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## Highly Cited Works on Human Clinical Trials

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# Highly Cited Works on Human Clinical Trials

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## Abstract

*The aim of this study was to determine landscapes of the most cited publications on Human Clinical Trials. The top 856 most cited publications on Human Clinical Trials were identified from Web of Science database. The 856 most cited papers on Human Clinical Trials were published between 1989 and 2021 with an average Citation per paper is 1065.46 (Citations range: 400–6319) and are included among the 56 most cited papers in in New England Journal of Medicine with 50851 Citations followed by Journal of Clinical Oncology with 43200 Citations, JAMA Journal of the American Medical Association with 28875 Citations, Nature with 26456 and Lancet with 25181 Citations. The most Cited Countries are: USA with 453423 Citations followed by UK with 100930 Citations, Canada with 84220, France with 61930, Germany with 61752 and India ranked 31<sup>st</sup> Place according to Citations with 4409. The most cited publications on Human Clinical Trials are highly impactful, landmark studies representing Institutions, Countries, Sources and authorship pattern. A clinical trial is a research study in human volunteers to answer specific health questions. Carefully conducted clinical trials are fastest and safest way to find treatment that work in people and way to improve health. These influential publications have immensely inspiration research for invention of Drugs, Vaccines and Medicines.*

**Keywords:** Human Clinical Trials; Highly Cited works; Citations Classics

## Introduction

The Scientometric study of the research has become one of the most used techniques to evaluate the research performance of the Individual researchers, Departments, Institutions, Countries, Subject domains and Journals. The purpose of this study was to bring out a Scientometric evaluation of the global research performance on Human Clinical Trials during 1989-2021. A Scientometric study in this area will help the scientists to understand the progress in research and development.

Clinical trials are research studies performed in people that are aimed at evaluating a medical, surgical, or behavioral intervention. They are the primary way that researchers find out if a new treatment, like a new drug or diet or medical device (for example, a pacemaker) is safe and effective in people. Often a clinical trial is used to learn if a new treatment is more effective and/or has less harmful side effects than the standard treatment. Other clinical trials test ways to find a disease early, sometimes before there are symptoms. Still others

test ways to prevent a health problem. A clinical trial may also look at how to make life better for people living with a life-threatening disease or a chronic health problem. Clinical trials sometimes study the role of caregivers or support groups. Before the U.S. Food and Drug Administration (FDA) approves a clinical trial to begin, scientists perform laboratory tests and studies in animals to test a potential therapy's safety and efficacy. If these studies show favorable results, the FDA gives approval for the intervention to be tested in humans. (NIG 2021).

## **OBJECTIVES OF THE STUDY**

The objective of the study was to perform a Scientometric analysis of all Human Clinical Trials research publications in the world. In particular, the study was confined to the following:

- To find out growth of Publications and Citations;
- To identify the country-wise research contribution and international collaboration;
- To find out the highly productive countries
- To find out Single Country and Multiple Country Publications;
- To find out highly cited publications (Citation Classics);
- To find out highly preferred journals;
- To identify the various types of publications;
- to identify the highly productive institutions;
- To identify the most productive authors

## **MATERIALS AND METHODS**

Web of Science database was used for retrieving data on Human Clinical Trials for all years using the search term 'Human Clinical Trials' in the 'topic' field. Records pertaining to Human Clinical Trials were retrieved only from 1989 onwards. A total of 856 publications received 624361 Citations and these publications were transferred to Biblioshiny, VOSviewer, Histcite for analyzed the data as per objectives of the study.

## **DATA ANALYSIS AND INTERPRETATIONS**

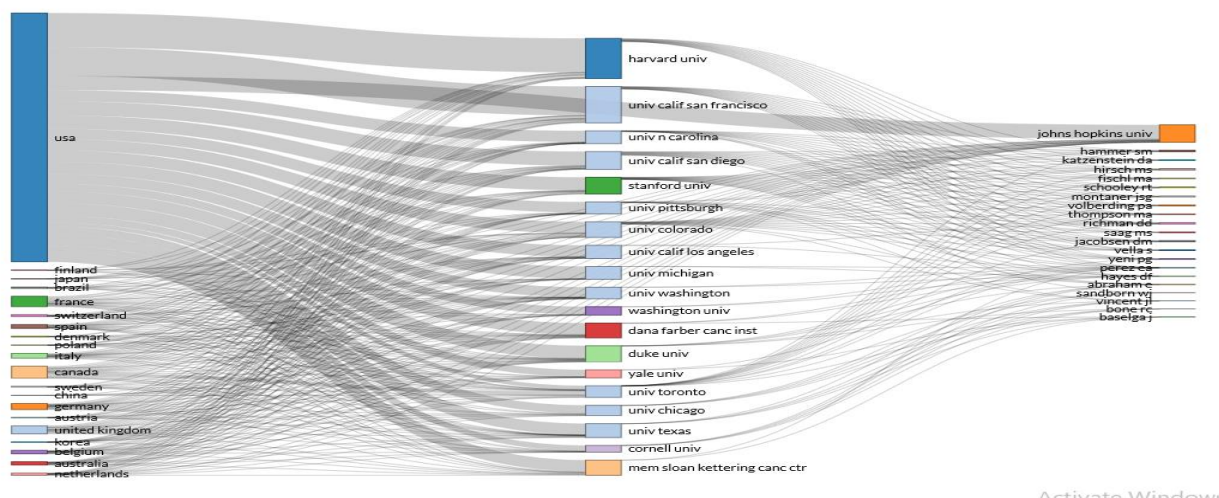
### **Geographical wise Citation of Publications**

The study found that the 856 publications came from 61 countries. Table 1 illustrates that United States (USA) is the most Cited and productive country with 453423 Citations for 589 Publications. The second highest Citation recorded by UK with 100930 Citations for 130 publications. The third highest citations recorded by Canada with 84220 Citations for 111 Publications followed by Germany with 61752 Citations, France with 61930 Citations, Italy with 49835 and Australia with 49754 Citations. Besides this, USA shared 68.8% (589) Publications followed by UK with 15.2% of Publications, Canada with 13% of Publications and Germany shared 10.7% of Publications. It noted that 16 countries registered more than 10000 Citations, 28 Countries with

registered more than 5000 Citations and 47 countries recorded more than 1000 Citations.

**Table: 1 Most Cited Countries**

| #  | Country         | Records | Citations | Country        | Records | Citations |
|----|-----------------|---------|-----------|----------------|---------|-----------|
| 1  | USA             | 589     | 453423    | Philippines    | 5       | 3674      |
| 2  | UK              | 130     | 100930    | Portugal       | 5       | 3249      |
| 3  | Canada          | 111     | 84220     | Hungary        | 4       | 3139      |
| 4  | France          | 73      | 61930     | Peru           | 5       | 3086      |
| 5  | Germany         | 92      | 61752     | Singapore      | 4       | 3054      |
| 6  | Italy           | 63      | 49835     | Czech Republic | 5       | 3024      |
| 7  | Australia       | 56      | 49754     | Romania        | 3       | 2723      |
| 8  | Belgium         | 44      | 39767     | Uganda         | 2       | 2674      |
| 9  | Netherlands     | 49      | 38792     | Turkey         | 4       | 2530      |
| 10 | Spain           | 52      | 35588     | New Zealand    | 3       | 2253      |
| 11 | Switzerland     | 39      | 27559     | Bangladesh     | 3       | 2005      |
| 12 | Japan           | 28      | 16769     | Estonia        | 3       | 1591      |
| 13 | Finland         | 18      | 12037     | Colombia       | 2       | 1367      |
| 14 | Sweden          | 20      | 11227     | Mexico         | 2       | 1319      |
| 15 | Denmark         | 19      | 10950     | Slovakia       | 1       | 1095      |
| 16 | Brazil          | 17      | 10860     | Saudi Arabia   | 2       | 1079      |
| 17 | Ireland         | 13      | 9599      | Egypt          | 2       | 959       |
| 18 | Austria         | 14      | 9222      | Chile          | 1       | 952       |
| 19 | Greece          | 12      | 8930      | Malaysia       | 1       | 914       |
| 20 | Poland          | 15      | 8930      | Pakistan       | 1       | 914       |
| 21 | Taiwan          | 10      | 8216      | Croatia        | 2       | 851       |
| 22 | Israel          | 13      | 7891      | Tunisia        | 1       | 777       |
| 23 | South Korea     | 11      | 7685      | Cote Ivoire    | 1       | 657       |
| 24 | Peoples R China | 12      | 7614      | Senegal        | 1       | 657       |
| 25 | Argentina       | 10      | 7501      | Kenya          | 1       | 610       |
| 26 | South Africa    | 7       | 6136      | Nigeria        | 1       | 590       |
| 27 | Thailand        | 8       | 5951      | Vietnam        | 1       | 590       |
| 28 | Norway          | 7       | 5576      | Latvia         | 1       | 463       |
| 29 | Russia          | 7       | 4964      | Zambia         | 1       | 448       |
| 30 | India           | 6       | 4409      | Jamaica        | 1       | 404       |
| 31 | Slovenia        | 5       | 4127      |                |         |           |



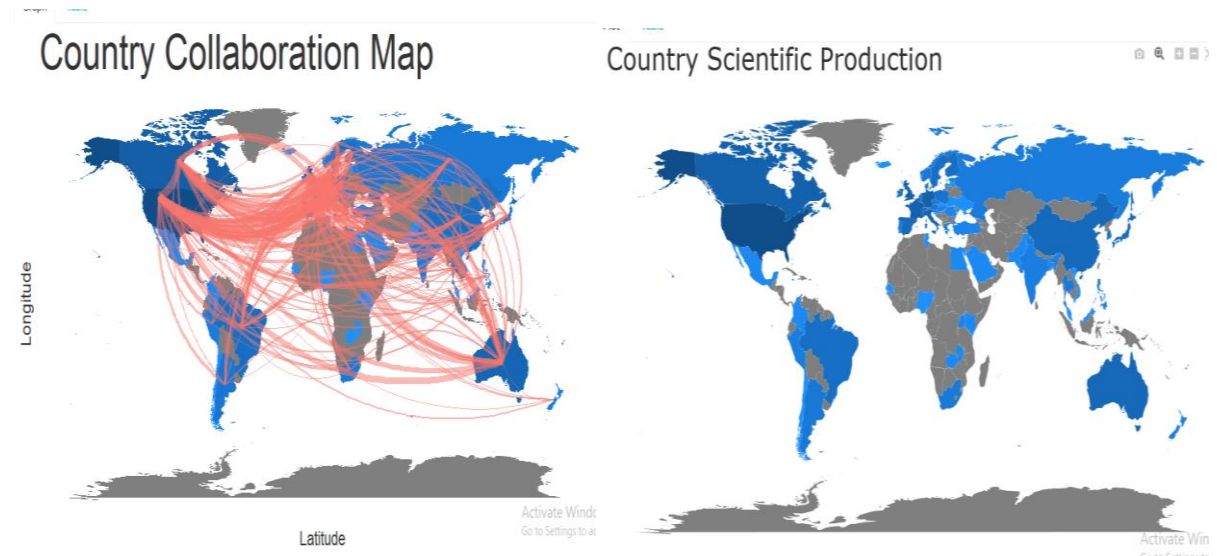
## Country wise Collaboration

The highest number of collaboration by USA with Canada (72), UK (72), Germany (64), France (59), Italy (49), Spain (42) followed by UK with France (39), Canada (34), Germany (34) and Italy (31) Publications. The figure shows Corresponding author's Country i.e. Single Vs Multiple Country Publications.

**Table: 2 Country wise Collaboration**

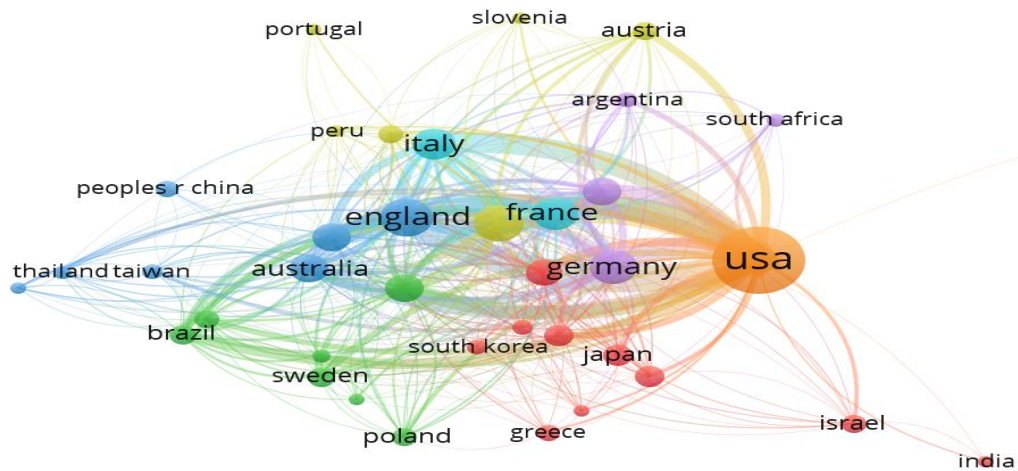
| From           | To             | Frequency | From           | To          | Frequency |
|----------------|----------------|-----------|----------------|-------------|-----------|
| USA            | CANADA         | 72        | UNITED KINGDOM | AUSTRALIA   | 23        |
| USA            | UNITED KINGDOM | 72        | FRANCE         | NETHERLANDS | 22        |
| USA            | GERMANY        | 64        | ITALY          | SPAIN       | 22        |
| USA            | FRANCE         | 59        | CANADA         | SPAIN       | 21        |
| USA            | ITALY          | 49        | USA            | BRAZIL      | 21        |
| USA            | SPAIN          | 42        | CANADA         | BELGIUM     | 20        |
| UNITED KINGDOM | FRANCE         | 39        | FRANCE         | AUSTRALIA   | 19        |
| USA            | AUSTRALIA      | 37        | NETHERLANDS    | BELGIUM     | 19        |
| UNITED KINGDOM | CANADA         | 34        | UNITED KINGDOM | BELGIUM     | 19        |
| UNITED KINGDOM | GERMANY        | 34        | CANADA         | NETHERLANDS | 18        |
| FRANCE         | ITALY          | 32        | FRANCE         | BELGIUM     | 18        |
| GERMANY        | FRANCE         | 32        | GERMANY        | AUSTRALIA   | 18        |
| USA            | BELGIUM        | 32        | GERMANY        | ITALY       | 18        |
| UNITED KINGDOM | ITALY          | 31        | AUSTRALIA      | SPAIN       | 17        |
| USA            | NETHERLANDS    | 31        | GERMANY        | SPAIN       | 17        |
| CANADA         | FRANCE         | 30        | ITALY          | AUSTRALIA   | 17        |
| USA            | SWITZERLAND    | 28        | USA            | DENMARK     | 17        |
| UNITED KINGDOM | NETHERLANDS    | 27        | GERMANY        | SWITZERLAND | 15        |

|                |             |    |                |             |    |
|----------------|-------------|----|----------------|-------------|----|
| FRANCE         | SPAIN       | 26 | ITALY          | NETHERLANDS | 15 |
| GERMANY        | BELGIUM     | 26 | USA            | JAPAN       | 15 |
| CANADA         | ITALY       | 25 | AUSTRALIA      | BELGIUM     | 14 |
| GERMANY        | NETHERLANDS | 25 | BELGIUM        | SPAIN       | 14 |
| UNITED KINGDOM | SPAIN       | 25 | ITALY          | SWITZERLAND | 14 |
| GERMANY        | CANADA      | 24 | UNITED KINGDOM | DENMARK     | 13 |
| CANADA         | AUSTRALIA   | 23 | UNITED KINGDOM | SWITZERLAND | 13 |

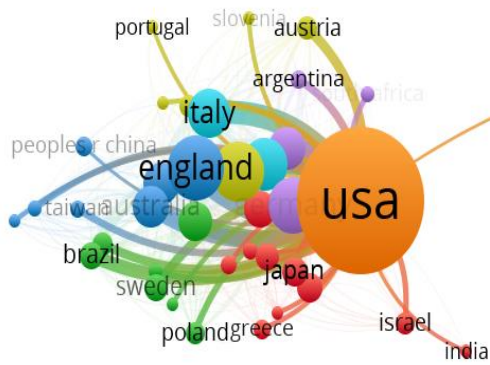


Three Fields Plot: (Countries, Institutions and Authors)

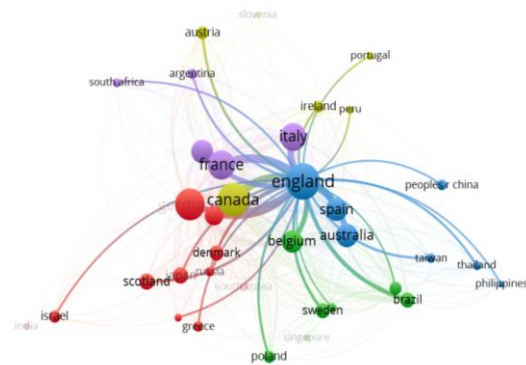
| Country     | Documents | Citations | Total link strength |
|-------------|-----------|-----------|---------------------|
| usa         | 606       | 467347    | 1558                |
| england     | 128       | 103310    | 605                 |
| canada      | 110       | 83113     | 717                 |
| germany     | 100       | 69949     | 482                 |
| france      | 85        | 72743     | 631                 |
| italy       | 77        | 59496     | 443                 |
| netherlands | 57        | 44973     | 292                 |
| australia   | 55        | 49340     | 357                 |
| spain       | 54        | 37981     | 408                 |
| belgium     | 50        | 45348     | 371                 |
| switzerland | 42        | 30013     | 183                 |
| japan       | 28        | 16769     | 71                  |
| scotland    | 28        | 17047     | 65                  |
| denmark     | 24        | 15255     | 108                 |
| sweden      | 23        | 13451     | 110                 |
| brazil      | 23        | 15619     | 243                 |
| finland     | 17        | 11381     | 107                 |
| austria     | 17        | 12966     | 113                 |
| poland      | 16        | 11563     | 74                  |
| israel      | 16        | 11902     | 39                  |



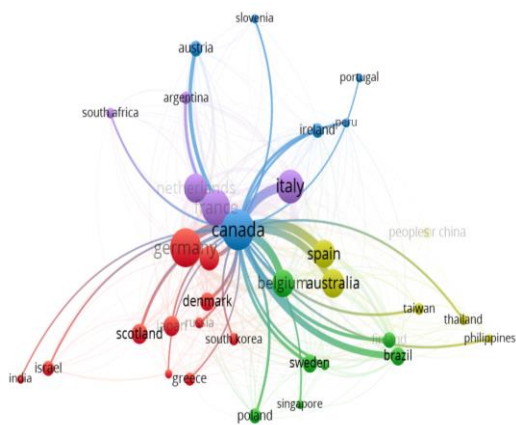
**Citation Network of Countries**



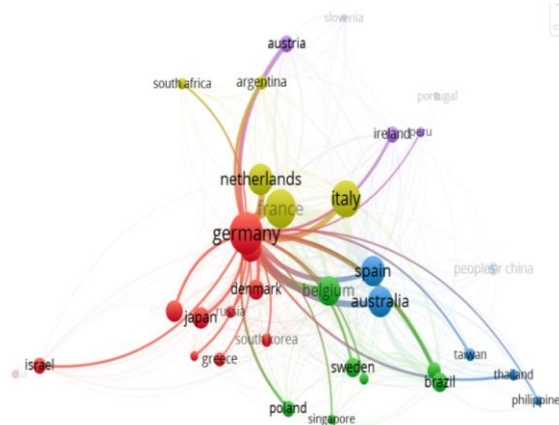
**Citation Network of USA**



**England - Citation network**



**Canada - Citation network**



**Germany - Citation network**

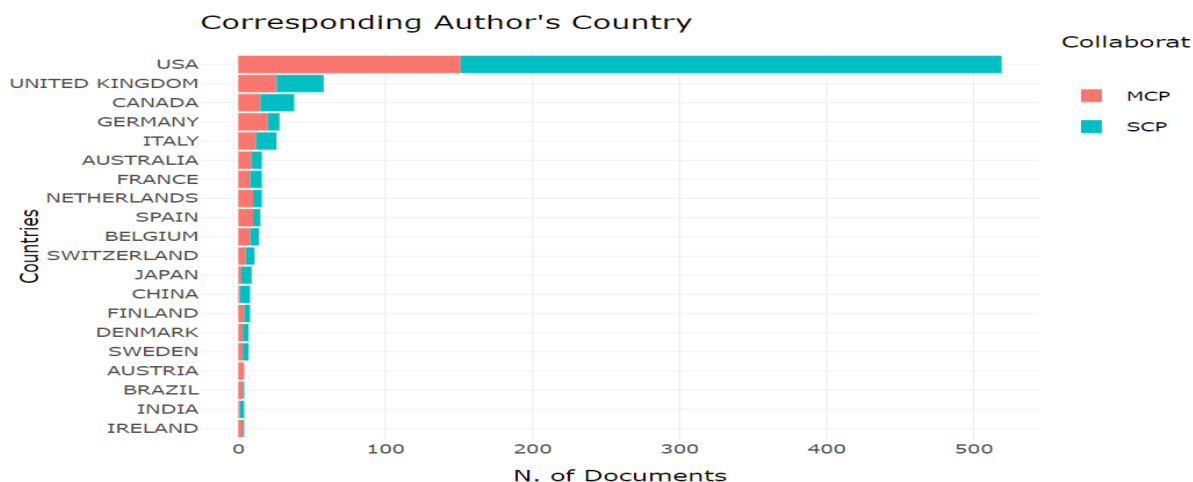
## Corresponding Author's Country

The highest number of SCP (368) and MCP(151) by USA with 519 publications and MCP Ratio is 0.291 followed by UK with 58 Publications (SCP:32 and MCP:26 and MCP Ratio is 0.448. The MCP ratio ranged from 0.125 to 1.

**Table: Corresponding Author's Country**

| Country        | Articles | Frequency | SCP | MCP | MCP_Ratio |
|----------------|----------|-----------|-----|-----|-----------|
| USA            | 519      | 0.62455   | 368 | 151 | 0.291     |
| UNITED KINGDOM | 58       | 0.0698    | 32  | 26  | 0.448     |
| CANADA         | 38       | 0.04573   | 23  | 15  | 0.395     |
| GERMANY        | 28       | 0.03369   | 8   | 20  | 0.714     |
| ITALY          | 26       | 0.03129   | 14  | 12  | 0.462     |
| AUSTRALIA      | 16       | 0.01925   | 7   | 9   | 0.562     |
| FRANCE         | 16       | 0.01925   | 8   | 8   | 0.5       |
| NETHERLANDS    | 16       | 0.01925   | 6   | 10  | 0.625     |
| SPAIN          | 15       | 0.01805   | 5   | 10  | 0.667     |
| BELGIUM        | 14       | 0.01685   | 6   | 8   | 0.571     |
| SWITZERLAND    | 11       | 0.01324   | 6   | 5   | 0.455     |
| JAPAN          | 9        | 0.01083   | 7   | 2   | 0.222     |
| CHINA          | 8        | 0.00963   | 7   | 1   | 0.125     |
| FINLAND        | 8        | 0.00963   | 4   | 4   | 0.5       |
| DENMARK        | 7        | 0.00842   | 4   | 3   | 0.429     |
| SWEDEN         | 7        | 0.00842   | 4   | 3   | 0.429     |
| AUSTRIA        | 4        | 0.00481   | 0   | 4   | 1         |
| BRAZIL         | 4        | 0.00481   | 1   | 3   | 0.75      |
| INDIA          | 4        | 0.00481   | 3   | 1   | 0.25      |
| IRELAND        | 4        | 0.00481   | 1   | 3   | 0.75      |
| GREECE         | 3        | 0.00361   | 1   | 2   | 0.667     |
| POLAND         | 3        | 0.00361   | 3   | 0   | 0         |
| PORTUGAL       | 3        | 0.00361   | 1   | 2   | 0.667     |
| THAILAND       | 2        | 0.00241   | 0   | 2   | 1         |
| ISRAEL         | 1        | 0.0012    | 1   | 0   | 0         |
| KOREA          | 1        | 0.0012    | 1   | 0   | 0         |
| NEW ZEALAND    | 1        | 0.0012    | 1   | 0   | 0         |
| RUSSIA         | 1        | 0.0012    | 0   | 1   | 1         |
| SAUDI ARABIA   | 1        | 0.0012    | 0   | 1   | 1         |
| SINGAPORE      | 1        | 0.0012    | 1   | 0   | 0         |
| SLOVAKIA       | 1        | 0.0012    | 0   | 1   | 1         |
| SOUTH AFRICA   | 1        | 0.0012    | 0   | 1   | 1         |





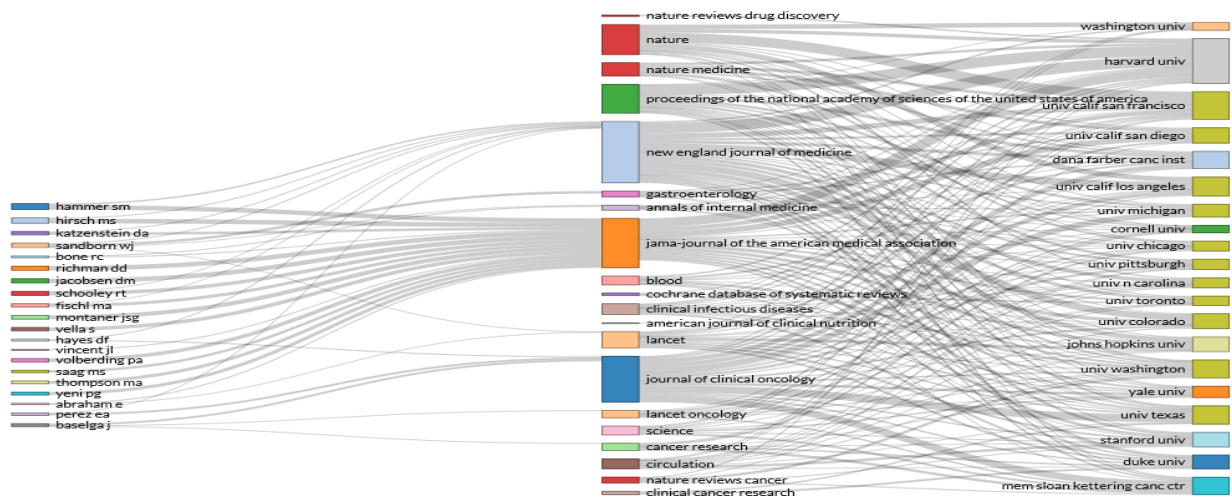
### Most Cited and Productive Authors

It was identified that Eight authors(Doherty GM, Haugen BR, Mandel SJ, Pacini F, Schlumberger M, Sherman SI, Steward DL) have registered the highest number of Citations with 9107 for 2 Publications(ACPP-4553.50) followed by Vincent JL with 8918 Citations for 7 Publications (ACPP-1274), Hammer SM with 8816 Citations for 12 Publications (ACPP-734.6), Sandborn W J with 7162 Citations for 10 Publications (ACPP-716.2), Jain RK with 7114 Citations for 2 Publications (ACPP-3557) and Levy MM with 7000 Citations for 7 Publications (ACPP-1750). It is note that 36 Authors registered more than 5000 Citations and 1528 authors recorded more than 1000 Citations. The most productive authors identified are: Hammer SM with 12 Publications (ACPP-734.6), followed by Hirsch MS with 11 Publications(ACPP-605.27), Richman DD with 10 publications(ACPP-599.8), Sandhorn WJ with 10 Publications(ACPP716.2).

### Most Cited and Productive Authors

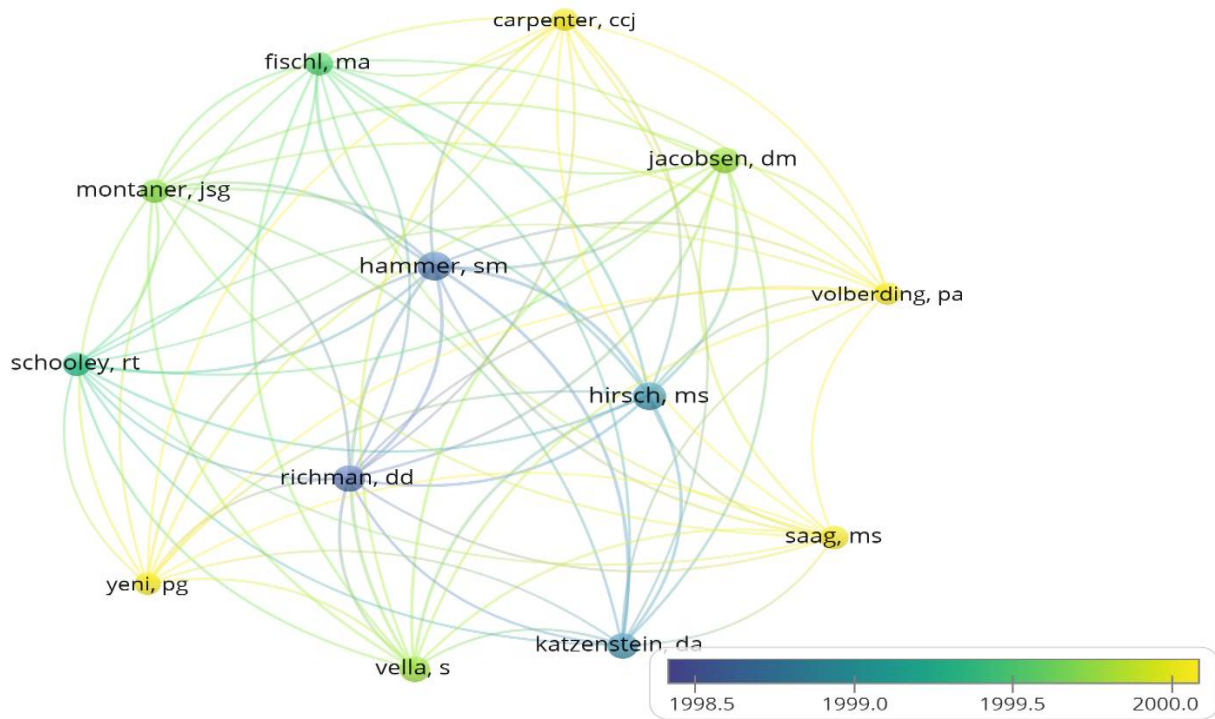
| #  | Author         | Records | Citations | Author         | Records | Citations |
|----|----------------|---------|-----------|----------------|---------|-----------|
| 1  | Hammer SM      | 12      | 8816      | Doherty GM     | 2       | 9107      |
| 2  | Hirsch MS      | 11      | 6658      | Haugen BR      | 2       | 9107      |
| 3  | Richman DD     | 10      | 5998      | Mandel SJ      | 2       | 9107      |
| 4  | Sandborn WJ    | 10      | 7162      | Pacini F       | 2       | 9107      |
| 5  | Jacobsen DM    | 9       | 5532      | Schlumberger M | 2       | 9107      |
| 6  | Montaner JSG   | 8       | 5148      | Sherman SI     | 2       | 9107      |
| 7  | Schooley RT    | 8       | 5208      | Steward DL     | 2       | 9107      |
| 8  | Fischl MA      | 7       | 5975      | Tuttle RM      | 2       | 9107      |
| 9  | Katzenstein DA | 7       | 4177      | Vincent JL     | 7       | 8918      |
| 10 | Perez EA       | 7       | 6911      | Hammer SM      | 12      | 8816      |
| 11 | Vella S        | 7       | 4095      | Sandborn WJ    | 10      | 7162      |
| 12 | Vincent JL     | 7       | 8918      | Jain RK        | 2       | 7114      |
| 13 | Volberding PA  | 7       | 4488      | Levy MM        | 4       | 7000      |
| 14 | Abraham E      | 6       | 6901      | Fischl B       | 3       | 6914      |
| 15 | Baselga J      | 6       | 4212      | Perez EA       | 7       | 6911      |
| 16 | Hayes DF       | 6       | 5952      | Abraham E      | 6       | 6901      |

|    |               |   |      |             |    |      |
|----|---------------|---|------|-------------|----|------|
| 17 | Saag MS       | 6 | 4282 | de Bono JS  | 3  | 6843 |
| 18 | Thompson MA   | 6 | 3644 | Hirsch MS   | 11 | 6658 |
| 19 | Yeni PG       | 6 | 3817 | Marshall JC | 4  | 6593 |
| 20 | Bone RC       | 5 | 3645 | Carmeliet P | 1  | 6319 |
| 21 | Carpenter CCJ | 5 | 3051 | Aggarwal BB | 4  | 6278 |
| 22 | Gatell JM     | 5 | 3307 | Scher HI    | 4  | 6241 |
| 23 | Rutgeerts P   | 5 | 3640 | Cohen J     | 3  | 6169 |
| 24 | Sosman JA     | 5 | 4329 | Ramsay G    | 3  | 6169 |
| 25 | Aggarwal BB   | 4 | 6278 | Sellers WR  | 4  | 6035 |
| 26 | Anderson KC   | 4 | 2511 | Richman DD  | 10 | 5998 |
| 27 | Balk RA       | 4 | 2802 | Fischl MA   | 7  | 5975 |
| 28 | Burris HA     | 4 | 3022 | Hayes DF    | 6  | 5952 |
| 29 | Caplan AI     | 4 | 3104 | Opal SM     | 4  | 5829 |
| 30 | Colombel JF   | 4 | 3145 | Fink MP     | 4  | 5748 |



Three Fields Plot: Authors, Sources and institutions

| Author               | Documents | Citations | Total link strength |
|----------------------|-----------|-----------|---------------------|
| hammer, sm           | 10        | 7379      | 349                 |
| hirsch, ms           | 9         | 5221      | 312                 |
| jacobsen, dm         | 7         | 4095      | 269                 |
| richman, dd          | 8         | 4561      | 269                 |
| vella, s             | 7         | 4095      | 269                 |
| montaner, jsg        | 6         | 3711      | 245                 |
| katzenstein, da      | 7         | 4177      | 238                 |
| fischl, ma           | 6         | 5209      | 236                 |
| schooley, rt         | 6         | 3771      | 223                 |
| carpenter, ccj       | 5         | 3051      | 195                 |
| saag, ms             | 6         | 4282      | 195                 |
| volberding, pa       | 5         | 3051      | 195                 |
| yeni, pg             | 5         | 3051      | 195                 |
| rutgeerts, paul      | 5         | 3640      | 19                  |
| sandborn, william j. | 8         | 5885      | 19                  |
| perez, edith a.      | 5         | 5223      | 0                   |
| vincent, jl          | 5         | 7598      | 0                   |



### **Bibliographic Forms of Publications**

A total 856 publications 470 (54.91 %) are articles published in journals. Reviews are 344 (40.2 %), followed by Article; Proceedings Paper 22 (2.6 %), Review; Book Chapter 9 and Editorial Material 9 (3.44 %) respectively. It is note that researchers have preferred 7 bibliographical forms of communications for their research. It is also note that Journal articles and Review are more preferred.

#### **Bibliographical forms of Communications**

| # | Document Type                  | Records | %     | Citations |
|---|--------------------------------|---------|-------|-----------|
| 1 | Article                        | 470     | 54.91 | 343204    |
| 2 | Review                         | 344     | 40.2  | 255449    |
| 3 | Article; Proceedings Paper     | 22      | 2.6   | 14987     |
| 4 | Review; Book Chapter           | 9       | 1.1   | 4763      |
| 5 | Editorial Material             | 9       | 1.1   | 4735      |
| 6 | Article; Retracted Publication | 1       | 0.1   | 770       |
| 7 | Note                           | 1       | 0.1   | 453       |

### **Most Preferred and Highly Cited Sources**

In the study, 60 highly Cited and preferred journals publishing Human Clinical Trials research papers were identified and listed in the below table. Table indicated below shows the impact of the most Cited Journals. NEW ENGLAND

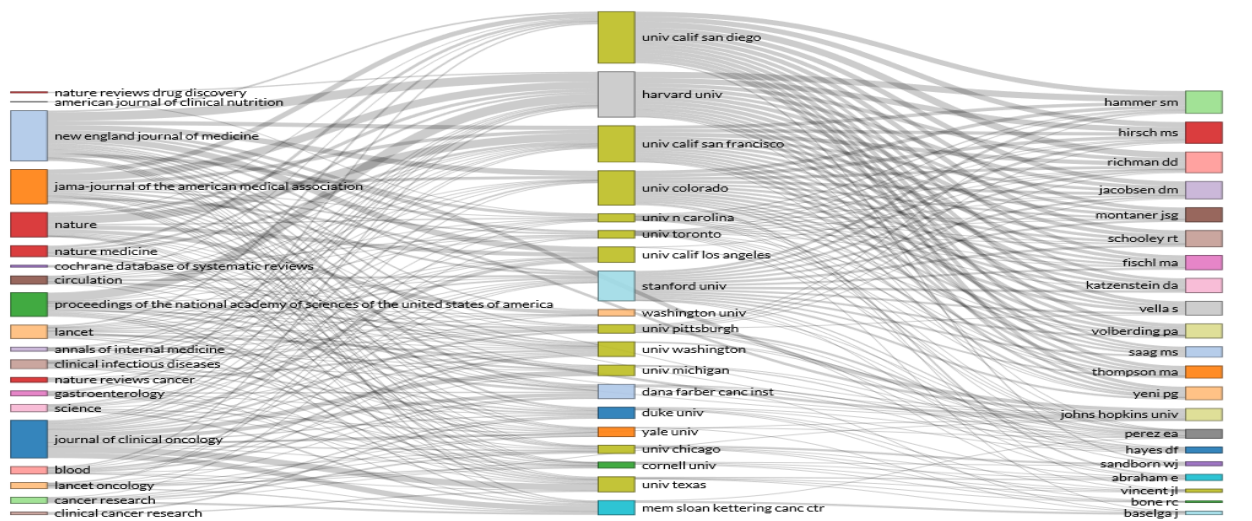
JOURNAL OF MEDICINE is the highly Cited journal with 50851 Citations, followed by JOURNAL OF CLINICAL ONCOLOGY with 43200 Citations, JAMA-JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION with 28875 Citations, NATURE with 26456 Citations, and LANCET with 25181 Citations.

It was found that NEW ENGLAND JOURNAL OF MEDICINE has the highest impact factor (74.699) followed by NATURE REVIEWS DRUG DISCOVERY (64.797), LANCET (60.392), NATURE REVIEWS CANCER (53.030), JAMA-JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION (45.540), SCIENCE (41.845), NATURE REVIEWS IMMUNOLOGY (40.358). It is note that 35 Journals registered more than 40 Impact Factor and it shows quality of research in the field of Human Clinical Trials.

**Table: Most Preferred and Highly Cited Sources**

| #  | Journal   | Impact Factor | Records | Citations |
|----|---|---------------|---------|-----------|
| 1  | NEW ENGLAND JOURNAL OF MEDICINE   | 74.699        | 56      | 50851     |
| 2  | JOURNAL OF CLINICAL ONCOLOGY  | 32.956        | 63      | 43200     |
| 3  | JAMA-JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION                                | 45.540        | 44      | 28875     |
| 4  | NATURE  | 26            | 20      | 26456     |
| 5  | LANCET  | 60.392        | 30      | 25181     |
| 6  | NATURE REVIEWS DRUG DISCOVERY   | 64.797        | 18      | 13875     |
| 7  | BLOOD   | 17.794        | 19      | 13797     |
| 8  | COCHRANE DATABASE OF SYSTEMATIC REVIEWS   | 7.890         | 18      | 13020     |
| 9  | PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA | 9.412         | 22      | 12936     |
| 10 | CANCER RESEARCH   | 9.727         | 20      | 12764     |
| 11 | NATURE REVIEWS CANCER   | 53.030        | 13      | 11222     |
| 12 | SCIENCE   | 41.845        | 9       | 10385     |
| 13 | THYROID   | 7.557         | 3       | 9625      |
| 14 | CRITICAL CARE MEDICINE  | 7.414         | 6       | 7958      |
| 15 | ANNALS OF INTERNAL MEDICINE   | 21.317        | 13      | 7454      |
| 16 | CIRCULATION   | 23.603        | 12      | 7383      |
| 17 | GASTROENTEROLOGY  | 19.809        | 10      | 7141      |
| 18 | CLINICAL CANCER RESEARCH  | 10.107        | 10      | 7094      |
| 19 | NEUROIMAGE  | 5.902         | 3       | 6914      |
| 20 | AMERICAN JOURNAL OF CLINICAL NUTRITION  | 6.766         | 8       | 6473      |
| 21 | NATURE MEDICINE   | 36.230        | 11      | 6371      |
| 22 | JOURNAL OF CLINICAL INVESTIGATION   | 11.864        | 6       | 5700      |
| 23 | CLINICAL INFECTIOUS DISEASES  | 9.117         | 8       | 5375      |
| 24 | ENDOCRINE REVIEWS   | 15.745        | 6       | 5311      |
| 25 | JNCI-JOURNAL OF THE NATIONAL CANCER INSTITUTE                                   | 11.577        | 6       | 4913      |
| 26 | ANNALS OF ONCOLOGY  | 18.274        | 5       | 4820      |
| 27 | LANCET ONCOLOGY   | 33.752        | 7       | 4746      |
| 28 | PAIN  | 6.029         | 3       | 4014      |
| 29 | NATURE REVIEWS IMMUNOLOGY   | 40.358        | 6       | 4013      |
| 30 | PEDIATRICS  | 5.417         | 2       | 3990      |
| 31 | SCIENCE TRANSLATIONAL MEDICINE  | 16.304        | 5       | 3877      |
| 32 | PHARMACOLOGICAL REVIEWS   | 17.814        | 5       | 3830      |
| 33 | STEM CELLS  | 3.231         | 5       | 3601      |
| 34 | MOLECULAR PHARMACEUTICS   | 4.57          | 2       | 3565      |
| 35 | FASEB JOURNAL   | 4.966         | 1       | 3359      |

|    |   |        |   |      |
|----|---|--------|---|------|
| 36 | ANTICANCER RESEARCH                           | 1.937  | 2 | 3332 |
| 37 | JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY | 20.589 | 5 | 3308 |
| 38 | JOURNAL OF BIOLOGICAL CHEMISTRY               | 4.238  | 4 | 2586 |
| 39 | ONCOGENE                                      | 7.971  | 4 | 2521 |
| 40 | ARTHRITIS AND RHEUMATISM                      | 4.7    | 4 | 2520 |
| 41 | PHARMACOLOGY & THERAPEUTICS                   | 11.127 | 4 | 2473 |
| 42 | AMERICAN JOURNAL OF TRANSPLANTATION           | 7.163  | 3 | 2409 |
| 43 | ANNUAL REVIEW OF IMMUNOLOGY                   | 19.900 | 3 | 2358 |
| 44 | BRAIN   | 11.337 | 4 | 2357 |
| 45 | JOURNAL OF CONTROLLED RELEASE                 | 7.633  | 3 | 2350 |
| 46 | LANCET NEUROLOGY                              | 30.039 | 4 | 2333 |
| 47 | CLINICAL NEUROPHYSIOLOGY                      | 3.614  | 3 | 2331 |
| 48 | CLINICAL MICROBIOLOGY REVIEWS                 | 17.406 | 4 | 2317 |
| 49 | GUT   | 19.819 | 4 | 2234 |
| 50 | ANNUAL REVIEW OF MEDICINE                     | 9.716  | 3 | 2218 |
| 51 | DIABETES CARE                                 | 15.3   | 5 | 2210 |
| 52 | NATURE GENETICS                               | 27.603 | 2 | 2181 |
| 53 | LANCET INFECTIOUS DISEASES                    | 36.421 | 2 | 2153 |
| 54 | ANTIMICROBIAL AGENTS AND CHEMOTHERAPY         | 4.715  | 2 | 2048 |
| 55 | BRITISH JOURNAL OF CANCER                     | 5.791  | 4 | 2040 |
| 56 | MOLECULAR AND CELLULAR BIOCHEMISTRY           | 2.057  | 2 | 1962 |
| 57 | NATURE BIOTECHNOLOGY                          | 36.558 | 3 | 1961 |
| 58 | CHEST   | 9.657  | 3 | 1953 |
| 59 | HUMAN REPRODUCTION UPDATE                     | 12.684 | 2 | 1943 |
| 60 | NATURE REVIEWS GENETICS                       | 33.133 | 4 | 1859 |



Activate Windows

Three Fields Plot: (Sources, Institutions and Authors)

| Source                               | Documents | Citations | Total link strength |
|--------------------------------------|-----------|-----------|---------------------|
| new england journal of medicine      | 56        | 50851     | 53                  |
| jama-journal of the american medi... | 44        | 28875     | 40                  |
| journal of clinical oncology         | 63        | 43200     | 39                  |
| lancet                               | 30        | 25181     | 26                  |
| gastroenterology                     | 10        | 7141      | 16                  |
| annals of internal medicine          | 13        | 7454      | 12                  |
| blood                                | 19        | 13797     | 12                  |
| cancer research                      | 20        | 12764     | 11                  |
| clinical cancer research             | 10        | 7094      | 11                  |
| journal of clinical investigation    | 6         | 5700      | 10                  |
| nature reviews drug discovery        | 18        | 13875     | 10                  |
| proceedings of the national acade... | 22        | 12936     | 9                   |
| critical care medicine               | 6         | 7958      | 7                   |
| endocrine reviews                    | 6         | 5311      | 6                   |
| lancet oncology                      | 7         | 4746      | 6                   |
| science                              | 9         | 10385     | 6                   |
| cochrane database of systematic r... | 18        | 13020     | 5                   |
| nature                               | 20        | 26456     | 5                   |
| nature medicine                      | 11        | 6371      | 5                   |
| annals of oncology                   | 5         | 4820      | 4                   |



## Most Productive year

This table gives the year wise distribution of articles. Out of total 856 articles, the maximum numbers of articles are in the year 2005 contributing 61 articles, which is 41827 to the total Citations. The minimum numbers of articles are in the year of 2019 with 1 (455 Citations), 1990 with 1 (439 Citations), 1989 with 1 (723 Citations) and 1992 with 2 (910 Citations). This table also shows the citation pattern of articles distributed in the year of 2008 with 43606 Citations for 59 Publications followed by 2005 with 41827 Citations for 61 Publications, 2006 with 39638 Citations for 51 articles. It is noted that almost all the year registered highly cited papers.

**Table: Most Productive year**

| # | Citation Impact |         |           | Publication Impact |         |           |
|---|-----------------|---------|-----------|--------------------|---------|-----------|
|   | Year            | Records | Citations | Year               | Records | Citations |
| 2 | 2008            | 59      | 43606     | 2005               | 61      | 41827     |

|    |      |    |       |      |    |       |
|----|------|----|-------|------|----|-------|
| 1  | 2005 | 61 | 41827 | 2008 | 59 | 43606 |
| 4  | 2006 | 51 | 39638 | 2007 | 47 | 38741 |
| 6  | 2007 | 47 | 38741 | 2009 | 44 | 36922 |
| 7  | 2000 | 46 | 38411 | 2003 | 54 | 36542 |
| 8  | 2009 | 44 | 36922 | 2011 | 42 | 32232 |
| 3  | 2003 | 54 | 36542 | 2006 | 51 | 39638 |
| 9  | 2011 | 42 | 32232 | 2002 | 47 | 30069 |
| 5  | 2002 | 47 | 30069 | 2000 | 46 | 38411 |
| 10 | 2012 | 37 | 29081 | 2012 | 37 | 29081 |
| 12 | 2004 | 36 | 27335 | 2001 | 36 | 26737 |
| 11 | 2001 | 36 | 26737 | 2004 | 36 | 27335 |
| 13 | 2013 | 33 | 22690 | 2013 | 33 | 22690 |
| 15 | 2010 | 29 | 21604 | 1998 | 27 | 17770 |
| 16 | 1998 | 27 | 17770 | 1999 | 25 | 17233 |
| 17 | 1999 | 25 | 17233 | 2014 | 30 | 17191 |
| 14 | 2014 | 30 | 17191 | 2010 | 29 | 21604 |
| 20 | 1996 | 22 | 14982 | 1995 | 23 | 14875 |
| 19 | 2015 | 23 | 14896 | 2015 | 23 | 14896 |
| 18 | 1995 | 23 | 14875 | 1996 | 22 | 14982 |
| 21 | 1997 | 21 | 14607 | 1997 | 21 | 14607 |
| 22 | 2016 | 15 | 13362 | 2016 | 15 | 13362 |
| 24 | 1994 | 8  | 8115  | 1993 | 10 | 6637  |
| 23 | 1993 | 10 | 6637  | 1994 | 8  | 8115  |
| 25 | 1991 | 7  | 5981  | 1991 | 7  | 5981  |
| 27 | 2020 | 7  | 4706  | 2017 | 7  | 3832  |
| 26 | 2017 | 7  | 3832  | 2020 | 7  | 4706  |
| 28 | 2018 | 4  | 2212  | 2018 | 4  | 2212  |
| 29 | 1992 | 2  | 910   | 1992 | 2  | 910   |
| 30 | 1989 | 1  | 723   | 1989 | 1  | 723   |
| 32 | 2019 | 1  | 455   | 1990 | 1  | 439   |
| 31 | 1990 | 1  | 439   | 2019 | 1  | 455   |

## Most Cited Institutions

Among all the Institutions, the highly productive Institutions were: Harvard University from USA with 82 publications and received 78100 Citations

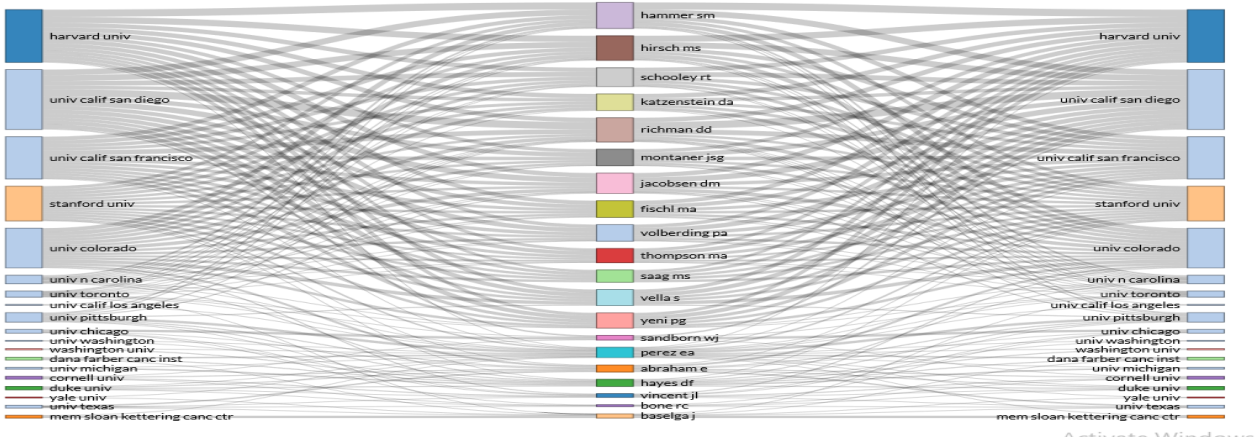
followed by University Calif San Francisco - USA with 49 publications and 38573 citations, University Colorado - USA with 31 publications and 36448 citations, Mem Sloan Kettering Cancer Centre- USA with 36 publications and 36300 citations. USA Institutes are dominating in terms of Citation and Publications in the field of Human Clinical Trials research. 46 Institutes were recorded 10000 and above Citations and 694 institutions were registered 1000 and above citations.

**Table: Most Cited Institutions**

| #  | Institution                                | Country | Records | Citations |
|----|--|---------|---------|-----------|
| 1  | Harvard University                         | USA     | 82      | 78100     |
| 2  | University Calif San Francisco             | USA     | 49      | 38573     |
| 3  | University Colorado                        | USA     | 31      | 36448     |
| 4  | Mem Sloan Kettering Cancer Centre          | USA     | 36      | 36300     |
| 5  | University Texas                           | USA     | 35      | 31511     |
| 6  | Johns Hopkins University                   | USA     | 36      | 31225     |
| 7  | University Calif San Diego                 | USA     | 35      | 29371     |
| 8  | University Texas MD Anderson Cancer Centre | USA     | 23      | 28086     |
| 9  | Massachusetts Gen Hospital                 | USA     | 23      | 27857     |
| 10 | University Pittsburgh                      | USA     | 31      | 27699     |
| 11 | University Washington                      | USA     | 31      | 25858     |
| 12 | Dana Farber Cancer Institute               | USA     | 30      | 25265     |
| 13 | Duke University                            | USA     | 29      | 24722     |
| 14 | University Penn                            | USA     | 20      | 23929     |
| 15 | Mayo Clinic                                | USA     | 24      | 23299     |
| 16 | University Calif Los Angeles               | USA     | 27      | 23184     |
| 17 | Stanford University                        | USA     | 32      | 21995     |
| 18 | University Toronto                         | Canada  | 24      | 19786     |
| 19 | University N Carolina                      | USA     | 29      | 18864     |
| 20 | Institute Gustave Roussy                   | France  | 12      | 18427     |
| 21 | University Cincinnati                      | USA     | 11      | 17886     |
| 22 | University of Michigan                     | USA     | 22      | 16672     |
| 23 | NIAID                                      | USA     | 17      | 16608     |
| 24 | Boston University                          | USA     | 11      | 15673     |
| 25 | Washington University                      | USA     | 22      | 15529     |
| 26 | University Miami                           | USA     | 18      | 15271     |
| 27 | Emory University                           | USA     | 22      | 14287     |
| 28 | Yale University                            | USA     | 20      | 14232     |
| 29 | NCI  | USA     | 25      | 14133     |
| 30 | Oregon Health & Science University         | USA     | 14      | 13611     |
| 31 | University of Chicago                      | USA     | 19      | 13473     |
| 32 | University British Columbia                | Canada  | 17      | 13142     |
| 33 | MIT  | USA     | 10      | 12892     |
| 34 | University Oxford                          | UK      | 14      | 12325     |
| 35 | Columbia University                        | USA     | 16      | 12193     |
| 36 | University of Minnesota                    | USA     | 14      | 12049     |
| 37 | Brigham & Women's Hospital                 | USA     | 17      | 12010     |
| 38 | Vanderbilt University                      | USA     | 11      | 11888     |
| 39 | Tufts University                           | USA     | 12      | 11772     |
| 40 | Indiana University                         | USA     | 16      | 11503     |
| 41 | Brown University                           | USA     | 13      | 11049     |

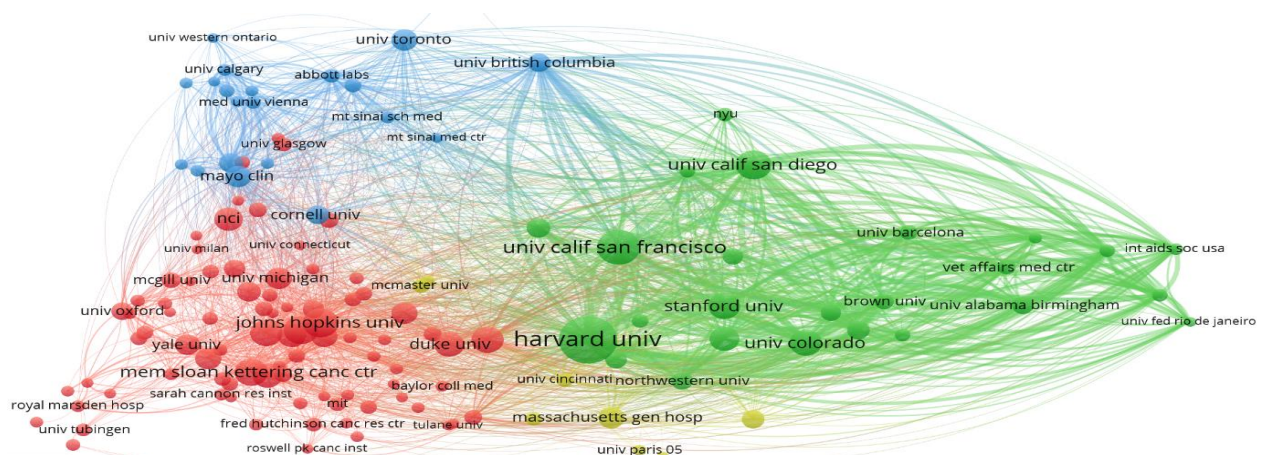


|    |                             |       |    |       |
|----|-----------------------------|-------|----|-------|
| 42 | University of Rochester     | USA   | 13 | 10882 |
| 43 | Northwestern University     | USA   | 16 | 10854 |
| 44 | Genentech Inc               | USA   | 11 | 10533 |
| 45 | University Siena            | Italy | 4  | 10471 |
| 46 | Howard Hughes Med Institute | USA   | 4  | 10447 |



Three Fields plot: Affiliations, Authors and Institutions

| Organization                | Documents | Citations | Total link strength |
|-----------------------------|-----------|-----------|---------------------|
| harvard univ                | 81        | 77100     | 886                 |
| univ calif san diego        | 35        | 29371     | 682                 |
| univ calif san francisco    | 47        | 35873     | 590                 |
| univ colorado               | 30        | 34748     | 543                 |
| univ miami                  | 16        | 13576     | 492                 |
| stanford univ               | 30        | 20307     | 446                 |
| hop bichat claude bernard   | 8         | 4890      | 435                 |
| ist super sanita            | 8         | 4803      | 432                 |
| univ british columbia       | 16        | 12142     | 408                 |
| vet affairs med ctr         | 11        | 7918      | 398                 |
| int aids soc usa            | 7         | 4441      | 381                 |
| brown univ                  | 12        | 10260     | 367                 |
| aids res consortium atlanta | 6         | 3846      | 340                 |
| niaid                       | 17        | 16608     | 304                 |
| univ alabama birmingham     | 15        | 9066      | 299                 |
| univ rochester              | 13        | 10882     | 298                 |
| univ alabama                | 8         | 6555      | 273                 |
| univ barcelona              | 11        | 8059      | 271                 |
| univ n carolina             | 26        | 16702     | 267                 |
| northwestern univ           | 14        | 9598      | 252                 |



## Highly Cited Works

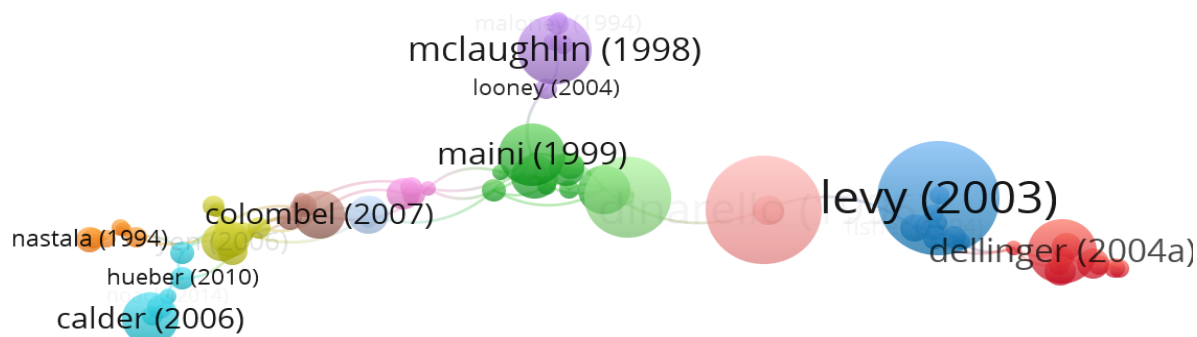
856 papers have received more than 400 citations and it has considered as Citation Classic Paper (In general, a publication cited more than 400 times should be considered a classic; but in some fields with fewer researchers, 100 citations might qualify a work- **Eugene Garfield**), besides this the citations count has been taken as the number of citations received by each paper since these were published till March 2021. Table presents the pattern of frequently cited papers. It is found that there were 123 papers, which have received more than 1000 citations. The most cited paper “Carmeliet P, Jain RK, (2000, Canada). Angiogenesis in cancer and other diseases”, published in NATURE with 6319 Citations followed by Desikan RS, Segonne F, Fischl B, Quinn BT, Dickerson BC, et al. (2006, Slovakia, England and USA). “An automated labeling system for subdividing the human cerebral cortex on MRI scans into gyral based regions of interest”, published in NEUROIMAGE with 4933 citations. Top 20 journals are indexed during 2000 to 2016.

**Table: Highly Cited Works**

| # | Date / Author / Journal   | LCS | GCS  | LCR | CR   |
|---|---|-----|------|-----|------|
| 1 | 186 Carmeliet P, Jain RK, Angiogenesis in cancer and other diseases NATURE. 2000 SEP 14; 407 (6801): 249-257  | 3   | 6319 | 1   | 75   |
| 2 | 460 Desikan RS, Segonne F, Fischl B, Quinn BT, Dickerson BC, et al., An automated labeling system for subdividing the human cerebral cortex on MRI scans into gyral based regions of interest, NEUROIMAGE. 2006 JUL 1; 31 (3): 968-980  | 1   | 4933 | 0   | 63   |
| 3 | 826 Haugen BR, Alexander EK, Bible KC, Doherty GM, Mandel SJ, et al., 2015 American Thyroid Association Management Guidelines for Adult Patients with Thyroid Nodules and Differentiated Thyroid Cancer The American Thyroid Association Guidelines Task Force on Thyroid Nodules and Differentiated Thyroid Cancer, THYROID. 2016 JAN 1; 26 (1): 1-133 | 0   | 4579 | 1   | 1071 |
| 4 | 620 Cooper DS, Doherty GM, Haugen BR, Kloos RT, Lee SL, et al. Revised American Thyroid Association Management Guidelines for Patients with Thyroid Nodules and Differentiated Thyroid Cancer THYROID. 2009 NOV; 19 (11): 1167-1214   | 2   | 4528 | 0   | 435  |
| 5 | 294 Levy MM, Fink MP, Marshall JC, Abraham E, Angus D, et al. 2001 SCCM/ESICM/ACCP/ATS/SIS International Sepsis Definitions Conference CRITICAL CARE MEDICINE. 2003 APR; 31 (4): 1250-1256  | 2   | 3636 | 0   | 41   |
| 6 | 718 Barretina J, Caponigro G, Stransky N, Venkatesan K, Margolin AA, et al. The Cancer Cell Line Encyclopedia enables predictive modelling of anticancer drug sensitivity, NATURE. 2012 MAR 29; 483 (7391): 603-607   | 0   | 3492 | 0   | 26   |
| 7 | 378 Gartner LM, Morton J, Lawrence RA, Naylor AJ, O'Hare D, et al. Breastfeeding and the use of human milk PEDIATRICS. 2005 FEB; 115 (2): 496-506   | 0   | 3475 | 0   | 215  |
| 8 | 60 Dinarello CA, Biologic basis for interleukin-1 in disease BLOOD. 1996 MAR 15; 87 (6): 2095-2147  | 0   | 3428 | 3   | 585  |
| 9 | 541 Reagan-Shaw S, Nihal M, Ahmad N Dose translation from animal to human studies revisited   | 0   | 3359 | 0   | 20   |

|    |   |   |      |   |     |
|----|---|---|------|---|-----|
|    | FASEB JOURNAL. 2008 MAR; 22 (3): 659-661  |   |      |   |     |
| 10 | 228 Farrar JT, Young JP, LaMoreaux L, Werth JL, Poole RM<br>Clinical importance of changes in chronic pain intensity measured on an 11-point numerical pain rating scale, PAIN. 2001 NOV; 94 (2): 149-158   | 1 | 2970 | 0 | 22  |
| 11 | 518 Anand P, Kunnumakkara AB, Newman RA, Aggarwal BB<br>Bioavailability of curcumin: Problems and promises<br>MOLECULAR PHARMACEUTICS. 2007 NOV-DEC; 4 (6): 807-818   | 3 | 2868 | 4 | 85  |
| 12 | 29 CONNOR EM, SPERLING RS, GELBER R, KISELEV P, SCOTT G, et al.<br>REDUCTION OF MATERNAL-INFANT TRANSMISSION OF HUMAN-IMMUNODEFICIENCY-VIRUS TYPE-1 WITH ZIDOVUDINE TREATMENT<br>NEW ENGLAND JOURNAL OF MEDICINE. 1994 NOV 3; 331 (18): 1173-1180   | 6 | 2719 | 0 | 39  |
| 13 | 681 De Bono JS, Logothetis CJ, Molina A, Fizazi K, North S, et al.<br>Abiraterone and Increased Survival in Metastatic Prostate Cancer<br>NEW ENGLAND JOURNAL OF MEDICINE. 2011 MAY 26; 364 (21): 1995-2005   | 0 | 2705 | 0 | 50  |
| 14 | 700 Macdonald G, Higgins JPT, Ramchandani P, Valentine JC, Bronger LP, et al.<br>Cognitive-behavioural interventions for children who have been sexually abused<br>COCHRANE DATABASE OF SYSTEMATIC REVIEWS. 2012; (5): Art. No. CD001930  | 0 | 2659 | 0 | 102 |
| 15 | 500 Moore MJ, Goldstein D, Hamm J, Figer A, Hecht JR, et al.<br>Erlotinib plus gemcitabine compared with gemcitabine alone in patients with advanced pancreatic cancer: A phase III trial of the National Cancer Institute of Canada clinical trials group<br>JOURNAL OF CLINICAL ONCOLOGY. 2007 MAY 20; 25 (15): 1960-1966 | 3 | 2633 | 0 | 36  |
| 16 | 483 Wolff AC, Hammond MEH, Schwartz JN, Hagerty KL, Allred DC, et al.<br>American Society of Clinical Oncology/College of American Pathologists guideline recommendations for human epidermal growth factor receptor 2 testing in breast cancer, JOURNAL OF CLINICAL ONCOLOGY. 2007 JAN 1; 25 (1): 118-145                  | 2 | 2618 | 1 | 88  |
| 17 | 179 Rayman MP, The importance of selenium to human health<br>LANCET. 2000 JUL 15; 356 (9225): 233-241   | 2 | 2587 | 0 | 85  |
| 18 | 188 Noseworthy JH, Lucchinetti C, Rodriguez M, Weinshenker BG<br>Medical progress: Multiple sclerosis.<br>NEW ENGLAND JOURNAL OF MEDICINE. 2000 SEP 28; 343 (13): 938-952   | 0 | 2527 | 1 | 106 |
| 19 | 684 Lehmann BD, Bauer JA, Chen X, Sanders ME, Chakravarthy AB, et al.<br>Identification of human triple-negative breast cancer subtypes and preclinical models for selection of targeted therapies<br>JOURNAL OF CLINICAL INVESTIGATION. 2011 JUL; 121 (7): 2750-2767   | 0 | 2513 | 2 | 78  |
| 20 | 353 Ferrara N, Vascular endothelial growth factor: Basic science and clinical progress, ENDOCRINE REVIEWS. 2004 AUG; 25 (4): 581-611  | 2 | 2442 | 2 | 435 |

| Document          | Citations | Links |
|-------------------|-----------|-------|
| cheng (2001)      | 1476      | 12    |
| hammer (1997)     | 2158      | 11    |
| sharma (2004)     | 819       | 11    |
| sharma (2001)     | 587       | 10    |
| aggarwal (2003)   | 1856      | 9     |
| colombel (2007)   | 1425      | 9     |
| sharma (2005)     | 1075      | 9     |
| koc (2000)        | 810       | 9     |
| carpenter (1996)  | 539       | 9     |
| zhou (2011)       | 406       | 9     |
| maini (1999)      | 1922      | 8     |
| carpenter (2000)  | 844       | 8     |
| carpenter (1998)  | 642       | 8     |
| mannon (2004)     | 623       | 8     |
| sandborn (2008)   | 515       | 8     |
| naksuriya (2014)  | 475       | 8     |
| strimpakos (2008) | 432       | 8     |
| singh (2011)      | 404       | 8     |
| anand (2007)      | 2868      | 7     |
| coussens (2002)   | 2084      | 7     |
| davis (2010)      | 1791      | 7     |



## FINDINGS AND CONCLUSION

As per the Web of Science database, a total of 856 publications were published on Human Clinical Trials, which received 624361 citations during 1989-2020. The highest number of citations (43606) were received in 2008. A total of 624361 citations were included in 856 publications with an average of 19511.27 citations per Year in Human Clinical Trials research. USA is identified as the most leading country in terms of publications and Citations with 453423 Citations for 589 Publications in Human Clinical Trials research. It has shared 68.8 percent of world publications. India holds 32<sup>nd</sup> rank with 6 papers which has 0.7 percent share and 31<sup>st</sup> rank with received 4409 Citations. The most cited journals are New England Journal of Medicine with 50851 Citations followed by Journal of Clinical Oncology with 43200 Citations, JAMA Journal of the American Medical Association with 28875 Citations, Nature with 26456 and Lancet with 25181 Citations. The most Cited Countries are: USA with 453423 Citations followed by UK with 100930 Citations, Canada with 84220, France with 61930, Germany with 61752 and India ranked 31<sup>st</sup> Place according to Citations with 4409. The most productive authors identified are: Hammer SM

with 12 Publications (ACPP-734.6), followed by Hirsch MS with 11 Publications (ACPP-605.27), Richman DD with 10 publications (ACPP-599.8), Sandhorn WJ with 10 Publications (ACPP716.2). The most cited paper “Carmeliet P, Jain RK, (2000, Canada). Angiogenesis in cancer and other diseases”, published in NATURE with 6319 Citations followed by Desikan RS, Segonne F, Fischl B, Quinn BT, Dickerson BC, et al. (2006, Slovakia, England and USA). “An automated labeling system for subdividing the human cerebral cortex on MRI scans into gyral based regions of interest”, published in NEUROIMAGE with 4933 citations. Top 20 journals are indexed during 2000 to 2016. The most cited publications on Human Clinical Trials are highly impactful, landmark studies representing Institutions, Countries, Sources and authorship pattern. A clinical trial is a research study in human volunteers to answer specific health questions. Carefully conducted clinical trials are fastest and safest way to find treatment that work in people and way to improve health. These influential publications have immensely inspiration research for invention of Drugs, Vaccines and Medicines

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