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Making available information from studies sponsored by the pharmaceutical industry: some current practices

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Since the web-based registry ClinicalTrials.gov was launched on 29 February 2000, the pharmaceutical industry has made available an increasing amount of information about the clinical trials that it sponsors. The process has been spurred on by a number of factors including a wish by the industry to provide greater transparency regarding clinical trial data; and has been both aided and complicated by the number of institutions that have a legitimate interest in guiding and defining what should be made available. This article reviews the history of this process of making information about clinical trials publicly available. It provides a reader's guide to the study registries and the databases of results; and looks at some indicators of consistency in the posting of study information. Copyright © 2010 John Wiley & Sons, Ltd.

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1. INTRODUCTION

The amount of information available to the public about clinical trials has increased greatly since the Food and Drug Administration Modernization Act (FDAMA), which came into law in the United States in November 1997 [1], mandated the registration of certain clinical trials, followed some 7 years later in 2004 by the creation by the industry organization Pharmaceutical Researchers and Manufacturers of America (PhRMA) of the first public repository for clinical trial results.

The *Journal of the American Medical Association* (*JAMA*) in its July 2005 editorial gave voice to 'concerns about misleading reporting of industry-sponsored research' [2]. No doubt chief among its concerns was selective reporting of more favourable endpoints and subgroups without regard to the pre-specified plan set out in the trial protocol. An antidote to both of these problems is the availability to the referee or reader of a clear description of what analyses were actually planned, which among them was regarded as the primary analysis, and on what population the hypothesis was to be tested. Providing this basic information online in a publically accessible website can mitigate such potential source of bias. Likewise, making study results publicly available online provides a mechanism to mitigate concerns that negative trials are not published, or else that their publication is unreasonably delayed.

Section 1 of this article looks at how requirements for making study information available developed from 1997 to 2009, and also assesses practical progress in implementing this in the United States and the European Union (EU) in the same period. The proposals for how study information might be formatted are also described, distinguishing between the information needed in a registry of studies and the information needed to report study results. Section 2 describes the history of publicly available study registries and databases of study results since 1997. Section 3 examines the company policies on making study information available and summarizes the facilities for accessing study information that are offered by company websites.

The article draws upon information from 11 large pharmaceutical companies and 5 smaller companies. The selections were made from a published list of pharmaceutical companies that included information about their region (US, Europe) and market capitalization, and were made without reference to the authors' affiliations and without the person responsible for the selection having any knowledge of companies' initiatives to make study information available, except that of Pfizer, whose plan for disclosure was given in detail on their website. No formal randomization method was used, but companies were selected without reference to any information other than region

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and market capitalization. Because the selection was based on market capitalization, privately owned companies were not included, but notwithstanding this limitation a representative selection was attempted with regard to region and size of company.

To give an idea of the levels of study information that are being migrated to publicly available websites across the industry, Section 4 presents search results at three important websites for the companies. These search results are analyzed for consistency between the websites and for correlation between the numbers of studies registered and the numbers of studies with reports of results available. The article concludes with a brief discussion in Section 5.

2. HISTORY

FDAMA required the establishment of a 'clinical trials databank', which in 2000 resulted in the US National Library of Medicine (NLM) website ClinicalTrials.gov. In a recent article, Bacon and North [3] gave an account of the progress since then in making study information available in the United States, with some reference to the rest of the world. In 2001 EU directive 2001/20/EC required a database of information about clinical trials to be created, and the EudraCT database was set up to hold information on all EU trials starting after 1st May 2004. However, the directive allows for access 'only to the competent authorities of the Member States, the Agency and the Commission' rather than to the general public [4]. Among EU countries, although registration on the web may well become legally required more generally, Bacon and North found public registering of studies to be mandatory only in the Czech Republic. In practice, since most EU-based pharmaceutical companies market their treatments in the United States, the US laws are predominant in determining how the industry makes information available to the public about both US and EU studies.

2.1. Scope of the registries

Between 1997 and 2009 the scope and type of information to be made available has broadened, with initiatives being taken by a number of groups including government bodies, editors of medical journals, the pharmaceutical industry, and the World Health Organization.

The 1997 US FDA Modernization Act mandated the registration of studies of treatments for serious and life-threatening diseases undergoing the investigational new drug (IND) process. Studies were to be registered within 21 days of the start of enrollment. The registry was to include all studies ongoing as of March 2002. In that month, the FDA issued a guidance on using the registry [5]. This guidance stated that registration was required ('Section 113 of the Modernization Act requires you to submit information to the data bank'). However, there were no concrete penalties for noncompliance, and an early FDA study suggested that compliance was relatively poor, with for example only 16 out of 20 qualifying oncology studies registered [6,7].

In 2004 the International Committee of Medical Journal Editors (ICMJE) went further, and stipulated that in order to be published, any interventional study from phase II onwards – not just studies in serious and life-threatening diseases – must be registered on ClinicalTrials.gov prior to the start of enrollment [8]. This was the first time a real penalty – that of non-publication – could be incurred by failure to register a clinical study.

Also in 2004, the US industry group PhRMA created a publicly available web-based repository for study results called clinicalstudyresults.org [9]. In a parallel development, in the same year two individual pharmaceutical companies (GlaxoSmithKline and Eli Lilly) launched their own registries of information about their trials [10]. In January 2005, the United States, European and Japanese pharmaceutical industry came together with the global industry group the International Federation of Pharmaceutical Manufacturers and Associations (IFPMA) to issue a Joint Position paper [11]. The Position paper committed to registering all phase II–IV studies, albeit limiting the requirement to 'hypothesis-testing' studies. This definition of scope excluded dose-finding and PK/PD studies, for example. Consistent with the FDAMA Act, studies were to be registered within 21 days of the start of enrollment. However, the IFPMA went further and proposed the publishing of study results, either at the PhRMA site clinicalstudyresults.org or in company databases, for marketed drugs only, within a year of approval.

In April 2005 the World Health Organization (WHO) issued a set of technical standards for making study information available, which had resulted from 'consultations with various stakeholders' [12]. These standards covered the kind of studies to be registered; a minimum registration data set; and a common format for making results available. The WHO standards were broadly consistent with those proposed by IFPMA. The WHO agreed with the IFPMA that 'exploratory studies … need not be registered', although in the following year the WHO Scientific Advisory group declared 'registration of all interventional trials is a scientific, ethical, and moral responsibility' [13] and phase I studies are now included in the WHO definition of applicable clinical trials [14].

Some months later in July 2005 an editorial in *JAMA* gave a set of requirements for reporting industry-sponsored clinical studies [2]. As well as declarations of financial interest, the submission was to include the CONSORT flow diagram and checklist [15]; authors were 'encouraged to submit study protocols at the time of the manuscript submission'. Consistent with the ICMJE requirement, the study was to be registered with a publicly available registry such as clinicaltrials.gov. JAMA also stated that for industry-sponsored studies, 'an additional independent analysis of the data must be conducted by statisticians at an academic institution, such as a medical school, academic medical center, or government research institute…. The results of these analyses should be reported in the manuscript.'

The ICMJE widened the scope of the requirement of medical journals in 2007 to include the registration of all interventional studies including phase I studies [16], not just studies from phase II onwards. The journals allowed for making results available by stating that publishing a summary of less than 500 words on the web would not be counted as prior publication and would not therefore jeopardize publication in a journal.

The FDA Amendments Act (FDAAA) enacted in September 2007 [17] made registration compulsory for treatments marketed in the United States, and defined the scope of the registry quite broadly: it was to include all controlled intervention studies from phase II onwards, not just 'hypothesis-testing studies'; studies of devices were included in the scope [18]. Registration on the US government-sponsored NLM registry ClinicalTrials.gov was compulsory for all trials ongoing on or after 27 September 2007. The US legislature followed the industry group IFPMA in also requiring the publication of results. Results were to be made available for all studies registered after

27 September 2007. The legislation states that the study results are to be accessible from ClinicalTrials.gov: 'the Secretary shall ensure that the registry data bank [i.e. ClinicalTrials.gov] includes links to results information… 30 days after the date of the approval of the drug (or device)…'.

Most recently, in November 2008 the industry group IFPMA revised their position paper on behalf of the pharmaceutical industry to reflect the new US Act, by including all confirmatory and exploratory studies in the proposed scope for registration, not just 'hypothesis-testing' studies [19].

2.2. Information to be made available

As well as defining the kind of study that should be registered and for which results should be made available, the US legislature, the industry and journal publishers have also attempted to define the type of study information that should be published, and its format. The WHO specified a minimum registration data set, defining in its April 2005 Technical Consultation document [12] a 20-item minimum set of information about a clinical trial that a registry should contain. This is listed in Table I.

The WHO document notes that while the 20 items are a minimum, 'one or more of data items 10, 13, 17, 19 and 20 may be regarded as sensitive for competitive reasons by the sponsor who may wish to delay release of the information'. The IFPMA in its 2008 proposal reiterated this concern. As of 2009, while the WHO website states that the 20 items are the 'minimum amount of trial information that must appear in a register in order for a given trial to be considered fully registered', it nevertheless leaves room for omitting or delaying some items, noting only that 'some registries may choose to make all 20 items mandatory before they will accept registration' [20,21]. ClinicalTrials.gov holds these items, and they are regularly, though by no means always, present in the records.

Table I. The WHO specification for a minimum registration data set.

1. Unique trial number
2. Trial registration date
3. Secondary IDs
4. Funding source(s)
5. Primary sponsor
6. Secondary sponsor(s)
7. Responsible contact person
8. Principal investigator
9. Brief title of the study
10. Official scientific title of the study (including intervention, indication and outcome)
11. Research ethics review(Y/N)
12. Indication/condition
13. Intervention(s) (including intervention duration)
14. Key inclusion and exclusion criteria
15. Study type (category from clinicaltrials.gov)
16. Anticipated trial start date
17. Target sample size
18. Recruitment status (if available)
19. Primary outcome (including time of measurement or time to completion)
20. Key secondary outcomes

The definition of what is required in a registry of clinical trials has been reasonably straightforward and the WHO specification has been accepted with minor variations. However, the question of the format for the results of clinical trials has not been fully resolved.

In its January 2005 Joint Position paper, the IFPMA specified that the study results should be presented in the form of a synopsis using the format for synopses of study results recommended by the International Conference on Harmonization (ICH) in their guideline *Structure and content of clinical study reports*, known as ICH-E3. The ICH-E3 guideline defines the format of a synopsis via a template in its Annex I [22]. This template for synopses allows for a brief description of the study and its planned endpoints. For the presentation of results the template specifies only the headings 'Efficacy results', 'Safety results' and 'Conclusions'. In the body of the guideline the only other specification is that 'the synopsis should include numerical data to illustrate results, not just text or *p*-values'. The ICMJE tentatively suggested the CONSORT template [15] as an option. The CONSORT checklist gives more detail than ICH-E3 about how results should be presented. For example, for outcomes it requires 'for each primary and secondary outcome, a summary of results for each group, and the estimated effect size and its precision (e.g. 95% confidence interval)'. Each item in the checklist also links to a filled-in example illustrating how the item might be presented.

The ICH-E3 format is in fact the one used in most cases by pharmaceutical companies for reporting results in clinicalstudyresults.org and in other results databases. However, in the United States the 2007 FDAAA law has been interpreted by the FDA as requiring the reporting of study results to the NLM-sponsored ClinicalTrials.gov rather than to PhRMA's clinicalstudyresults.org. On its web page about submitting new drug applications [23], the FDA states that 'the new provisions require additional information to be submitted to the clinical trials data bank (ClinicalTrials.gov), including expanded information on clinical trials and information on the results of clinical trials.' The requirement for integrating registry and results information was emphasized by Robert Temple, Director of the FDA Office of Medical Policy, at the June 2008 meeting of the Drug Information Association. He stated that 'Registries need to give study results. If they don't, they miss the concern about publication bias' [24]. Furthermore, the FDA now gives its own detailed description of the format required for results data [25,26] to be used on the 'Study results posted' tab of the ClinicalTrials.gov registry. However, in the large number of study records sampled, this tab was never found to be used. A recent survey suggested that 'less than 1% of the trials (on ClinicalTrials.gov) have any results attached' [27]. Instead, some companies comply with the requirement to integrate registry information with study results by providing links for at least some completed studies to a report in a company database of study results, or a publication, or to a page in the PhRMA results site clinicalstudyresults.org, or to both a publication and a web page.

3. AVAILABILITY OF STUDY INFORMATION

Pharmaceutical companies have addressed how to make study information available in various ways as summarized in Table II. Because the primary purpose of this article is to examine patterns in the level and kind of information available rather

Table II. Characteristics of websites of 11 large companies based on market capitalization, with regard to making study information available.

				Links to registries of studies			Links to databases of study results		
	Company ID	Policy statement	Link for registry and results to IFPMA	NLM site	Provides company search engine linking to external site	Company registry	PhRMA site	Provides company search engine linking to external site	Company database
Large cap – US	A	Y	Y	Y	NF	NF	Y	NF	NF
	B	Y	Y	Y	Y	Y	Y	NF	Y
	C	Y	Y	Y	Y	NF	Y	Y	NF
	D	Y	NF	Y	NF	NF	NF	NF	NF
	E	Y	NF	Y	NF	NF	Y	NF	NF
	F	Y	Y	Y	N	Y*	Y	N	N
	G	Y	Y	Y	NF	NF	Y	NF	NF
	H	NF	NF	NF	NF	NF	Y	NF	Y
Large cap – Europe	I	Y	Y	Y	N	Y	Y	N	Y
	J	Y	Y	Y	N	Y	Y	N	Y
	K	Y	Y	Y	NF	NF	NF	NF	Y

Note: NF = not found. N = company confirms this facility is not offered – verification has been sought for items not found, but company confirmation has not been received for all such items. Results are as of 10th March 2009. See text for description of the IFPMA, NLM and PhRMA sites. Company A's site was being revised at the time of this research. Company G had published a policy but this was not accessible when the time came to assess the contents of the policy. Note that a link may not be found for a registry at a company's website (and thus NF or N may appear in the table) but study information for that company may still be present on that registry.
*Company F offers access to a company registry of studies planned in one therapeutic area.

than to highlight the performance of individual companies, the companies have been anonymized and designated as Company A–P.

Though not required to do so, many companies publish a policy statement about how they undertake to make study information available. (Note that those companies that do not publish policies may have an internal policy, not published.)

Among 11 large companies based on market capitalization listed in Table II, a policy about making study information available was found on all but one company website. The public policy statements tend to contain careful definitions of the categories of study that are included in the registry and in the database of results. Often the policy states that the results will be published whether favourable or unfavourable to the study treatment. For ongoing studies, the policy usually reiterates FDAAA in undertaking to register studies within 21 days of the start of enrollment; and to publish results within 30 days of approval or within 1 year of the end of the study, if post-approval.

Policy pages usually link to a registry and a source of study results. The three important cross-company sources of study information discussed here are as follows:

- NLM site ClinicalTrials.gov: the US-based site run by the NLM, originally designed to be an online registry of basic study information, but also having space for reports of study results.
- PhRMA site clinicalstudyresults.org: the US-based site run by the pharmaceutical industry group PhRMA, designed to hold reports of study results.
- IFPMA site clinicaltrials.ifpma.org: the portal run by the global pharmaceutical industry group IFPMA, designed to access registry information from the NLM site and results information from the PhRMA site above, and accessing other sites as necessary, including companies' own registries, with the object of making available as much study registry and study results information as possible from one point on the web. It should be noted that the IFPMA portal does not attempt to access study results stored on the NLM ClinicalTrials.gov site, despite the fact that the latest US legislation specifies that study results should be integrated with the registry at this site.

Some companies (e.g. Companies E and F) state their policy with regard to authorship of articles based on sponsored studies – a matter which has been studied recently [28]. Most policies state that investigator-initiated research is not covered.

Although 3 of the 11 pharmaceutical companies reviewed do not provide a link from their website to the industry umbrella group IFPMA portal, registry information for studies from all 11 pharmaceutical companies can be found via this portal. The IFPMA portal is therefore a reasonably simple route to finding studies of a particular treatment or device.

For study results (as opposed to study registries), the facilities provided by company websites are similar in many respects. Ten of the eleven companies make study results available either via the IFPMA website or the PhRMA site, or both. However, Company D in particular has undertaken to make results available on the NLM registry, which is the location required by the latest US legislation. The majority of Company D reports are available as links under the 'Additional information' heading

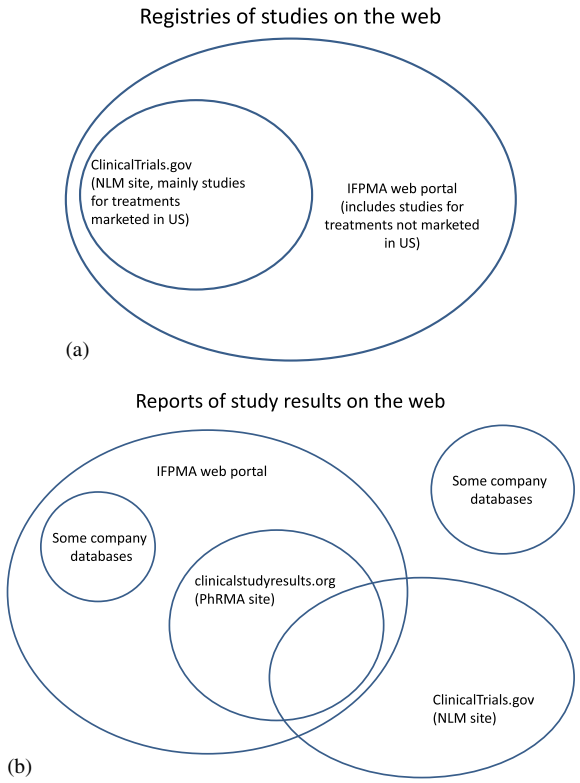

Figure 1. Venn diagram showing overlap among sources of study information. If a study has a results report in two websites, or if one website links to the results report in another website, the two websites will overlap in the Venn diagram. From the companies in Table III below registrations in (a) totalled 11 138 in ClinicalTrials.gov and 11 293 via the IFPMA search portal; records of results in (b) totalled 2575 in clinicalstudyresults.org and 2862 via the IFPMA search portal. Totals omit Company J, where one count was not available.

in the NLM registry, rather than via the IFPMA site. Although study results for Company F are available via the IFPMA site, they have also undertaken in their policy statement to make results available on the NLM registry.

The overlap among the sources of study information discussed here is shown in Figures 1(a) and (b).

4. STUDY INFORMATION COMPLETENESS

All of the nine pharmaceutical companies in Table II whose policy was accessible undertook to register their studies; in seven of the nine policies accessed, the company also specifically undertook to comply with the FDAAA law which requires study results to be published within 30 days of approval of the treatment or, post-approval, within 1 year of the end of the study. However, the initiatives for making study information available is described in Section 2 varied for different kinds of study (phase I vs phase II and later; studies of serious and life-threatening diseases vs other studies; 'hypothesis-testing' studies vs other studies) and also varied for different classes of study information (registries vs results). In addition to what was mandated or required, pharmaceutical companies have made further study information available voluntarily. For example, the large pharmaceutical company Eli Lilly in their policy document gave themselves a deadline of 1st July 2005 to make available results for 'core efficacy and safety registration trials for products first approved… (after) July 1, 1994' [29] – this was considerably more than was required by the US law. We note that a number of companies have published accounts of progress made in making study information available. On its website, GlaxoSmithKline notes that their '(own) register contains more than 3089 summaries of clinical trials'. It adds that 'the posting of studies is continuing as the data are entered into the common register format' [30]. Figure 2 shows the steps taken over the 6 years since 2002 by one company, Pfizer, to migrate study information to the ClinicalTrials.gov registry and to migrate reports of study results to the web [31].

It is clear that different levels of voluntary disclosure and differences in legal requirements must result in varying levels of public availability of study information depending upon the kind of study, the classes of information and on the sponsor company. This section attempts a more general, albeit indirect, assessment of the completeness of study information now available.

4.1. Proportion of study information available on the web: methods of assessment

It would be difficult to quantify the proportion of completed or ongoing clinical studies that are now on a publicly available register, and the proportion whose results are now publicly available on the web. Two early assessments looked at trends in registration [32,33]; one found that the number of studies registered increased after the ICMJE made registration a condition of publication [33]. A recent paper sampled publications for 2008, and found that almost all (111/114) studies reported in the selected general medical journals had been registered, but that only 123/209 had been registered among studies reported in the speciality journals selected [34]. This article also noted instances of late registration and of incomplete registration information. Half the sampled studies were industry-funded, but a breakdown of quality of registration information by source of funding was not provided. In this article, the consistency of available information is assessed by comparing for selected companies the overall numbers of studies registered on the web at two important registries, and with other factors associated with the numbers of studies that might be expected to be registered. We perform a similar check for the correlation between the registering of studies and the publishing of study results.

4.2. Consistency among sources

To assess consistency of registry information and of reporting of study results among companies, we conducted searches on the three major web sources described earlier, the IFPMA portal for registry and results information; the US government sponsored ClinicalTrials.gov site run by the NLM; and the US industry site for study results clinicalstudyresults.org.

Figure 3 shows the numbers of studies with registry information available via the IFPMA portal and the NLM registry by pharmaceutical company, for 11 large companies. Since the IFPMA portal references various sources of study information supplied by industry, and since most industry studies for any treatments that are marketed in the United States are required to be registered on the US NLM site, one would expect fairly good agreement between the IFPMA and NLM sources, with perhaps somewhat more studies available via the IFPMA site to allow for the treatments that are not marketed in the United States and thus are not required to be registered at the NLM

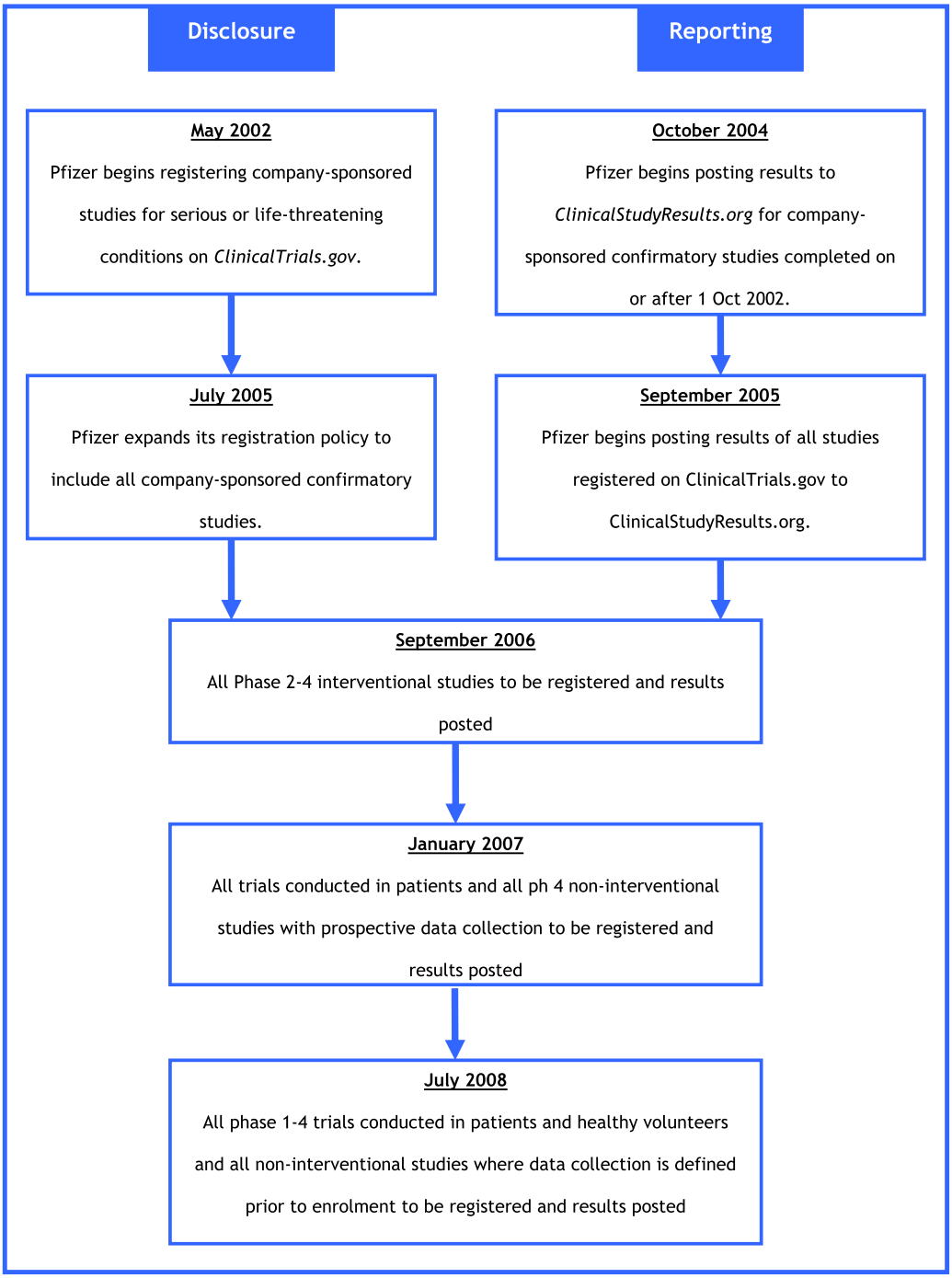

Figure 2. Steps taken by one company, Pfizer, to make study information available (*Source*: Pfizer website).

site. Results from the two websites are fairly consistent, with as expected, somewhat more studies available via the IFPMA site.

Table III suggests that as with registry records, somewhat more results are available via the IFPMA search portal compared with the US-based service, which is provided by PhRMA. It should be noted that some companies (e.g. Company I) hold some study results on an in-house database, accessible from the IFPMA site but not from PhRMA's clinicalstudyresults.org.

If all studies were registered at startup and all also had results published on the web, one would still expect to find fewer results than registration entries, because of the time needed to run the study before results can be produced. In fact, there was a 4-year gap between the launching of the US registration site ClinicalTrials.gov (2000) and the US database of study results clinicalstudyresults.org (2004); furthermore, results are required to be made available only if the treatment is approved. (A requirement to publish results of studies for treatments that fail to get approval comes into force in 2010.) In fact, the study registers include many older studies none of whose results are required by law to be made available on the web. In addition, as noted earlier, companies have voluntarily committed to migrating greater and lesser amounts of historic

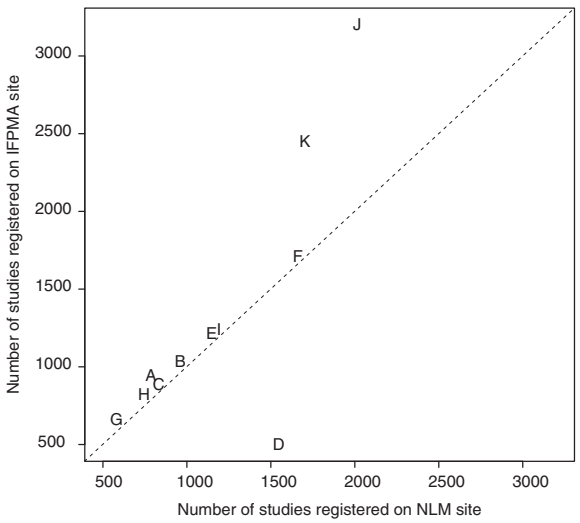

Figure 3. Correlation between numbers of studies in the IFPMA portal and the NLM registry. Plot shows the number of studies registered via IFPMA site vs the number registered on NLM site, for 11 large publicly quoted pharmaceutical companies. The dashed reference line marks equal numbers in both registries. There appears to be a technical problem in the IFPMA portal search, which may be affecting the accuracy of the search for studies sponsored by Company D. Additionally, Company D has a large number of subsidiary companies many of whose study registrations are likely not included in the analysis.

study results data. Table III suggests that the size of a company's registry of studies is not a good predictor of the number of reports of study results available from that company on the web.

4.3. Completeness of results information

It may be noted that with regard to the type of results information that is actually made available, the category, quantity and detail of results published vary greatly. Among the study results made available, there are examples of 3-page synopses with no estimates of treatment effect or confidence intervals, and there are examples of 17-page reports giving a very complete summary of a study's results. There are pages on the IFPMA/PhRMA website with a note 'No document provided' where the report of study results might be expected. There are in addition a considerable number of instances where the link to the results of a study leads to a publication, rather than to a strictly ICH-E3-style synopsis.

5. SUMMARY AND CONCLUSIONS

This article has described the development of publicly available sources of study registry and results information. It has also examined the completeness of the available study information indirectly by comparing a number of sources of this information for evidence of consistency, with the object of allowing the reader to judge how the information now available may empower referees and readers to judge the claims made by published articles. Since the first legislation recommended making study information available on a voluntary basis in 1997, the scope of publicly available registries of clinical trials has grown, as has that of publicly available databases of study results. Our findings demonstrate that much has been achieved in making study information available on the web: study registration information is available in fairly consistent numbers across two important websites, with larger companies tending to have more studies registered; but that there is no single route to accessing information about study results, and the quantity of results information published on the web by pharmaceutical companies is variable and less clearly related to the size of a company; and that the format of results is loose, leading to instances of lack of completeness in reports.

Clinical study registries contain basic information such as planned primary and secondary endpoints, whose pre-specification forms an important part of the basis for inference from the study. Therefore, access to the registry entry will help referees and readers to assess claims made by reports of a clinical study. However, as noted earlier, a recent study suggests that key information about planned endpoints is often absent from registry records, or incomplete [34], so there is still room for improvement in this aspect of making study information available. Although perhaps of more interest as an antidote to delay in publishing or failure to publish study results in print, access to study results on the web may also be helpful in assessing a report in a journal. However, many reports of study results are submitted for publication before a treatment is approved and thus before results are legally required to be made publicly available on the web. The very loose ICH-E3 format often used for making results publicly available also limits their helpfulness in assessing the report of a study in a journal.

Most of the larger pharmaceutical companies have issued policy statements about making study information available. The web services offered by individual companies for making study information available vary, but registry information from all the larger companies can be accessed on the umbrella site run by IFPMA. However, for the results of studies, (as opposed to study registration) it is not possible to find all available information from the industry IFPMA portal, and it is sometimes necessary to go to the NLM website, whose store of study results is not at the moment accessed by the IFPMA site, or to search the company's own website. In practical terms, one may construct meaningful searches of what is available as follows:

1. To search for the existence of studies and learn important points of their design (i.e. find a registry entry), use the IFPMA portal 'Search ongoing trials' page (which will find trials even if they are finished). The IFPMA site allows a word search with logical AND and OR clauses.
2. To search for reports of study results, one must:

(a) use the IFPMA portal 'Search Trials Results' option and
(b) check the NLM site ClinicalTrials.gov and
(c) check individual company websites.

The latest US legislation specifies that study results be integrated into the US NLM study registry ClinicalTrials.gov. The US requirement to integrate study results with the US study registry should make it easier in the future for the public to evaluate a study as a whole. However the NLM site is accessed by the IFPMA industry portal for registration information, but the portal does not access study results on the NLM site. Because of this, study results posted in accordance with US legislation on the NLM site will not be found from the IFPMA portal. For the moment, therefore, companies who follow the US legislation and make their results available on ClinicalTrials.gov (and don't post them elsewhere) will not have their results found by searches using the IFPMA industry portal whose

Table III. For three important websites (the IFPMA, NLM and PhRMA sites) the numbers of studies with registry information and numbers of studies with results published, for 11 leading pharmaceutical companies based on market capitalization, and selected smaller companies.

			Number of studies registered		Number of studies with results available	
	Company ID	Mkt cap ($1000 m)	via IFPMA site CT.IFPMA.org	at NLM site ClinicalTrials.gov	via IFPMA site CT.IFPMA.org	via PhRMA site Clinical StudyResults.org
Large cap – US	A	50–100	866	782	105	99
	B	<50	968	915	145	150
	C	50–100	823	803	508	510
	D	>100	488*	1532	21†	21†
	E	50–100	1159	1114	295	289
	F	>100	1643	1599	840	866
	G	<50	634	534	155	159
	H	50–100	783	740	141	142
Large cap – EUR	I	50–100	1171	1139	643	329
	J	>100	3192	1953	6473	NA
	K	>100	2426	1640	0‡	0‡
Small/med cap	L	<50	25	24	9	10
	M	<50	4	3	0	0
	N	<50	9	8	0	0
	O	<50	107	113	0	0
	P	<50	187	192	0	0

Notes: the search results are as of 6th March 2009 with corrections for companies B, M, O and P as of 27th April 2009. Registries include investigator-initiated studies of commercial treatments. Search results for a company include studies where that company's treatment is the active control. For the IFPMA site, numbers may be inflated due to some studies being found in two separate registries, and counted as two separate records by the IFPMA search engine. For more detailed notes on the search strategies employed for this table, see Appendix (available online as Supporting Information). In particular note that a word search was used to find a company's studies on the NLM site. That site's 'find by sponsor' facility gives fewer registration records – see table in Appendix (available online as Supporting Information) for a comparison. The IFPMA registry search has no 'find by sponsor' option. Search for Company J study results on PhRMA site gave error 'too many records'. Company D has a large number of subsidiary companies many of whose study registrations are likely not included in the analysis.

*There appears to be a technical problem with a particular search string in the IFPMA portal search, which may be affecting the accuracy of the search for studies sponsored by Company D at this site.

†For most studies, Company D posts results to the NLM registry, rather than to the IFPMA and PhRMA sites.

‡Rather than using the PhRMA site, Company K post results to a database accessible from the company website.

function is to give general access to study information. Until a solution to this technical problem is found, the public may need to check the NLM site, the IFPMA site and the company website to find a study's results.

This article aims to be a factual account of the availability of study information on the web, with some analysis of the usefulness of such information for referees and readers of journal publications of industry-sponsored clinical studies. Other articles in this issue discuss the background to the questioning of industry-sponsored studies [35], and give recommendations for the future publishing of study results [36].

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APPENDIX A: DETAILS OF SEARCH STRATEGIES USED IN THE TABLES

A.1. General

Search results for both tables were verified by a second researcher. The researchers shared notes (so as not to miss certain string combinations) but otherwise worked independently. It was noted that the numbers of hits on the websites changed hourly, so that exact matches in results were not achieved; the numbers of hits tended to increase slowly over time, indicating that there is ongoing migration of information to the registries and databases of results.

String search anomalies were found in the NLM registry, e.g. search for 'Company D' gives study NCT00746876, a

study that does not mention any component of the company name.

A.2. Kinds of searches used

For the IFPMA site, a word search was used; IFPMA's 'synonyms' option was used.

For the NLM site, a word search was also used. The option to 'List studies by sponsor' gave somewhat fewer results than the simple word search and its results are not presented in the table or the plots. The search using the option to 'List studies by sponsor' gave the following results, compared with the word search for the NLM site:

Company ID	A	B	C	D	E	F	G	H	I	J	K
Word search	782	915	803	1532	1114	1599	534	740	1139	1953	1640
'By sponsor' search	477	721	794	463	1020	1510	474	700	1128	1854	1522

As noted in the main paper, word searches may include studies where the sponsor's treatment is the active control and investigator-instigated studies.

A.3. Issues when searching for sponsor's studies

A company may be credited with studies where sponsor name includes the company name, e.g. studies with sponsor 'Company A-Other company' are credited to Company A in the table.

In general, the search by company name may give a result that includes studies that happen to have an investigator with the same name as the company. Where this ambiguity was detected, it was as far as possible avoided by specifying the company name in full.

With one exception, only the main company name and its variants have been used in the search, and studies accessible under the names of subsidiaries or of companies now merged may not be counted in the search result.