

# Scientific publications on hepatocellular carcinoma: a global survey of the literature with a special emphasis on China's contributions

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**Background:** Hepatocellular carcinoma (HCC) is the most common primary malignancy of the liver associated with a high morbidity and mortality. Scientific publications may be the most helpful method to distribute information and improve our understanding of HCC. A literature review aimed to systematically analyze the global distribution of scientific publications regarding HCC was performed.

**Methods:** The Web of Science database was searched to identify all papers regarding HCC from January, 1980 to December, 2016. The major categories included the publication years, regions, journals, research areas, organizations, and funding agencies.

**Results:** A total of 103,197 papers regarding HCC were identified. The number of papers gradually increased over years and peaked in 2016. USA, China, and Japan ranked as the top three countries in number of publications. In 2016, China ranked first as the country with the greatest number of publications. According to the number of papers published in 2016 by organization, Fudan University ranked first. According to the total number of papers by funding agency, the National Natural Science Foundation of China ranked first. Additionally, the top three research areas according to the total number of papers were gastroenterology/hepatology, oncology, and surgery; and the top three journals according to the total number of papers were Hepatology, Journal of Hepatology, and World Journal of Gastroenterology.

**Conclusions:** Our literature survey describes the global distribution of manuscripts in the field of HCC. Notably, Chinese researchers are now the leading publisher of manuscripts in the field.

**Keywords:** Hepatocellular carcinoma (HCC); publication; research; China; systematic review

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## Introduction

Hepatocellular carcinoma (HCC) is the most common liver malignancy (1). It is estimated that HCC accounts for 70–90% of all liver cancers. HCC is the 6th most common cancer and the 2nd cause of malignancy-related death worldwide (2–5). Major etiologies of HCC include viral hepatitis B and C, alcoholic liver disease, nonalcoholic fatty liver disease, and autoimmune hepatitis. There are many therapeutic options to address HCC (6). Classical treatment options include liver transplantation, surgical resection, radiofrequency ablation, transarterial chemoembolization, as well as sorafenib (7–12). Novel treatment options have emerged in recent years, including radioembolization (13,14), thermotherapy (15), high-intensity focused ultrasound (16), radiotherapy (17), three-dimensional conformal radiation therapy, argon-helium cryotherapy system, traditional Chinese medicine (18), cytokine-induced killer cell therapy (19), regorafenib (20,21), and tivantinib (22,23), as well as others. Additionally, new modalities for the prognostic assessment of HCC and treatment selection have been proposed and/or employed in clinical practice (24–29).

Generally, current understanding of HCC has dramatically improved owing to a remarkable growth of scientific publications in this topic and rapid dissemination of associated knowledge. Herein, we have conducted a literature review to systematically analyze the distribution of scientific publications regarding HCC according to the publication years, regions, journals, research areas, organizations, and funding agencies by using the Web of Science database.

## Methods

We searched published papers regarding HCC via the Web of Science database from January, 1980 to December, 2016. The search item was “hepatocellular carcinoma”. All publication types (reviews, case reports, comments, letters, and clinical or experimental studies) were included. We did

not identify any duplicated publications among the different journals. We stratified the publications according to the specific categories originally established by the Web of Science, and we identified the publication year, countries/territories, journals, research areas, organizations, and funding agencies. We calculated the number of publications within the defined categories. All relevant data is reported in text and/or tables. Line charts are used to demonstrate the trends, while pie and line charts are used to express the proportions. Relevant statistical analyses were performed by using the SPSS 16.0 statistical software (Chicago, IL, USA) and Microsoft Excel 2010.

## Results

Overall, 103,197 papers were identified in the query.

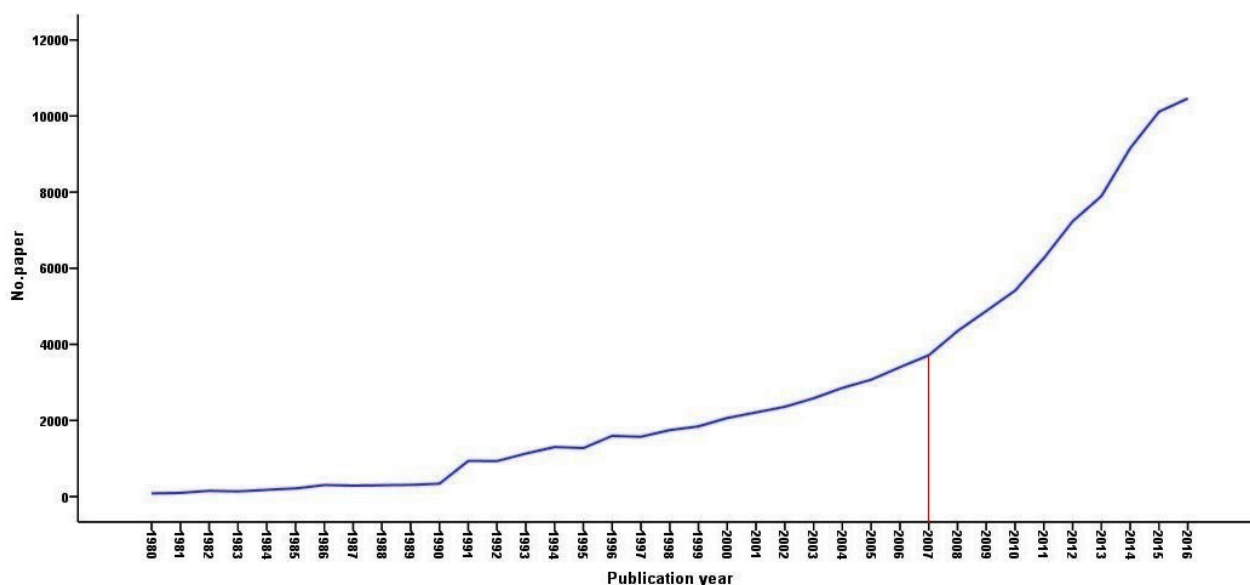
### Publication year

The number of publications per year gradually increased over the period (*Figure 1*), the largest number being in 2016 (n=10,763). The increased trend in HCC publications was noted after 2007.

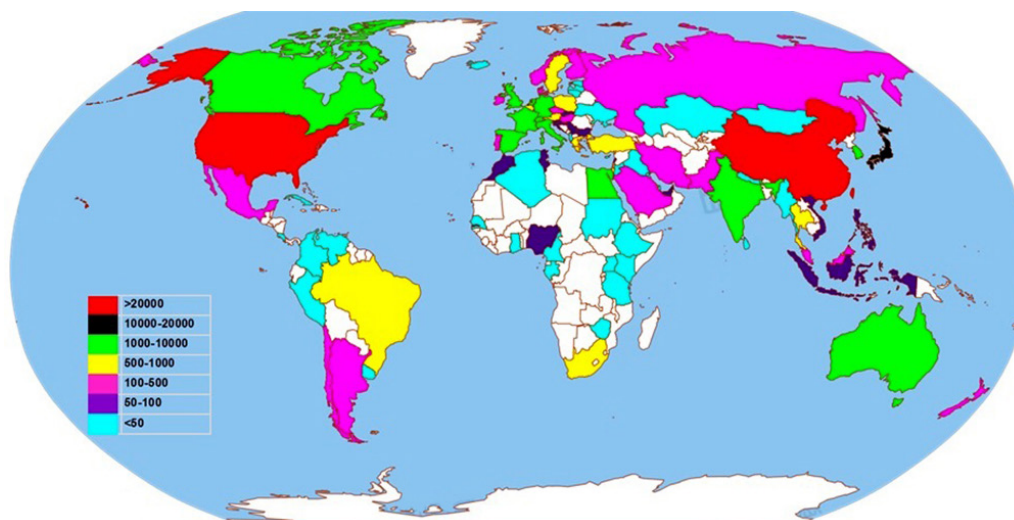
### Countries/territories

The top 100 countries/territories of publication origin are summarized in *Table S1* and *Figure 2*. The rank order of top 10 countries/territories of publication origin include USA (n=24,685), China (n=22,466), Japan (n=17,366), Italy (n=7,153), Germany (n=6,280), South Korea (n=5,632), Taiwan (n=5,285), France (n=5,213), England (n=3,484), and Spain (n=2,644), respectively.

Prior to 2003, Japan was the country of origin of the greatest number of publications, followed by USA. During the period of 2004–2012, USA was the greatest contributor of publications, followed by China and Japan. After 2013, China became the largest contributor of publications followed by USA. This trend continued with China leading the number of publications and in 2016 exceeding USA



**Figure 1** Number of papers over years.



**Figure 2** World distribution of papers.

publications greater than 2-fold (Figure 3).

### Journals

The top 100 journals according to the number of publications are summarized in Table S2. The top ten journals according to the number of publications included *Hepatology* (n=6,291), *Journal of Hepatology* (n=3,143), *World Journal of Gastroenterology* (n=2,214), *Gastroenterology*

(n=1,950), *PLoS One* (n=1,813), *Journal of Gastroenterology and Hepatology* (n=1,650), *Cancer Research* (n=1,424), *Hepatogastroenterology* (n=1,403), *Oncotarget* (n=1,090), and *Liver Transplantation* (n=1,046) (Figure 4).

Among the top five journals within the area of gastroenterology/hepatology according to the journal impact factor, the number of publications was listed as follows: *Gastroenterology* (n=1,950), *Gut* (n=504), *Nature Reviews Gastroenterology & Hepatology* (n=69), *Hepatology*

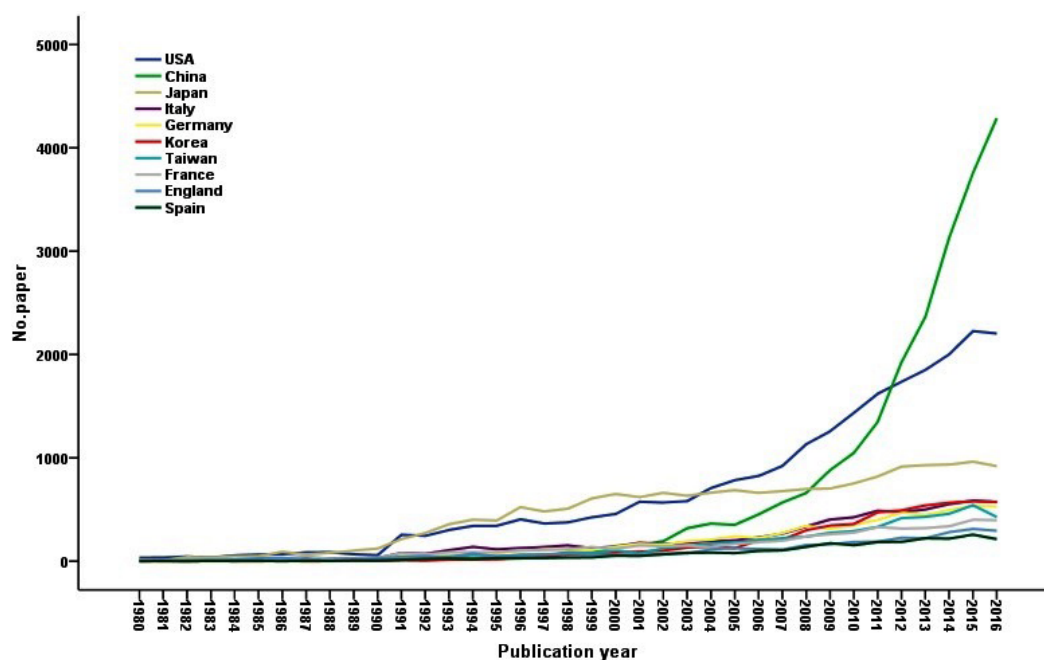


Figure 3 Number of papers over years in the top 10 countries.

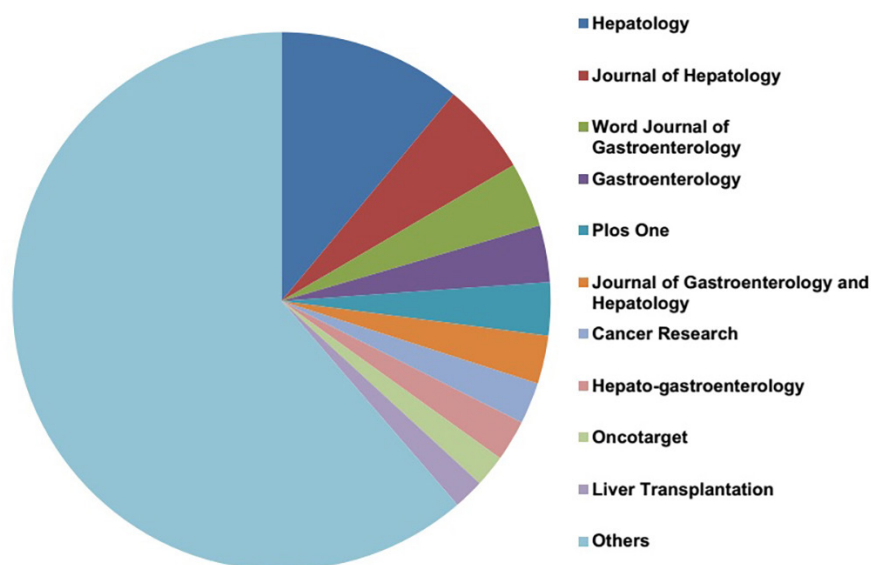


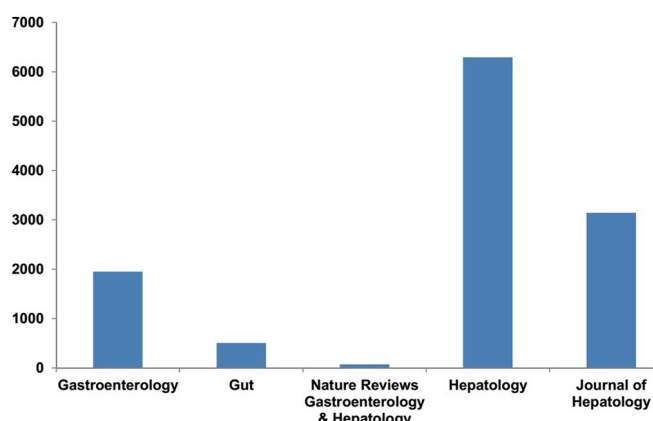
Figure 4 Proportion of papers in the top 10 journals.

(n=6,291), and *Journal of Hepatology* (n=3,143) (Figure 5).

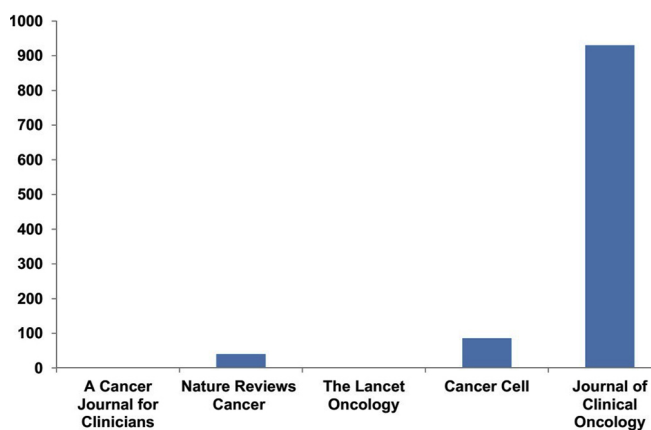
Next, the top five journals within the area of oncology according to the journal impact factor, the number of publications was listed as follows: *A Cancer Journal for Clinicians* (n=0), *Nature Reviews Cancer* (n=40), *The Lancet Oncology* (n=0), *Cancer Cell* (n=40), and *Journal of Clinical*

*Oncology* (n=930) (Figure 6).

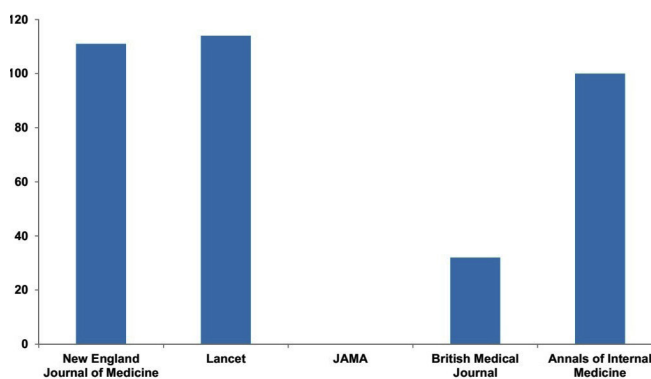
Lastly, the top five journals within the area of general and internal medicine according to the journal impact factor, the number of publications was listed as follows: *New England Journal of Medicine* (n=111), *Lancet* (n=114), *JAMA* (n=0), *British Medical Journal* (n=32), and *Annals of Internal*



**Figure 5** The number of papers in the top 5 journals within the area of gastroenterology/hepatology according to the journal impact factor.



**Figure 6** The number of papers in the top 5 journals within the area of oncology according to the journal impact factor.



**Figure 7** The number of papers in the top 5 journals within the area of general and internal medicine according to the journal impact factor.

Medicine (n=100) (Figure 7).

### Research areas

The top 100 research areas are summarized in Table S3. The top ten research areas included gastroenterology/hepatology (n=29,931), oncology (n=24,609), surgery (n=10,474), radiology nuclear medical imaging (n=8,256), biochemistry molecular biology (n=7,385), cell biology (n=5,626), pharmacology pharmacy (n=5,070), research experimental medicine (n=4,868), pathology (n=4,459), and general internal medicine (n=3,642) (Figure 8).

### Organizations

The top 100 organizations are summarized in Table S4. The top ten organizations included Assistance Publique Hopitaux Paris Aphp (n=2,299), Institut National De La Sante ET DE LA Recherche Medicale Inserm (n=2,225), University of California System (n=2,132), Fudan University (n=2,057), Harvard University (n=1,763), National Institutes of Health NIH USA (n=1,751), National Taiwan University (n=1,712), University of Tokyo (n=1,572), Sun Yat Sen University (n=1,505), and University of Hong Kong (n=1,470) (Figure 9). Notably, after 2012, researchers from the Fudan University ranked first among all organizations with respect to number of publications per year, followed by the National Taiwan University.

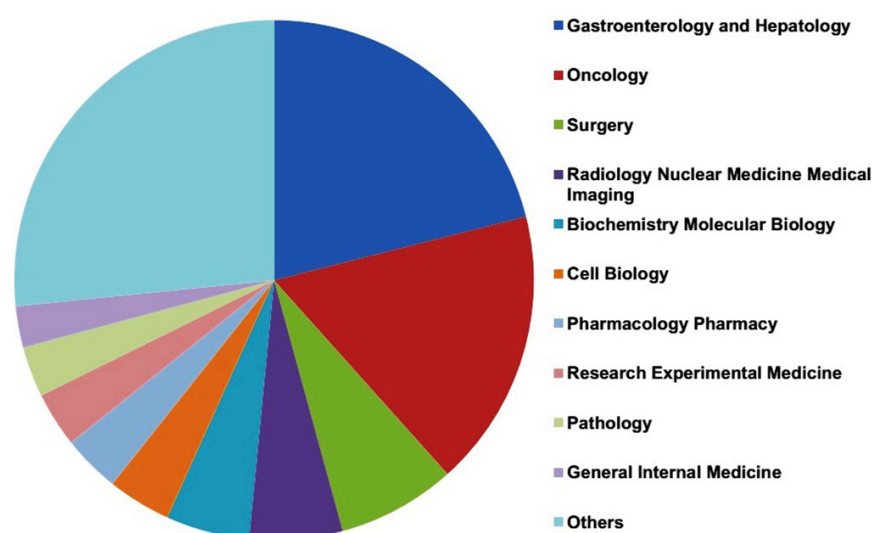
### Funding agencies

According to the number of publications supported by funding agencies, National Natural Science Foundation of China (n=7,779) supported the largest number of publications followed by National Institutes of Health (n=6,388), Health and Human Services (n=3,966), and National Cancer Institute (n=2,638).

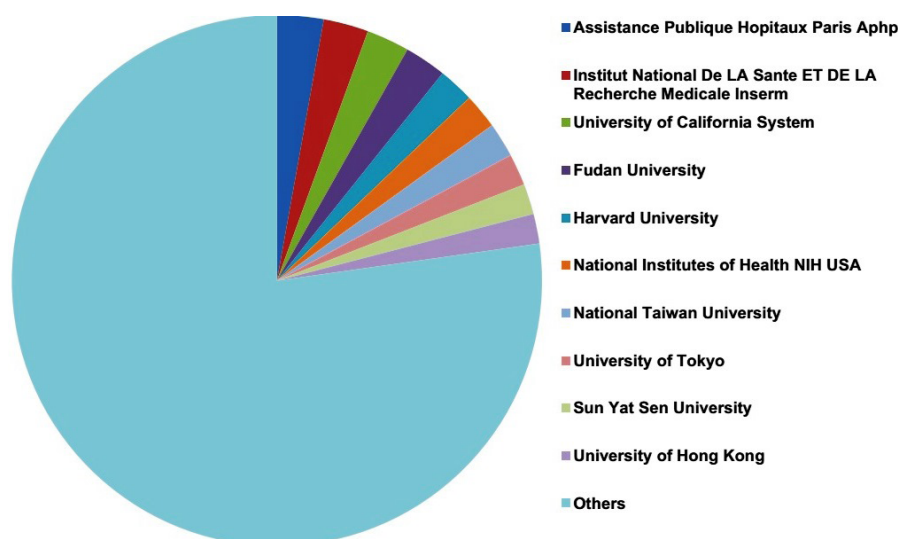
### Discussion

Currently, scientific publications are the reliable means of rapidly and widely disseminating relevant knowledge discovered by researchers worldwide. By analyzing the characteristics of scientific publications within a particular topic, researchers may obtain critical information such as: (I) the importance of the topic; (II) the contributions by different regions, institutions, and study teams; (III) the





**Figure 8** Proportion of papers in the top 100 research areas.



**Figure 9** Number of papers over years in the top 10 organizations.

most popular research areas at present and future. To the best of our knowledge, there are some similar papers which have explored the scientific publications in the field of Gastroenterology and Hepatology, such as primary biliary cirrhosis (30), portal vein thrombosis, and Budd-Chiari syndrome (31). In addition, there are manuscripts which have explored scientific publications according to the type of study (32) and journal distribution (33). In the present study, we have performed the first systematic analysis examining characteristics of scientific publications in the

field of HCC.

We identified an abundance of manuscripts relating to HCC with a striking increase over recent years. *Figure 1* demonstrates a drastically increased slope with regard to publication numbers over recent years. This finding is concordant with the increased global disease burden of HCC. Unfortunately, the increase in disease prevalence has not been accompanied by significant improvements in HCC outcomes despite developments of novel treatment modalities.

We also demonstrated the evolving distribution of HCC manuscripts worldwide. Until recently, USA had the largest number of HCC publications, closely followed by China. However, as shown in *Figure 3*, China has significantly surpassed all countries in the annual number of HCC manuscripts published after 2013. The following points should be noted: (I) only the Web of Science, in which nearly all indexed papers are published in English language, was employed; (II) manuscripts from the USA are published in English; (III) many Chinese researchers are more skilled at publishing in Chinese-language journals. Not surprisingly, China will rank first in total number of HCC manuscripts in the near future as evident by its swift increase in rate of publication. Indeed, this point could be confirmed by another two findings of our study: (I) the National Natural Science Foundation of China, the largest funding project in China, gives financial support to the largest number of publications among all funding agencies; (II) the Fudan University, one of the most prestigious Universities in China, has produced the largest annual number of HCC manuscripts in recent years. This phenomenon may be explained by the fact that China has the largest number of patients affected by HCC with an ever-growing incidence and perhaps due to more research funding having been provided by the Chinese government.

Based on the analysis regarding the number of publications according to journals and research areas, we found that a majority of papers were published in the field of digestive diseases and cancer. It should be noted that the *Hepatology*, the most impactful journal in the field of hepatology, had published 6,275 papers.

Our study has several limitations. First, we just analyzed the quantity of HCC papers according to the inherent categories established by the Web of Science. We did not evaluate the importance and quality of scientific publications or calculate the number of citations associated with each manuscript. Second, we limited the search to the Web of Science, rather than other databases. Last, we did not classify manuscripts according to the type of study.

In conclusion, we performed the first systematic analysis outlining world distribution of HCC manuscripts. It is clear over recent years that great attention has been focused on the study of HCC, with China contributing most to this great surge of dissemination of knowledge.

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## Footnote

*Conflicts of Interest:* The authors have completed the ICMJE uniform disclosure form (available at <http://dx.doi.org/10.21037/amj.2017.07.09>). Xingshun Qi serves as an Editor-in-Chief of *AME Medical Journal*. Stephen D. Wang is the CEO of AME Publishing Company. The other 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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## References

1. Torre LA, Bray F, Siegel RL, et al. Global cancer statistics, 2012. *CA Cancer J Clin* 2015; 65:87-108.
2. El-Serag HB. Hepatocellular carcinoma. *N Engl J Med* 2011;365:1118-27.
3. Forner A, Llovet JM, Bruix J. Hepatocellular carcinoma. *Lancet* 2012;379:1245-55.
4. Bruix J, Sherman M; American Association for the Study of Liver Diseases. Management of hepatocellular carcinoma: an update. *Hepatology* 2011;53:1020-2.
5. Heimbach J, Kulik LM, Finn R, et al. Aasld guidelines for the treatment of hepatocellular carcinoma. *Hepatology* 2017. [Epub ahead of print].
6. Qi X, Zhao Y, Li H, et al. Management of hepatocellular carcinoma: an overview of major findings from meta-analyses. *Oncotarget* 2016;7:34703-51.
7. Proneth A, Zeman F, Schlitt HJ, et al. Is resection or transplantation the ideal treatment in patients with hepatocellular carcinoma in cirrhosis if both are possible? A systematic review and metaanalysis. *Ann Surg Oncol* 2014;21:3096-107.
8. Qi X, Wang D, Su C, et al. Hepatic resection versus transarterial chemoembolization for the initial treatment

- of hepatocellular carcinoma: A systematic review and meta-analysis. *Oncotarget* 2015;6:18715-33.
9. Qi X, Tang Y, An D, et al. Radiofrequency ablation versus hepatic resection for small hepatocellular carcinoma: a meta-analysis of randomized controlled trials. *J Clin Gastroenterol* 2014;48:450-7.
  10. Qi X, Liu L, Wang D, et al. Hepatic resection alone versus in combination with pre- and post-operative transarterial chemoembolization for the treatment of hepatocellular carcinoma: A systematic review and meta-analysis. *Oncotarget* 2015;6:36838-59.
  11. Llovet JM, Ricci S, Mazzaferro V, et al. Sorafenib in advanced hepatocellular carcinoma. *N Engl J Med* 2008;359:378-90.
  12. Cheng AL, Kang YK, Chen Z, et al. Efficacy and safety of sorafenib in patients in the Asia-Pacific region with advanced hepatocellular carcinoma: a phase III randomised, double-blind, placebo-controlled trial. *Lancet Oncol* 2009;10:25-34.
  13. Salem R, Lewandowski RJ, Kulik L, et al. Radioembolization results in longer time-to-progression and reduced toxicity compared with chemoembolization in patients with hepatocellular carcinoma. *Gastroenterology* 2011;140:497-507.e2.
  14. Ettorre GM, Levi Sandri GB, Laurenzi A, et al. Yttrium-90 Radioembolization for Hepatocellular Carcinoma Prior to Liver Transplantation. *World J Surg* 2017;41:241-9.
  15. Li Z, Mi D, Yang K, et al. TACE combined with thermotherapy for primary hepatic carcinoma: A meta-analysis. *Chinese Journal of Evidence-Based Medicine* 2012;12:672-8.
  16. Cao H, Xu Z, Long H, et al. T Transcatheter arterial chemoembolization in combination with high-intensity focused ultrasound for unresectable hepatocellular carcinoma: a systematic review and meta-analysis of the chinese literature. *Ultrasound Med Biol* 2011;37:1009-16.
  17. Meng MB, Cui YL, Lu Y, et al. Transcatheter arterial chemoembolization in combination with radiotherapy for unresectable hepatocellular carcinoma: a systematic review and meta-analysis. *Radiother Oncol* 2009;92:184-94.
  18. Cheung F, Wang X, Wang N, et al. Chinese Medicines as an Adjuvant Therapy for Unresectable Hepatocellular Carcinoma during Transarterial Chemoembolization: A Meta-Analysis of Randomized Controlled Trials. *Evid Based Complement Alternat Med* 2013;2013:487919.
  19. Ma Y, Xu YC, Tang L, et al. Cytokine-induced killer (CIK) cell therapy for patients with hepatocellular carcinoma: efficacy and safety. *Exp Hematol Oncol* 2012;1:11.
  20. Bruix J, Qin S, Merle P, et al. Regorafenib for patients with hepatocellular carcinoma who progressed on sorafenib treatment (RESORCE): a randomised, double-blind, placebo-controlled, phase 3 trial. *Lancet* 2017;389:56-66.
  21. Mancuso A. Regorafenib for hepatocellular carcinoma progressing on sorafenib: just another starting point. *AME Med J* 2017;2:31.
  22. Santoro A, Rimassa L, Borbath I, et al. Tivantinib for second-line treatment of advanced hepatocellular carcinoma: a randomised, placebo-controlled phase 2 study. *Lancet Oncol* 2013;14:55-63.
  23. Qi XS, Guo XZ, Han GH, et al. MET inhibitors for treatment of advanced hepatocellular carcinoma: A review. *World J Gastroenterol* 2015;21:5445-53.
  24. Johnson PJ, Berhane S, Kagebayashi C, et al. Assessment of liver function in patients with hepatocellular carcinoma: a new evidence-based approach-the ALBI grade. *J Clin Oncol* 2015;33:550-8.
  25. Qiu J, Peng B, Tang Y, et al. CpG Methylation Signature Predicts Recurrence in Early-Stage Hepatocellular Carcinoma: Results From a Multicenter Study. *J Clin Oncol* 2017;35:734-42.
  26. Qi X, Li J, Deng H, et al. Neutrophil-to-lymphocyte ratio for the prognostic assessment of hepatocellular carcinoma: A systematic review and meta-analysis of observational studies. *Oncotarget* 2016;7:45283-301.
  27. Villa E, Critelli R, Lei B, et al. Neovascularization-related genes are hallmarks of fast-growing hepatocellular carcinomas and worst survival. Results from a prospective study. *Gut* 2016;65:861-9.
  28. Huckle F, Sieghart W, Pinter M, et al. The ART-strategy: sequential assessment of the ART score predicts outcome of patients with hepatocellular carcinoma re-treated with TACE. *J Hepatol* 2014;60:118-26.
  29. Nakaji S, Hirata N. Evaluation of the viability of hepatocellular carcinoma in the caudate lobe using contrast-enhanced endoscopic ultrasonography after transarterial chemoembolization. *Endosc Ultrasound* 2016;5:390-2.
  30. Qin B, Liang Y, Yang Z, et al. Scientific publications on primary biliary cirrhosis from 2000 through 2010: an 11-year survey of the literature. *PLoS One* 2012;7:e35366.
  31. Qi X, Jia J, Ren W, et al. Scientific publications on portal vein thrombosis and Budd-Chiari syndrome: a global survey of the literature. *J Gastrointest Liver Dis* 2014;23:65-71.
  32. Yang Z, Wu Q, Wu K, et al. Scientific publications on



systematic review and meta-analysis from Chinese authors: a 10-year survey of the English literature. *Front Med* 2012;6:94-9.

33. Gao R, Liao Z, Li ZS. Scientific publications in

gastroenterology and hepatology journals from Chinese authors in various parts of North Asia: 10-year survey of literature. *J Gastroenterol Hepatol* 2008; 23:374-8.

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Table S1 The top 100 countries/territories according to the number of papers	
Countries/territories	No. of paper
USA	24,685
China	22,466
Japan	17,366
Italy	7,153
Germany	6,280
South Korea	5,632
Taiwan	5,285
France	5,213
England	3,484
Spain	2,644
Canada	2,174
Australia	1,510
India	1,327
Switzerland	1,317
Netherlands	1,082
Egypt	1,043
Singapore	1,009
Belgium	953
Turkey	933
Greece	827
Austria	783
Brazil	775
Sweden	709
Israel	501
Thailand	461
Poland	458
South Africa	453
Scotland	400
Saudi Arabia	399
Iran	388
Denmark	346
Romania	278
Pakistan	277
Portugal	271
Mexico	268
Hong Kong	259
Argentina	257
Hungary	255
Finland	237
Norway	231
Russia	228
Malaysia	199
New Zealand	198
Ireland	195
Czech Republic	187
Chile	107
Vietnam	97
Nigeria	94
Philippines	84
Wales	80
Indonesia	78
Serbia	66
Morocco	61
Croatia	61
Fed Rep Ger	60
Slovenia	56
Gambia	54
U Arab Emirates	50
Lebanon	50
Bulgaria	47
Tunisia	45
Slovakia	44
Colombia	40
Ukraine	32
Mongol Peo Rep	32
Qatar	30
North Ireland	30
Kuwait	29
Sudan	28
Ghana	28
Cyprus	27
Bangladesh	27
Luxembourg	26
Zimbabwe	24
Venezuela	24
Cameroon	24
Cuba	20
Nepal	18
Ussr	18
Uruguay	17
Sri Lanka	17
Senegal	17
Peru	17
Senegambia	16
Ethiopia	15
Myanmar	14
Lithuania	14
Uganda	14
Kenya	13
Jordan	13
Kazakhstan	12
Iraq	12
Iceland	12
Tanzania	11
Algeria	11
Latvia	10
Gabon	10
Estonia	10
Costa Rica	10
Albania	9

Table S2 The top 100 journals according to the number of papers	
Journals	No. of paper
Hepatology	6,291
Journal of Hepatology	3,143
World Journal of Gastroenterology	2,214
Gastroenterology	1,950
PLos One	1,813
Journal of Gastroenterology and Hepatology	1,650
Cancer Research	1,424
Hepato Gastroenterology	1,403
Oncotarget	1,090
Liver Transplantation	1,046
Hepatology Research	943
Journal of Clinical Oncology	930
Oncology Reports	911
Radiology	870
Liver International	820
Cancer	795
Tumor Biology	772
American Journal of Gastroenterology	746
Cancer Letters	740
International Journal of Cancer	686
International Journal of Oncology	679
American Journal of Roentgenology	674
Biochemical and Biophysical Research Communications	587
Journal of Vascular and Interventional Radiology	586
Digestive Diseases and Sciences	572
Anticancer Research	564
Oncogene	549
Annals of Surgical Oncology	536
Carcinogenesis	531
Journal of Gastroenterology	513
Gut	504
Transplantation Proceedings	502
Clinical Cancer Research	488
Scientific Reports	434
Transplantation	428
British Journal of Cancer	428
Annals of Oncology	426
Oncology Letters	419
Digestive and Liver Disease	419
Journal of Viral Hepatitis	414
BMC Cancer	411
Laboratory Investigation	409
Journal of Medical Virology	408
Modern Pathology	407
Cardiovascular and Interventional Radiology	393
Journal of Biological Chemistry	390
American Journal of Transplantation	381
World Journal of Surgery	379
Molecular Medicine Reports	378
International Journal of Radiation Oncology	374
Biology Physics	
Annals of Surgery	374
European Journal of Gastroenterology Hepatology	371
Journal of Surgical Oncology	355
International Journal of Clinical and Experimental Pathology	355
European Journal of Cancer	345
Asian Pacific Journal of Cancer Prevention	333
Journal of Cancer Research and Clinical Oncology	320
Oncology	315
Gastroenterologie Clinique Et Biologique	311
European Radiology	305
British Journal of Surgery	304
Journal of Virology	300
European Journal of Radiology	297
Journal of Clinical Gastroenterology	295
Abdominal Imaging	277
Cancer Science	276
Surgery	272
International Journal of Molecular Medicine	268
Medicine	264
Alimentary Pharmacology Therapeutics	261
Journal of Gastrointestinal Surgery	251
Seminars in Liver Disease	249
Hepatology International	248
Medical Oncology	247
Clinical Gastroenterology and Hepatology	239
Proceedings of The National Academy of Sciences of The United States of America	235
International Journal of Molecular Sciences	232
International Journal of Clinical and Experimental Medicine	231
Transplant International	230
Journal of The American College of Surgeons	229
Journal of Experimental Clinical Cancer Research	228
Journal of Computer Assisted Tomography	226
Hepatobiliary Pancreatic Diseases International	223
Cancer Chemotherapy and Pharmacology	221
Human Pathology	218
HPB	218
Journal of Magnetic Resonance Imaging	212
American Journal of Pathology	210
Chinese Medical Journal	209
Molecular Carcinogenesis	207
Biomed Research International	201
Digestive Diseases	200
Oncotargets and Therapy	197
Journal of Nuclear Medicine	191
Hepatitis Monthly	187
Scandinavian Journal of Gastroenterology	183
Journal of Surgical Research	181
Journal of Proteome Research	176
European Journal of Nuclear Medicine and Molecular Imaging	172
Intervirolgy	166

**Table S3** The top 100 research areas according to the number of papers

Research areas	No. of paper
Gastroenterology hepatology	29,931
Oncology	24,609
Surgery	10,474
Radiology nuclear medicine medical imaging	8,256
Biochemistry molecular biology	7,385
Cell biology	5,626
Pharmacology pharmacy	5,070
Research experimental medicine	4,868
Pathology	4,459
General internal medicine	3,642
Science technology other topics	3,180
Transplantation	2,988
Immunology	2,855
Genetics heredity	2,647
Virology	2,410
Chemistry	2,019
Biotechnology applied microbiology	2,015
Toxicology	1,538
Infectious diseases	1,344
Biophysics	1,342
Cardiovascular system cardiology	1,326
Public environmental occupational health	1,022
Endocrinology metabolism	865
Medical laboratory technology	830
Hematology	742
Microbiology	655
Engineering	653
Life sciences biomedicine other topics	633
Physiology	542
Pediatrics	534
Materials science	513
Nutrition dietetics	473
Food science technology	441
Acoustics	427
Integrative complementary medicine	411
Neurosciences neurology	349
Veterinary sciences	335
Health care sciences services	280
Environmental sciences ecology	256
Urology nephrology	255
Plant sciences	252
Obstetrics gynecology	232
Physics	196
Mathematical computational biology	195
Dermatology	195
Computer science	185
Substance abuse	179
Respiratory system	163
Developmental biology	155
Tropical medicine	133
Anatomy morphology	126
Dentistry oral surgery medicine	125
Polymer science	113
Optics	112
Agriculture	95
Medical informatics	91
Geriatrics gerontology	87
Spectroscopy	82
Business economics	73
Mathematics	72
Microscopy	65
Zoology	61
Rheumatology	61
Parasitology	61
Nuclear science technology	61
Anesthesiology	60
Otorhinolaryngology	58
Reproductive biology	54
Electrochemistry	54
Ophthalmology	52
Nursing	48
Imaging science photographic technology	45
Marine freshwater biology	43
Instruments instrumentation	41
Psychiatry	38
Psychology	36
Orthopedics	35
Allergy	30
Rehabilitation	22
Mycology	20
Legal medicine	20
Emergency medicine	20
Biomedical social sciences	20
Education educational research	16
Fisheries	15
Crystallography	14
Telecommunications	13
Automation control systems	13
Robotics	11
Water resources	10
Sport sciences	10
Anthropology	10
Thermodynamics	5
Social sciences other topics	5
Mechanics	5
Behavioral sciences	5
Oceanography	4
Mathematical methods in social sciences	4
Evolutionary biology	4
Audiology speech language pathology	4

**Table S4** The top 100 organizations according to the number of papers

Organizations	No. of paper
Assistance Publique Hopitaux Paris APHP	2,299
Institut National De La Sante Et De La Recherche Medicale Inserm	2,225
University of California System	2,132
Fudan University	2,057
Harvard University	1,763
National Institutes of Health NIH USA	1,751
National Taiwan University	1,712
University of Tokyo	1,572
Sun Yat Sen University	1,505
University of Hong Kong	1,470
Second Military Medical University	1,274
Seoul National University	1,251
Pennsylvania Commonwealth System of Higher Education Pcshe	1,189
Shanghai Jiao Tong University	1,173
University of London	1,170
Chinese University of Hong Kong	1,170
NIH National Cancer Institute NCI	1,169
National Taiwan University Hospital	1,146
Chang Gung Memorial Hospital	1,131
Johns Hopkins University	1,128
UTMD Anderson Cancer Center	1,046
Yonsei University	995
National Yang Ming University	986
VA Boston Healthcare System	970
Osaka University	952
Zhejiang University	942
University of Pittsburgh	940
Chinese Academy of Sciences	918
Mayo Clinic	884
National Cancer Center Japan	877
University of Barcelona	875
University of Toronto	861
Chang Gung University	846
Universite Sorbonne Paris Cite USPC Comue	832
Kyushu University	828
University of California San Francisco	799
Sungkyunkwan University	787
Sorbonne Universites Comue	786
Pierre Marie Curie University Paris 6	783
University of Milan	776
Massachusetts General Hospital	772
University of Bologna	767
Mount Sinai School Of Medicine	740
Peking University	725
Samsung Medical Center	719
Kanazawa University	716
Ruprecht Karl University Heidelberg	702
Hospital Clinic De Barcelona	687
Kyoto University	684
Unicancer	677
Huazhong University of Science Technology	675
Hopital Universitaire Beaujon APHP	674
Shandong University	670
Fourth Military Medical University	650
Nanjing Medical University	647
Kurume University	644
University of California Los Angeles	636
National University of Singapore	629
Sichuan University	625
University of Ulsan	624
University College London	618
University of Michigan System	613
University of Michigan	612
Chiba University	600
University of Padua	593
University of Munich	592
Prince of Wales Hospital	586
Stanford University	572
China Medical University Taiwan	562
Helmholtz Association	560
University of North Carolina	550
Kindai University Kinki University	537
Central South University	537
Chinese Academy of Medical Sciences Peking Union Medical College	534
Osaka City University	528
Xi An Jiaotong University	526
Taipei Veterans General Hospital	523
Hannover Medical School	518
Humboldt University of Berlin	514
Centre National De La Recherche Scientifique CNRS	511
Imperial College London	505
Free University of Berlin	505
University of Pennsylvania	501
Kaohsiung Medical University	497
Okayama University	494
Northwestern University	491
Catholic University of Korea	488
Idibaps	486
University of Washington Seattle	485
University of Washington	485
Seoul National University Hospital	475
Charite Medical University of Berlin	474
Baylor College of Medicine	467
University of Southern California	463
Irccs Ca Granda Ospedale Maggiore Policlinico	450
Asan Medical Center	444
Memorial Sloan Kettering Cancer Center	443
Southern Medical University China	439
State University System Of Florida	438
Hiroshima University	437