



Assessment of the digestive system malignancy information in Wikipedia and Baidu Encyclopedia: a longitudinal study

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Background: An increasing number of patients search for medical information on the Internet if they have health problems. The reliability of the online medical information is not yet known. Baidu Encyclopedia and Wikipedia are the most widely used Chinese and English search engines. The quality of the online medical information in these websites needs to be evaluated. We perform this research study to evaluate the quality and timeliness of articles related to digestive system malignancy in articles retrieved from these encyclopedias. A 3-year follow-up was conducted to determine if the quality and timeliness of the articles improved, and comparisons were made between the 2 encyclopedias.

Methods: We conducted a search of Wikipedia and Baidu Encyclopedia based on the classification codes of the International Statistical Classification of Diseases and Related Health Problems (10th revision, version 2016), and evaluated the retrieved articles related to digestive system malignancy using the DISCERN instrument. The update timeliness of these websites were evaluated by calculating the update interval of the articles.

Results: In 2019 and 2022, we retrieved 50 and 52 articles, respectively, from Baidu Encyclopedia, representing an increase of 2 articles and no deleted articles, and 30 and 31 articles, respectively, from Wikipedia, representing an increase of 1 article and no deleted articles. According to the scores calculated using the DISCERN instrument, in both 2019 and 2022, Wikipedia scored higher than Baidu Encyclopedia in Sections 1 and 2, and the difference was statistically significant. The total score of Wikipedia was higher than that of Baidu Encyclopedia, and the difference was statistically significant. The update interval of Wikipedia was shorter than that of Baidu Encyclopedia with better timeliness and statistical significance.

Conclusions: The quality and timeliness of the digestive system malignancy articles on Wikipedia are better than those on Baidu Encyclopedia. The quality of both the Baidu Encyclopedia and Wikipedia articles had improved over the last 3 years. However, there is still no guarantee of the comprehensiveness or reliability of the treatment information obtained from the Internet.

Keywords: Wikipedia; Baidu Encyclopedia; digestive system malignancy; health information; DISCERN instrument

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Introduction

In September 2021, the number of Internet users in the world reached 5.16 billion, of which China, as the most populous country in the world, accounts for 18.2% (940 million) (1,2). Due to the rise and rapid development of the Internet, its convenience, and the immense amount of information available, it has gradually become the main source from which people obtain information. A study found that 87.8% of scoliosis patients searched the Internet for health-related information (3), and >50% of United States Internet users search for Internet-based medical information (4,5). As these studies show, the Internet has become an important health-information source for patients. An increasing number of people search for disease information on the Internet, but the accuracy and reliability of this medical information has yet to be verified (6,7).

Wikipedia is a web-based encyclopedia that contains close to 6 million articles in English (8-10). It provides valuable disease information. Previous studies have compared search engines and shown that medical sources from Wikipedia are more reliable than others sources (9,11); however, online articles still contain more errors than peer-reviewed sources (12). Baidu Encyclopedia, China's version of Wikipedia (13), publishes more than 16 million articles in Chinese. Wikipedia and Baidu Encyclopedia are the most widely used English and Chinese search engine websites, respectively (14-16); however, the quality of the medical information contained on these websites has not yet been examined.

Malignancies originating from digestive system are the common malignant tumors in human beings. This study sought to evaluate the quality and timeliness of medical information related to digestive system malignancy retrieved from Wikipedia and Baidu Encyclopedia. Due to the high frequency of updates on the Internet, we were of the view that 3 years could be used as an extended period to assess changes in the information over a long interval. A longitudinal study is one that repeats the same or same group of subjects over a relatively long period of time. We monitored Wikipedia and Baidu Encyclopedia over a 3-year period to compare whether the information on these search engines improved over that time. Our findings will

help people determine the reliability of online encyclopedia entries, and help patients to avoid medical issues that could arise if they rely on unreliable information on the websites.

Methods

Data sources

The articles involved in this study were all obtained from Wikipedia (8) and Baidu Encyclopedia (13). For the 3-year follow-up period, the initial data collection period ran from June 20, 2019 to July 1, 2019, and the final data collection period ran from June 20, 2022 to July 1, 2022. A period of 3 years is an acceptable and widely used length for a follow-up period (17-19); thus, we chose 3 years as the follow-up time for the comparison.

Retrieval of liver disease articles

The International Statistical Classification of Diseases and Related Health Problems (10th revision, version 2016; ICD-10) is the diagnostic classification criteria for all clinical and research purposes. The ICD sets uniform diagnostic and classification criteria for all health-related diseases. In the ICD-10, digestive system malignancy (i.e., malignant neoplasms of digestive organs) are classified as neoplasms in Chapter II, with categories ranging from C15 to C26 (20). Based on the diagnostic and classification codes provided by the ICD-10, this study investigated articles and entries on Wikipedia and Baidu Encyclopedia. All the ICD-10 classification code titles for the malignant neoplasms of digestive organs were used for the retrieval. Entries without search results were excluded from the study. Search terms on these websites are listed in [Tables S1-S4](#), respectively. A proportion of the available search results was recorded and analyzed.

Assessment of the quality of the research articles

The DISCERN instrument, which is a tool for judging the quality of health information on treatment choices, was used to assess the quality of the articles retrieved from Wikipedia and Baidu Encyclopedia (21); however, its actual

function is a matter of debate. Some scholars have argued that the original version of the DISCERN instrument is not suitable for evaluating Wikipedia articles (22,23); however, a great deal of recent research has still used the DISCERN instrument to evaluate the quality of online Wikipedia articles (15,16). Thus, in the absence of a better tool, the DISCERN instrument was considered an appropriate tool for evaluating the quality of the Wikipedia online articles.

The DISCERN instrument comprises 16 questions that are rated on a 5-point scale (on which 1 = definitely no, and 5 = definitely yes). The testable questions are divided into 3 sections. Section 1 (Questions 1 to 8) assesses the reliability of a paper, Section 2 (Questions 9 to 15) focuses on the quality of the treatment information, and Section 3 (question 16) evaluates the overall quality of the articles (21). The higher DISCERN score, the better the quality of the article. Overall, a total DISCERN score can range from 16 to 80, and based on the total score, the articles are categorized as very poor (a score of 16–26), poor (a score of 27–38), fair (a score of 39–50), good (a score of 51–62), and excellent (a score of 63–80) (15,16).

In this study, 4 authors evaluated the quality of the articles. All of the authors were surgeons specializing in general surgery with years of practice experience. They were capable of professionally evaluating the medical-related information provided in the articles retrieved from Wikipedia and Baidu Encyclopedia. Of the 4 authors, 3 used the DISCERN instrument to evaluate the articles retrieved from Baidu Encyclopedia and Wikipedia. The discrimination scores were determined by discussion, after which, all the authors agreed on the final score. If a consensus was unable to be reached during the discussion, the 4th author, who was the most senior, made the final determination.

Timeliness of the updated articles

We planned to assess the timeliness of the articles by analyzing the time interval between updates, which reflects the update frequency of the webpages. The update interval was calculated as the date interval between the update date and the date on which we performed the search. In 2019, the update interval was calculated as the interval between the updated date and July 1, 2019. In 2022, the update interval was calculated as the date interval between the updated date and July 1, 2022. We compared the update interval of each article to evaluate the update timeliness of the article retrieved from Wikipedia or Baidu Encyclopedia.

Statistical analysis

SPSS software (version 26.0) was used for the statistical analysis. The samples with a normal distribution were analyzed by an independent sample *t*-test and a Welch correction or a paired sample *t*-test. The samples without a normal distribution were analyzed using a non-parametric test. A P value <0.05 was considered statistically significant. GraphPad Prism version 9 software (GraphPad Prism Software Inc) was used for figure production and rendering.

Results

Retrieval of liver disease articles

Malignant neoplasms of digestive organs are classified as Chapter II in ICD-10 (version 2016). They are divided into 12 categories (C15–C26) according to the pathogenic sites or organs, and there is a total of 109 disease items. Through the search, only a portion of the disease items could be retrieved in relevant article, while some other items may be retrieved to more than one relevant article. We included all these relevant articles in this study.

In 2019 and 2022, we retrieved a total of 50 and 52 articles, respectively, from Baidu Encyclopedia, representing an increase of 2 articles and no deleted articles, and 30 and 31 articles, respectively from Wikipedia, representing an increase of 1 article and no deleted articles (see *Table 1*). In terms of quantity, the number of articles on both websites increased, and more articles were retrieved from Baidu Encyclopedia than Wikipedia.

Evaluation of the quality of articles

In the absence of any better evaluation tool, the DISCERN instrument was used to score the articles included in this study. According to the design features of the DISCERN instrument, 3 scores can be obtained for Sections 1, 2, and 3, and the total score is calculated by summing up the scores for each section (see *Figure 1*). In the horizontal comparison, the score of Wikipedia in Section 1 was significantly higher than that of Baidu Encyclopedia in both 2019 and 2022, and the difference was statistically significant (19.07±0.90 *vs.* 15.24±0.62, P<0.001 in 2019; 19.65±0.99 *vs.* 15.87±0.67, P<0.0001 in 2022, respectively). In Sections 2 and 3, there were no significant statistically significant differences between Wikipedia and Baidu Encyclopedia in 2019 or 2022. Overall, Wikipedia's total scores were significantly higher than Baidu Encyclopedia's total scores in 2019

Table 1 The proportion of the available search results in Baidu Encyclopedia and Wikipedia in 2019 and 2022

ICD-10 category	Articles included in the ICD-10 classification (n=109)	Baidu Encyclopedia articles in 2019 (n=50)	Wikipedia articles in 2019 (n=30)	Baidu Encyclopedia articles in 2022 (n=52)	Wikipedia articles in 2022 (n=31)
C15 malignant neoplasm of esophagus	9	3	1	3	1
C16 malignant neoplasm of stomach	22	10	3	11	3
C17 malignant neoplasm of small intestine	6	3	2	3	2
C18 malignant neoplasm of colon	16	5	1	5	1
C19 malignant neoplasm of rectosigmoid junction	2	1	0	1	1
C20 malignant neoplasm of rectum	2	1	0	1	0
C21 malignant neoplasm of anus and anal canal	8	3	1	3	1
C22 malignant neoplasm of liver and intrahepatic bile ducts	12	7	7	8	7
C23 malignant neoplasm of gallbladder	1	1	1	1	1
C24 malignant neoplasm of other and unspecified parts of biliary tract	12	5	2	5	2
C25 malignant neoplasm of pancreas	15	8	8	8	8
C26 malignant neoplasm of other and ill-defined digestive organs	4	3	4	3	4

ICD-10, International Statistical Classification of Diseases and Related Health Problems 10th Revision.

and 2022, and the difference was statistically significant (34.03 ± 1.99 vs. 28.38 ± 1.11 , $P=0.02$ in 2019; 35.42 ± 2.19 vs. 29.5 ± 1.26 , $P=0.003$ in 2022, respectively) (see *Table 2*). Thus, the quality of articles from Wikipedia was better than the quality of articles from Baidu Encyclopedia in 2019 and 2022.

We classified the included articles according to their DISCERN scores. Among the articles from Baidu Encyclopedia, 6 articles were evaluated to be of fair quality, 23 of poor quality, and 21 of very poor quality in 2019, while 9 articles were evaluated to be of fair quality, 21 of poor quality, and 22 of very poor quality in 2022. Among the articles from Wikipedia, 4 articles were evaluated to be of good quality, 5 of fair quality, 13 of poor quality, and 8 of very poor quality in 2019, while 5 articles were evaluated to be good quality, 5 of fair quality, 13 of poor quality, and 8 of very poor quality in 2022. Thus, a vertical comparison was performed to find out whether the quality of the articles on the 2 websites improved over the 3-year period of updates. The Section 1 score in 2022 was significantly higher than that in 2019 for both websites, and the difference

was statistically significant (15.87 ± 0.67 vs. 15.24 ± 0.62 , $P=0.001$ in Baidu Encyclopedia; 19.65 ± 0.99 vs. 19.07 ± 0.90 , $P<0.0001$ in Wikipedia). The results for the Section 2 scores were similar (11.88 ± 0.62 vs. 11.46 ± 0.55 , $P=0.002$ in Baidu Encyclopedia; 13.45 ± 1.13 vs. 12.93 ± 1.06 , $P=0.004$ in Wikipedia, respectively). In relation to the Section 3 score, there was no statistically significant difference between 2019 and 2022. Overall, the total score in 2022 was significantly higher than that in 2019, and the difference was statistically significant (29.5 ± 1.26 vs. 28.38 ± 1.11 , $P<0.001$ in Baidu Encyclopedia; 35.42 ± 2.19 vs. 34.03 ± 1.99 , $P<0.0001$ in Wikipedia) (see *Table 3*).

Timeliness of articles

The time interval between updates represents the timeliness of the article. To compare the timeliness of the articles from Baidu Encyclopedia and Wikipedia, we recorded and followed up the update intervals of the 2 websites in 2019 and 2022 (see *Figure 2*). In 2019, the mean update interval for Baidu Encyclopedia articles was 970.88 days, while the

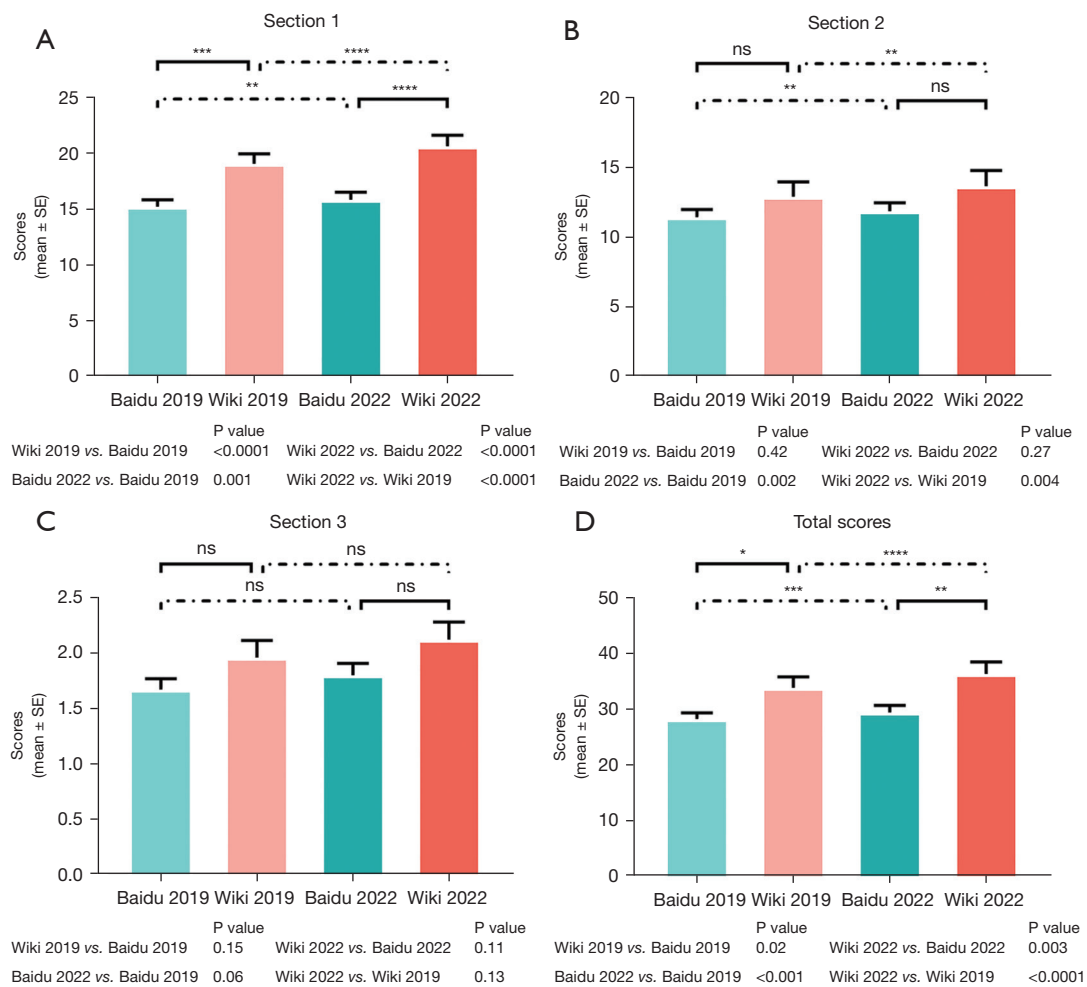


Figure 1 The DISCERN scores of articles from Baidu Encyclopedia and Wikipedia on digestive system malignancy in 2019 and 2022. *, P<0.05, **, P<0.01, ***, P<0.001, ****, P<0.0001. Baidu 2019, Baidu Encyclopedia articles in 2019; Baidu 2022, Baidu Encyclopedia articles in 2022; Wikipedia 2019, Wikipedia articles in 2019; Wikipedia 2022, Wikipedia articles in 2022; ns, no significant difference.

Table 2 Horizontal comparison of DISCERN scores of Baidu Encyclopedia and Wikipedia articles on malignant tumors of digestive system origin

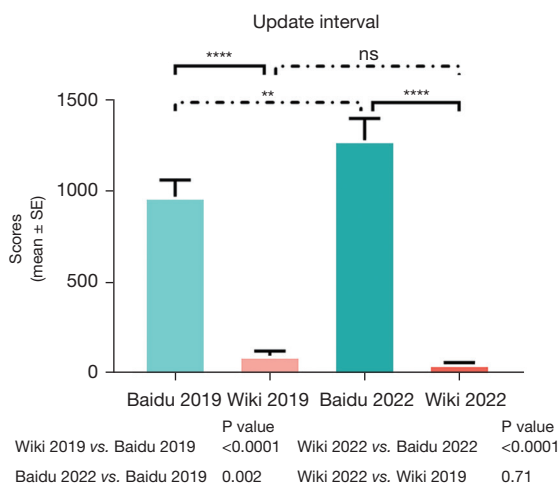
Year, sections of DISCERN	Baidu Encyclopedia, mean ± SE	Wikipedia, mean ± SE	P value
2019			
Section 1	15.24±0.62	19.07±0.90	<0.001
Section 2	11.46±0.55	12.93±1.06	0.42
Section 3	1.68±0.10	2.03±0.16	0.15
Total score	28.38±1.11	34.03±1.99	0.02
2022			
Section 1	15.87±0.67	19.65±0.99	<0.0001
Section 2	11.88±0.62	13.45±1.13	0.27
Section 3	1.75±0.10	2.32±0.20	0.11
Total score	29.5±1.26	35.42±2.19	0.003

SE, standard error.

Table 3 Longitudinal comparison of DISCERN scores of Baidu Encyclopedia and Wikipedia articles on malignant tumors of digestive system origin

Websites, sections of DISCERN	2019, mean ± SE	2022, mean ± SE	P value
Baidu Encyclopedia			
Section 1	15.24±0.62	15.87±0.67	0.001
Section 2	11.46±0.55	11.88±0.62	0.002
Section 3	1.68±0.10	1.75±0.10	0.06
Total score	28.38±1.11	29.5±1.26	<0.001
Wikipedia			
Section 1	19.07±0.90	19.65±0.99	<0.0001
Section 2	12.93±1.06	13.45±1.13	0.004
Section 3	2.03±0.16	2.32±0.20	0.13
Total score	34.03±1.99	35.42±2.19	<0.0001

SE, standard error.

**Figure 2** The update interval of articles from Baidu Encyclopedia and Wikipedia on digestive system malignancy in 2019 and 2022. **, P<0.01, ****, P<0.0001. Baidu 2019, Baidu Encyclopedia articles in 2019; Baidu 2022, Baidu Encyclopedia articles in 2022; Wiki 2019, Wikipedia articles in 2019; Wiki 2022, Wikipedia articles in 2022; ns, no significant difference.

mean update interval for Wikipedia articles was 100.23 days. The update interval for articles in Baidu Encyclopedia was significantly longer than the update interval for articles in Wikipedia, and the difference was statistically significant (970.88±91.05 *vs.* 100.23±24.90, P<0.0001). In 2022, the mean update interval for Baidu Encyclopedia articles was 1,280.05 days, while the mean update interval for Wikipedia

articles was 54.61 days. The update interval for articles in Baidu Encyclopedia was significantly longer than that for articles in Wikipedia, and the difference was statistically significant (1,280.05±119.10 *vs.* 54.61±7.76, P<0.0001). The update interval for Baidu Encyclopedia was significantly longer than that for Wikipedia, which means that the articles on Wikipedia were more timely. However, the update interval for Baidu Encyclopedia in 2022 was shorter than that in 2019 (1,280.05±119.10 *vs.* 970.88±91.05, P=0.002). Thus, after 3 years of follow-up, the timeliness of the Baidu Encyclopedia articles had improved.

Discussion

With the rapid development of technology and science, the Internet has gradually become the most common way for people to search for information. An increasing number of people search for relevant information or even treatment plans on the Internet when they have health problems (5). However, issues arise because the information that the networks provide is uninspected (6). Indeed, previous research has shown that the health information provided by search engines is not credible (24–26). We conducted this study to assess the quality of medical-related information provided to people by Baidu Encyclopedia and Wikipedia, the 2 most popular and widely accessible search engines in Chinese and English, respectively (9). As malignant tumors of the digestive tract are a threat to people's health (27), and the incidence of such tumors has been on the rise in recent

years, we took these tumors as the object of the disease evaluation. We analyzed the quality and improvement of articles on the 2 websites before and after the 3-year follow-up, and also compared the update intervals of the articles over the 3-year period to determine the timeliness of the websites. The results were not satisfactory. Wikipedia had a higher quality of articles than Baidu Encyclopedia; however, most of the articles were of low quality.

The DISCERN instrument contains 3 sections (see *Figure 1*). Section 1 mainly evaluates whether the information contained in an article is reliable and has a clear source. Wikipedia is a good search engine for medical information on the internet (9,14) and is a much more detailed source of information than Baidu Encyclopedia. The sources (e.g., books, literature, or websites) of the data mentioned in most articles, such as morbidity and mortality data, are tagged in most articles. In Wikipedia, the citations can be clearly identified and can be directly linked to a corresponding academic database, such as PubMed. High-quality references guarantee the reliability of an article (28). Over the 3 years of the updates, both websites improved in this area.

Section 2 focuses on the quality of information on treatment choices. In many of the articles we retrieved, treatment was only vaguely mentioned or not mentioned at all. For oncological diseases, most articles only described surgical treatment, and there were few references to radiotherapy, chemotherapy, or targeted therapy. However, studies have shown that for gastrointestinal tumors, chemoradiotherapy is also an effective treatment (29). For liver cancer, in addition to surgery, transarterial chemoembolization (TACE) is also a possible option. Beyond that, chemotherapy drugs, such as sorafenib and regorafenib, and programmed cell death protein 1 (PD-1) targeting drugs can be used as treatments (30). Such omissions will seriously affect patients' understanding of the treatment of diseases, and may be misleading and may even cause conflicts between doctors and patients (31). Both websites scored low on this section, but both had improved after the 3-year follow-up period.

Section 3 provides a general evaluation of the article. No difference was found in the scores of the 2 websites, which were both low. Additionally, the 2 websites showed no significant improvement over time. Wikipedia scored higher in all 3 sections and the total score, indicating that articles from Wikipedia were of higher quality than those from Baidu Encyclopedia. The articles on both websites

improved the standardization of the data cited, and the quality of the treatment choices, which is of most concern to patients. The total scores had increased; however, the scores remained low, and the reliability of the articles were still not ideal.

During the search process, we also found that the Wikipedia articles were illustrated by a large number of accurate pictures. Some of the images could even be considered specialist and might be difficult for non-medical readers to understand. Additionally, Wikipedia is not a dependable source for medical students (22,32). Conversely, Baidu Encyclopedia articles had few illustrations, and while most were easy to understand, the accuracy was relatively poor, and many of the pictures were old.

Wikipedia's information framework is very clear, and similar search terms are combined. A table or tree diagram is designed for a class of diseases with jump links for related entries (33,34). Such features increase the readability of articles. Baidu Encyclopedia had many similar entries, some of which refer to different Chinese names for the same disease. Thus, the Baidu Encyclopedia articles were repetitive, and this may also explain why Baidu Encyclopedia had a larger number of articles than Wikipedia. The website interface of Wikipedia is concise and clear, while keywords in Baidu Encyclopedia will be highlighted in the texts. Both search engines have their own advantages.

Over the course of 3 years, we found that Wikipedia updates its articles quite frequently, even several times a day. Some of these updates reflected modifications to the latest guidelines, and some were corrections to words or even spelling and grammar. Baidu Encyclopedia did a poor job in updating information, and some articles were not updated at all during the entire follow-up period.

Websites such as Baidu Encyclopedia and Wikipedia have a wide audience. Information provided to the general public should not be riddled with errors or irregularities. Patients' therapeutic effect and prognosis will be affected by the wrong information. Unfortunately, as noted above, inaccuracies in expression, irregular citations, and a lack of treatment-related advice are widespread. The Internet is not yet a reliable source of medical information. In order to reduce the negative impact of inaccurate information in Wikipedia and Baidu Encyclopedia, website maintainers should update and correct articles in a timely manner. The professional qualifications of the authors of the articles should be more strictly checked. To improve this situation,

we suggest that the websites establish a strict review process for professional articles and tighten the qualification process for article authors. More professionals need to be recruited to participate in the writing of professional articles. Baidu Encyclopedia launched the rainbow project on December 9, 2012, and since then, all medical online entries can only be edited and revised by certified medical personnel. This has increased the quality of the provided health information (35). Active references to progressive diagnosis and treatment plans or guidelines are also urgently needed. Regular updates should be provided to ensure the timeliness of the articles. Further, individual differences were found in the occurrence and development of the disease in each patient; thus, the Internet cannot replace clinicians. Reliable professional advice should be sought directly from medical personnel (36). We hope that in the future, hospitals will not only be responsible for treating people when they become ill, but will also be responsible for providing accurate and accessible health education to the public before illness occurs.

This study had some limitations. First, digestive tract malignancies are only one of the many diseases that threaten human health, and thus are not fully representative of all types of diseases. Second, in the study of the update time interval, the selection of different time nodes may have affected the analysis. The results need to be verified by more follow-up studies. Third, it is still controversial as to whether the DISCERN instrument can be used as an effective evaluation method. Better evaluation tools are needed that are recognized by the public for future studies.

In conclusion, the quality and timeliness of articles on gastrointestinal malignancies on Wikipedia are better than those on Baidu Encyclopedia. The quality of articles on both Baidu Encyclopedia and Wikipedia articles have improved over the past 3 years. However, there is still no guarantee of the comprehensiveness or reliability of any treatment information obtained from the Internet. Thus, patients should consult a medical professional directly.

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Footnote

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at <https://atm.amegroupp.com/article/view/10.21037/atm-22-4435/coif>). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Table S1 Scores of Baidu Encyclopedia in 2019

ICD-10	Search terms in Chinese	URL	Section 1	Section 2	Section 3	Total score
C15.051	shi dao ai	https://baike.baidu.com/item/%E9%A3%9F%E9%81%93%E7%99%8C/9264898	20	20	3	43
C15.301	shi guan ai	https://baike.baidu.com/item/%E9%A3%9F%E7%AE%A1%E7%99%8C/957242	12	10	1	23
C15.901	yuan fa xing shi dao ai	https://baike.baidu.com/item/%E5%8E%9F%E5%8F%91%E6%80%A7%E9%A3%9F%E9%81%93%E7%99%8C/7338836	14	13	2	29
C16.001	ben men ai	https://baike.baidu.com/item/%E8%B4%B2%E9%97%A8%E7%99%8C/5242891	11	10	1	22
C16.002	shi guan ai & ben men ai	https://baike.baidu.com/item/%E9%A3%9F%E7%AE%A1%E7%99%8C%E5%8F%8A%E8%B4%B2%E9%97%A8%E7%99%8C/3541750	8	7	1	16
C16.301	wei dou xian ai	https://baike.baidu.com/item/%E8%83%83%E7%AA%A6%E8%85%BA%E7%99%8C/9969221	10	12	2	24
C16.402	you men guan ai	https://baike.baidu.com/item/%E5%B9%BD%E9%97%A8%E7%AE%A1%E7%99%8C/8518982	8	7	1	16
C16.501	wei xiao wan ai	https://baike.baidu.com/item/%E8%83%83%E5%B0%8F%E5%BC%AF%E7%99%8C	8	7	1	16
C16.801	ben men wei di ai	https://baike.baidu.com/item/%E8%B4%B2%E9%97%A8%E8%83%83%E5%BA%95%E7%99%8C	9	9	1	19
C16.901	can wei ai	https://baike.baidu.com/item/%E6%AE%8B%E8%83%83%E7%99%8C	18	11	2	31
C16.902	wei ai	https://baike.baidu.com/item/%E8%83%83%E7%99%8C/807868	20	19	3	42
C16.906	zao qi wei ai	https://baike.baidu.com/item/%E6%97%A9%E6%9C%9F%E8%83%83%E7%99%8C	14	14	2	30
C16.907	pi ge wei	https://baike.baidu.com/item/%E7%9A%AE%E9%9D%A9%E8%83%83	15	7	1	23
C17.001	shi er zhi chang ai	https://baike.baidu.com/item/%E5%8D%81%E4%BA%8C%E6%8C%87%E8%82%A0%E7%99%8C	13	12	1	26
C17.101	xiao chang e xing zhong liu	https://baike.baidu.com/item/%E5%B0%8F%E8%82%A0%E6%81%B6%E6%80%A7%E8%82%BF%E7%98%A4	8	7	1	16
C17.901	xiao chang ai	https://baike.baidu.com/item/%E5%B0%8F%E8%82%A0%E7%99%8C	18	10	1	29
C18.002	mang chang ai	https://baike.baidu.com/item/%E7%9B%B2%E8%82%A0%E7%99%8C/10599695	11	7	1	19
C18.101	lan wei ai	https://baike.baidu.com/item/%E9%98%91%E5%B0%BE%E7%99%8C/5627840	8	7	1	16
C18.701	yi zhaung jie chang ai	https://baike.baidu.com/item/%E4%B9%99%E7%8A%B6%E7%BB%93%E8%82%A0%E7%99%8C	16	9	1	26
C18.902	jie chang ai	https://baike.baidu.com/item/%E7%BB%93%E8%82%A0%E7%99%8C	15	15	2	32
C18.951	da chang ai	https://baike.baidu.com/item/%E5%A4%A7%E8%82%A0%E7%99%8C	17	14	2	33
C19. 51	jie chang zhi chang ai	https://baike.baidu.com/item/%E7%BB%93%E8%82%A0%E7%9B%B4%E8%82%A0%E7%99%8C/4737005	16	17	3	36
C20.01	zhi chang ai	https://baike.baidu.com/item/%E7%9B%B4%E8%82%A0%E7%99%8C/1133228	16	16	3	35
C21.001	gang men ai	https://baike.baidu.com/item/%E8%82%9B%E9%97%A8%E7%99%8C	18	9	1	28
C21.101	gang guan ai	https://baike.baidu.com/item/%E8%82%9B%E7%AE%A1%E7%99%8C	18	15	2	35
C21.852	gang guan zhi chang ai	https://baike.baidu.com/item/%E8%82%9B%E7%AE%A1%E7%9B%B4%E8%82%A0%E7%99%8C/7684453	15	15	2	32
C22.102	gan nei dan guan xi bao ai	https://baike.baidu.com/item/%E8%82%9D%E5%86%85%E8%83%86%E7%AE%A1%E7%BB%86%E8%83%9E%E7%99%8C	25	18	2	45
C22.201	gan mu xi bao liu	https://baike.baidu.com/item/%E8%82%9D%E6%AF%8D%E7%BB%86%E8%83%9E%E7%98%A4	24	7	1	32
C22.303	gan xue guan rou liu	https://baike.baidu.com/item/%E8%82%9D%E8%A1%80%E7%AE%A1%E8%82%89%E7%98%A4	18	7	1	26
C22.751	gan ai	https://baike.baidu.com/item/%E8%82%9D%E7%99%8C/833095	21	18	2	41
C22.101	dan guan ai	https://baike.baidu.com/item/%E8%83%86%E7%AE%A1%E7%99%8C	16	15	2	33
C22.451	gan rou liu	https://baike.baidu.com/item/%E8%82%9D%E8%82%89%E7%98%A4	17	7	1	25
C22.951	yuan fa xing gan ai	https://baike.baidu.com/item/%E5%8E%9F%E5%8F%91%E6%80%A7%E8%82%9D%E7%99%8C/1385837	17	16	2	35
C23.001	dan nang ai	https://baike.baidu.com/item/%E8%83%86%E5%9B%8A%E7%99%8C/5056251	16	10	2	28
C24.001	dan guan ai	https://baike.baidu.com/item/%E8%83%86%E7%AE%A1%E7%99%8C/5059220	13	12	2	27
C24.004	dan zong guan ai	https://baike.baidu.com/item/%E8%83%86%E6%80%BB%E7%AE%A1%E7%99%8C/2444570	9	7	1	17
C24.006	gan men dan guan ai	https://baike.baidu.com/item/%E8%82%9D%E9%97%A8%E8%83%86%E7%AE%A1%E7%99%8C	22	17	2	41
C24.102	hu fu zhou wei ai	https://baike.baidu.com/item/%E5%A3%B6%E8%85%B9%E5%91%A8%E5%9B%B4%E7%99%8C/6507888	13	9	1	23
C24.901	dan dao ai	https://baike.baidu.com/item/%E8%83%86%E9%81%93%E7%99%8C/1740170	17	12	2	31
C25.001	yi tou ai	https://baike.baidu.com/item/%E8%83%B0%E5%A4%B4%E7%99%8C/9589201	18	11	2	31
C25.101	yi ti ai	https://baike.baidu.com/item/%E8%83%B0%E4%BD%93%E7%99%8C	19	15	2	36
C25.201	yi wei ai	https://baike.baidu.com/item/%E8%83%B0%E5%B0%BE%E7%99%8C	20	10	2	32
C25.401	yi dao su liu	https://baike.baidu.com/item/%E8%83%B0%E5%B2%9B%E7%B4%A0%E7%98%A4/4873386#4	19	7	2	28
C25.402	yi dao ai	https://baike.baidu.com/item/%E8%83%B0%E5%B2%9B%E7%99%8C	10	7	1	18
C25.403	yi dao xi bao lei ai	https://baike.baidu.com/item/%E8%83%B0%E5%B2%9B%E7%BB%86%E8%83%9E%E7%B1%BB%E7%99%8C/4873204	10	7	1	18
C25.405	yi gao xue tang su liu	https://baike.baidu.com/item/%E8%83%B0%E9%AB%98%E8%A1%80%E7%B3%96%E7%B4%A0%E7%98%A4/4873517#8	20	16	3	39
C25.901	yi xian ai	https://baike.baidu.com/item/%E8%83%B0%E8%85%BA%E7%99%8C/2374350	16	11	2	29
C26.051	chang dao ai	https://baike.baidu.com/item/%E8%82%A0%E9%81%93%E7%99%8C/6592376	13	11	2	26
C26.101	pi e xing zhong liu	https://baike.baidu.com/item/%E8%84%BE%E6%81%B6%E6%80%A7%E8%82%BF%E7%98%A4	16	9	1	26
C26.901	wei chang dao ai	https://baike.baidu.com/item/%E8%83%83%E8%82%A0%E9%81%93%E7%99%8C/8312637	17	15	3	35

Table S2 Scores of Baidu Encyclopedia in 2022

ICD-10	Search terms in Chinese	URL	Section 1	Section 2	Section 3	Total score
C15.051	shi dao ai	https://baike.baidu.com/item/%E9%A3%9F%E9%81%93%E7%99%8C/9264898	24	20	3	47
C15.301	shi guan ai	https://baike.baidu.com/item/%E9%A3%9F%E7%AE%A1%E7%99%8C/957242	12	10	1	23
C15.901	yuan fa xing shi dao ai	https://baike.baidu.com/item/%E5%8E%9F%E5%8F%91%E6%80%A7%E9%A3%9F%E9%81%93%E7%99%8C/7338836	14	13	2	29
C16.001	ben men ai	https://baike.baidu.com/item/%E8%B4%B2%E9%97%A8%E7%99%8C/5242891	11	10	1	22
C16.002	shi guan ai&ben men ai	https://baike.baidu.com/item/%E9%A3%9F%E7%AE%A1%E7%99%8C%E5%8F%8A%E8%B4%B2%E9%97%A8%E7%99%8C/3541750	8	7	1	16
C16.301	wei dou xian ai	https://baike.baidu.com/item/%E8%83%83%E7%AA%A6%E8%85%BA%E7%99%8C/9969221	10	14	2	26
C16.402	you men guan ai	https://baike.baidu.com/item/%E5%B9%BD%E9%97%A8%E7%AE%A1%E7%99%8C/8518982	8	7	1	16
C16.501	wei xiao wan ai	https://baike.baidu.com/item/%E8%83%83%E5%B0%8F%E5%BC%AF%E7%99%8C	8	7	1	16
C16.801	ben men wei di ai	https://baike.baidu.com/item/%E8%B4%B2%E9%97%A8%E8%83%83%E5%BA%95%E7%99%8C	9	9	1	19
C16.901	can wei ai	https://baike.baidu.com/item/%E6%AE%8B%E8%83%83%E7%99%8C	18	11	2	31
C16.902	wei ai	https://baike.baidu.com/item/%E8%83%83%E7%99%8C/807868	22	19	3	44
C16.903	wei kui yang ai bian	https://baike.baidu.com/item/%E8%83%83%E6%BA%83%E7%96%A1%E7%99%8C%E5%8F%98	15	7	2	24
C16.906	zao qi wei ai	https://baike.baidu.com/item/%E6%97%A9%E6%9C%9F%E8%83%83%E7%99%8C	16	14	2	32
C16.907	pi ge wei	https://baike.baidu.com/item/%E7%9A%AE%E9%9D%A9%E8%83%83	15	7	1	23
C17.001	shi er zhi chang ai	https://baike.baidu.com/item/%E5%8D%81%E4%BA%8C%E6%8C%87%E8%82%A0%E7%99%8C	13	12	1	26
C17.101	xiao chang e xing zhong liu	https://baike.baidu.com/item/%E5%B0%8F%E8%82%A0%E6%81%B6%E6%80%A7%E8%82%BF%E7%98%A4	8	7	1	16
C17.901	xiao chang ai	https://baike.baidu.com/item/%E5%B0%8F%E8%82%A0%E7%99%8C	18	10	1	29
C18.002	mang chang ai	https://baike.baidu.com/item/%E7%9B%B2%E8%82%A0%E7%99%8C/10599695	11	7	1	19
C18.101	lan wei ai	https://baike.baidu.com/item/%E9%98%91%E5%B0%BE%E7%99%8C/5627840	8	7	1	16
C18.701	yi zhaung jie chang ai	https://baike.baidu.com/item/%E4%B9%99%E7%8A%B6%E7%BB%93%E8%82%A0%E7%99%8C	16	9	1	26
C18.902	jie chang ai	https://baike.baidu.com/item/%E7%BB%93%E8%82%A0%E7%99%8C	15	15	2	32
C18.951	da chang ai	https://baike.baidu.com/item/%E5%A4%A7%E8%82%A0%E7%99%8C	19	16	2	37
C19. 51	jie chang zhi chang ai	https://baike.baidu.com/item/%E7%BB%93%E8%82%A0%E7%9B%B4%E8%82%A0%E7%99%8C/4737005	16	20	3	39
C20.01	zhi chang ai	https://baike.baidu.com/item/%E7%9B%B4%E8%82%A0%E7%99%8C/1133228	19	17	3	39
C21.001	gang men ai	https://baike.baidu.com/item/%E8%82%9B%E9%97%A8%E7%99%8C	18	9	1	28
C21.101	gang guan ai	https://baike.baidu.com/item/%E8%82%9B%E7%AE%A1%E7%99%8C	18	15	2	35
C21.852	gang guan zhi chang ai	https://baike.baidu.com/item/%E8%82%9B%E7%AE%A1%E7%9B%B4%E8%82%A0%E7%99%8C/7684453	15	15	2	32
C22.102	gan nei dan guan xi bao ai	https://baike.baidu.com/item/%E8%82%9D%E5%86%85%E8%83%86%E7%AE%A1%E7%BB%86%E8%83%9E%E7%99%8C	26	18	2	46
C22.201	gan mu xi bao liu	https://baike.baidu.com/item/%E8%82%9D%E6%AF%8D%E7%BB%86%E8%83%9E%E7%98%A4	24	7	1	32
C22.303	gan xue guan rou liu	https://baike.baidu.com/item/%E8%82%9D%E8%A1%80%E7%AE%A1%E8%82%89%E7%98%A4	18	7	1	26
C22.751	gan ai	https://baike.baidu.com/item/%E8%82%9D%E7%99%8C/833095	23	21	3	47
C22.901	gan e xing zhong liu	https://baike.baidu.com/item/%E8%82%9D%E6%81%B6%E6%80%A7%E8%82%BF%E7%98%A4	25	20	3	48
C22.101	dan guan ai	https://baike.baidu.com/item/%E8%83%86%E7%AE%A1%E7%99%8C	17	16	2	35
C22.451	gan rou liu	https://baike.baidu.com/item/%E8%82%9D%E8%82%89%E7%98%A4	17	7	1	25
C22.951	yuan fa xing gan ai	https://baike.baidu.com/item/%E5%8E%9F%E5%8F%91%E6%80%A7%E8%82%9D%E7%99%8C/1385837	19	17	2	38
C23.001	dan nang ai	https://baike.baidu.com/item/%E8%83%86%E5%9B%8A%E7%99%8C/5056251	17	10	2	29
C24.001	gan guan ai	https://baike.baidu.com/item/%E8%83%86%E7%AE%A1%E7%99%8C/5059220	13	12	2	27
C24.004	dan zong guan ai	https://baike.baidu.com/item/%E8%83%86%E6%80%BB%E7%AE%A1%E7%99%8C/2444570	9	7	1	17
C24.006	gan men dan guan ai	https://baike.baidu.com/item/%E8%82%9D%E9%97%A8%E8%83%86%E7%AE%A1%E7%99%8C	24	20	3	47
C24.102	hu fu zhou wei ai	https://baike.baidu.com/item/%E5%A3%B6%E8%85%B9%E5%91%A8%E5%9B%B4%E7%99%8C/6507888	13	9	1	23
C24.901	dan dao ai	https://baike.baidu.com/item/%E8%83%86%E9%81%93%E7%99%8C/1740170	17	12	2	31
C25.001	yi tou ai	https://baike.baidu.com/item/%E8%83%B0%E5%A4%B4%E7%99%8C/9589201	18	11	2	31
C25.101	yi ti ai	https://baike.baidu.com/item/%E8%83%B0%E4%BD%93%E7%99%8C	19	15	2	36
C25.201	yi wei ai	https://baike.baidu.com/item/%E8%83%B0%E5%B0%BE%E7%99%8C	21	11	2	34
C25.401	yi dao su liu	https://baike.baidu.com/item/%E8%83%B0%E5%B2%9B%E7%B4%A0%E7%98%A4/4873386#4	19	7	2	28
C25.402	yi dao ai	https://baike.baidu.com/item/%E8%83%B0%E5%B2%9B%E7%99%8C	10	7	1	18
C25.403	yi dao xi bao lei ai	https://baike.baidu.com/item/%E8%83%B0%E5%B2%9B%E7%BB%86%E8%83%9E%E7%B1%BB%E7%99%8C/4873204	10	7	1	18
C25.405	yi gao xue tang su liu	https://baike.baidu.com/item/%E8%83%B0%E9%AB%98%E8%A1%80%E7%B3%96%E7%B4%A0%E7%98%A4/4873517#8	20	16	3	39
C25.901	yi xian ai	https://baike.baidu.com/item/%E8%83%B0%E8%85%BA%E7%99%8C/2374350	16	12	2	30
C26.051	chang dao ai	https://baike.baidu.com/item/%E8%82%A0%E9%81%93%E7%99%8C/6592376	13	11	2	26
C26.101	pi e xing zhong liu	https://baike.baidu.com/item/%E8%84%BE%E6%81%B6%E6%80%A7%E8%82%BF%E7%98%A4	16	9	1	26
C26.901	wei chang dao ai	https://baike.baidu.com/item/%E8%83%83%E8%82%A0%E9%81%93%E7%99%8C/8312637	17	15	3	35

Table S3 Scores of Wikipedia in 2019

ICD-10	Search terms in English	URL	Section 1	Section 2	Section 3	Total score
C15.901	Esophageal cancer	https://en.wikipedia.org/wiki/Esophageal_cancer	26	25	3	54
C16.101	Stomach cancer	https://en.wikipedia.org/wiki/Stomach_cancer	25	19	3	47
C16.902	Signet ring cell carcinoma	https://en.wikipedia.org/wiki/Signet_ring_cell_carcinoma	20	11	2	33
C16.907	Linitis plastica	https://en.wikipedia.org/wiki/Linitis_plastica	15	7	2	24
C17.001	Duodenal cancer	https://en.wikipedia.org/wiki/Duodenal_cancer	14	9	1	24
C17.901	Small intestine cancer	https://en.wikipedia.org/wiki/Small_intestine_cancer	16	7	1	24
C18.101	Appendix cancer	https://en.wikipedia.org/wiki/Appendix_cancer	24	7	1	32
C21.001	Anal cancer	https://en.wikipedia.org/wiki/Anal_cancer	20	15	2	37
C22.001	Hepatocellular carcinoma	https://en.wikipedia.org/wiki/Hepatocellular_carcinoma	25	24	3	52
C22.102	Cholangiocarcinoma	https://en.wikipedia.org/wiki/Cholangiocarcinoma	23	19	3	45
C22.103	Klatskin tumor	https://en.wikipedia.org/wiki/Klatskin_tumor	16	10	2	28
C22.201	Hepatoblastoma	https://en.wikipedia.org/wiki/Hepatoblastoma	16	10	1	27
C22.303	Angiosarcoma	https://en.wikipedia.org/wiki/Angiosarcoma	13	7	1	21
C22.701	Fibrolamellar hepatocellular carcinoma	https://en.wikipedia.org/wiki/Fibrolamellar_hepatocellular_carcinoma	13	9	1	23
C22.901	Liver cancer	https://en.wikipedia.org/wiki/Liver_cancer	26	23	4	53
C23.001	Gallbladder cancer	https://en.wikipedia.org/wiki/Gallbladder_cancer	23	11	2	36
C24.006	Hilar Cholangiocarcinoma	https://en.wikipedia.org/wiki/Hilar_Cholangiocarcinoma	16	10	2	28
C24.102	Periampullary cancer	https://en.wikipedia.org/wiki/Periampullary_cancer	8	7	1	16
C25.001	Pancreatic cancer	https://en.wikipedia.org/wiki/Pancreatic_cancer	24	20	3	47
C25.401	Pancreatic endocrine tumor	https://en.wikipedia.org/wiki/Neuroendocrine_tumor	27	21	3	51
C25.402	Islet cell carcinoma	https://en.wikipedia.org/wiki/Pancreatic_neuroendocrine_tumor	24	21	3	48
C25.402	Somatostatinoma	https://en.wikipedia.org/wiki/Somatostatinoma	15	10	1	26
C25.403	VIPoma	https://en.wikipedia.org/wiki/VIPoma	18	9	1	28
C25.404	Insulinoma	https://en.wikipedia.org/wiki/Insulinoma	14	12	2	28
C25.405	Glucagonoma	https://en.wikipedia.org/wiki/Glucagonoma	14	8	1	23
C25.901	Gastrinoma	https://en.wikipedia.org/wiki/Gastrinoma	16	10	2	28
C26.051	Gastrointestinal cancer	https://en.wikipedia.org/wiki/Gastrointestinal_cancer	21	7	3	31
C26.851	Gastrointestinal stromal tumor	https://en.wikipedia.org/wiki/Gastrointestinal_stromal_tumor	23	17	3	43
C26.901	Hereditary nonpolyposis colorectal cancer	https://en.wikipedia.org/wiki/Hereditary_nonpolyposis_colorectal_cancer	19	11	2	32
C26.901	Carcinoid	https://en.wikipedia.org/wiki/Carcinoid#Gastrointestinal	18	12	2	32

Table S4 Scores of Wikipedia in 2022

ICD-10	Search terms in English	URL	Section1	Section 2	Section 3	Total score
C15.901	Esophageal cancer	https://en.wikipedia.org/wiki/Esophageal_cancer	28	25	4	57
C16.101	Stomach cancer	https://en.wikipedia.org/wiki/Stomach_cancer	25	19	3	47
C16.902	Signet ring cell carcinoma	https://en.wikipedia.org/wiki/Signet_ring_cell_carcinoma	20	11	2	33
C16.907	Linitis plastica	https://en.wikipedia.org/wiki/Linitis_plastica	15	7	3	25
C17.001	Duodenal cancer	https://en.wikipedia.org/wiki/Duodenal_cancer	14	9	1	24
C17.901	Small intestine cancer	https://en.wikipedia.org/wiki/Small_intestine_cancer	16	7	1	24
C18.101	Appendix cancer	https://en.wikipedia.org/wiki/Appendix_cancer	24	7	1	32
C19.51	Colorectal cancer	https://en.wikipedia.org/wiki/Colorectal_cancer	29	25	3	57
C21.001	Anal cancer	https://en.wikipedia.org/wiki/Anal_cancer	20	15	2	37
C22.001	Hepatocellular carcinoma	https://en.wikipedia.org/wiki/Hepatocellular_carcinoma	26	24	4	54
C22.102	Cholangiocarcinoma	https://en.wikipedia.org/wiki/Cholangiocarcinoma	25	19	4	48
C22.103	Klatskin tumor	https://en.wikipedia.org/wiki/Klatskin_tumor	16	10	2	28
C22.201	Hepatoblastoma	https://en.wikipedia.org/wiki/Hepatoblastoma	16	10	1	27
C22.303	Angiosarcoma	https://en.wikipedia.org/wiki/Angiosarcoma	13	7	1	21
C22.701	Fibrolamellar hepatocellular carcinoma	https://en.wikipedia.org/wiki/Fibrolamellar_hepatocellular_carcinoma	13	9	1	23
C22.901	Liver cancer	https://en.wikipedia.org/wiki/Liver_cancer	29	23	3	55
C23.001	Gallbladder cancer	https://en.wikipedia.org/wiki/Gallbladder_cancer	23	11	3	37
C24.006	Hilar Cholangiocarcinoma	https://en.wikipedia.org/wiki/Hilar_Cholangiocarcinoma	16	10	2	28
C24.102	Periampullary cancer	https://en.wikipedia.org/wiki/Periampullary_cancer	8	7	1	16
C25.001	Pancreatic cancer	https://en.wikipedia.org/wiki/Pancreatic_cancer	24	22	3	49
C25.401	Pancreatic endocrine tumor	https://en.wikipedia.org/wiki/Neuroendocrine_tumor	27	22	4	53
C25.402	Islet cell carcinoma	https://en.wikipedia.org/wiki/Pancreatic_neuroendocrine_tumor	24	21	4	49
C25.402	Somatostatinoma	https://en.wikipedia.org/wiki/Somatostatinoma	15	10	1	26
C25.403	VIPoma	https://en.wikipedia.org/wiki/VIPoma	18	9	2	29
C25.404	Insulinoma	https://en.wikipedia.org/wiki/Insulinoma	14	12	2	28
C25.405	Glucagonoma	https://en.wikipedia.org/wiki/Glucagonoma	14	8	1	23
C25.901	Gastrinoma	https://en.wikipedia.org/wiki/Gastrinoma	16	10	2	28
C26.051	Gastrointestinal cancer	https://en.wikipedia.org/wiki/Gastrointestinal_cancer	21	7	3	31
C26.851	Gastrointestinal stromal tumor	https://en.wikipedia.org/wiki/Gastrointestinal_stromal_tumor	23	18	4	45
C26.901	Hereditary nonpolyposis colorectal cancer	https://en.wikipedia.org/wiki/Hereditary_nonpolyposis_colorectal_cancer	19	11	2	32
C26.901	Carcinoid	https://en.wikipedia.org/wiki/Carcinoid#Gastrointestinal	18	12	2	32