ISCoS The International Spinal Cord Society

ARTICLE

Check for updates

Clinical trials and tribulations: lessons from spinal cord injury studies registered on ClinicalTrials.gov

Freda M. Warner[1,2], Nicole G. Bailey[2,3], Paulina S. Scheuren[4], Robin Lütolf[4], Rachel McGregor[5], Rohan Banga[2], Jane T. C. Hsieh[4] and John L. K. Kramer[2,3]✉

STUDY DESIGN: Article.
OBJECTIVE: ClinicalTrials.gov is an online trial registry that provides public access to information on past, present, and future clinical trials. While increasing transparency in research, the quality of the information provided in trial registrations is highly variable. The objective of this study is to assess key areas of information on ClinicalTrials.gov in interventional trials involving people with spinal cord injuries.
SETTING: Interventional trials on ClinicalTrials.gov involving people with spinal cord injuries.
METHODS: A subset of data on interventional spinal cord injury trials was downloaded from ClinicalTrials.gov. Reviewers extracted information pertaining to study type, injury etiology, spinal cord injury characteristics, timing, study status, and results.
RESULTS: Of the interventional trial registrations reviewed, 62.5%, 58.6%, and 24.3% reported injury level, severity, and etiology, respectively. The timing of intervention relative to injury was reported in 72.8% of registrations. Most trials identified a valid study status (89.2%), but only 23.5% of those completed studies had posted results.
CONCLUSIONS: Our review provides a snapshot of interventional clinical trials conducted in the field of spinal cord injury and registered in ClinicalTrials.gov. Areas for improvement were identified with regards to reporting injury characteristics, as well as posting results.

Spinal Cord (2021) 59:1256–1260; https://doi.org/10.1038/s41393-021-00699-1

INTRODUCTION

ClinicalTrials.gov is a web-based application that aims to provide public access to valuable information regarding ongoing and completed clinical trials. As a central source of public trial documentation, it addresses a number of ethical and scientific issues related to the transparency, conduct, and reporting of clinical trials [1]. Beyond increasing transparency, ClinicalTrials.gov has proven to be a valuable tool to monitor and evaluate temporal trends in research practice [2, 3].

Emerging applications of ClinicalTrials.gov are focused on facilitating participant recruitment by improving coordination between trial stakeholders. In the case of spinal cord injury, this has led to the development SCITrialsFinder.net—a patient-oriented platform that curates clinical trial registrations from ClinicalTrials.gov. The goal of SCITrialsFinder.net is to raise awareness of future and recruiting clinical trials by presenting select information posted on ClinicalTrials.gov into a consistent format and clear language benefiting patients, their families, and their health care providers. Indeed, the trial descriptions provided on ClinicalTrials.gov have been previously criticized for low readability [4].

The curation and consistency of the information provided by SCITrialsFinder.net is, however, dependent on the adequacy of the information provided in the original registrations. This is a challenge due to the current lack of standards for registering spinal cord injury trials. At present, in cases with unclear registrations, SCITrialsFinder.net curators have the option to contact trial investigators to clarify key recruitment issues—a process that is not always successful, nor sustainable in the long term [5]. As a first step toward improving the effectiveness of these tools, existing strengths and weaknesses in spinal cord injury trial registrations need to be understood. To this end, we performed a systematic review of key areas in registrations of trials involving individuals with spinal cord injuries in ClinicalTrials.gov. Our aim was to evaluate general trial characteristics, as well as variables uniquely relevant to spinal cord injury (e.g., level and severity of injury) within trials registered at ClinicalTrials.gov.

METHODS

A dataset of clinical trials within a spinal cord injury population was identified using the initial search of "spinal cord injury" in the Condition or Disease search field. This search identified relevant synonyms, and additional searches were performed for "Spinal cord diseases", "spinal cord compression" and "spinal cord syndrome". Results from all searches were downloaded from ClinicalTrials.gov on February 28th, 2020 and merged. Inclusion criteria were interventional studies administered within a traumatic spinal cord injury population, without any restriction on dates of trial or trial registration. Each

[1]Faculty of Pharmaceutical Sciences, University of British Columbia, Vancouver, BC, Canada. [2]International Collaboration on Repair Discoveries (ICORD), University of British Columbia, Vancouver, BC, Canada. [3]Department of Anesthesiology, Pharmacology and Therapeutics, University of British Columbia, Vancouver, BC, Canada. [4]Spinal Cord Injury Center, Balgrist University Hospital, University of Zurich, Zurich, Switzerland. [5]School of Kinesiology, University of British Columbia, Vancouver, BC, Canada. ✉email: kramer@icord.org

Received: 28 January 2021 Revised: 13 August 2021 Accepted: 18 August 2021
Published online: 3 September 2021

study was manually evaluated for information pertaining to injury etiology. Studies that included any "non-traumatic" injuries as part of their population were excluded (e.g., vascular, orthopedic, and/or progressive injury etiologies). Remaining studies were then determined to be observational and interventional based on the definitions provided by ClinicalTrials.gov, and observational studies were subsequently excluded from further analyses. Studies were screened by reviewers NB, RM, and RB, with information extracted from the following key areas:

1. **Study type:** studies registered in ClinicalTrials.gov self-identify as observational or interventional. ClinicalTrials.gov describes interventional studies or clinical trials as "participants assigned to intervention(s) based on protocol", whereas observational studies involve "participants *not* assigned to intervention(s) based on protocol; typically in context of routine care". For our study, we reviewed each trial individually to verify the accuracy of these registration details, and all studies determined to be observational were excluded from further analyses.
2. **Injury etiology**: injury etiologies within included trials were classified as "traumatic" and "unknown". Traumatic studies explicitly used the words "trauma" or "traumatic" or described the etiology within their registration, whereas "unknown" provided no description.
3. **Specific spinal cord injury characteristics**: spinal cord injuries are characterized by their neurological level and severity. Both have a major impact on neurological and health outcomes, and are important in determining suitability for a clinical trial. Registrations were reviewed for any details on spinal cord injury level and severity, including but not limited to those defined by the International Standards for Neurological Classification of Spinal Cord Injury (ISNCSCI). Our focus for neurological level was on common descriptors, such as "tetraplegia", "paraplegia", "thoracic", and "cervical", among others. Injury severity was based on a review of the registration for terms "complete" and "incomplete", as well as specific measures such as grades from the American Spinal Injury Association Impairment Scale (AIS).
4. **Timing of injury**: timing of the injury/intervention was examined to capture how long since the diagnosis of spinal cord injury an intervention aimed to be administered. This is important to consider because some interventions aim to be administered within a specific time window after injury. Specifically, preclinical work has indicated that there may be a "window of opportunity" early after injury for neuroprotective and neuroregenerative interventions [6–8]. Generally speaking, spinal cord injury is broadly classified by "acute", "subacute", and "chronic" phases of injury. For our purposes, acceptable descriptions of timing included a general description of the duration of spinal cord injuries, or any specified time points.
5. **Study status**: study status was manually recorded from the "Status" section. Available statuses were as follows: "Active, not recruiting", "Completed", "Enrolling by invitation", "No longer available", "Not yet recruiting", "Recruiting", "Suspended", "Terminated", "Unknown", "Unknown status", and "Withdrawn". According to ClinicalTrials.gov, trials that were "Recruiting", "Not yet recruiting", or "Active, not recruiting" and had not confirmed their status in 2 years are redefined as "Unknown".
6. **Study results posted on ClinicalTrials.gov**: ClinicalTrials.gov also allows investigators to upload study results. For a subset of studies, posting of results is required within 12 months of the completion date [9, 10]. We reviewed the provision of results for all spinal cord injury trials listed with a "Completed" status.

RESULTS

A dataset of 2319 spinal cord injury clinical trial registrations was downloaded from ClinicalTrials.gov. All trials that included defined non-traumatic spinal cord injury study populations were excluded ($n = 1450$). An additional study was excluded ($n = 1$), based on its lack of application within a spinal cord injury population. The remaining trials were classified by reviewers as observational or interventional. The initial postings of the final 744 interventional trials on ClinicalTrials.gov were between the dates October 19, 1999 and February 26, 2020 (Fig. 1). Fifteen trials were posted prior to 2004, 122 between 2005 and 2009, 235 between 2010 and 2014, and 372 between 2015 and the date of extraction.

1. **Observational vs. interventional**: of the eligible 868 traumatic or unknown trials, 735 were initially registered as interventional, with the remaining 133 as observational. Further investigation led to recategorizing 9 (1.2%) of the original interventional trials as observational, and 18 (13.5%) of the original observational trials as interventional. In total, 744 interventional studies were included in our subsequent analyses (Table 1).
2. **Injury etiology**: only 24% of the included trials ($n = 181$) specified traumatic injuries. The remainder were unknown ($n = 563$).
3. **Specific spinal cord injury characteristics**: trials defining the level of a spinal cord injury included the following terms: "cervical", "thoracic", "lumbar", "paraplegic", "tetraplegic" or "quadriplegic", and "suprasacral", as well as "all levels" or specific levels (e.g., C6-T12). Descriptions accepted for injury severity included those that defined a degree of neurological impairment, through completeness or other common metrics (e.g., AIS, ISNCSCI, etc.). A total of 63% and 59% of trials reported on level and severity of injury, respectively.
4. **Timing of injury**: of the included trials, 72.8% included a description of injury timing, using descriptors that varied from specific timeframes (e.g., 2 weeks after injury), to broader terms such as acute or chronic injuries. The majority of trials including a description of timing provided a specific timeframe, with 9.8% relying only on broader terms. Within the trials that defined their broad terms, the definitions varied widely. "Acute" injury definitions ranged from less than 6 h after injury to 6 months, and "chronic" from at least 6 months to 5 years after injury.
5. **Study status**: of the included trials, 89.2% provided information in the section regarding their study status. The majority of trials registered on ClinicalTrials.gov were "Completed" (51.8%), with a variety of terms for the 36.4% currently ongoing (i.e., "Active, not recruiting", "Available", "Enrolling by invitation", "Recruiting", "Not yet recruiting"), and the 11.7% that had formally stopped (i.e., "No longer available", "Suspended", "Terminated", "Withdrawn"). Statuses that were neither ongoing nor ceased were those with an "Unknown" or "Unknown status", and comprised 11.7% of the trials.
6. **Study results posted on ClinicalTrials.gov**: of "Completed" trials ($n = 344$), only 23.5% had results posted on ClinicalTrials.gov. Among trials that were ceased ($n = 78$), 20.5% had study results posted.

In summary, of the 744 included studies, a total of 83 (11.2%) correctly identified their study type, provided a valid study status, and provided sufficient detail about the included injury characteristics (etiology, level, severity, and timing). The proportion of studies exhibiting this level of completeness did not improve over time (20.0%, 7.3%, 11.5%, and 11.8% from <2004, 2005–2009, 2010–2014, and 2015 to date, respectfully). Within the 83 detailed studies, 36 (4.8%) were "Completed", of which 5 (13.9%) reported results.

DISCUSSION

ClinicalTrials.gov was developed as a platform to increase transparency in human research. The information prepared and reported on ClinicalTrials.gov is commonly used in meta-research, for example, to evaluate trends in clinical trial design [2, 3, 11]. The obvious advantage of this approach lies in including trials that are unpublished, providing a picture that is more up to date (e.g., recent trials that are not yet published) and less prone to various

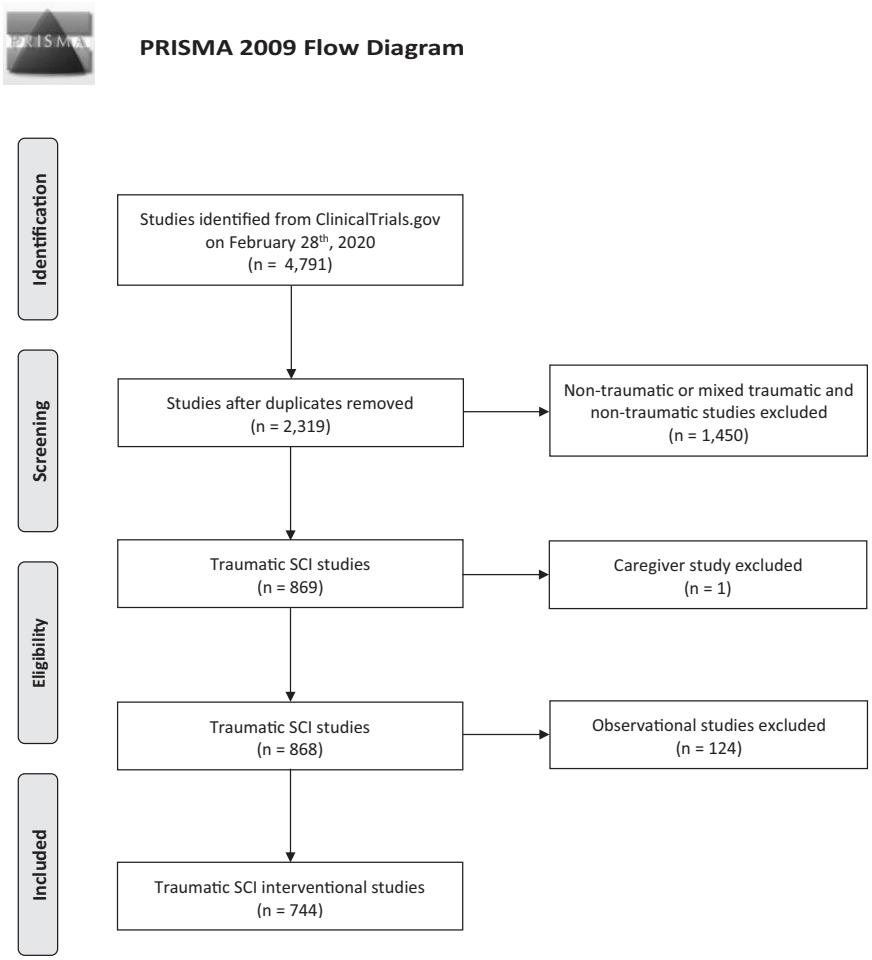

Fig. 1 PRISMA flow diagram. The PRISMA flow diagram illustrates the number of initial studies identified from ClinicalTrials.gov, as well as the number of all excluded and included studies.

Table 1. Trial characteristics.

Item		Number of trials reporting (%)
Study type: interventional		744 (100.0)
	Correctly identified	732 (98.4)
Injury etiology		
	Specified traumatic	181 (24.3)
Injury characteristics		
	Level of injury	465 (62.5)
	Severity of injury	436 (58.6)
Timing of injury		
	Specified	542 (72.8)
Study phase		
	For pharmaceutical/ biological trials ($n = 221$)	204 (91.1)
Valid study status		664 (89.2)
	Completed	344 (51.8)
	Ongoing	242 (36.4)
	Ceased	78 (11.7)
Results		
	Completed trials ($n = 344$)	81 (23.5)
	Ceased trials ($n = 78$)	16 (20.5)

sources of bias (e.g., unpublished negative results). ClinicalTrials.gov has further evolved as a tool to increase collaborations among researchers, [12, 13] with potential to recruit patients into clinical trials. Regardless of how ClinicalTrials.gov is utilized by researchers, clinicians, or the general public, its value is predicated on the accuracy and quality of the information included in a trial's registration. In this regard, our review of spinal cord injury trials revealed a number of ways to improve the provision of information broadly, as well in trials specific to spinal cord injury.

The first opportunity for improvement that our study reveals is the classification of interventional versus observational trials. Previous meta-studies utilizing ClinicalTrials.gov often focus on interventional trials [14–17]. To our knowledge, few have explored the validity of the self-reported observational versus interventional status. In our sample, most self-assigned interventional trials were correct in their classification (1.2% incorrect), whereas those identifying as observational were more prone to error (13.5%). Further examination of the 18 misclassified observational trials suggests the issue lies in the assignment of participants to different study arms. Although not always randomized or assigned to contrasting protocols (e.g., able bodied and injured participants completing the same intervention), these trials clearly applied an intervention (e.g., training, medications, stimulation). At the initial registration of a clinical trial, the classification of trials as observational or interventional should focus not on the arms or randomization of a study, but rather in the application of an intervention outside of "routine standard of care" to improve accuracy.

Another area for improvement is the lack of results posted on ClinicalTrials.gov. Recent estimates indicate that less than 40% of trials required to report results have adequately done so after completion or termination [18]. In the case of spinal cord injury, results have been posted for less than 25% of completed trials. A lower estimate is not entirely surprising given that we included all trials, many of which do not have an obligation to post results (e.g., non-FDA regulated). Nevertheless, posting results on ClinicalTrials.gov increases transparency, and should arguably be done regardless of requirements under an ethical obligation to the research, clinical, and participant communities. Previous studies also suggest that posted results on ClinicalTrials.gov are more complete and unbiased (e.g., adverse events) than corresponding publications [19–21]. Therefore, we recommend authors link all publications pertinent to the relevant registration for further transparency.

For spinal cord injury, three condition-specific details are frequently important to determine participant eligibility in a trial [22]. The first relates to the etiology of a spinal cord injury. The term "spinal cord injury" can reflect a number of different pathologies, including that arising due to non-traumatic pathology (e.g., multiple sclerosis). For our purposes, we aimed to focus on "traumatic" injury that occurs from sudden mechanical perturbation, often in response to a major motor vehicle accident or fall. After ruling out trials that were specifically recruiting non-traumatic populations, less than a quarter explicitly stated injury type in their registration. As traumatic and non-traumatic spinal cord injuries vary greatly in their demographics, pathophysiologies, neurological outcomes, and eligibility for trials [23], more accurate registrations regarding etiologies are essential.

Lesion level and severity are major contributors to the heterogeneity of spinal cord injury, with variable damage in the cervical, thoracic, lumbar, or sacral spinal cord yielding markedly different neurological and functional deficits, as well as secondary complications. While trials may aim to include all levels and severities of injury, there is often a targeted subset of participants with specific deficits needed for an intervention. For example, a trial of upper limb rehabilitation will intuitively only recruit individuals with deficits in the upper extremity, ruling out injuries in the thoracic and lumbar cords. Inclusion for other trials may be less intuitive, such as first-in-person cell-based interventions that aim to restore neurological function, which are often launched in individuals with more severe (e.g., more impaired neurological function) thoracic injuries. Based on our review, only 62.5% and 58.6% of interventional spinal cord injury trials in ClinicalTrials. gov reported the level and severity of injury, respectively, intended for recruitment.

Finally, there is the issue of reporting the timing of an intervention relative to the date of injury. The success of interventions to enhance neurological and functional outcomes after spinal cord injury depend, in part, on when they are initiated. The most obvious example is neuroprotective interventions. Based on preclinical studies, these need to be initiated in the very early stages of injury (e.g., minutes to hours) [6–8]. Alternative approaches targeting other biological mechanisms (e.g., neural plasticity) may have a longer window of opportunity. Timing information was absent in 27.2% of registrations. Another notable concern was the lack of consistency between registrations with regards to the terms "acute", "subacute", and "chronic". Consensus is urgently needed here to facilitate standardization in registration.

The recent launch of SCITrialsFinder.net aims to increase enrollment in clinical trials by directly providing online common language clinical trial information to potential participants anywhere in the world. The effectiveness of this tool critically depends, however, on the provision of sufficient detail in the registration to guide recruitment. Within the current framework of SCITrialsFinder.net, users can activate an automatic email to be sent to a contact person outlining their interest to participate in a trial. While impossible to guarantee eligibility, insufficient or inaccurate details in trial registrations could, inadvertently, discourage applicants from reaching out to investigators (based on repeated rejections of eligibility), and researchers from responding to SCITrialsFinder.net generated inquiries. To optimize these tools for future applications, more detailed and accurate clinical trial registration is of paramount importance.

Our review provides a snapshot of interventional clinical trials conducted within spinal cord injury and registered in ClinicalTrials.gov. While trials investigating a drug, biologic, or device in the United States must legally be registered, others do not, creating an incomplete perspective of ongoing and completed trials [15, 24]. Previous studies have suggested that focusing solely on ClinicalTrials.gov provides an incomplete picture of global clinical trials and should be supported with other sources, including additional trial registries [14, 25]. It is possible that our search terms may also have overlooked relevant trials within ClinicaTrials.gov, and were limited to traumatic spinal cord injury populations. However, this review has provided valuable insight into the potential areas of improvement within a large sample of registered interventional studies in spinal cord injury populations.

ClinicalTrials.gov was originally developed to increase transparency in human-based research. It has since become a valuable source of data to evaluate research practice, with the potential to enable awareness and collaboration across clinical trials [12, 13]. To continue to meet these evolving needs, the accuracy and depth of information provided in registrations are critically important. Our study has revealed missing information related to injury characteristics (i.e., level, severity, and timing), as well as a lack of reporting results for completed spinal cord injury clinical trials, which should be addressed in future registrations.

DATA AVAILABILITY

Data can be readily accessed and downloaded from ClinicalTrials.gov using the search and inclusion-exclusion criteria described in the "Methods".

REFERENCES

1. Zarin DA, Tse T, Williams RJ, Califf RM, Ide NC. The ClinicalTrials.gov results database — update and key issues. N Engl J Med. 2011. https://doi.org/10.1056/nejmsa1012065
2. Jaffe IS, Chiswell K, Tsalik EL. A decade on: systematic review of ClinicalTrials.gov infectious disease trials, 2007–2017. Open Forum Infect Dis. 2019. https://doi.org/10.1093/ofid/ofz189
3. Wortzel JR, Turner BE, Weeks BT, Fragassi C, Ramos V, Truong T, et al. Trends in mental health clinical research: characterizing the ClinicalTrials.gov registry from 2007–2018. PLoS ONE. 2020. https://doi.org/10.1371/journal.pone.0233996
4. Wu DTY, Hanauer DA, Mei Q, Clark PM, An LC, Proulx J, et al. Assessing the readability of ClinicalTrials. gov. J Am Med Informatics Assoc. Published online 2016. https://doi.org/10.1093/jamia/ocv062
5. Chaturvedi N, Mehrotra B, Kumari S, Gupta S, Subramanya HS, Saberwal G Some data quality issues at ClinicalTrials. gov. Trials. 2019. https://doi.org/10.1186/s13063-019-3408-2
6. Fan B, Wei Z, Yao X, Shi G, Cheng X, Zhou X, et al. Microenvironment Imbalance of Spinal Cord Injury. Cell Transplant. 2018. https://doi.org/10.1177/0963689718755778
7. Batchelor PE, Kerr NF, Gatt AM, Aleksoska E, Cox SF, Ghasem-Zadeh A, et al. Hypothermia prior to decompression: buying time for treatment of acute spinal cord injury. J Neurotrauma. 2010. https://doi.org/10.1089/neu.2010.1360
8. Wu Y, Satkunendrarajah K, Teng Y, Chow DSL, Buttigieg J, Fehlings MG. Delayed post-injury administration of riluzole is neuroprotective in a preclinical rodent model of cervical spinal cord injury. J Neurotrauma. 2013. https://doi.org/10.1089/neu.2012.2622
9. Frequently Asked Questions—ClinicalTrials. gov. https://clinicaltrials.gov/ct2/manage-recs/faq#resultsInfoSubDeadline. Accessed 21 Jan 2021.
10. Tse T, Williams RJ, Zarin DA. Reporting "basic results" in ClinicalTrials. gov. Chest. 2009. https://doi.org/10.1378/chest.08-3022

11. Hirsch BR, Califf RM, Cheng SK, Tasneem A, Horton J, Chiswell K, et al. Characteristics of oncology clinical trials: Insights from a systematic analysis of clinicaltrials. gov. JAMA Intern Med. 2013. https://doi.org/10.1001/jamainternmed.2013.627
12. Thorlund K, Dron L, Park J, Hsu G, Forrest JI, Mills EJ. A real-time dashboard of clinical trials for COVID-19. Lancet Digit Health. 2020;2:e286–e287. https://doi.org/10.1016/S2589-7500(20)30086-8
13. Glasziou PP, Sanders S, Hoffmann T. Waste in covid-19 research. BMJ. 2020. https://doi.org/10.1136/bmj.m1847
14. Stergiopoulos S, Getz KA, Blazynski C. Evaluating the completeness of ClinicalTrials. gov. Ther Innov Regul Sci. 2019. https://doi.org/10.1177/2168479018782885
15. Zarin DA, Tse T, Williams RJ, Califf RM, Ide NC. The ClinicalTrials.gov results database—update and key issues. N Engl J Med. 2011. https://doi.org/10.1056/NEJMsa1012065
16. Goswami ND, Pfeiffer CD, Horton JR, Chiswell K, Tasneem A, Tsalik EL. The state of infectious diseases clinical trials: a systematic review of ClinicalTrials. gov. PLoS ONE. 2013. https://doi.org/10.1371/journal.pone.0077086
17. Zwierzyna M, Davies M, Hingorani AD, Hunter J Clinical trial design and dissemination: Comprehensive analysis of clinicaltrials.gov and PubMed data since 2005. BMJ. 2018. https://doi.org/10.1136/bmj.k2130
18. Anderson ML, Chiswell K, Peterson ED, Tasneem A, Topping J, Califf RM. Compliance with results reporting at ClinicalTrials.gov. N Engl J Med. 2015. https://doi.org/10.1056/NEJMsa1409364
19. Jurić D, Pranić S, Tokalić R, Milat AM, Mudnić I, Pavličević I, et al. Clinical trials on drug-drug interactions registered in ClinicalTrials.gov reported incongruent safety data in published articles: an observational study. J Clin Epidemiol. 2018. https://doi.org/10.1016/j.jclinepi.2018.07.017
20. Tang E, Ravaud P, Riveros C, Perrodeau E, Dechartres A. Comparison of serious adverse events posted at ClinicalTrials.gov and published in corresponding journal articles. BMC Med. 2015. https://doi.org/10.1186/s12916-015-0430-4
21. Riveros C, Dechartres A, Perrodeau E, Haneef R, Boutron I, Ravaud P. Timing and completeness of trial results posted at ClinicalTrials.gov and published in journals. PLoS Med. 2013. https://doi.org/10.1371/journal.pmed.1001566
22. Blight AR, Hsieh J, Curt A, Fawcett JW, Guest JD, Kleitman N, et al. The challenge of recruitment for neurotherapeutic clinical trials in spinal cord injury. Spinal Cord. 2019. https://doi.org/10.1038/s41393-019-0276-2
23. Gedde MH, Lilleberg HS, Aßmus J, Gilhus NE, Rekand T. Traumatic vs non-traumatic spinal cord injury: A comparison of primary rehabilitation outcomes and complications during hospitalization. J Spinal Cord Med. 2019. https://doi.org/10.1080/10790268.2019.1598698
24. History, policies, and laws—ClinicalTrials. gov. https://clinicaltrials.gov/ct2/about-site/history. Accessed 30 Oct 2020.
25. Tse T, Fain KM, Zarin DA. How to avoid common problems when using clinicaltrials.gov in research: 10 issues to consider. BMJ. 2018. https://doi.org/10.1136/bmj.k1452

AUTHOR CONTRIBUTIONS

FMW contributed to designing the review protocol, interpreting the results, and writing the report. NB conducted the search and screening of studies, contributed to data extraction and cleaning, and provided feedback on the report. PSS contributed to interpreting the results and providing feedback on the report. RL contributed to interpreting the results and providing feedback on the report. RM contributed to data extraction and cleaning, and provided feedback on the report. RB contributed to data extraction and cleaning, and provided feedback on the report. JTCH contributed to designing the review protocol and writing the report. JLKK contributed to designing the review protocol, interpreting the results, and writing the report.

COMPETING INTERESTS

Authors JTCH, PSS, and RL wish to declare a non-financial conflict of interest due to their involvement in the development of SCITrialsFinder.net.

ETHICAL APPROVAL

This study did not concern animal experimentation or the use of human volunteers.

ADDITIONAL INFORMATION

Correspondence and requests for materials should be addressed to John L. K. Kramer.