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Review

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

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ABSTRACT

Purpose: Bibliometric analysis highlights the key topics and studies which have led to the current understanding and treatment of a disease of interest. In this original article we analyze the 100 most cited manuscripts in the field of colorectal cancer (CRC).

Materials and methods: The Thomson Reuters Web of Science database with the search terms 'colorectal cancer,' 'colorectal cancer surgery,' 'colon cancer,' 'rectal cancer,' 'colorectal carcinoma,' 'colon carcinoma,' 'rectal carcinoma' and/or 'colonoscopy' was used to identify the manuscripts for the study. Only full length manuscripts were included. The 100 most cited papers were identified and further analyzed by topic, journal, author, year and institution. The journals' 5 year impact factor and Eigenfactor scores were recorded.

Results: 146,833 eligible papers were returned. Within the top 100 cited manuscripts, the most studied topic was genetics in CRC (n = 41), followed by chemotherapy (n = 20) and surgical management (n = 7). The most cited paper authored by Fearon et al. (7850 citations) focused on genetic models of tumorigenesis. The NEJM published the highest number of papers (n = 23 with 42,576 citations). The country and year with the greatest number of publications were the USA (n = 62) and 2004 (n = 13) respectively.

Conclusion: The most cited manuscripts highlighted in the current work describe the genetic, immunologic, basic science and surgical techniques that have resulted in the current understanding and treatment of CRC. The majority of these works were published in high impact journals and have been cited at least 900 times each reflecting their quality and influence. This work provides a reference of what could be considered as the most influential papers in CRC and serves as a reference for researchers and clinicians as to what makes a 'citable' paper.

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Introduction

Colorectal cancer (CRC) is a significant cause of mortality and morbidity worldwide.¹ There is a large and growing body of evidence on the topic with new manuscripts published in oncological, surgical, medical, basic science and radiological journals daily. The current understanding of the disease at a molecular level has been molded by these scientific publications over the past 50 years. This understanding has led to subsequent changes in the screening, diagnosis and treatment of CRC resulting in more targeted treatment. The difficulty with the presence of such a large body of evidence is establishing the most important or influential manuscripts. One method is bibliometric citation analysis, a process which studies the citation history of individual manuscripts on a topic of interest. The volume of citations has implications for journals and authors as manuscripts that generate large numbers of citations directly raise the profile of the author and effect the journal's impact factor. The impact factor is calculated by creating a ratio comprised of the number of citations versus the number of articles published over a defined time period, typically one or five years. The high number of citations generated by certain manuscripts reflects the importance of such works and suggests a direct influence on the disease understanding and treatment. As several factors can influence the amount and quality of publications from an individual journal, several additional metrics are used to determine a journal's impact on the scientific community. Eigenfactor scores are scaled scores of all journals listed in Thomson's Journal Citation Reports (JCR) which take into account journal size and overall impact over 5 years. The scores can be found on www.eigenfactor.org and represent the total influence of all indexed publications from the journal of interest.

In recent years bibliometric citation analysis has been used to determine the most influential scientific papers in medical fields including plastic surgery,² dermatology,³ burns⁴ and general surgery.⁵ To date, no such study has been undertaken to determine the most influential papers in the fields of colorectal cancer research and treatment. Analysis of these data provides insight into how our understanding of CRC has developed and how this information has changed our management of the disease. Additionally, this work serves as a concise reference for the most cited papers in CRC.

Methods

A search of the Thomson Reuters Web of Science citation indexing database and research platform was completed using the search terms 'colorectal cancer' or 'colon cancer' or 'rectal cancer' or 'colorectal carcinoma' or 'colon carcinoma' or 'rectal carcinoma' and/or 'colonoscopy.' The search was refined to include English language manuscripts published between Jan 1, 1900 and Dec 31, 2013. The returned dataset was filtered to include only full manuscripts and then sorted by number of citations. This method was developed by Paladugu⁵ and replicated by Joyce,⁴ Kelly,⁶ and Kavanagh.⁷ The 100

most cited manuscripts were identified from the large number of manuscripts returned and the dataset further evaluated. Title, first and senior author, institution and department of the first author, topic, year of publication and the country of origin of each manuscript were recorded and analyzed. The individual and five year impact factors (both for the year 2013) of each journal publishing the manuscripts was also recorded.

Results

The Web of Science search returned 146,833 full length, English language papers (Supplemental Fig. 1). Table 1 lists the 100 most cited of these papers. The number of citations derived from each work ranges from 7850 (Fearon's 'A Genetic Model for Colorectal Tumorigenesis')⁸ to 989 (Ekblom's 'Ulcerative Colitis And Colorectal Cancer – A Population-Based Study').⁹ The oldest manuscript featured on the list was published in 1971 and focused on the epidemiology of CRC.¹⁰ The most recent manuscript was published in 2009 and studied the use of cetuximab for metastatic disease.¹¹ The year which yielded the highest number of influential papers was 2004 (n = 13, 22,420 citations) followed by 1993 (n = 9, 17,459 citations, Fig. 1).

The top 100 manuscripts were published in 22 journals (Table 2). The New England Journal of Medicine (NEJM) published the most papers in the top 100 and also generated the largest number of citations with 23 papers and a total of 42,576 citations. NEJM also had the highest impact factor (54.4) and the highest 5 year impact factor (52.4). Somatic cell genetics published one manuscript which ranked 99th on the top 100 list.¹² The journal did not publish an impact factor for the year 2013 or have a five year impact factor.

The country with the greatest number of publications in the top 100 was the United States of America with a total of 62 papers (Fig. 2). The United Kingdom and France were responsible for eleven and six manuscripts respectively. The Johns Hopkins University School of Medicine was the institution that had the greatest number of manuscripts in the top 100 with 19 papers generating 9347 citations (Table 3). Eight authors had more than one first authorship in the top 100 list (Supplemental Table 1). Two authors had 3 publications Leonard Saltz (4066 citations), Chief of the Gastrointestinal Oncology Service and head of the Colorectal Oncology Section at Memorial Sloan Kettering, and Professor Sidney J. Winawer (4927 citations) also from Memorial Sloan Kettering and the Paul Sherlock chair and professor of medicine at Weill Cornell Medical College. Professor Bert Vogelstein, current Clayton Professor of Oncology and Pathology at Johns Hopkins, had the highest number of senior authorships in the top 100 with a total of 12 manuscripts and a cumulative 26,608 citations. He also was the first author on an additional paper.

Of the top ten most cited papers, seven featured the genetics of colorectal cancer. Four focused on hereditary colorectal cancer (Table 4). Two focused on chemotherapy regimens in the setting of metastatic disease and one, which ranked tenth on the list, on CRC prevention. The trend of the

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