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Review

The 100 most influential manuscripts in gastric cancer: A bibliometric analysis

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HIGHLIGHTS

- The most cited topic was the pathogenesis of gastric cancer relating to Helicobacter Pylori infection.
- The most cited nations were USA (29%) and Japan (28%).
- Reporting of clinical trials has the fastest growing citation rate.
- The most influential papers are not confined to the highest ranking journals.

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ABSTRACT

Background: Bibliometric analysis highlights the key topics and publications which have shaped the understanding and management of Gastric cancer. Here the 100 most cited manuscripts in the field of gastric cancer (GC) are analysed.

Methods: The Thomson Reuters Web of Science database with the search terms 'gastric cancer' or 'gastric carcinoma' or 'stomach cancer' or 'stomach carcinoma' or 'gastroscopy' was used to identify all English language full manuscripts for the study. The 100 most cited papers were further analysed by topic, journal, author, year and institution.

Results: 122,616 eligible papers were returned and the median (range) citation number was 417 (2893 −299). The most cited paper (by Parsonnet) focused on H.Pylori risk and gastric cancer (2893 citations). Cancer Research published the highest number of papers (n = 13, 6901 citations) and The New England Journal of Medicine (NEJM) had the most citations (n = 8, 9358 citations). The country and year with the greatest number of publications were the USA (n = 29), and 1998 (n = 10). The most ubiquitous topic was the pathology of gastric cancer (n = 57) followed by aetiology of gastric cancer (n = 47), and basic science of gastric cancer (n = 44).

Conclusion: The most cited manuscripts highlighted in this study describe the science related to the pathogenesis of GC including surgery and regimens that have resulted in the contemporary understanding and treatment of GC. This work provides the most influential references related to GC and serves as a guide as to what makes a citable paper.

1. Introduction

Gastric cancer (GC) is a significant cause of morbidity and mortality worldwide and there is a growing body of evidence encompassing the pathological, clinical, oncological, radiological and basic science features of the disease. Improvements in the global knowledge base continue apace and underpin better treatments and improved survival.

The establishment of a citation rank list identifies published work that has had the greatest intellectual influence [1]. A citation is received when a publication is referenced by another peer-reviewed article. Work that has the greatest impact on the scientific community is likely to be cited many times. Citation analysis involves ranking and evaluating an article or journal based on the number of citations it receives. In addition to determining the most frequently cited articles, this analysis is also used to rank journals in

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terms of impact [1].

Many medical specialties have utilised the citation rank analysis to identify the most influential papers in their field which includes; trauma and orthopaedic surgery [2], plastic surgery [3], general surgery [4] and oncology [5]. To date, no study has been undertaken to determine the most influential papers in the field of gastric cancer. Analysis of these data provides insight into how our understanding of gastric cancer has developed and how this information has changed our management of the disease. Additionally, this work serves as a reference for the most cited papers in gastric cancer. The aim of this study was to determine the topics and specifically the studies that have been most influential during this time of improved understanding and management of gastric cancer.

2. Methods

A search of the Thomson Reuters Web of Science citation indexing database and research platform was completed using the search terms 'gastric cancer' or 'gastric carcinoma' or 'stomach cancer' or 'stomach carcinoma' or 'gastroscopy'. The returned dataset was filtered to include only English language and full manuscripts and sorted by number of citations; a method initially developed by Paladugu and colleagues [4]. The 100 most cited manuscripts were identified from the large number of manuscripts returned. The dataset was then further evaluated examining title, first and senior author, institution and department of the first author, topic, year of publication and the country of origin. The individual and 5 year impact factors (both for the year 2013) of each journal publishing the manuscripts were recorded.

3. Results

The Web of Science search returned 122,616 full-length, English language papers. Table 1 lists the 100 most cited of these papers [6–105]. The number of citations ranged from 2893 for Parsonnet et al. (Helicobacter-Pylori infection and the risk of gastric carcinoma) [6] to 299 for Fukushige et al. (Localization of a

Table 1
The top 100 cited paper in gastric cancer.

Rank	Citations	First author	Rank	Citations	First author
1	2893	Parsonnet, J [6]	51	416	Kelley, J [56]
2	2002	Uemura, N [7]	52	405	Toyota, M [57]
3	1697	Correa, P [8]	53	404	Siewert, J [58]
4	1485	Nomura, A [9]	54	399	Mayer, B [59]
5	1464	El-Omar, E [10]	55	393	Hansson, L [60]
6	1417	Devesa, S [11]	56	389	Rosivatz, E [61]
7	1276	Bang, Y [12]	57	389	Yasumoto, K [62]
8	1093	Forman, D [13]	58	389	Hohenberger, P [63]
9	937	Bonenkamp, J [14]	59	386	Figueiredo, C [64]
10	894	Guilford, P [15]	60	386	Morson B [65]
11	811	Sakuramoto, S [16]	61	383	Yoo, C [66]
12	782	Ono, H [17]	62	378	Uemura, N [67]
13	774	Houghton, J [18]	63	376	*Japanese Gastric Cancer Association [68]
14	750	Li, Q [19]	64	372	Fukase, K [69]
15	749	Cuschieri, A [20]	65	370	*Japanese Gastric Cancer Association [70]
16	733	Crew, K [21]	66	367	Hofmann, M [71]
17	729	Van Cutsem, E [22]	67	361	Xia, L [72]
18	726	Forman, D [23]	68	357	Nakajima, T [73]
19	717	Ristimaki, A [24]	69	356	Hundahl, S [74]
20	711	Watanabe, T [25]	70	353	Wang, T [75]
21	711	Siewert, J [26]	71	352	Correa, P [76]
22	687	Wong, B [27]	72	350	Dent, D [77]
23	666	Bonekamp, J [28]	73	349	Sasako, M [78]
24	649	Becker, K [29]	74	349	Songun, I [79]
25	641	Koizumi, W [30]	75	346	Machado, J [80]
26	611	Parsonnet, J [31]	76	344	Shimoyama, Y [81]
27	579	Maeda, K [32]	77	341	Farrow, D [82]
28	572	Cuschieri, A [33]	78	341	Vaughn, T [83]
29	563	Huang, J [34]	79	336	Martin, H [84]
30	554	El-Omar, E [35]	80	334	Machado, J [85]
31	554	Howson, C [36]	81	334	Maruyama, K [86]
32	523	Wagner, A [37]	82	333	Yang, L [87]
33	518	Lu, C [38]	83	328	Sakamoto, H [88]
34	517	Pyrhonen, S [39]	84	321	Ichihara, F [89]
35	514	Mirvish, S [40]	85	319	Oka, S [90]
36	506	Han, H [41]	86	316	Honda, S [91]
37	502	Petrocca, F [42]	87	316	Gravalos, C [92]
38	488	Fuchs, C [43]	88	311	Ernst, P [93]
39	468	Hartgrink, H [44]	89	311	Earle, C [94]
40	467	Aird, I [45]	90	310	Noguchi, Y [95]
41	462	Murad, A [46]	91	308	Tanner, M [96]
42	455	Glimelius, B [47]	92	307	Engel, L [97]
43	447	Wanebo, H [48]	93	306	Fleisher, A [98]
44	444	Sakata, Y [49]	94	305	Yasui, W [99]
45	442	Huscher, C [50]	95	304	Imai, S [100]
46	437	Webb, P [51]	96	303	Yonemura, Y [101]
47	436	Myeroff, L [52]	97	303	Leung, S [102]
48	427	Ming, S [53]	98	302	Roder, J [103]
49	418	Haenszel, W [54]	99	302	Takaishi, S [104]
50	417	Park, K [55]	100	299	Fukushige, S [105]

Novel v-erbB-Related Gene, c-erbB-2, on Human Chromosome 17 and Its Amplification in a Gastric Cancer Cell Line) [105]. The oldest manuscript featured in the top 100 was by Aird et al. (A relationship between cancer of stomach and the ABO blood groups) and published in 1953 [45]. The most recent manuscripts were published by the Japanese Gastric Cancer Association in 2011 and looked at the classification and treatment of gastric cancer [68,70].

The 100 most influential papers were across 36 journals with the number of manuscripts per journal ranging from 1 to 13 (Table 2). Although Cancer Research published the most papers (n = 13 and 6901 citations), The New England Journal of Medicine (NEJM) had the most citations (n = 8 and 9358 citations). The NEJM also had the highest impact factor (54.420) and 5 year impact factor (50.810).

The country with the greatest number of publications in the top 100 was the United States of America (USA) with 29 publications followed by Japan with 28 publications (Fig. 1). The National Cancer Institute Bethesda had the highest amount of citations with 3605 and was the joint highest institution for number of publications in the top 100 with 4 manuscripts (Table 3). Ten authors had 2 first author publications in the top 100. Professor Julie Parsonnet, George DeForest Barnett Professor in Medicine, Stanford University had the highest volume of citations with 3504. This was followed by Naomi Uemura, Director of the National Center for Global Health and Medicines Kohnodai Hospital in Ichikawa had 2380 citations and Professor Pelayo Correa, Anne Potter Wilson Chair in Medicine and Professor of pathology, Microbiology and Immunology, Vanderbilt University Medical Center had 2049 citations. Manuel Sobrinho-Simões, Professor of Cancer biology at the Institute of molecular Pathology and Immunology of the University of Porto (Ipatimup) had 3 senior author publications in the top 100 with 1066 citations. Despite this, the senior author with the most citations was Professor Richard K Sibley (2893), Professor of Pathology, Stanford School of Medicine for his paper 'Helicobacter-Pylori infection and the risk of gastric carcinoma' [6].

A possible limitation of this type of study is that historical manuscripts may accrue a larger number of citations despite lacking the impact of newer publications. To control for this, the number of citations were divided by the number of years since publication to give a citation rate (Table 4) [6,7,10–12,16,21,30,68,70]. The citation rate for the top 10 manuscripts ranged from 255 for Bang et al. (Trastuzumab in combination with chemotherapy versus chemotherapy alone for treatment of HER2-positive advanced gastric or gastro-oesophageal junction cancer (ToGA): a phase 3, open-label, randomised controlled trial) [12] to 81 for Crew et al. (Epidemiology of gastric cancer) [21]. Japan had the most papers in the top 10 citation rate with 5 followed by USA with 4 and South Korea with 1.

Pathology of gastric cancer was the topic most widely studied with 57 of the top 100 papers covering the topic (Table 5). Forty seven manuscripts looked at the aetiology of gastric cancer of which 44 were scientific papers. Thirty papers studied the prognostic basis of clinicopathological factor with 20 papers describing clinical trials of which 19 were covering management. Four papers were consensus statements of guidelines.

Table 2
Journals with the top 100 cited gastric cancer papers.

Journal title	Impact factor as of 2015	5 Year impact factor	Number of manuscripts in the top 100	Number of citations
American Journal of Pathology	4.602	5.330	1	389
Annals of Oncology	6.580	6.470	3	1079
Annals of Surgery	7.188	8.260	4	1934
Annual Review of Microbiology	13.018	15.210	1	311
British Journal of Surgery	5.210	4.960	3	1137
British Medical Journal	14.093	13.511	2	1560
British Journal of Cancer	4.820	5.210	3	1652
Cancer	4.901	5.690	9	4719
Cancer Cell	23.893	26.640	1	502
Cancer Epidemiology, Biomarkers & Prevention	4.324	4.700	3	1060
Cancer Research	9.284	8.958	13	6901
Cell	33.116	34.774	1	750
Clinical Cancer Research	8.193	7.830	2	624
Epidemiologic Reviews	7.333	19.050	1	554
European Journal of Cancer	4.820	5.260	2	755
Gastric Cancer	4.828	3.620	3	1103
Gastroenterology	13.93	12.840	6	2861
Gastrointestinal endoscopy	4.900	5.280	1	319
GUT	13.319	9.990	3	1880
Histopathology	3.301	3.510	1	367
International Journal of Cancer	5.007	5.470	2	697
JAMA	30.387	29.270	1	687
Japanese Journal of Cancer Research	2.225	0	1	418
Journal of Clinical Epidemiology	5.478	3.600	1	416
Journal of Clinical Oncology	17.880	17.260	3	1720
Journal of the National Cancer Institute	15.161	14.790	2	693
Lancet	39.207	39.315	6	4001
Lancet Oncology	24.725	24.229	2	990
Molecular and Cellular Biology	5.036	6.370	1	299
Nature	42.351	38.160	2	2358
New England Journal of Medicine	54.420	50.810	8	9358
Proceedings of the National Academy of Sciences of the United States of America	9.809	10.580	3	1049
Science	31.477	32.450	1	774
Stem Cells	7.133	8.370	1	302
The Journal of Biological Chemistry	4.600	5.020	1	389
World Journal of Gastroenterology	2.433	2.590	2	1066

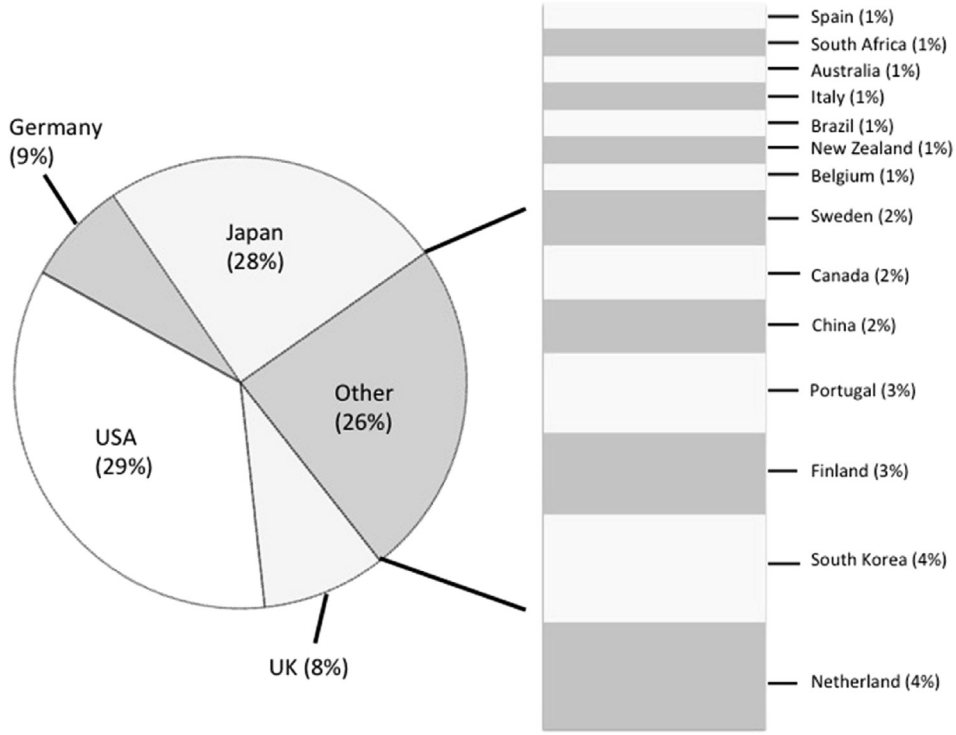

Fig. 1. Proportion of citations by country.

4. Discussion

Gastric cancer is the third leading cause of cancer death accounting for approximately 723,000 deaths worldwide in 2012 [106]. Disease incidence and outcomes of treatment vary globally with the Republic of Korea, Mongolia and Japan reporting incidence rates per 100,000 population as high as 41.8, 32.5 and 29.9 compared to Botswana and Mozambique with rates of 0.9 and 0.9 respectively [106]. Despite this the principles of treatment are consistent. The understanding of the aetiological factors at play and how genetic aberrations relate to pathogenesis has led to improvements in patient prognostication and management. The results of the current study confirm that these topics were highly represented with 76 manuscripts of the top 100 influential papers covering these areas. More recently published manuscripts had a higher citation rate, which suggests a significant influence within the top 100 within the next 5–10 years.

Influential publications are more likely to be cited by the scientific community and these citations form the basis of the impact factor. The impact factor of a journal quantifies the average citations of the manuscripts published within the journal during a specific period. Therefore, journals with a higher impact factor are recognized as being of a higher quality and more likely to contain influential publications. Journals with very high impact factors (54.420–30.387); NEJM, Nature, Cell and Science, JAMA and Lancet only represent 19% of all publications in the top 100. Furthermore, the median impact factor was 9.284 and 25% of publications were in journals with an impact factor of 4.900 or less. A possible

Table 3
Institutions with the highest number of papers in the top 100.

Institution	Number of publication in top 100	Total number of citations
Technische Universität München	4	1806
National Cancer Institute Bethesda	4	3605
University of porto	3	1066
Osaka University	3	1396
National Cancer Center Hospital	3	1465
Leiden University Medical Center	3	1754
Hiroshima University School of Medicine	3	1002
University of Washington	2	682
University of Uppsala	2	848
Stanford University School of Medicine	2	3504
Oxford University	2	1819
Ninewells Hospital and Medical School	2	1321
National cancer center research institute tskuijii	2	672
Louisiana State University Medical Center	2	2049
Kyoto prefectural university of medicine	2	746
Kitasato University School of Medicine	2	1452
Kanazawa University	2	692
Columbia University	2	1035

Table 4
Top 10 papers with the highest citation rate.

Rank	Citation rate	First author	Senior author	Title	Institution	Country
1	255	Bang, Y [12]	Kang, Y	Trastuzumab in combination with chemotherapy versus chemotherapy alone for treatment of HER2-positive advanced gastric or gastro-oesophageal junction cancer (ToGA): a phase 3, open-label, randomised controlled trial	Seoul National University College of Medicine	South Korea
2	143	Uemura, N [7]	Schlemper, R	*Helicobacter pylori* Infection and the Development of Gastric Cancer	Fukuoka University School of Medicine	Japan
3	121	Parsonnet, J [6]	Sibley, R	Helicobacter-Pylori infection and the risk of gastric cancer	Stanford University School of Medicine	USA
4	101	Sakuramoto, S [16]	Arai, K	Adjuvant Chemotherapy for Gastric Cancer with S-1, an Oral Fluoropyrimidine	Kitasato University School of Medicine	Japan
5	98	El-Omar, E [10]	Rabkin, C	Interleukin-1 polymorphisms associated with increased risk of gastric cancer	National Cancer Institute Bethesda	USA
6	94	Japanese Gastric Cancer Association [68]	Japanese Gastric Cancer Association	Japanese classification of gastric carcinoma: 3rd English edition	Kyoto prefectural university of medicine	Japan
7	93	Japanese Gastric Cancer Association [70]	Japanese Gastric Cancer Association	Japanese gastric cancer treatment guidelines 2010 (ver. 3)	Kyoto prefectural university of medicine	Japan
8	92	Koizumi, W [30]	Takeuchi, M	S1 plus cisplatin versus S-1 alone for first-line treatment of advanced gastric cancer (SPIRITS trial): a phase III trial	Kitasato University School of Medicine	Japan
9	83	Devesa, S [11]	Fraumeni, J	Changing Patterns in the Incidence of Esophageal and Gastric Carcinoma in the United States	National Cancer Institute Bethesda	USA
10	81	Crew, K [21]	Neugut, A	Epidemiology of gastric cancer	Columbia University	USA

explanation for this relates to the novelty of the results. Novelty can be classified as relating to science in general or only gastric cancer. Findings that have already been established in other cancers may then be re-established in gastric cancer. These manuscripts are unlikely to be published in high impact factor journals, however, within the context of this study they are likely to be considered influential.

On review of the topics covered in the top 100, pathology and more specifically the aetiology and pathophysiology of gastric cancer was well studied with 47 manuscripts. Helicobacter Pylori infection and its association with gastric cancer development accounts for 14 papers in the top 100 and is also the most highly cited manuscript [6]. Other topics included aetiology (47%), basic science (44%), genetics (31%), prognosis (30%), epidemiology (22%), clinical trials (20%), management (19%), surgery (15%) and chemotherapy (10%). Despite surgery remaining the mainstay of treatment and the only potential cure for gastric cancer, it was only represented in 15 manuscripts of the top 100 and is therefore relatively under represented. Of these 15 surgical related manuscripts, nearly half examined the role of the extended D2 lymphadenectomy in gastric cancer survival and report the results of clinical trials. The importance of these topics is confirmed by their publication in high impact factor journals; NEJM, Lancet and Journal of Clinical Oncology.

Even with advances in surgical techniques and perioperative care, five year survival rates for patients with potentially curable gastric cancer in the UK remain at approximately 50%. Consequently, there has been a greater effort in developing chemotherapeutic agents and the emergence of these studies in the top 100 confirms their importance to the scientific community. The majority of studies have looked at chemotherapy regimens in advanced gastric cancer with only two publications, a metanalysis of randomised trials by Earle et al. [94] and a randomised control trial by Sakuramoto et al. [16], looking at adjuvant chemotherapy in patients undergoing potentially curative resection. The recent heightened importance of chemotherapy based studies is reflected by their publication in higher impact factor journals such as NEJM, Lancet and Journal of Clinical Oncology.

Table 5
Most frequently referenced topics.

Subject	Number of papers
Pathology	57
Aetiology/Pathophysiology	47
Science	44
Genetics	31
Prognosis	30
Epidemiology	22
Clinical trials	20
Management	19
Surgery	15
Chemotherapy	10
Consensus statement/Guidelines	4

*Due to overlap of topics, cell numbers do not add up to 100.

The main limitation of this manuscript is the potential for several types of bias, which may affect results. Disproportionate citation may result from institutional bias, language biases, self citation or powerful person bias. In addition, older journals may receive more citations. Although an attempt to control for this has been made by using the citation rate index, it may take a number of years for influential manuscripts to accrue citations due to the publication lead-time for their citing manuscript. Therefore, recently published manuscripts that have reached enough citations for inclusion in the top 100 have added importance. A further limitation is the inclusion of only first and senior authors and the institution of the first author. It is possible that several first authors will have co-authored other papers in the top 100 and are therefore under represented in the current study format.

5. Conclusion

The most cited manuscripts highlighted in the current study describe the basic science related to the aetiology and pathogenesis of gastric cancer in addition to the surgical techniques and associated treatment regimens that have resulted in the contemporary understanding and improved treatment outcomes of gastric cancer. Arguably, given the perceived relative lack of novelty to the science community in general, the majority of manuscripts were published in journals with impact factors of less than 10. In addition to providing a reference of what could be considered as the most influential papers in gastric cancer, this work serves as a reference

for researchers and clinicians alike as to what makes a citable paper in the arena of gastric cancer study. This study also suggests that newer manuscripts have a higher citation rate, which will have a significant impact on the top 100 within the next 5–10 years.

Ethical approval

None.

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Author contribution

Arfon G M T Powell – Study design, data collection, analysis and writing.

Daniel L Hughes - data collection, analysis and writing.

Jennifer R Wheat – analysis and writing.

Wyn G Lewis – Conceived the idea, study design, analysis and writing.

Conflict of interest

All named authors hereby declare that they have no conflict of interest to disclose.

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References

[1] M.R. Murray, T. Wang, G.D. Schroeder, et al., The 100 most cited spine articles, Eur. Spine J. 21 (2012) 2059–2069.
[2] J.C. Kelly, R.W. Glynn, D.E. O'Briain, et al., The 100 classic papers of orthopaedic surgery: a bibliometric analysis, J. Bone Jt. Surg. Br. 92 (2010) 1338–1343.
[3] M.P. Loonen, J.J. Hage, M. Kon, Plastic Surgery Classics: characteristics of 50 top-cited articles in four Plastic Surgery Journals since 1946, Plast. Reconstr. Surg. 121 (2008) 320e–327e.
[4] R. Paladugu, M. Schein, S. Gardezi, et al., One hundred citation classics in general surgical journals, World J. Surg. 26 (2002) 1099–1105.
[5] F. Tas, An analysis of the most-cited research papers on oncology: which journals have they been published in? Tumour Biol. 35 (2014) 4645–4649.
[6] J. Parsonnet, G. Friedman, D. Vandersteen, et al., Helicobacter pylori infection and the risk of gastric carcinoma, N. Engl. J. Med. 325 (1991) 1127–1131.
[7] N. Uemura, S. Okamoto, S. Yamamoto, et al., Helicobacter pylori infection and the development of gastric cancer, N. Engl. J. Med. 345 (2001) 784–789.
[8] P. Correa, Human gastric carcinogenesis: a multistep and multifactorial process–first American Cancer Society Award Lecture on Cancer Epidemiology and Prevention, Cancer Res. 52 (1992) 6735–6740.
[9] A. Nomura, G.N. Stemmermann, P.H. Chyou, et al., Helicobacter pylori infection and gastric carcinoma among Japanese Americans in Hawaii, N. Engl. J. Med. 325 (1991) 1132–1136.
[10] E.M. El-Omar, M. Carrington, W.H. Chow, et al., Interleukin-1 polymorphisms associated with increased risk of gastric cancer, Nature 404 (2000) 398–402.
[11] S.S. Devesa, W.J. Blot, J.F. Fraumeni Jr., Changing patterns in the incidence of esophageal and gastric carcinoma in the United States, Cancer 83 (1998) 2049–2053.
[12] Y.J. Bang, E. Van Cutsem, A. Feyereislova, et al., Trastuzumab in combination with chemotherapy versus chemotherapy alone for treatment of HER2-positive advanced gastric or gastro-oesophageal junction cancer (ToGA): a phase 3, open-label, randomised controlled trial, Lancet 376 (2010) 687–697.
[13] D. Forman, D.G. Newell, F. Fullerton, et al., Association between infection with Helicobacter pylori and risk of gastric cancer: evidence from a prospective investigation, BMJ 302 (1991) 1302–1305.
[14] J.J. Bonenkamp, J. Hermans, M. Sasako, et al., Extended lymph-node dissection for gastric cancer, N. Engl. J. Med. 340 (1999) 908–914.
[15] P. Guilford, J. Hopkins, J. Harraway, et al., E-cadherin germline mutations in familial gastric cancer, Nature 392 (1998) 402–405.
[16] S. Sakuramoto, M. Sasako, T. Yamaguchi, et al., Adjuvant chemotherapy for gastric cancer with S-1, an oral fluoropyrimidine, N. Engl. J. Med. 357 (2007) 1810–1820.
[17] H. Ono, H. Kondo, T. Gotoda, et al., Endoscopic mucosal resection for treatment of early gastric cancer, Gut 48 (2001) 225–229.
[18] J. Houghton, C. Stoicov, S. Nomura, et al., Gastric cancer originating from bone marrow-derived cells, Science 306 (2004) 1568–1571.
[19] Q.L. Li, K. Ito, C. Sakakura, et al., Causal relationship between the loss of RUNX3 expression and gastric cancer, Cell 109 (2002) 113–124.
[20] A. Cuschieri, S. Weeden, J. Fielding, et al., Patient survival after D1 and D2 resections for gastric cancer: long-term results of the MRC randomized surgical trial. Surgical Co-operative Group, Br. J. Cancer 79 (1999) 1522–1530.
[21] K.D. Crew, A.I. Neugut, Epidemiology of gastric cancer, World J. Gastroenterol. 12 (2006) 354–362.
[22] E. Van Cutsem, V.M. Moiseyenko, S. Tjulandin, et al., Phase III study of docetaxel and cisplatin plus fluorouracil compared with cisplatin and fluorouracil as first-line therapy for advanced gastric cancer: a report of the V325 Study Group, J. Clin. Oncol. 24 (2006) 4991–4997.
[23] D. Forman, M. Coleman, Debacker, et al., An international association between Helicobacter pylori infection and gastric cancer. The EUROGAST Study Group, Lancet 341 (1993) 1359–1362;
(a) A. Ristimäki, N. Honkanen, H. Jänkälä, et al., Expression of cyclooxygenase-2 in human gastric carcinoma, Cancer Res. 57 (1997) 1276–1280.
[24] J.R. Siewert, K. Böttcher, H.J. Stein, et al., Relevant prognostic factors in gastric cancer: ten-year results of the German Gastric Cancer Study, Ann. Surg. 228 (1998) 449–461.
[25] T. Watanabe, M. Tada, H. Nagai, et al., Helicobacter pylori infection induces gastric cancer in mongolian gerbils, Gastroenterology 115 (1998) 642–648.
[26] B.C. Wong, S.K. Lam, W.M. Wong, et al., Helicobacter pylori eradication to prevent gastric cancer in a high-risk region of China: a randomized controlled trial, JAMA 291 (2004) 187–194.
[27] J.J. Bonenkamp, I. Songun, J. Hermans, et al., Randomised comparison of morbidity after D1 and D2 dissection for gastric cancer in 996 Dutch patients, Lancet 345 (1995) 745–748.
[28] K.F. Becker, M.J. Atkinson, U. Reich, et al., E-cadherin gene mutations provide clues to diffuse type gastric carcinomas, Cancer Res. 54 (1994) 3845–3852.
[29] W. Koizumi, H. Narahara, T. Hara, et al., S-1 plus cisplatin versus S-1 alone for first-line treatment of advanced gastric cancer (SPIRITS trial): a phase III trial, Lancet Oncol. 9 (2008) 215–221.
[30] J. Parsonnet, G.D. Friedman, N. Orentreich, et al., Risk for gastric cancer in people with CagA positive or CagA negative Helicobacter pylori infection, Gut 3 (1997) 297–301.
[31] K. Maeda, Y.S. Chung, Y. Ogawa, et al., Prognostic value of vascular endothelial growth factor expression in gastric carcinoma, Cancer 77 (1996) 858–863.
[32] A. Cuschieri, P. Fayers, J. Fielding, et al., Postoperative morbidity and mortality after D1 and D2 resections for gastric cancer: preliminary results of the MRC randomised controlled surgical trial. The Surgical Cooperative Group, Lancet 347 (1996) 995–999.
[33] J.Q. Huang, S. Sridhar, Y. Chen, et al., Meta-analysis of the relationship between Helicobacter pylori seropositivity and gastric cancer, Gastroenterology 114 (1998) 1169–1179.
[34] E.M. El-Omar, C.S. Rabkin, M.D. Gammon, et al., Increased risk of noncardia gastric cancer associated with proinflammatory cytokine gene polymorphisms, Gastroenterology 124 (2003) 1193–1201.
[35] C.P. Howson, T. Hiyama, E.L. Wynder, The decline in gastric cancer: epidemiology of an unplanned triumph, Epidemiol. Rev. 8 (1986) 1–27.
[36] A.D. Wagner, W. Grothe, J. Haerting, et al., Chemotherapy in advanced gastric cancer: a systematic review and meta-analysis based on aggregate data, J. Clin. Oncol. 24 (2006) 2903–2909.
[37] C.D. Lu, D.C. Altieri, N. Tanigawa, Expression of a novel antiapoptosis gene, survivin, correlated with tumor cell apoptosis and p53 accumulation in gastric carcinomas, Cancer Res. 58 (1998) 1808–1812.
[38] S. Pyrhönen, T. Kuitunen, P. Nyandoto, et al., Randomised comparison of fluorouracil, epidoxorubicin and methotrexate (FEMTX) plus supportive care with supportive care alone in patients with non-resectable gastric cancer, Br. J. Cancer 71 (1995) 587–591.
[39] S.S. Mirvish, Role of N-nitroso compounds (NOC) and N-nitrosation in etiology of gastric, esophageal, nasopharyngeal and bladder cancer and contribution to cancer of known exposures to NOC, Cancer 93 (1995) 17–48.
[40] H.J. Han, A. Yanagisawa, Y. Kato, et al., Genetic instability in pancreatic cancer and poorly differentiated type of gastric cancer, Cancer Res. 53 (1993)

5087–5089.
[41] F. Petrocca, R. Visone, M.R. Onelli, et al., E2F1-regulated microRNAs impair TGFbeta-dependent cell-cycle arrest and apoptosis in gastric cancer, Cancer Cell 13 (2008) 272–286.
[42] E.1 Hiyama, T. Yokoyama, N. Tatsumoto, et al., Telomerase activity in gastric cancer, Cancer Res. 55 (1995) 3258–3262.
[43] C.S. Fuchs, R.J. Mayer, Gastric Carcinoma, N. Engl. J. Med. 333 (1995) 32–41.
[44] H.H. Hartgrink, C.J. van de Velde, H. Putter, et al., Extended lymph node dissection for gastric cancer: who may benefit? Final results of the randomized Dutch gastric cancer group trial, J. Clin. Oncol. 22 (2004) 2069–2077.
[45] I. Aird, H.H. Bentall, J.A. Fraser Roberts, Relationship Between Cancer of Stomach and the ABO Blood Groups, BMJ 1 (1953) 799–801.
[46] A.M. Murad, F.F. Santiago, A. Petroianu, et al., Modified therapy with 5-fluorouracil, doxorubicin, and methotrexate in advanced gastric cancer, Cancer 72 (1993) 37–41.
[47] B. Glimelius, K. Ekström, K. Hoffman, et al., Randomized comparison between chemotherapy plus best supportive care with best supportive care in advanced gastric cancer, Ann. Oncol. 8 (1997) 163–168.
[48] H.J. Wanebo, B.J. Kennedy, J. Chmiel, et al., Cancer of the stomach. A patient care study by the American College of Surgeons, Ann. Surg. 218 (1993) 583–592.
[49] Y. Sakata, A. Ohtsu, N. Horikoshi, et al., Late phase II study of novel oral fluoropyrimidine anticancer drug S-1 (1 M tegafur-0.4 M gimestat-1 M otastat potassium) in advanced gastric cancer patients, Eur. J. Cancer 34 (1998) 1715–1720.
[50] C.G. Huscher, A. Mingoli, G. Sgarzini, et al., Laparoscopic versus open subtotal gastrectomy for distal gastric cancer: five-year results of a randomized prospective trial, Ann. Surg. 241 (2005) 232–237.
[51] Helicobacter and Cancer Collaborative Group, Gastric cancer and Helicobacter pylori: a combined analysis of 12 case control studies nested within prospective cohorts, Gut 49 (2001) 347–353.
[52] L.L. Myeroff, R. Parsons, S.J. Kim, et al., A transforming growth factor beta receptor type II gene mutation common in colon and gastric but rare in endometrial cancers with microsatellite instability, Cancer Res. 55 (1995) 5545–5547.
[53] S.C. Ming, Gastric carcinoma. A pathobiological classification, Cancer 39 (1977) 2475–2485.
[54] A.M. Nomura, G.N. Stemmermann, P.H. Chyou, Gastric cancer among the Japanese in Hawaii, Jpn. J. Cancer Res. 86 (1995) 916–923.
[55] K. Park, S.J. Kim, Y.J. Bang, et al., Genetic changes in the transforming growth factor beta (TGF-beta) type II receptor gene in human gastric cancer cells: correlation with sensitivity to growth inhibition by TGF-beta, Proc. Natl. Acad. Sci. U. S. A. 13 (91) (1994) 8772–8776.
[56] J.R. Kelley, J.M. Duggan, Gastric cancer epidemiology and risk factors, J. Clin. Epidemiol. 56 (2003) 1–9.
[57] M. Toyota, N. Ahuja, H. Suzuki, et al., Aberrant methylation in gastric cancer associated with the CpG island methylator phenotype, Cancer Res. 59 (1999) 5438–5442.
[58] J.R. Siewert, K. Böttcher, J.D. Roder, et al., Prognostic relevance of systematic lymph node dissection in gastric carcinoma. German Gastric Carcinoma Study Group, Br. J. Surg. 80 (1993) 1015–1018.
[59] B. Mayer, J.P. Johnson, F. Leitl, et al., E-cadherin expression in primary and metastatic gastric cancer: down-regulation correlates with cellular dedifferentiation and glandular disintegration, Cancer Res. 53 (1993) 1690–1695.
[60] L.E. Hansson, O. Nyrén, A.W. Hsing, et al., The risk of stomach cancer in patients with gastric or duodenal ulcer disease, N. Engl. J. Med. 335 (1996) 242–249.
[61] P. Hohenberger, S. Gretschel, Gastric cancer, Lancet 362 (2003) 305–315.
[62] E. Rosivatz, I. Becker, K. Specht, et al., Differential expression of the epithelial-mesenchymal transition regulators snail, SIP1, and twist in gastric cancer, Am. J. Pathol. 161 (2002) 1881–1891.
[63] K. Yasumoto, S. Okamoto, N. Mukaida, et al., Tumor necrosis factor alpha and interferon gamma synergistically induce interleukin 8 production in a human gastric cancer cell line through acting concurrently on AP-1 and NF-kB-like binding sites of the interleukin 8 gene, J. Biol. Chem. 267 (1992) 22506–22511.
[64] C. Figueiredo, J.C. Machado, P. Pharoah, et al., Helicobacter pylori and interleukin 1 genotyping: an opportunity to identify high-risk individuals for gastric carcinoma, J. Natl. Cancer Inst. 94 (2002) 1680–1687.
[65] B.C. Morson, Carcinoma Arising from Areas of Intestinal Metaplasia in the Gastric Mucosa, Br. J. Cancer 9 (1955) 377–385.
[66] C.H. Yoo, S.H. Noh, D.W. Shin, et al., Recurrence following curative resection for gastric carcinoma, Br. J. Surg. 87 (2000) 236–242.
[67] N. Uemura, T. Mukai, S. Okamoto, et al., Effect of Helicobacter pylori eradication on subsequent development of cancer after endoscopic resection of early gastric cancer, Cancer Epidemiol. Biomarkers Prev. 6 (1997) 639–642.
[68] Japanese Gastric Cancer Association, Japanese classification of gastric carcinoma: 3rd English edition, Gastric Cancer 14 (2011) 101–112.
[69] K. Fukase, M. Kato, S. Kikuchi, et al., Effect of eradication of Helicobacter pylori on incidence of metachronous gastric carcinoma after endoscopic resection of early gastric cancer: an open-label, randomised controlled trial, Lancet 372 (2008) 392–397.
[70] Japanese Gastric Cancer Association, Japanese gastric cancer treatment guidelines 2010 (ver. 3), Gastric Cancer 14 (2011) 113–123.
[71] M. Hofmann, O. Stoss, D. Shi, et al., Assessment of a HER2 scoring system for gastric cancer: results from a validation study, Histopathology 52 (2008) 797–805.
[72] L. Xia, D. Zhang, R. Du, et al., miR-15b and miR-16 modulate multidrug resistance by targeting BCL2 in human gastric cancer cells, Int. J. Cancer 123 (2008) 372–379.
[73] T. Nakajima, Gastric cancer treatment guidelines in Japan, Gastric Cancer 5 (2002) 1–5.
[74] S.A. Hundahl, J.L. Phillips, H.R. Menck, The National Cancer Data Base Report on poor survival of U.S. gastric carcinoma patients treated with gastrectomy: Fifth Edition American Joint Committee on Cancer staging, proximal disease, and the "different disease" hypothesis, Cancer 88 (2000) 921–932.
[75] T.C. Wang, C.A. Dangler, D. Chen, et al., Synergistic interaction between hypergastrinemia and Helicobacter infection in a mouse model of gastric cancer, Gastroenterology 118 (2000) 36–47.
[76] P. Correa, J. Fox, E. Fontham, et al., Helicobacter pylori and gastric carcinoma. Serum antibody prevalence in populations with contrasting cancer risks, Cancer 66 (1990) 2569–2574.
[77] D.M. Dent, M.V. Madden, S.K. Price, Randomized comparison of R1 and R2 gastrectomy for gastric carcinoma, Br. J. Surg. 75 (1988) 110–112.
[78] I. Songun, H. Putter, E.M. Kranenbarg, et al., Surgical treatment of gastric cancer: 15-year follow-up results of the randomised nationwide Dutch D1D2 trial, Lancet Oncol. 11 (2010) 439–449.
[79] M. Sasako, T. Sano, S. Yamamoto, et al., D2 lymphadenectomy alone or with para-aortic nodal dissection for gastric cancer, N. Engl. J. Med. 359 (2008) 453–462.
[80] J.C. Machado, C. Figueiredo, P. Canedo, et al., A proinflammatory genetic profile increases the risk for chronic atrophic gastritis and gastric carcinoma, Gastroenterology 125 (2003) 364–371.
[81] Y. Shimoyama, S. Hirohashi, Expression of E- and P-cadherin in gastric carcinomas, Cancer Res. 51 (1991) 2185–2192.
[82] D.C. Farrow, T.L. Vaughan, P.D. Hansten, et al., Use of aspirin and other nonsteroidal anti-inflammatory drugs and risk of esophageal and gastric cancer, Cancer Epidemiol. Biomarkers Prev. 7 (1998) 97–102.
[83] T.L. Vaughan, S. Davis, A. Kristal, et al., Obesity, alcohol, and tobacco as risk factors for cancers of the esophagus and gastric cardia: adenocarcinoma versus squamous cell carcinoma, Cancer Epidemiol. Biomarkers Prev. 4 (1995) 85–92.
[84] H.M. Martin, M.I. Filipe, R.W. Morris, et al., p53 expression and prognosis in gastric carcinoma, Int. J. Cancer 50 (1992) 859–862.
[85] J.C. Machado, P. Pharoah, S. Sousa, et al., Interleukin 1B and interleukin 1RN polymorphisms are associated with increased risk of gastric carcinoma, Gastroenterology 121 (2001) 823–829.
[86] K. Maruyama, P. Gunvén, K. Okabayashi, et al., Lymph node metastases of gastric cancer. General pattern in 1931 patients, Ann. Surg. 210 (1989) 596–602.
[87] L. Yang, Incidence and mortality of gastric cancer in China, World J. Gastroenterol. 12 (2006) 17–20.
[88] H. Sakamoto, M. Mori, M. Taira, et al., Transforming gene from human stomach cancers and a noncancerous portion of stomach mucosa, Proc. Natl. Acad. Sci. U. S. A. 83 (1986) 3997–4001.
[89] F. Ichihara, K. Kono, A. Takahashi, et al., Increased populations of regulatory T cells in peripheral blood and tumor-infiltrating lymphocytes in patients with gastric and esophageal cancers, Clin. Cancer Res. 9 (2003) 4404–4408.
[90] S. Oka, S. Tanaka, I. Kaneko, et al., Advantage of endoscopic submucosal dissection compared with EMR for early gastric cancer, Gastrointest. Endosc. 64 (2006) 877–883.
[91] C. Gravalos, A. Jimeno, HER2 in gastric cancer: a new prognostic factor and a novel therapeutic target, Ann. Oncol. 19 (2008) 1523–1529.
[92] S. Honda, T. Fujioka, M. Tokieda, et al., Development of Helicobacter pylori-induced gastric carcinoma in Mongolian gerbils, Cancer Res. 58 (1998) 4255–4259.
[93] P.B. Ernst, B.D. Gold, The disease spectrum of Helicobacter pylori: the immunopathogenesis of gastroduodenal ulcer and gastric cancer, Annu. Rev. Microbiol. 54 (2000) 615–640.
[94] C.C. Earle, J.A. Maroun, Adjuvant chemotherapy after curative resection for gastric cancer in non-Asian patients: revisiting a meta-analysis of randomised trials, Eur. J. Cancer 35 (1999) 1059–1064.
[95] Y. Noguchi, T. Imada, A. Matsumoto, et al., Radical surgery for gastric cancer. A review of the Japanese experience, Cancer 64 (1989) 2053–2062.
[96] M. Tanner, M. Hollmén, T.T. Junttila, et al., Amplification of HER-2 in gastric carcinoma: association with Topoisomerase IIalpha gene amplification, intestinal type, poor prognosis and sensitivity to trastuzumab, Ann. Oncol. 16 (2005) 273–278.
[97] L.S. Engel, W.H. Chow, T.L. Vaughan, et al., Population attributable risks of esophageal and gastric cancers, J. Natl. Cancer Inst. 95 (2003) 1404–1413.
[98] A.S. Fleisher, M. Esteller, S. Wang, et al., Hypermethylation of the hMLH1 gene promoter in human gastric cancers with microsatellite instability, Cancer Res. 59 (1999) 1090–1095.
[99] W. Yasui, H. Sumiyoshi, J. Hata, et al., Expression of epidermal growth factor receptor in human gastric and colonic carcinomas, Cancer Res. 48 (1988) 137–141.
[100] S. Imai, S. Koizumi, M. Sugiura, et al., Gastric carcinoma: monoclonal epithelial malignant cells expressing Epstein-Barr virus latent infection protein, Proc. Natl. Acad. Sci. U. S. A. 91 (1994) 9131–9135.

[101] Y. Yonemura, Y. Endo, H. Fujita, et al., Role of vascular endothelial growth factor C expression in the development of lymph node metastasis in gastric cancer, Clin. Cancer Res. 5 (1995) 1823–1829.
[102] S.Y. Leung, S.T. Yuen, L.P. Chung, et al., hMLH1 promoter methylation and lack of hMLH1 expression in sporadic gastric carcinomas with high-frequency microsatellite instability, Cancer Res. 59 (1999) 159–164.
[103] S. Takaishi, T. Okumura, S. Tu, et al., Identification of gastric cancer stem cells using the cell surface marker CD44, Stem Cells 27 (2009) 1006–1020.
[104] J.D. Roder, K. Böttcher, J.R. Siewert, et al., Prognostic factors in gastric carcinoma. Results of the German Gastric Carcinoma Study 1992, Cancer 72 (1993) 2089–2097.
[105] S. Fukushige, K. Matsubara, M. Yoshida, et al., Localization of a novel v-erbB-related gene, c-erbB-2, on human chromosome 17 and its amplification in a gastric cancer cell line, Mol. Cell Biol. 6 (1986) 955–958.
[106] World Health Organisation, Stomach Cancer: Estimated Incidence, Mortality and Prevalence Worldwide in 2012, 2012. http://globocan.iarc.fr/old/FactSheets/cancers/stomach-new.asp (accessed 01.08.15.).