

## Original Article

# How to fund clinical research in orthopedics and traumatology? Grants and opportunities

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## Abstract

**Objective:** The aim of the study was to identify: how to fund clinical research in orthopedics and traumatology?

**Methods:** A survey of funding for clinical research was performed.

**Results:** According to data from the PIVOT<sup>®</sup> platform, the funding is concentrated in the USA, UK, and Medical Societies. The main sponsor was the DOD (USA), followed by the SICOT (Belgium). According to data from the DIMENSIONS<sup>®</sup> platform, there was a reduction of projects financed. The main country was the USA, followed by Japan. Regarding the amounts, the largest funders were the USA and Belgium. FAPESP (Brazil) is in the 7th position among sponsors. According to data from the InCites<sup>®</sup> platform, the main countries were the USA, China, and Japan.

**Conclusion:** The reduction of projects in the last two years may be related to the limitations imposed by the SARS-CoV-2 pandemic. Regarding the amounts, the largest funders were the USA and Belgium. This data confirms the importance of funding from the SICOT. The main sponsor was the DOD; this data may be related to injuries that occurred in the war. The fact that the NIDA (USA) is the third largest funder may be related to the increase in the consumption of opioids for pain management. The incidence of falls among the elderly may be associated with Japan being one of the countries most supporting this area. Brazil is in the 8th position, and CAPES, CNPq, and FAPESP are among the top 20 funders.

**Level of Evidence IV; Descriptive Observational Study.**

**Keywords:** Capital fundings; Clinical protocols; Musculoskeletal diseases; Orthopedics; Traumatology.

## Introduction

Financing is providing resources, usually financial, to support an activity, program, or project by a researcher, group, institution, or company. The most common modality at universities and research institutes is non-commercial research funding from government agencies, research councils, or philanthropic entities<sup>(1)</sup>.

Creating well-designed clinical studies in orthopedics and traumatology can be difficult for various reasons. In today's focus on evidence-based medicine, there is a strong

emphasis on selecting treatments based on the results of randomized controlled trials<sup>(2)</sup>. For this reason, orthopedists should prioritize conducting randomized controlled clinical trials whenever feasible. While the information obtained from other types of studies with less evidence, such as case-control, cohort, case series, descriptions of techniques, and specialist's opinions, is also valuable, it's crucial to be informed of the potential bias and evaluate the results critically. If possible, these results should be interpreted with those from randomized controlled clinical trials<sup>(3)</sup>.

Study performed at the Escritório de Pesquisa Clínica (EPeClin), Hospital das Clínicas, Faculdade de Medicina, Universidade de São Paulo, São Paulo, SP, Brazil.

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Conducting randomized controlled trials take a significant number of resources and may not be appropriate for answering all types of research questions. Other research methods, like case-control studies, prospective cohort studies, and cross-sectional studies, can also be used to gain knowledge in orthopedic trauma<sup>(2)</sup>. Therefore, funding organizations conduct extensive consultations to determine priorities, adapt investments to changes, and contemplate new demands and scientific fields, something especially important when resources are reduced<sup>(4)</sup>.

In global terms, a survey on the InCites platform revealed 1,032 active funding entities worldwide mentioned in the texts of documents indexed in the Web of Science database between 2011 and 2018. According to these results, the largest research funding agencies worldwide are the National Natural Science Foundation of China (NSFC), the National Institutes of Health (NIH), and the National Science Foundation (NSF) in the United States of America (USA)<sup>(1)</sup>.

Stakeholders involved in the scientific field need to make strategic decisions about allocating resources. These decisions may include determining which research areas should receive the most financial support, selecting the best candidates for open positions, and evaluating which continuing projects should be kept and which new projects should be initiated. Therefore, it is important to understand the various research options available to make these decisions effectively<sup>(4)</sup>.

Research funding in Brazil takes place through different development systems and institutions, which are directly or indirectly linked to Brazilian ministries. Among them are Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), Financiadora de Estudos e Projetos (FINEP), Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES), Fundo Nacional de Desenvolvimento Científico e Tecnológico (FNDCT), Banco Nacional de Desenvolvimento Econômico e Social (BNDES), in addition to the state agencies that constitute the Foundations Research Support States (FAPs)<sup>(1)</sup>.

Improving the ability to conduct health research in nations that are not as economically advanced is considered a top priority in global health. To understand the impact of orthopedic conditions in Latin America, it is necessary to have a strong collaboration between more developed countries and those that do not<sup>(5)</sup>. According to recent literature data, most clinical research related to orthopedic disorders conducted worldwide and in Brazil depended on sponsorship and private institutions, and the importance of the foot and ankle area is evident when it is the 7th most studied worldwide and the 2nd most studied in Brazil<sup>(6)</sup>.

Few studies focus on funding agencies as assessment units, but this could change as information systems become more integrated and accessible. In addition, the limitations associated with using funding data retrieved from acknowledgments or footnotes of articles cannot be ignored. Even so, significant insights can be gained from analyzing this data<sup>(1)</sup>.

The aim of the study is to identify: how to fund clinical research in orthopedics and traumatology?

## Methods

An observational study including clinical trials exclusively in orthopedics and traumatology. A literature review was performed, considering the following terms: “clinical research and orthopedic disorder,” “clinical research and musculoskeletal diseases,” and “orthopedics, traumatology, funding, and grants.” The search was conducted in the PubMed, Scielo, and Google Scholar databases.

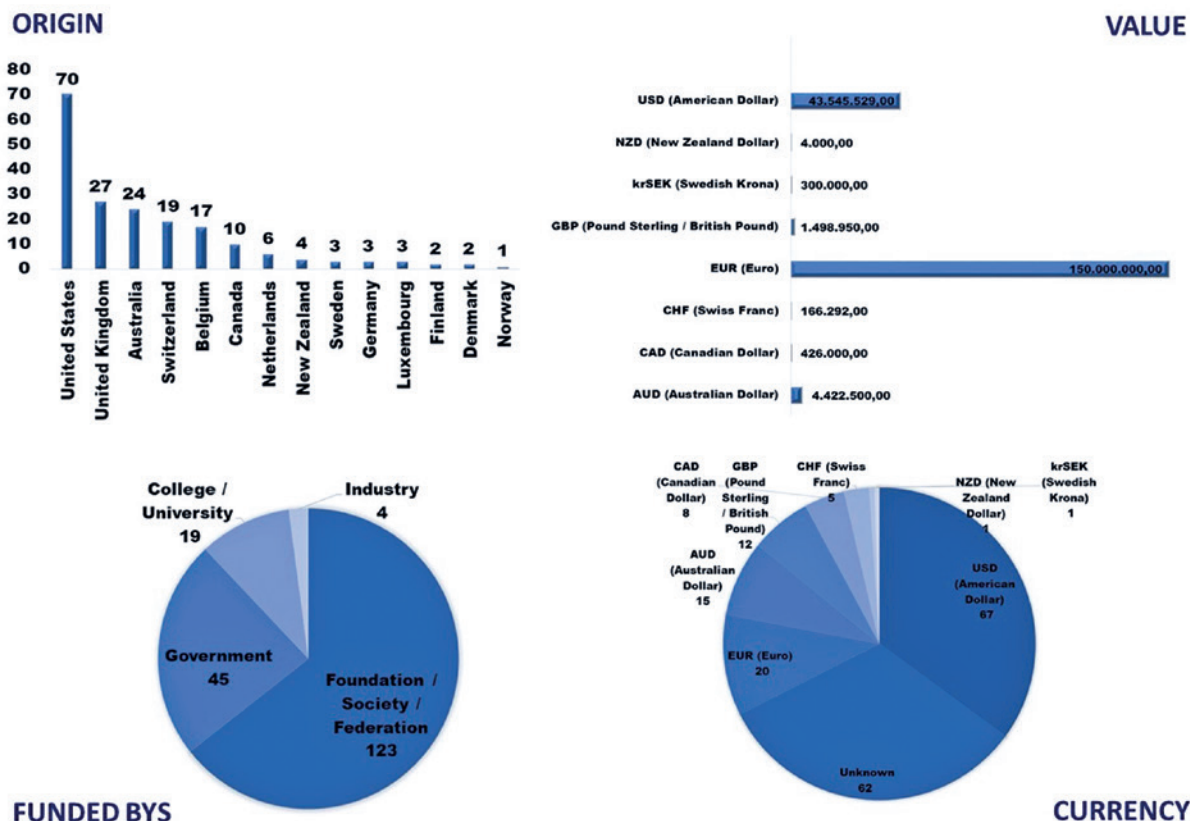
A survey of funding opportunities for clinical research in orthopedics and traumatology was performed in three different platforms:

- a) **PIVOT® platform:** an active search for research funding related to orthopedic disorders registered on the PIVOT® platform was performed. For this purpose, the PIVOT® platform was accessed on July 22, 2022, at 2:00 pm (Brazilian time), and we used the keywords: “orthopedics” and “orthopedic disorder.” This platform presents results on research funding that are available at the time of the search but does not provide retroactive information. Therefore, it was not possible to find data on research funding in the last five years.
- b) **DIMENSIONS® platform:** an active search for research funding related to orthopedic disorders registered on the DIMENSIONS® platform was performed. For this purpose, the DIMENSIONS® platform was accessed on August 12, 2022, at 10:35 am (Brazilian time), and we used the filter summary: “orthopedics disorder,” “start date from January 01, 2017, to July 29, 2022.”
- c) **InCites® platform:** an active search for research funding related to orthopedic disorders registered on the InCites® platform was performed. For this purpose, the InCites® platform was accessed on July 29, 2022, at 11:00 am (Brazilian time), and we used the filter summary: “Dataset: InCites Dataset + ESCI. Schema: Web of Science. Domestic/International Collaboration: All. Period Time: [2017, 2022]. Include Early Access documents: true. Document Type: NOT [Review]. Funding Data Source: All Sources. Research Area: [ORTHOPEDICS]. Funding Output Type: Funded. Exported date Jul 25, 2022. InCites dataset updated 2022-06-28. Includes Web of Science content indexed through 2022-05-31.”

Data extracted from the databases were recorded in a spreadsheet using the Microsoft Excel® 2010 program (Microsoft Corporation, Redmond, Washington, USA). After checking the data consistency, a descriptive analysis was performed.

## Results

According to data from the PIVOT® platform, in terms of the number of funded projects, the source of financial resources for clinical research in orthopedics and traumatology worldwide is concentrated in the USA, United Kingdom (UK), and funds from Foundations, Societies, or Medical Federations (Figure 1).



**Figure 1.** Orthopedic and traumatology research sponsorship registered on the PIVOT® platform (July 2022). Funding opportunities.

The data showed that the largest number of financed projects was concentrated in the USA, and most of the resources (values) were declared in US dollar (USD) (Figure 1). The second largest sponsor of funded projects was the International Society of Orthopedic Surgery and Traumatology (SICOT), an international non-profit association incorporated under Belgian law (Figure 2).

According to data from the PIVOT® platform the main sponsor of projects related to orthopedics and traumatology was the USA Department of Defense (DOD) (Figure 2).

According to data from the DIMENSIONS® platform there was a reduction in projects financed in orthopedics and traumatology in the last two years (Figure 3).

Most registered sponsorships in the DIMENSIONS® platform were declared in USD, and the largest amounts funders were the USA and Belgium (Figure 3).

The data found on the DIMENSIONS® platform showed that the main country in terms of funded projects in clinical research in orthopedics and traumatology is the USA, followed by Japan (Figure 3).

In the USA, the origin of the funding is dispersed among different institutions affiliated with the NIH, such as

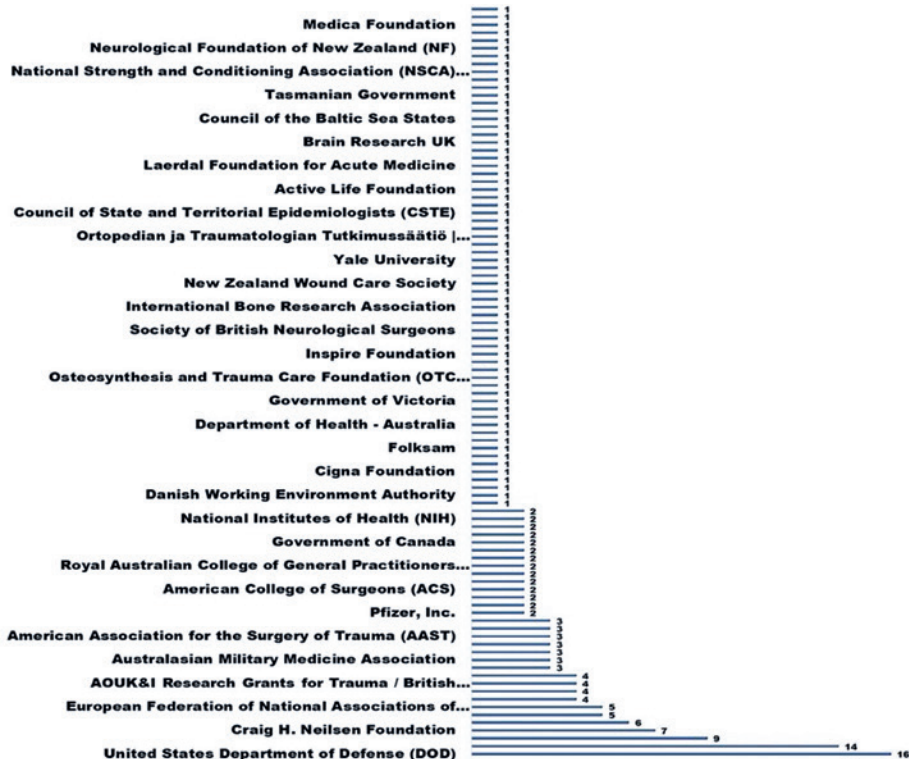
Congressionally Directed Medical Research Programs, Eunice Kennedy Shriver National Institute of Child Health and Human Development, National Institute on Drug Abuse (NIDA), and the National Institute of Arthritis and Musculoskeletal and Skin Diseases (Figures 4 and 5).

In Japan, the number of funded projects in clinical research in orthopedics and traumatology, the sponsorship is concentrated in the Japan Society for the Promotion of Science (Figure 5).

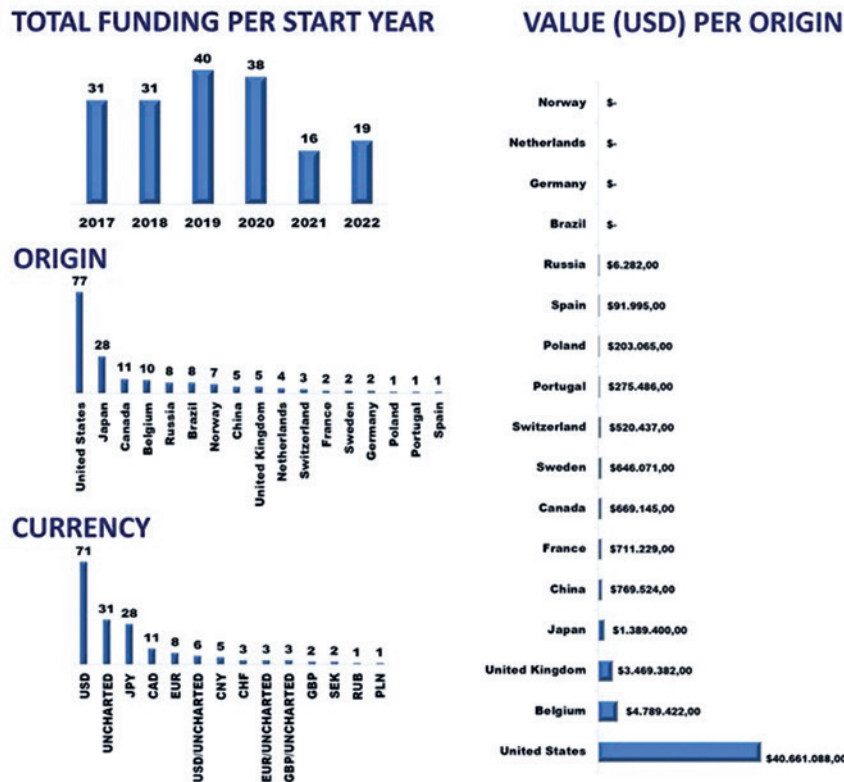
According to data from the DIMENSIONS® platform, São Paulo Research Foundation (Fundação de Amparo à Pesquisa do Estado de Sao Paulo - FAPESP) is in the 7th position among sponsors or collaborators who conducted the most research in this area (Figure 5).

According to data from the InCites® platform the main countries of funded projects in clinical research in orthopedics and traumatology are the USA, China, and Japan (Figure 6).

Brazil is in the 8th position among the countries that conducted the most research in this area. CAPES, CNPq, and FAPESP are among the top 20 funders of clinical research in orthopedics and traumatology worldwide (Figure 6).



**Figure 2.** Orthopedic and traumatology research sponsorship registered on the PIVOT® platform (July 2022). Sponsors or collaborators.



**Figure 3.** Orthopedic and traumatology research sponsorship registered on the DIMENSIONS® platform from January 2017 to July 2022. Funding opportunities. (Note: \$- < \$6,000,00).

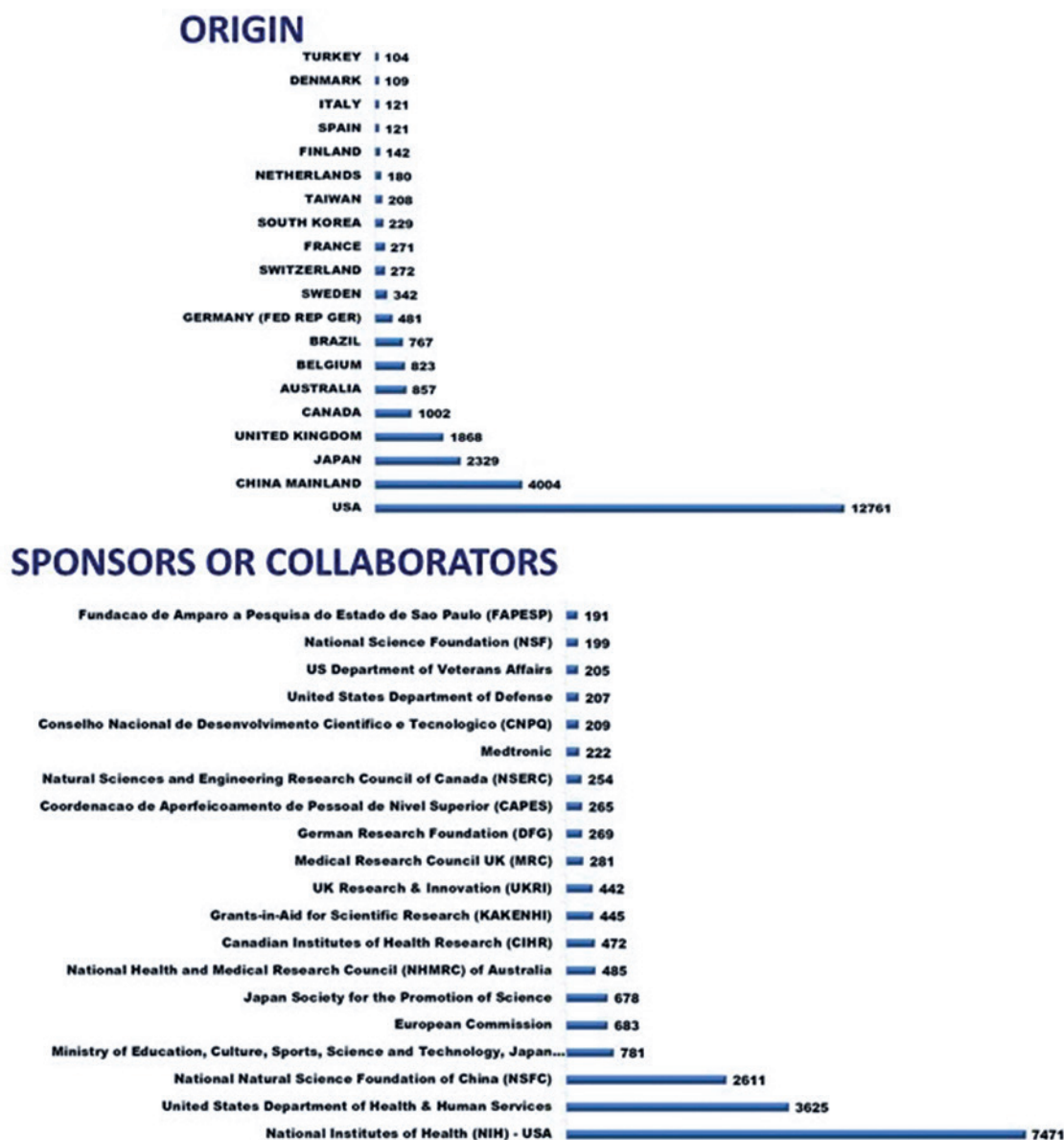




Figure 4. Orthopedic and traumatology research sponsorship registered on the DIMENSIONS® platform from January 2017 to July 2022. Value (USD) per sponsor or collaborator. (Note: \$- < \$6,000,00).



Figure 5. Orthopedic and traumatology research sponsorship registered on the DIMENSIONS® platform from January 2017 to July 2022. Sponsors or collaborators.



**Figure 6.** Orthopedic research sponsorship registered on the InCites® platform from January 2017 to July 2022. Sponsorship.

## Discussion

The PIVOT® platform allows access only to open grants at the time of consultation. Therefore, data from this tool allow a cross-sectional analysis of funding opportunities for clinical research in orthopedics and traumatology.

According to data from the PIVOT® platform, although the largest number of financed projects was concentrated in the USA and most of the amounts were declared in USD, when we add all resources originating in Europe (values in Euros) this value exceeds the sum of resources originating in the USA (values in USD). Therefore, the fact that the absolute number

of funded projects is greater in the USA does not mean that the largest source of funds (values) comes from that country.

According to data from the PIVOT® platform the main sponsor of projects related to orthopedics and traumatology was the DOD (USA). This data may be related to research associated with injuries due to firearms and explosives used in the war.

The DIMENSIONS® platform allows access to the funds registered during the analyzed period. Therefore, data originating from this platform allows a retroactive longitudinal analysis from January 2017 to July 2022.

According to data from the DIMENSIONS® platform, in general terms, we observed a decrease in projects financed in orthopedics and traumatology in the last two years. This reduction of projects supported in orthopedics and traumatology may be related to the limitations imposed by the first years of the new coronavirus SARS-CoV-2 (COVID-19) pandemic.

Regarding the amounts, similar to the results found on the PIVOT® platform, according to data from the DIMENSIONS® platform, the USA and Belgium were the largest funders. This data confirms the importance of funding from SICOT in Belgium.

The fact that the NIDA (USA) is the third largest funder of clinical research in orthopedics and traumatology may be related to the public health issue caused by the increase in the indiscriminate consumption of opioids for pain management.

Fall prevention is challenging in the aging population, and the number of falls increases in magnitude as the number of older adults increases in many nations worldwide<sup>(7)</sup>. A study in Japan showed that the incidence of falls in the elderly population is 20%<sup>(8)</sup>. Adhesive capsulitis was more common between 55 and 64 years, and Asian ethnicity is a risk factor for adhesive capsulitis<sup>(9)</sup>. Therefore, the conditions described above may be related to Japan being one of the countries that most supports clinical research in orthopedics and traumatology worldwide.

According to data from the DIMENSIONS® platform, FAPESP is in the 7th position among sponsors or collaborators who conducted the most research in this area. This can be explained because FAPESP, one of Brazil's main research funding agencies, has an annual budget corresponding to 1% of the total tax revenue of São Paulo state, supports research and finances investigation, exchange, and dissemination of science and technology<sup>(10)</sup>. This is connected because the Universidade de São Paulo (USP) is in the 6th position among collaborators who conducted the most research in this area<sup>(6)</sup>.

The InCites® platform is a web-based research evaluation tool that allows access to the institutional productivity and collaboration activity registered during the analyzed period. Therefore, data originating from this platform allows a retroactive longitudinal analysis from January 2017 to July 2022.

According to data from the InCites® platform the main countries in terms of funded projects in clinical research in

orthopedics and traumatology are the USA, China, and Japan. Over the past decades, there have been great advances in orthopedics in China and Mainland China, which seems to have caught up to Hong Kong and Taiwan regarding research output. Furthermore, Chinese researchers in the orthopedics field have been increasingly active in the global orthopedic community during the past ten years<sup>(11)</sup>. This data confirms China's growth in the international clinical research scenario.

Our results show that Brazil is in the 8th position among the countries that conducted the most research in this area. CAPES, CNPq, and FAPESP are among the top 20 funders of clinical research in orthopedics and traumatology worldwide. Recently, the Resolution RDC No. 548 of August 30, 2021, Ministry of Health/Brazilian, National Health Surveillance Agency/Collegiate Board (ANVISA), which provides for clinical trials with medical devices in Brazil, increased requirements to register these products in the country<sup>(12)</sup>. Therefore, Brazil expects more clinical trials related to orthopedic disorders in the coming years<sup>(6)</sup>.

## Conclusion

Regarding the amounts, the largest funders were the USA and Belgium. This data confirms the importance of funding from the SICOT in Belgium.


The main sponsor of projects related to orthopedics and traumatology was the DOD (USA). This data may be related to research associated with injuries that occurred due to firearms and explosives used in the war.

The fact that the NIDA (USA) is the third largest funder of clinical research in orthopedics and traumatology may be related to the public health issue caused by the increase in the indiscriminate consumption of opioids for pain management.

The incidence of falls among the elderly in Japan and the fact that Asian ethnicity is a risk factor for adhesive capsulitis may be related to Japan being one of the countries that most supports clinical research in orthopedics and traumatology worldwide. Our data confirm China's growth in the international clinical research scenario.

Our results show that Brazil is in the 8th position among the countries that conducted the most research in this area. CAPES, CNPq, and FAPESP are among the top 20 funders of clinical research in orthopedics and traumatology worldwide.

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**Authors' contributions:** Each author contributed individually and significantly to the development of this article: LLM \*(<https://orcid.org/0000-0002-1422-8597>) Conceived and planned the activities that led to the study, Interpreted the results of the study, participated in the review process, approved the final version; COC \*(<https://orcid.org/0000-0001-5483-0737>), and VSN \*(<https://orcid.org/0000-0002-3212-9648>), and BCL \*(<https://orcid.org/0000-0003-1106-1047>), and SLS \*(<https://orcid.org/0000-0002-0143-5095>), and ALGS \*(<https://orcid.org/0000-0002-6672-1869>) Data collection, interpreted the results of the study, participated in the review process. All authors read and approved the final manuscript. \*ORCID (Open Researcher and Contributor ID) 

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