focused attention on gastritis in all its clinical expression and dealt with four main topics: classification of gastritis in relation to ongoing ICD revision, FD and \textit{H. pylori} infection, diagnosis of gastritis and the management of gastritis. The methodology of the meeting adopted all modern means for reaching consensus and included an internet-based Delphi method with full access to published data in a completely ‘neutral’ environment.

In summary, the Kyoto meeting proposed an aetiology-based classification for gastritis and concluded that \textit{H. pylori} gastritis is an infectious disease. As such, \textit{H. pylori} gastritis requires treatment whether or not it is associated with symptoms because it represents a condition that may evolve towards serious complications, including peptic ulcer and gastric neoplasia.

Consensus was reached on the existence of a separate category of patients with dyspeptic symptoms that are due to \textit{H. pylori} gastritis. In these patients, eradication therapy is the recommended first-line treatment. Because of the diagnostic problems related to ‘gastritis’, these patients should be labelled as having \textit{H. pylori}-associated dyspepsia and are identified by sustained dyspeptic symptom relief after eradication.

For the diagnosis of gastritis, it was agreed that risk stratification systems such as OLGA and OLGIM are useful as are the serological markers. In view of recent technological advancements, image-enhanced endoscopy should be encouraged for identifying mucosal changes which carry a high risk of developing into gastric neoplasia. Finally, it was recommended that early eradication therapy, ideally before preneoplastic changes occur, should be undertaken. However, the feasibility of implementing this strategy should be regionally tailored. As eradication therapy does not guarantee elimination of the risk of gastric cancer, follow-up should be considered for patients who have preneoplastic conditions.

Although there are still many remaining areas to be discussed, we believe the outcome of the Kyoto consensus meeting presented in this report will improve patient care and will provide a cornerstone for further refinement and research in the area of gastritis.
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Kyoto global consensus report on *Helicobacter pylori* gastritis

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