Guidance on research integrity: no union in Europe

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Research integrity is a regularly raised issue in academic journals and the press.[1-3] To clarify the regulatory framework regarding this issue in Europe, we analysed national official documents concerning guidance on scientific integrity in the European Economic Area.

As summarized in Figure 1, the European situation with regard to research integrity is heterogeneous. No guidelines could be analysed for 12 countries (13% of the target population's published output[4]), but we retrieved and analysed 49 guidelines, published by 19 countries (see e-supplement for our methodology and detailed results). In general, the Nordic countries and most countries of Central and Western Europe have national guidelines addressing research misconduct and promoting research integrity. Only Denmark and Norway have a specific law to deal with research misconduct, whilst many countries have multiple guidelines with seemingly little internal consensus.

Most of the guidelines have been published in the past ten years (sometimes only after scandals involving prominent personalities). Although many guidelines refer to common sources of inspiration, such as the US Office of Research Integrity[5], the European Science foundation[6], or the International Committee of Medical Journal Editors[7], not all of them do so explicitly. Not one list of principles or one definition is identical in any two guidelines (except for Denmark and Norway). Positive and negative approaches can be distinguished depending on whether integrity or misconduct is emphasised. Fabrication, falsification and plagiarism are evoked most frequently as forms of misconduct, although several guidelines recognise other possible forms. Some guidelines make explicit gradations and distinguish serious misconduct, such as data fabrication, from less serious forms, such as denying deserved authorship. Similar forms of misconduct are sometimes judged differently by different guidelines. For example, one Swedish guideline qualifies continued carelessness as misconduct, whereas Finnish guidelines consider carelessness as less serious than fabrication, which is qualified as fraud. The notions of intention, negligence or deceit feature explicitly in certain definitions of misconduct although establishing intentionality is acknowledged to be difficult. All guidelines (except in Latvia) require a creative contribution as a condition for being an author.

Most guidelines consider competition as instrumental in causing misconduct, although competition is approached from different angles. The guidelines also condemn misconduct because it damages trust and reputation, but these concepts are, again, approached from varying perspectives: trust between society and the scientific community, mutual trust between scientists, trust of funding providers, trust in science itself, trust granted to reviewers, trust of participants in research, and trust in the academic merit system. Reputation concerns individual researchers and institutions, as well as the reputation of research in general. Only some guidelines explicitly stress the need to protect the reputation of both the whistleblower and the potentially falsely accused.

The guidelines advocate various possible actions to prevent misconduct, although some also acknowledge that total prevention is impossible. Training and education in good research practices feature regularly, especially directed towards junior scientists. Only the Irish

guidelines explicitly stress the need to also instruct senior researchers. The research environment and daily practice are considered to be important.

The observed heterogeneity in guidelines within and between European countries results in a confusing situation. This may encourage research misconduct and, hence, threaten the foundational value of trust, without which science cannot advance or even function. We therefore support pleas for harmonising the guidance on research integrity in Europe.[8] The Memorandum on Scientific Integrity published by ALLEA and others,[9] the European Scientific Misconduct Strategy published by the European Research Council,[10] and the European Code of Conduct for Research Integrity published by ALLEA and the European Science Foundation[11] are all steps in the right direction. However, these initiatives do not guarantee a unified approach throughout Europe. Thus, for example, the Hungarian guideline contains marked discrepancies from the European Code of Conduct for Research Integrity, although it claims to be based on this code.

Finally, it should be noted that we experienced great difficulties in retrieving the guidelines of several countries. If these guidelines are so hard to find, how can they then serve as a framework for researchers? Moreover, how can researchers cooperate in international research projects with such diversity in guidelines? We have to conclude that the European countries are not yet united when it comes to guiding scientific integrity.

References

1 Anonymous. Promoting research integrity: a new global effort. *Lancet* 2012; **380**: 1445.

2 Macilwain C. The time is right to confront misconduct. *Nature* 2012; **488**: 7.

3 Crocker J, Cooper ML. Addressing scientific fraud. *Science* 2011; **334**: 1182.

4 SCImago Lab. SCImago journal and country rank. http://www.scimagojr.com/countryrank.php?area=2700&category=0&region=all&year=all&order=it&min=0&min_type=it (accessed on 18 October 2012).

5 Office of Research Integrity. http://www.ori.dhhs.gov/ (accessed on 10 February 2012).

6 European Science Foundation, http://www.esf.org/home.html (accessed on 10 February 2012).

7 International Committee of Medical Journal Editors, http://www.icmje.org/ (accessed on 10 February 2012).

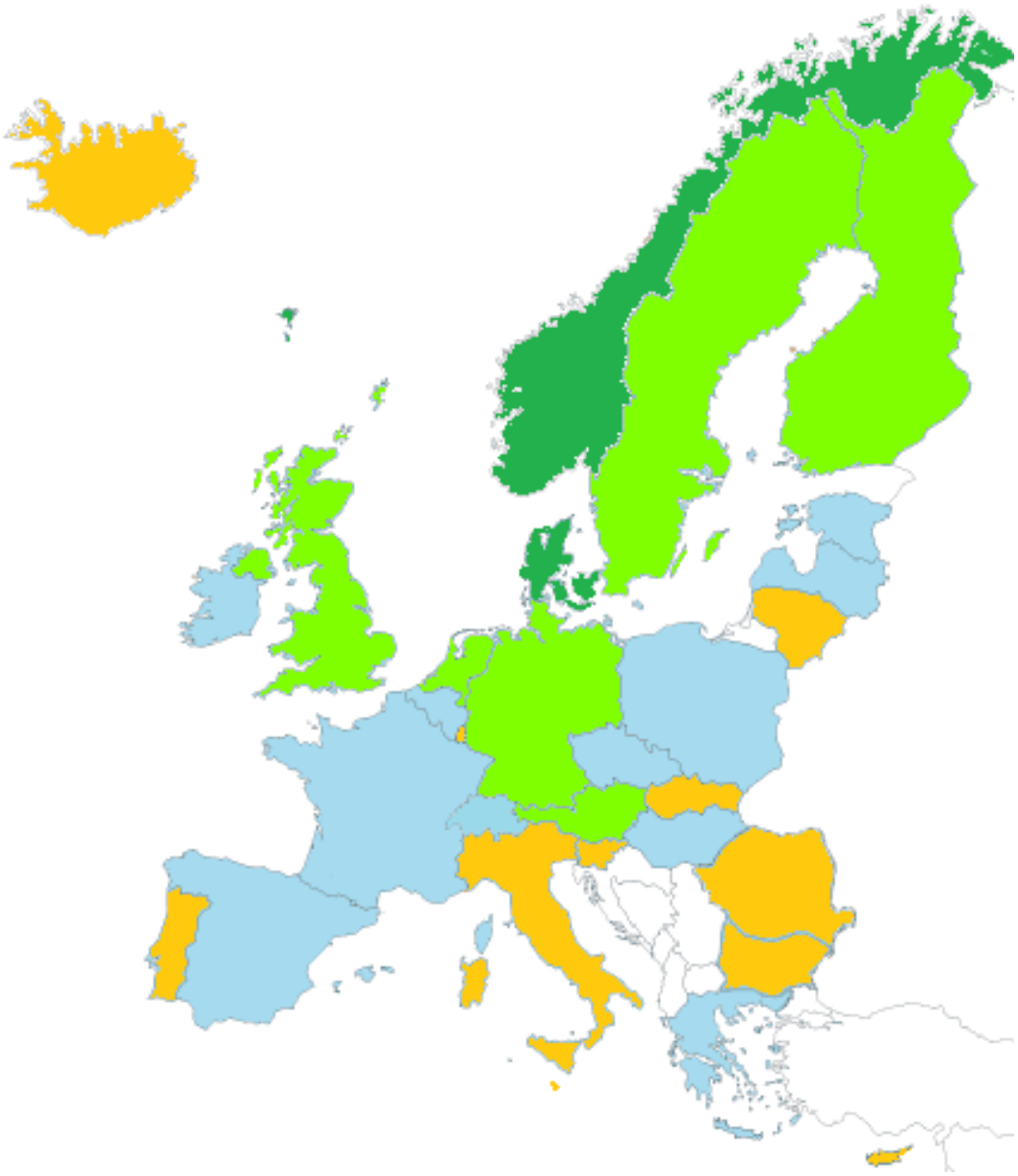
8 Bosch X. Safeguarding good scientific practice in Europe. *EMBO Rep* 2010; **11**: 252–7.

9 Memorandum on Scientific Integrity, http://www.allea.org/Pages/ALL/12/727.bGFuZz1FTkc.html (accessed on 18 October 2012)

10 European Research Council. European Scientific Misconduct Strategy. http://erc.europa.eu/sites/default/files/document/file/ERC_Scientific_misconduct_strategy.pdf (accessed October 26, 2012).

11 European Science Foundation/All European Academies. European Code of Conduct for Research Integrity. http://www.esf.org/activities/mo-fora/research-integrity.html. (accessed April 18, 2012).

Figure 1: Classification of the countries belonging to the European Union and the European Free Trade Association according to some broad categories defined by how they deal with scientific integrity.



Adapted from http://europa.eu/europedirect/meet_us/interactive_map/index_en.htm

Key:

- Countries having a national framework to deal with research integrity or misconduct, established by law.
- Countries having a national framework (or equivalent) to deal with research integrity or misconduct, not established by law.
- Countries that do not have a national framework to deal with research integrity or misconduct.
- Countries where no guideline could be identified or analysed.

Supplementary online material

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Methods

We conducted a search of the documents on research integrity, involving either biomedical research or scientific research in general, from all 27 countries of the European Union plus the four countries of the European Free Trade Association, i.e. Iceland, Liechtenstein, Norway, and Switzerland. In the following, these documents, which include laws and guidelines, will be called "guidelines".

To identify these guidelines, we searched the internet (between 1 February 2012 and 18 July 2012) using Google, Google Scholar and PubMed, and the following search terms and their relevant combinations: "biomedical research", "scientific misconduct", "research misconduct", "research ethics", "scientific integrity", "mentoring", "education", "biomedical research", "mentor", "training", "bioethics", "models of prevention", "prevention of research misconduct", "prevention", "good scientific conduct", "responsible conduct of research", "disclosure", "self-disclosure", "guidelines", "scientific fraud", "fraudulent data", "misconduct in science", "questionable research", "questionable research practice", "fabrication", "falsification", "plagiarism", "Europe". We also added the names of the individual European countries. The retrieved guidelines were considered for possible inclusion if they were published or explicitly referred to by one or more of the following national organizations: the bio-ethical committees listed by the World Health Organization (WHO),[1] the national academies of sciences belonging to All European Academies (ALLEA),[2] or a national research integrity governance framework, if any existed. Guidelines were included if they dealt with scientific research in general, or more specifically with biomedical research.

In a second phase we contacted each of the aforementioned organisations by e-mail, and asked them if the guidelines we had found were indeed the relevant guidelines for their country. If we had been unable to find any guidelines, we asked them whether guidelines existed concerning scientific integrity in their country. If these organisations referred explicitly to other guidelines, we investigated these as well. In a third phase we also contacted the national association of universities or an academic individual, such as someone who had published on scientific integrity or had spoken at the 1st or 2nd World Conference on Research Integrity.[3-4] We also asked them to confirm whether the guidelines we had found or received were indeed relevant.

All the retrieved guidelines were thematically analysed by a single person (SG), provided they were available in English, French, German, Dutch or Italian. No statistical analyses were needed for this descriptive study. In the tables, the countries are identified by the official abbreviations for each country, as listed in e-figure 1. In the following the word misconduct refers to infringements on scientific integrity.

Role of the funding source

There was no involvement of the funding source. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Results

For this study, we sent more than 340 specific e-mails, including reminder e-mails and messages requesting clarifications. The flow chart (e-figure 1) shows how we ended up with 49 relevant guidelines, published by 19 countries.

No information was found for Liechtenstein; no guidelines could be identified or analysed for 11 other countries. No guidelines on research integrity were retrieved for 7 countries (Bulgaria, Cyprus, Lithuania, Portugal, Romania, Slovenia, and Luxembourg) even after repeated contacts with individuals working in these countries. We were also unable to analyse guidelines from Slovakia, because these were only available in Slovak. In spite of a considerable amount of e-mail exchanges, Italy, Malta and Iceland could also not be included in our analysis because the documents received from these countries were not devoted to research integrity as such.

The 49 guidelines amenable to analysis are listed in e-table 1, together with the institution that developed the guideline, the year of publication, the title, word count and URL of the guideline. In the following, guidelines are identified by country code followed, if applicable, by a small capital letter, in square brackets: e.g. [FR(A)], as shown in e-table 1. Most guidelines (90%) were published between 2002 and 2012. The number of words (including references) ranged from 139 to 57287 words (median: 2467 words, 25th-75th percentile: 1377-5795).

E-table 2 summarizes the main (explicit) sources of inspiration for the guidelines. The structures that address research misconduct or promote research integrity in Europe differ markedly between countries. Only Denmark and Norway appear to have a specific law to deal with research misconduct [NO(A), DK(B,C)]; several other countries have more than one guideline with seemingly little internal consensus [IE(A-H), FR(A-C), PL(A,B), UK(A-G), ES(A,B)]. E-table 3 gives an overview of the principles to which the guidelines explicitly refer, and unacceptable actions or events that define misconduct in the guidelines.

A detailed analysis of how the various themes are addressed by each country will be published elsewhere.

Comments

Our review contains some methodological problems and limitations. We cannot completely rule out that some documents have been overlooked. It is conceivable that the institutions that we initially approached in each country do not play the most important role in safeguarding research integrity. However, we compensated for this limitation by contacting key persons in each country and including guidelines published by other institutions if our contacts had referred to these documents. So, we trust that our extensive and persistent search strategy led to the inclusion of all relevant existing guidelines. We are aware that the Medical Research Council of the UK has published an update of the guideline "Good research practice: principles and guidelines"[5] in August 2012, which we could not formally include in our analysis, because our search stopped on 18 July. Nevertheless, this guideline is based on the previous guideline published in 2002 [UK(C)], which is included in our review. We did not verify the accuracy of the English translated versions against the documents in the original languages, and it is conceivable that some nuances may have been lost in translation. However, it is unlikely that this has seriously affected our findings.

One could also object that we only investigated the guidelines of 19 of the 31 countries. However, these 19 countries are responsible for almost 90% of all citable scientific publications from our target population.[6] How research integrity is guided in the 12 other countries remains unclear. The absence of a national framework does not rule out the existence of local guidelines in universities or research institutions. Obviously the absence of national guidelines or a national structure to deal with research misconduct does not imply that the research in that country is not performed with integrity. Nevertheless, it is remarkable that several countries, such as Germany, Austria and Norway, only established national frameworks after scandals concerning serious cases of misconduct had been revealed [IE(E)]. It is beyond the scope of our investigation to judge whether guidelines published by national bodies are effective in ensuring research integrity.

Although relatively little research has been devoted to scientific integrity, our findings are compatible with those of other studies on this issue. Thus, the defensive attitude of certain guidelines towards competition corresponds with empirical research findings on how researchers perceive competition.[7] Consistent with research on research misconduct,[8-9] several guidelines recognise that there are far more forms of misconduct than just outright fabrication, falsification and plagiarism. However, even though empirical research has questioned the efficiency of education and training in decreasing misconduct,[10] education and training are still the most recurring elements of prevention mentioned in the analysed guidelines.

Contributors

BN and KD contributed to the study design, the elaboration of the manuscript, and supervised the research. SG performed the search for documents concerning research integrity or misconduct, collected, analyzed and interpreted the data, wrote the first and successive drafts of the manuscript, figures, and tables. All authors have approved the final revision.

Conflicts of interest

All other authors declare that they have no conflicts of interest.

Acknowledgements

We thank all our contacts for their cooperation. We thank Giovanni Pagliaro, a native Italian speaker and sworn Italian interpreter, for his help in translating Italian documents.

References

1 World Health Organisation. http://www.who.int/ethics/committees/euro/en/ (accessed on 1 February 2012).

2 All European Academies. http://www.allea.org/Pages/ALL/4/731.bGFuZz1FTkc.html (accessed on 1 February 2012).

3 1st World Conference on Research Integrity. http://www.esf.org/index.php?id=4479 (accessed on 1 February 2012).

4 2nd World Conference on Research Integrity. http://www.wcri2010.org/speakers.asp (accessed on 1 February 2012).

5 The Medical Research Council. Good research practice: principles and guidelines. http://www.mrc.ac.uk/Utilities/Documentrecord/index.htm?d=MRC002415 (accessed 10 October 2012).

6 SCImago Lab. SCImago journal and country rank. http://www.scimagojr.com/countryrank.php?area=2700&category=0&region=all&year=all&order=it&min=0&min_type=it (accessed on 18 October 2012).

7 Anderson MS, Ronning EA, De Vries R, Martinson BC. The perverse effects of competition on scientists' work and relationships. *Sci Eng Ethics* 2007; **13**: 437–61.

8 Martinson BC, Anderson MS, De Vries R. Scientists behaving badly. *Nature* 2005; **435:** 737–8.

9 Fanelli D. How many scientists fabricate and falsify research? A systematic review and meta-analysis of survey data. *PLoS ONE* 2009; **4**: e5738

10 Anderson MS, Horn AS, Risbey KR, Ronning EA, De Vries R, Martinson BC. What do mentoring and training in the responsible conduct of research have to do with scientists' misbehavior? Findings from a national survey of NIH-funded scientists. *Acad Med* 2007; **82**: 853–60.

177 **E-Figure 1: Flowchart**

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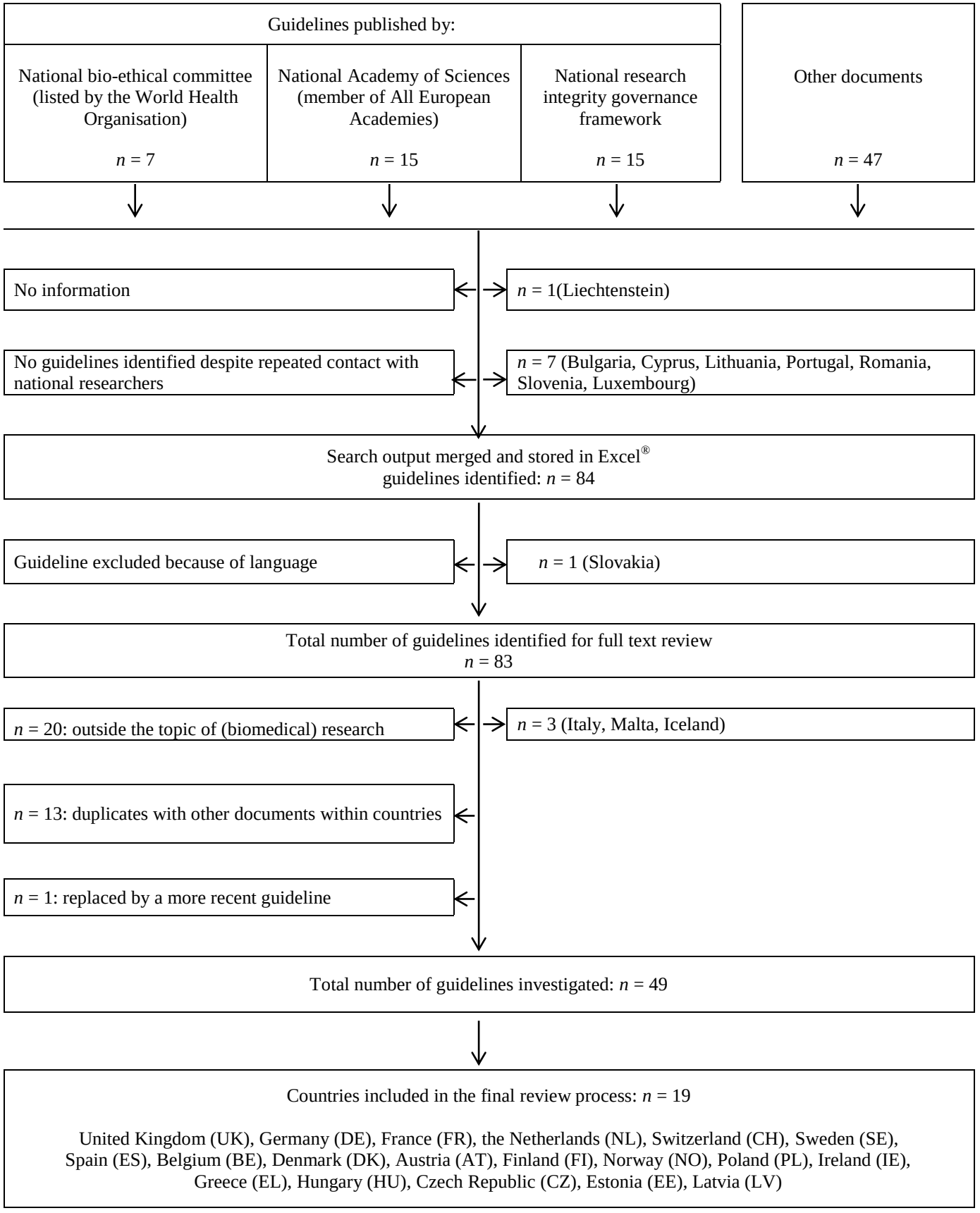

E-Table 1: Overview of the guidelines ranked according to the first date of publication within the country, guideline developer, year, title, word count (English versions), and URL.

Country		Guideline developer	Year	Title	Word count	URL
LV		Latvian Academy of Sciences	1997	Scientist's Code of Ethics	2383	http://www.lzp.gov.lv/index.php?mylang=english
DE		German Research Foundation	1998	Recommendations of the Commission on Professional Self-Regulation in Science	16864	http://www.dfg.de/en/research_funding/legal_conditions/good_scientific_practice/index.html
FR	A	National Institute for Health and Medical Research	2000	Responding to Allegation of Scientific Misconduct: the Procedure at the French National Health and Medical Research Institute	3068	http://www.ncbi.nlm.nih.gov/pubmed/11273435
	B	National Centre for Scientific Research	2006	Scientific fraud at the National Centre for Scientific Research	442	http://www.cnrs.fr/fr/organisme/ethique/comets/avis.htm
	C	National Alliance for Life and Health Sciences	2011	Recommendations for the signing of scientific papers in the field of life sciences and health	929	http://www.inserm.fr/qu-est-ce-que-l-inserm/organigramme/comites/dis
NL	A	Royal Netherlands Academy of Arts and Sciences	2001	Note on Scientific Integrity	4632	http://www.knaw.nl/smartsite.dws?id=26101&lang=NL&pub=20011082
	B	Royal Netherlands Academy of Arts and Sciences and All European Academies	2003	Memorandum on Scientific Integrity	4776	http://www.allea.org/Pages/ALL/12/727.bGFuZz1FTkc.html
	C	Association of Universities in the Netherlands	2004	The Netherlands Code of Conduct for Scientific Practice. Principles of good scientific teaching and research (additions added in 2012)	3419	http://redactie.vsnu.nl/Universities/Quality-assurance/Code-of-conduct-for-scientific-practice-1.htm
PL	A	Polish Academy of Sciences	2001	Good manners in science. A set of principles and guidelines	7319	http://www.ken.pan.pl/images/stories/pliki/goodmanners.pdf
	B	Ministry of Science and Information Technology	2004	Good scientific research practice	5301	http://www.nauka.gov.pl/fileadmin/user_upload/37/23/37237/20080505_Good_practice_for_scientific_research_EN.pdf
EE		Estonian Academy of Sciences	2002	Code of Ethics for Estonian Scientists	1376	http://www.akadeemia.ee/en/documents/
FI	A	The National Advisory Board on Research Ethics	2002	Good scientific practice and procedures for handling misconduct and fraud in science	3980	http://www.tenk.fi/en/good_scientific_practice/printable.html
	B	The National Academy of Finland	2005	Guidelines on research ethics	2467	http://www.tenk.fi/en/links.html
UK	A	Wellcome Trust	2002	Guidelines on good research practice (updated in 2005)	1377	http://www.wellcome.ac.uk/About-us/Policy/Policy-and-position-statements/WTD002753.htm
	B	Wellcome Trust	2002	Statement on the handling of allegations of research misconduct (updated in 2005)	2453	http://www.wellcome.ac.uk/About-us/Policy/Policy-and-position-statements/WTD002756.htm
	C	Medical Research Council	2002	Good Research Practice	3904	http://www.mrc.ac.uk/Utilities/Documentrecord/index.htm?d=MRC002415
	D	Medical Research Council	2009	Scientific Misconduct Policy and Procedure	5124	http://www.mrc.ac.uk/Utilities/Documentrecord/index.htm?d=MRC005820
	E	UK Research Integrity Office	2008	Procedure for the investigation of misconduct in research	18759	http://www.ukrio.org/publications/
	F	UK Research Integrity Office	2009	Code of Practice for Research. Promoting good practice and preventing misconduct	10170	http://www.ukrio.org/publications/
	G	Universities UK	2012	The concordat to support research integrity	5795	http://www.universitiesuk.ac.uk/Publications/Pages/concordattosupportresearchintegrity.aspx
NO	A	Law	2006	Act of 30 June 2006 No. 56 on ethics and integrity in research	572	http://www.etikkom.no/In-English/Act-on-ethics-and-integrity-in-research/
	B	The National Committee for Research Ethics in Science and Technology	2008	Guidelines for research ethics in science and technology	5876	http://www.etikkom.no/Documents/English-publications/Guidelines%20for%20research%20ethics%20in%20science%20and%20technology%20(2008).pdf

CZ		Academy of Sciences of the Czech Republic	2006	Code of Ethics for Researchers of the Academy of Sciences of the Czech Republic (additions made in 2010)	1560	http://www.rewi.uni-jena.de/rewimedia/Downloads/LS_Ruffert/Ethical_Codes/Academy+of+Sciences+of+the+Czech+Republic_Code+of+Ethics+for+Researchers.pdf
EL	A	Hellenic National Bioethics Commission	2008	National Commission of Bioethics. Opinion on research ethics in the biological science	925	http://www.bioethics.gr/document.php?category_id=55&document_id=601
	B	Hellenic National Bioethics Commission	2008	Report on research ethics in the biological sciences	4723	http://www.bioethics.gr/document.php?category_id=55&document_id=601
	C	Hellenic National Bioethics Commission	2009	Template of Code of Research Ethics for Biological Sciences	1545	http://www.bioethics.gr/document.php?category_id=55&document_id=760
	D	Hellenic National Bioethics Commission	2011	Opinion on conflict of interest in biomedical research	1289	http://www.bioethics.gr/document.php?category_id=55&document_id=1288
CH		Swiss Academies of Arts and Sciences	2008	Integrity in scientific research. Principles and procedures	6207	http://www.akademien-schweiz.ch/en/index/Portrait/Kommissionen-AG/Wissenschaftliche-Integritaet.html
BE		National Academy of Science	2009	Code of ethics for scientific research in Belgium	2650	http://www.kuleuven.be/cwi/english/Nationale%20code%20Belspo_en.pdf
DK	A	Danish Committees on Scientific Dishonesty	2009	Guidelines for Good Scientific Practice	14535	http://en.fi.dk/publications/2009/the-danish-committees-on-scientific-guidelines-for-good-scientific-practice/
	B	Law	2009	Consolidated Act No 306	1976	http://en.fi.dk/acts/executive-order-no.-306-of-20-april-2009
	C	Law	2010	Consolidated Act No 1064	6049	http://en.fi.dk/acts/act-on-the-research-advisory-system-etc/
HU		Hungarian Academy of Science	2010	Science Ethics Code of the Hungarian Academy of Sciences	10631	http://www.allea.org/Content/ALLEA/Scientific%20Integrity/ScienceEthicsCode-HAS.pdf
IE	A	Health Research Board	2002	Disclosure and Conflict of Interest (	1117	http://www.hrb.ie/fileadmin/Staging/Documents/RSF/PEER/Policy_Docs/Good_practice_guidelines/Disclosure___Conflict_of_Interest_01.pdf
	B	Health Research Board	2008	HRB Guidelines for Host Institutions on Good Research Practice	2174	http://www.hrb.ie/fileadmin/Staging/Documents/RSF/PEER/Policy_Docs/Good_practice_guidelines/HRB_Guidelines_on_Good_Research_Practice-FINAL241007.pdf
	C	Health Research Board	2008	Policy for Dealing with Alleged Research Misconduct in Applications Made to the HRB	1092	http://www.hrb.ie/fileadmin/Staging/Documents/RSF/PEER/Policy_Docs/Good_practice_guidelines/Plagiarism_policy_-_FINAL241007.pdf
	D	Health Research Board	2008	HRB Guidelines for Host Institutions on the Handling of Allegations of Research Misconduct	2023	http://www.hrb.ie/fileadmin/Staging/Documents/RSF/PEER/Policy_Docs/Good_practice_guidelines/Allegations_of_misconduct-FINAL241007.pdf
	E	Irish Council for Bioethics	2010	Recommendations for promoting research integrity	31932	http://irishpatients.ie/news/wp-content/uploads/2012/04/Irish-Council-of-Bioethics-Research_Integrity_Document.pdf
	F	Royal Irish Academy	2010	Ensuring integrity in Irish research. A Discussion Document	6347	http://www.ria.ie/getmedia/28404e5c-4839-4408-9d40-e2a3770c775a/ensuring-integrity-in-irish-research.pdf.aspx
	G	Health Research Board	2010	Health Research Board Position Statement on Authorship	139	http://www.hrb.ie/uploads/media/HRB_Position_Statement_on_Authorship__May2010.pdf
	H	Health Research Board	2010	Details on how HRB Authorship position can be applied	1179	http://www.hrb.ie/uploads/media/Applying_Authorship_Position_May2010.pdf
AT	A	Austrian Agency for Research Integrity	2010	Rules of procedure for the investigation of alleged scientific misconduct	1714	http://www.oeawi.at/en/downloads.html
	B	Austrian Agency for Research Integrity	2010	Annex I to the Rules of Procedure of the Commission for Research Integrity: Guidelines for the investigation of alleged scientific misconduct	1012	http://www.oeawi.at/en/downloads.html
	C	Austrian Agency for Research Integrity	2011	Statement of the Commission for Research Integrity on Handling Cases of Plagiarism	512	http://www.oeawi.at/en/downloads.html
ES	A	Spanish Bioethics Committee	2010	Recommendations of the Spanish Bioethics Committee in Relation to the Drive and Implementation of Good Scientific Practice in Spain	2124	http://www.comitedebioetica.es/documentacion/index.php
	B	Spanish National Research Council	2011	Code of Good Scientific Practices of the Spanish National Research Council	5057	http://www.csic.es/web/guest/etica-en-la-investigacion

SE	A	The Swedish Research Council	2004	Guidelines: Expert Group for Investigation of Suspected Research Misconduct	2108	http://www.vr.se/inenglish/ethics/publications.4.325716ea11d7602a6d180008726.html
	B	The Swedish Research Council	2006	Conflict of interest policy	2425	http://www.vr.se/inenglish/ethics/publications.4.325716ea11d7602a6d180008726.html
	C	The Swedish Research Council	2011	Good research practice	57287	http://www.vr.se/inenglish/ethics/publications.4.325716ea11d7602a6d180008726.html

E-Table 2: Overview of the sources referred to by at least three different European guidelines. The countries are ranked horizontally according to how frequently their guidelines refer to the organisations listed vertically. The sources are ranked according to how frequently they are referred to by the guidelines of the countries.

Sources referred to by the guidelines			Guidelines referring to sources														
National organisations			IE	SE	UK	DE	PL	ES	FR	NL	CH	BE	EL	HU	CZ	DK	NO	AT
Country	Organisation	URL																
USA	Office of Research Integrity	http://www.ori.dhhs.gov/	x	x	x	x	x		x	x							x	x
	National Academy of Sciences	http://www.nasonline.org/	x			x	x			x								
	National Science Foundation	http://www.nsf.gov/	x	x		x												
UK	Medical Research Council	http://www.mrc.ac.uk/index.htm	x		x	x	x	x	x									
	Wellcome Trust	http://www.wellcome.ac.uk/	x		x			x										
	Committee on Publication Ethics	http://publicationethics.org/	x		x				x									
	Research Councils UK	http://www.rcuk.ac.uk/Pages/Home.aspx	x		x		x											
DE	German Research Foundation	http://www.dfg.de/en/index.jsp	x			x	x	x	x		x							
	Max Planck Society	http://www.mpg.de/en				x	x								x			
DK	Danish Committees on Scientific Dishonesty	http://en.fi.dk/councils-commissions/the-danish-committees-on-scientific-dishonesty	x	x	x	x	x											
International organisations																		
Organisation		URL																
European Science Foundation		http://www.esf.org/home.html	x	x	x		x	x		x	x	x		x				
International Committee of Medical Journal Editors		http://www.icmje.org/	x	x	x	x			x							x	x	
World Medical Association		http://www.wma.net/en/10home/index.html		x	x	x	x	x								x		
All European Academies		http://www.allea.org/Pages/ALL/4/731.bGFuZz1FTkc.htm	x								x		x	x	x			
Unesco		http://www.unesco.org/new/en/unesco/	x	x				x					x				x	
Economic Co-operation and Development		http://www.oecd.org/	x	x	x							x						
Council of Europe		http://hub.coe.int/	x	x				x					x					
European Commission		http://ec.europa.eu/index_en.htm	x	x								x	x					

E-Table 3: Principles of integrity and the elements and actions incorporated in the definitions of misconduct of the European guidelines. The countries are ranked horizontally, firstly the countries that only refer to certain principles, according to how frequently their guidelines incorporate the elements listed vertically.

	Countries																		
Positive approach: principles of integrity	CZ	BE	EL	LV	IE	AT	FR	DE	UK	NO	HU	EE	CH	SE	ES	NL	DK	FI	PL
Honesty	x		x	x	x	x		x	x	x	x	x		x	x				x
Reliability	x	x			x					x	x	x		x		x	x		x
Impartiality		x		x	x						x	x		x	x	x			
Objectivity	x		x	x	x					x	x	x		x	x				
Openness or open communication	x				x				x	x	x				x		x	x	
Responsibility for future generations through education or training and skills	x				x				x		x	x		x	x				
Independence		x								x		x		x	x	x			
Integrity	x		x						x	x		x						x	
Duty of care					x				x		x		x						
Verifiability	x	x			x							x				x			
Accountability	x								x	x									
Rigour		x							x										
Negative approach: actions or events incorporated in clear definitions of misconduct																			
Fabrication					x	x	x	x	x	x	x	x			x		x	x	x
Falsification					x	x	x	x	x	x		x		x	x	x	x	x	x
Plagiarism					x	x	x	x	x	x	x	x			x		x	x	x
Possible intention					x		x		x	x			x	x			x		
Deception					x				x				x	x		x			
Mismanagement of primary data and/or materials					x	x			x		x		x						
Violation of the law							x		x		x		x						
Violation of intellectual property						x							x			x			
Misrepresentation									x	x								x	
Fraud										x		x						x	
Fraudulent claims of authorship													x				x		
Misconduct regarding publication					x						x		x						
Facilitating misconduct									x				x						
Breach of confidence as a reviewer or supervisor								x				x							