Volume 26 Number 2
June 2017

Medical Writing

Medical Devices

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- The future of science journalism
- Can medical writers submit articles to journals on behalf of corresponding authors?
- Are non-native speakers of English at a disadvantage in medical writing?
- Abstracts from the EMWA spring conference poster session
- Winners of the Geoff Hall Scholarship essay competition

EMWA EUROPEAN MEDICAL WRITERS ASSOCIATION

EUROPEAN MEDICAL WRITERS ASSOCIATION

Medical Writing is the official journal of the European Medical Writers Association (EMWA). It is a quarterly journal that publishes articles on topics relevant to professional medical writers. Members of EMWA receive *Medical Writing* as part of their membership. For more information, contact mew@emwa.org.

Submissions:
For instructions to authors, go to the journal section of EMWA's website (www.emwa.org). All manuscripts should be submitted to mew@emwa.org.

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Medical Writing

Medical Devices

An exciting industry at a crossroads

Welcome to this special edition of *Medical Writing* focusing on medical devices. When I volunteered to act as the guest editor for this issue, I did so knowing that we are at a crossroads in Europe. The Medical Device Directive is about to be replaced by more stringent Medical Device Regulation. This legislation will have all kinds of repercussions within the industry, so it is timely indeed that we focus on this topic in this issue.

I have spent over a decade in the world of medical devices and continue to find it fascinating. Although regarded by some as being quite niche, the medical devices industry should not be ignored. According to the European Commission, over half a million people are employed in the medical devices industry in Europe, with total sales of over €100 billion.[1]

And precisely this is what I find so fascinating. Although the medical device industry is large, it is relatively unknown – quite surprising, given that we all use them. There are more than 500,000 types of medical and in vitro test devices on the EU market.[2] These include simple everyday items like plasters and contact lenses. Of course, items like x-ray machines and hip replacements are probably more the kind of product that springs to mind when the average person thinks of medical devices. There are many others even more obscure. For example, did you know that medical leeches are classified as medical devices?[3] If you would like to know more, **Karin Eichele** in the Webscout section outlines some useful online resources related to medical devices.

In this issue of *Medical Writing*, you are well served with an array of information from medical writers who also work in the medical devices "bubble". Throughout the issue, and on a range of topics, they provide you with valuable information and insights.

The research (and marketing) budgets of pharmaceutical conglomerates dwarf those of medical device companies. As a result, Big Pharma commands attention well beyond the boundaries of the scientific world. Meanwhile, those of us in the medical device industry sometimes feel as though we have to fight to be heard. **Beatrix Doerr, Sophia Whitman,** and **Steven Walker** very succinctly sum up the differences between writing for the medical device industry and writing for pharmaceuticals. If you are mulling over a possible move into medical devices, this is an excellent introduction. **Gillian Pritchard** then drills down a little deeper to examine how medical device writers deal with Clinical Evaluation Reports.

GUEST EDITOR

Diarmuid De Faoite
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The changing European legislation is the number one story for the medical device industry. Not surprisingly, we have several contributions on the subject. **Robert Behan, Mark Watson,** and **Abhay Pandit** outline what this means EU-wide, and how Ireland is preparing for the new playing field. **Claudia Frumento**, who was the guest editor the last time that this journal – then called *The Write Stuff* – focused on medical devices, explains why the evermore demanding medical device legislation is a positive step. In a second article, Claudia outlines the background to the Poly Implant Prothèse scandal. The actions of this French medical device company, which produced breast implants from low quality materials, was a contributing factor for regulators to review the Medical Device Directive. **Raquel Billiones** in the Regulatory Matters section also highlights how the coming EU requirements present opportunities for medical writers. In the same section, **Greg Morley** examines how leaving the European Union affects the United Kingdom's hosting of one EU regulatory body.

> According to the European Commission, over half a million people are employed in the medical devices industry in Europe, with total sales of over €100 billion.

While the subject of governance in the pharma industry is well-known, the medical device industry also has its own set of issues around governance. This topic is addressed in two articles: **Fiona Dunlevy** examines transparency in the medical device world, and **Raquel Billiones** tackles disclosure and the repercussions for medical writers.

Also in this issue

Nico Pitrelli talks about the future of science journalism, and Editor-in-Chief **Phil Leventhal** discusses whether medical writers can submit articles to journals on behalf of corresponding authors.

This issue also includes two special sections. The first are the winning essays from the annual Geoff Hall Scholarship essay competition, which this year, was on 'Good Medical Writing Saves Lives'. This year's winners are **Sophia Whitman** and **Cirsten Verleger**. We wish them both luck in their new careers in medical writing.

The second special section includes abstracts from the second annual spring conference poster session. The poster session is an excellent way for EMWA members to see the latest thinking and research in a 'snapshot', and has been introduced as an annual addition to the educational offering from EMWA.

Although I have never worked in the pre-clinical world, I was intrigued by **Jayna Patel's** article, which examines the role of standardisation on animal testing of medical devices.

I was a little worried that this issue might be too heavy on EU law, so I was glad to welcome two lighter contributions. **Raquel Billiones** looks at the humorous side of medical device trade names. I also asked **Michael Todd** to pen something on his working life. His short piece reminds me of a medical writing version of Nicholson Baker's *The Mezzanine*. Now that is a sentence I never thought I would write!

If this issue has whetted your appetite, please don't miss the forthcoming webinars by two of the contributors to this issue – and comrades of mine on the EMWA Executive Committee! *Writing Clinical Study Reports for Medical Devices* by Beatrix Doerr is slated for July, while the *Introduction to Clinical Evaluation Reports for Medical Devices* by Raquel Billiones will be confirmed for later this year.

I hope that you enjoy this issue of *Medical Writing* as much as we have putting it together for you. My sincere thanks to all of the contributors, as well as to Phil and his editorial team for helping to make it happen.

References

1 European Commission. Medical Devices. 2017 [cited 2017 April 14]. Available from: http://ec.europa.eu/growth/sectors/medical-devices/.

2 European Commission. Commission welcomes new agreement for safer use of medical devices. 2016 [cited 2017 April 17]. Available from: http://ec.europa.eu/growth/tools-databases/newsroom/cf/itemdetail.cfm?item_id=8863&lang=en.

3 Medicines & Healthcare Products Regulatory Agency. Borderlines between medical devices and medicinal products. June 2013.

President's Message

From EMWA's New President

Dear EMWA Members,

What an exciting and proud moment this is for me to serve as President of an association that I have seen grow in professionalism over the years since first becoming an EMWA member in 1996! We have come a long way since those days and I can appreciate this even more since joining the Executive Committee (EC).

I want to thank Alison and the EC for sharing their experience and ideas with me while serving as Vice President. It has been both an energising and enlightening experience.

The spring conference in Birmingham was a success, with 49 workshops, 3 half-day ESS sessions covering topics related to medical communications, pharmacovigilance, and regulatory topics combined with an excellent Symposium on "Transparency and Disclosure of Clinical Regulatory Documentation." We had a number of outstanding speakers and panelists including a representative from the European Medicines Agency. There was something for everyone and plenty of networking opportunities including the Freelance business Forum and the Internship Forum as well as a full social programme including the Spring Dinner and Dance. A great time was had by all.

As EMWA's President, I intend to both hold the course and build on our strengths as the foremost educational organisation in Europe for medical communicators.

I believe that EMWA has an important role in promoting public awareness about our profession. We will intensify our efforts to broaden contacts with universities and research institutions to get the word out to undergraduate and graduate students about our organisation and careers in medical writing.

In recent years, increasing numbers of people have been attending local informal meetings to listen and learn about medical communication and to network. EMWA members who attend such meetings can act as ambassadors to talk about the profession and the benefits of membership. I think EMWA should continue to support such groups by publicising their meetings via our social media networks and website as well as by reporting on these events in the MEWs.

We plan to further develop our contacts with other

professional organiaations involved in different fields of scientific, regulatory, and medical communication. As an example, we collaborated with the Board of Editors in the Life Sciences (BELS) to hold their editing certification exam on the afternoon before the annual meeting in Birmingham.

We will also systematically evaluate information from previous conferences in order to get an idea of what has been successful in the past and what we can do better in the future.

It goes without saying that we will continue to offer high quality foundation and advanced level workshops and at the same time look at the structure of our training program and consider new alternatives.

For our experienced members, we will carry on with the Expert Seminar Series and Symposia to stimulate discussion and debate on exciting and timely topics as we learn and adapt to new regulatory requirements and the needs of our clients in a rapidly changing industry.

Planning for our future conferences in Cascais in the Autumn and Barcelona next Spring has already started. Both of these are beautiful places where we can combine our usual stimulating learning and networking environment with interesting sight-seeing. In Barcelona we are planning a thought-provoking symposium on Medical Devices. We look forward to seeing you all at these conferences.

Finally, I want to welcome our new EC members to the team, Tiziana von Bruchausen (Vice President) and Mario João Almeida (Publics Relations Officer). I look forward to working with them and all of the EC this year on the exciting road ahead.

Abe Shevack
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From EMWA's Outgoing President

Dear EMWA Members,

This will be my last "Presidents Message" as I stepped down as President at the Birmingham Conference last month and handed over to Abe Shevack, our new President. It has been a very busy and interesting 2 years on the Executive Committee – sometimes difficult but also sometimes fun. I have had the opportunity to work with some very dedicated and friendly people and to support and develop the services we provide to all medical communication professionals.

During my period of office we have invested in a number of new systems which will ensure the initiatives developed over the last few years such as Annual Symposium and Expert Seminar Series, the Special Interest Groups and the Internship Forum run smoothly and continue to flourish. We now routinely use a web based document repository for all EC documents and have implemented a new e-mail system for EMWA using Office 365. We have replaced the conference brochure, previously provided in PDF format, with a new dedicated conference "mini-site" which brings all of the conference information together in one place and provides the relevant information in a more easily accessible format and we have invested in a new website platform which will significantly improve website response time and will allow us to develop the website further and to provide additional services including an updated directory of freelance writers and a searchable archive of EMWA webinars.

We have maintained our profile as an important organisation within the industry and worked with both The American Medical Writers Association (AMWA) and The International Society for Medical Publication Professionals to prepare a position statement on the role of professional medical writers which was published at the beginning of this year. CORE reference, the user manual to help create clinical study report content developed jointly by EMWA and AMWA volunteers, continues to be widely used within the industry having received over 5,000 downloads since its launch in 2016.

Our social media team have been busy increasing awareness of EMWA via Twitter, Facebook and LinkedIn and we also developed and maintained reciprocal agreements with a number of organisations including ISMPP, DIA, eRegulatory Summit, and the Mediterranean Editors & Translators Meeting.

One of the mainstays of our organisation is the provision of quality training and this continues with the growth of our workshop and webinar programme. There were 49 workshops available at the Spring Conference in Birmingham covering a wide variety of topics and for those unable to join the conferences we have our training via webinars. This has now been taken over by the EPDC and will be developed further in the next year.

Overall we continue to remain a growing and vibrant organisation. This is, in no small part, due to the commitment and enthusiasm of all our volunteers and the dedicated head office staff – THANK YOU EVERYONE and a special thank you to all my colleagues on the Executive Committee for the time and energy they have given over the last year. My best wishes go to the new Executive Committee and our new President who I am confident will do a fantastic job in running our organisation. I hope to see many of you at future conferences for a number of years to come.

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Welcome to our new managing editor

Medical Writing is pleased to welcome Victoria White and her team at Review Without Peer, who will be providing managing editor services for EMWA's quarterly journal.

Vicki is particularly well-suited for this role, having served for 4 years as Editor-in-Chief of the *American Medical Writers Association (AMWA) Journal.* A former newspaper reporter, Vicki has worked in medical communications for the past 2 decades, first at the University of Florida, then at Emory University, before establishing her Florida-based company whose mission is to provide editorial office services for journals as well as writing and editing services for other clients.

For *Medical Writing*, the Review Without Peer team will handle many of the day-to-day administrative tasks and quality control functions of the publication, enabling the journal's Editor-in-Chief and Editorial Board to focus on long-range planning and attracting and polishing high-quality submissions.

EMWA News

Editorial

SECTION EDITOR

Evguenia Alechine
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What can I say? I am excited to be writing my first editorial as section editor of EMWA News. With Bea as my predecessor, I know I have some big shoes to fill and hope to be up to the task.

In this issue, we share the latest news from our association. The 44th conference in Birmingham has just finished, and Slavka prepared an overview of all the new features that were offered. As the renewed Freelance Business Group was presented in Birmingham, we asked Satyen to briefly introduce the changes and improvements to both Freelance Business Group and Forum. Diarmuid organized a conference map that allows EMWA members to keep track of past and upcoming conference sites. Moreover, last March, Abe and Carola attended the 3rd MedComms Meeting in Berlin. Here, they share their experiences. Finally, one year after the CORE Reference was launched, Sam surveyed its practical utility and shares the results in this section. In other news, some EC positions were renewed this year, and we welcome Tiziana von Bruchhausen as the new Vice-President, Maria João Almeida as PR Officer, and Beatrix Doerr as Honorary Secretary; James Visanji, was re-elected as Treasurer. To those leaving their positions, thank you for your outstanding work during the past year.

From the PR office, we are keeping our collaborations with international organisations as AMWA and ISMPP, as well as constantly building new bonds. Also, this year was the first time since 1966 that the BELS exam took place at the location of the EMWA Conference, and a number of members were able to take the Editor in Life Sciences (ELS) certification exam. We are looking forward to the positive results soon. Last but not least, we kindly remind you to save the date for our November conference in Cascais, Portugal, a wonderful location to balance work and pleasure. Looking forward to meeting you there!

44th EMWA Conference in Birmingham

In keeping with EMWA tradition, the 44th Spring Birmingham conference was a huge success. With 373 delegates, this meeting offered a rich educational programme including 31 foundation and 18 advanced workshops. I found it fascinating that delegates came from 28 different countries, many of them outside Europe, such as Argentina, India, Israel, Japan, Russia, Singapore, Taiwan, and Ukraine, among others. The 5th Symposium Day on "Transparency and Disclosure of Clinical Regulatory Documentation" with speakers representing regulatory bodies, the pharmaceutical industry as well as regulatory writers was attended by about a third of conference delegates. Experienced EMWA members enjoyed the 3rd Expert Seminar Series, which covered topics such as pharmacovigilance reporting, the role of medical writers in peer-reviewed publications and responses to regulatory authorities, how to organise a medical conference, and current industry position on clinical trial protocol templates. We were also excited to offer a rich list of non-EPDP activities, including new seminars on Mindfulness and Biosimilars.

The 2nd annual Internship Forum offered not only appointments with the companies but also career coaching for PhDs and post-docs who want to transition to medical writing. As usual, the Annual Meeting and Freelance Business Forum were part of the programme. This year the renewed Freelance Business Group was also introduced (see next article in this section).

Besides the educational programme, the rich social activities included a Balti masterclass, Birmingham walking, canal walk, and literary heritage tours.

Over 140 delegates enjoyed the annual Spring Dinner and Dance that offered a great opportunity to meet new and old friends.

Noteworthy, this year, a new conference minisite replaced the traditional conference PDF brochure, which allowed EMWA members to find information of interest in a fast and comprehensive manner. It also allowed conference organisers to swiftly update the conference information so that delegates were up-to-date with the latest conference news and developments. The new minisite has also influenced the content of the well-known conference mini-guide; practical information about conference events in the mini-guide helped delegates finding their way around, while detailed information about educational events content as well as the newest updates were available on the conference minisite. The EMWA PR team was present during the whole conference, updating all EMWA members on the latest conference proceedings via social media.

Now that the Spring conference is over, we are already organising our 45th conference, which will be in Cascais, Portugal, next Autumn.

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Freelance Business Group subcommittee introduced at the 44th EMWA Conference in Birmingham

A fantastic turnout for the Freelance Business Forum (FBF) at the 44th EMWA Conference in Birmingham continues to follow the pattern set at the preceding two conferences and reflects the increasing number of freelancers joining the EMWA community.

The Freelance Business Group (FBG) at EMWA has historically been managed by one or two (and sometimes even three) volunteer Freelance Advocates whose key responsibilities were overseeing the freelancer section (Out On Our Own) of *Medical Writing*, organising the FBF, and conducting periodic surveys. In the past year or so, a number of initiatives have been introduced by the FBG that expand the benefits available to our freelance members. To continue along these lines and provide added value to our freelance members requires more volunteers and ideas.

To address this requirement and harmonise the operation of the FBG with other EMWA subcommittees covering specific areas, in December 2016, EMWA's Executive Committee recommended the formation of a FBG subcommittee. Comprising of four to five volunteers and headed by a chairperson elected amongst them, the FBG subcommittee was slated to be introduced at the conference in Birmingham.

While I have continued to volunteer for the FBG, I am now joined by Allison Kirsop (UK), Petra Pachovska (Czech Republic), Paul Wafula (Germany), and George Xinarianos (UK) as fellow subcommittee members. It is our goal to continue running the FBG productively as in the past and to build on these to keep adding value for our members. Last but most important, your ideas, no matter how big or small, are an essential component to the success of the FBG. Should you wish to share these with us, please get in touch.

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EMWA Conference Map

Although EMWA provides many benefits to its members, it is safe to say that the bi-annual conferences remain a constant highlight. The very first conference was in Brussels in 1992 and the recent Birmingham conference was the 44th EMWA gathering!

With the natural passage of time, frequent delegates might find it difficult to remember exactly when and where certain conferences happened. To this end – and also as a contribution towards documenting EMWA history – I have created an interactive Google Map of all EMWA conferences, from 1992 to 2018!

You can access this map by going to www.emwa.org -> Conferences -> Past Conferences. Find the page directly by using this shortened URL: http://tinyurl.com/kcuec9e.

I hope that your electronic trip down memory lane awakens some nice recollections of previous EMWA conferences. If you have any corrections to the map, please just reach out to me. The same applies to any EMWA website-related issues you wish to raise.

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Call for volunteers

As you all know, EMWA is run by our members and relies on them to develop and support all our initiatives. There are currently a number of vacancies for EMWA members to get involved with various groups. This is a great opportunity to develop your skills and experience at the same time as helping to promote the role of medical writers and strengthen our association. If you are interested in getting involved or want more information please contact info@emwa.org.

CORE Reference One Year On

The year since the May 2016 launch of Clarity and Openness in Reporting: E3-based (CORE) Reference has been a busy one:

- CORE Reference has been downloaded over 7,000 times.
- Pharmaceutical companies, CROs, and freelance medical writers are using CORE Reference as both an official and unofficial resource, and have reported utility at www.core-reference.org/adoption-and-use.
- A mailing list was established to share important regulatory and public disclosure updates as they occur. Join via: http://www.core-reference.org/subscribe.
- CORE Reference was presented at the EMWA, AMWA and DIA conferences and at other national meetings. See "Publicity" at: http://www.core-reference.org/publications/
- Links to regulatory authority public disclosure pages have been added at: http://www.core-reference.org/disclosure-feedback/.
- EMWA and AMWA workshops are planned at forthcoming conferences from autumn 2017. See "Coming Soon…" at: http://www.core-reference.org/publications/.
- We conducted a Utility Survey and presented the data at the EMWA 2017 Spring Conference.

Results of the CORE Reference Utility Survey

At the 5th EMWA Symposium "Transparency and Disclosure of Clinical Regulatory Documentation" in Birmingham, UK on May 4, 2017, Tracy Farrow shared data gathered via the CORE Reference Utility Survey (March 22 to April 21, 2017) on how CORE Reference is used in practice.

Eighty-eight individuals responded to the survey. The vast majority (88%) were medical writers. 36% worked on publications, 30% on medical communications, 9% on results posting, 9% on clinical trial disclosure, and 6% on regulatory affairs. CROs were the most common employers (42%), followed by large pharma (18%) and small pharma or biotech companies (19%). Another 17% were freelancers, and 3% were academics. Responders' clients were most often in Europe (66%) and North America (44%), followed by Asia Pacific (19%) and other locations (6%). 37% responded that they used CORE Reference as an unofficial reference tool, 34% had incorporated it into their procedures, policies, or templates, and 28% had used it to author clinical study reports (CSRs). Most (80%) found CORE Reference to be very (48%) or somewhat valuable (31%). Just over half (52%) had signed up for the CORE Reference mailing list.

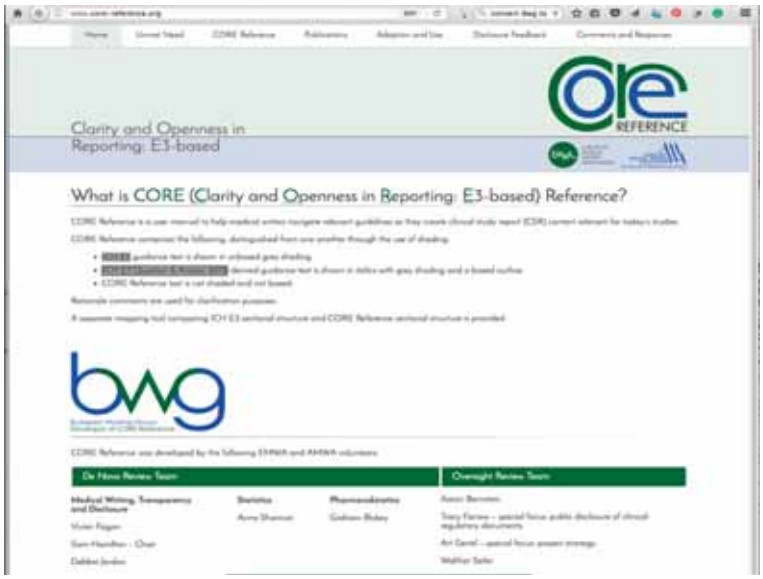
Full results from the CORE Reference Utility Survey are available at:

http://www.core-reference.org/media/1048/corerefutilitysurveyresults-bhamsympo-may17.pdf

Relationship between CORE Reference and public disclosure of CSRs

Sam Hamilton next explained the relationship between CORE Reference and public disclosure of CSRs. Sam emphasized the following:

- CORE Reference is a complete and authoritative open access resource for authoring CSRs for interventional studies fit for today's public disclosure environment.
- "Smart authoring" of the regulatory review version CSR – that incorporates proactive anonymisation of sensitive data – maintains high data utility whilst minimising the need for redactions in the public disclosure version CSR.
- CORE Reference highlights hotspots in the CSR where sensitive information may need to be safeguarded in line with European Medicines Agency Policy 0070, and includes links to relevant guidance, making it an all-inclusive resource.



Before presentation of the survey results, Sam asked audience members about the usefulness of CORE Reference in preparing CSRs fit for public disclosure, based on their understanding of the resource. Similar numbers responded "extremely useful", "somewhat useful", or "not sure", and none considered it "not at all useful". When Tracy repeated the same poll after she and Sam had presented the Utility Survey results and instructive information on CORE Reference, 58 of 64 audience responders felt that it was extremely or somewhat useful in the context of preparing CSRs fit for public disclosure, and only 6 remained unsure. These results highlighted the importance of continuing to engage with colleagues to raise awareness about the general utility potential of CORE Reference, not least in supporting CSR-related public disclosure requirements.

Tell us about your use of CORE Reference

Please continue to tell us about your use of CORE Reference via www.core-reference.org/adoption-and-use. We know that support is widespread, but we need your public declaration of support on the website.

This article was written with the support of Tania Kotsokechagia, Lexis Communications Ltd.

Sam Hamilton
Chair, CORE Reference
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Medical writers getting (it) together in Paris

Following the 2016 EMWA Spring conference, a few medical writers decided to meet together to meet, network, and share ideas. The first meeting was held in June 2016, where we passed a pleasant summer evening discussing medical writing issues in France. Since then, the group has continued to meet around every 3 months.

As the word got around, the fledgling, informal, and mostly English-speaking crowd became a rather motivated, French- AND English-speaking group with lots of ideas to share. And so today, the group has approximately 60 medical communication professionals, including writers, editors, translators and scientists, with about 20 showing up at each meeting.

Our objective going forward is to continue to meet, network, and support each other to improve the quality of medical writing in France and to help French research teams to publish their work. Our first project is to obtain official recognition for the role of the medical writer in France, which is not the case today. This, we hope, will simplify things for freelancers (insurance, employment codes, etc.) but also for academic and pharmaceutical research groups who depend on government assistance for research support.

So, medical writers are getting it together in France.

Anyone interested should contact Amy Whereat. Meetings are also usually published via www.eventbrite.fr and www.medcommsnetworking.com.

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3rd MedComms Meeting in Berlin

On Friday March 17, 2017 Stgilesmedical issued its third open invitation to an educational networking event in Berlin. In the cosy cinematic DaWanda Snuggery, the local MedComms community came together to network, promote and exchange current advances in the field. Medical Writers and newbies to the profession spent a sociable afternoon, which was framed by a set of diverse presentations.

Abe Shevack, who was EMWA's Vice-President at the time, gave an introduction about EMWA as an organisation and an enthusiastic overview of the events and activities scheduled for the upcoming annual conference in Birmingham. He described the topics for the Expert Seminar Sessions, the theme of this year's 5th Annual Symposium, and the Internship and Freelance Business Forums.

Steven Walker, Scientific Director at Stgilesmedical, introduced the audience to the role of MedComms professionals as educators. His talk covered the important role of medical writers in organising conventional and digital medical meetings. He pointed out the steps to follow when organizing meetings from developing the content and communication strategy to inviting speakers and giving practical tips about running meetings. From his talk, it became clear that medical writers take a great responsibility in organising, promoting and providing a communication service to distinct audiences in the medical industry.

The involvement of many professions in medical communication became clear through Alice Bergfeld's talk on the impact of medical translations in effectively communicating medical content. As a freelance medical translator, she introduced the audience to the educational prerequisites, intercultural knowledge, and other soft skills needed to pursue a successful career in medical translation.

How careers are connected to evolving regulatory guidelines was pointed out by Claudia Frumento. As a specialist in medical devices, she has been seeing an increased demand for medical device specialists, which has been going hand in hand with this year's release of the Medical Device Regulation due to replace the old Medical Device Directive.

In short, this event – with its informal character – once again provided participants with a wonderful opportunity to network and discuss current and upcoming MedComms topics.

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Writing for medical devices compared to pharmaceuticals: An introduction

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Abstract

The inherent differences between medical devices and drugs have implications for clinical research and medical writing. In view of the current move to more stringent regulatory requirements for the medical device industry, an increasing demand for suitably experienced medical writers is anticipated. The present article introduces writing for medical devices, highlights differences compared to communicating drug information, and explores the relevant regulatory guidelines. Our focus is on the European environment.

What is a medical device?

The term "medical device" refers to any instrument, apparatus, software, implant, reagent, material, or other article intended to be used for medical purposes and which does not achieve its principal action by pharmacological means.[1] This could mean anything from a simple syringe to a new hip implant. Confusingly, some devices do exert a pharmacological effect, e.g. a drug eluting vascular stent. But what is important in terms of classification is that this is not their principal mode of action. Another important subclassification is an "active device", this refers to a medical device which depends on a source of energy or power for its action, e.g. the battery in a cardiac pacemaker (Table 1).

What are the main differences compared to medicinal products?

There are a number of important differences between medical devices and medicinal products of which the most visually obvious is that the former may also be used outside of the body (e.g. *in-vitro* diagnostics, blood bags, or MR scanners).

Most importantly, as medical devices do not achieve their principal action by pharmacological means, they have fewer opportunities to interact with the human body as compared to the myriad possible systemic effects associated with a medicinal product. Nevertheless, medical devices still have the potential to cause harm, e.g., by introducing infection, promoting thrombosis, stimulating allergy, or causing conduction disturbances. Such complications are generally caused by biophysical mechanisms and can usually be anticipated. This means that a smaller cohort of subjects are needed to confirm safety and performance of a medical device, which in turn results in a faster product approval process compared to a medicinal product. For the latter, it is recognised that unexpected side effects can still occur despite extensive routine testing in large numbers of patients. Such adverse events have resulted in a number of high profile disasters and drug withdrawals, but also some unexpected benefits; e.g. Viagra™ was originally developed as an antianginal treatment.[2] Similarly, minoxidil, now a blockbuster for hair loss, was previously marketed as an antihypertensive agent.[3] Certainly, a knowledge of pharmacokinetics, pharmacodynamics, and pharmacogenomics is very relevant in the development process of medicinal products, something which is not the case for most medical devices.

A further difference between drugs and devices resulting from their different modes of action is that the latter is relatively simple to alter and changes rarely have detrimental effects. It is not unusual, for example, to see several product

Table 1. Definitions

Term	Definition	Further explanation / Examples
Active medical device[1]	A medical device that depends on a source of power, usually electrical.	e.g. cardiac pacemaker
Clinical data[5]	Safety and/or performance information generated from clinical use of a device.	Clinical data are related to the device in question or a similar device for which equivalence has been demonstrated. Clinical data can be sourced from (a) clinical investigations, (b) scientific literature, or (c) published and/or unpublished reports on other clinical experience.
Clinical evaluation[5]	A methodologically sound ongoing procedure to collect, appraise, and analyse clinical data pertaining to a medical device and to evaluate whether there is sufficient clinical evidence to confirm compliance with relevant essential requirements for safety and performance when using the device according to the manufacturer's Instructions for Use.	Submission of clinical evaluation report (CER) is required as part of the approval process allowing market access (CE-mark) for a medical device.
Clinical investigation[17]	Any systematic investigation or study in or on one or more human subjects undertaken to assess the safety, or performance of a medical device.	Synonym: Clinical study
Device deficiency[7]	Inadequacy of a medical device with respect to its identity, quality, durability, reliability, safety, or performance. This includes malfunctions, use errors, and inadequate labelling.	e.g. balloon rupture, unsterile packaging, kinking of the device
Device registry[17]	An organised system that uses observational study methods to collect defined clinical data under normal conditions of use.	Similar to Phase IV studies in drug research.
Equivalent device[5]	A device for which equivalence to the device in question can be demonstrated.	The equivalent device shall have similar technical, biological, and clinical characteristics, e.g. same intended purpose, similar design, made of same materials
Feasibility study[5]	Clinical investigation that is commonly used to capture preliminary information on a medical device (at an early stage of product design) to adequately plan further steps of device development, including needs for design modifications or parameters for a pivotal study.	Not all novel medical devices require feasibility studies.
Investigator's brochure[7]	Compilation of the current clinical and non-clinical information on an investigational medical device(s), relevant to the clinical investigation.	Also called "Clinical Investigator Brochure"; is required for studies involving a non-approved, investigational medical device.
Medical device[1]	Any instrument, apparatus, software, implant, reagent, material, or other article intended to be used for medical purposes and which does not achieve its principal intended action by pharmacological means.	e.g. plasters, blood bags, catheters, sutures, surgical instruments, bone cements, hip implants, stents, heart valves, CT scanner, hospital laboratory equipment etc.
Pivotal study[13]	A clinical investigation adequately designed and powered to collect definitive evidence of benefits to the patients, clinical risks, clinical performance, and/or clinical aspects of a device for a specified intended use.	Pivotal studies are commonly used to gain CE-certification

iterations being tested throughout the course of a study to "fine-tune" the design. By comparison, in the pharmaceutical industry, making a small change to a molecule can have major consequences. Again, a positive example: acetylation of salicylic acid to make acetylsalicylic acid (ASA) was found to significantly reduce the associated side effects resulting in the success story we now know as aspirin.[4]

How are devices classified?

As mentioned, medical devices can be anything from a pair of surgical scissors to an implantable heart valve. Because the associated dangers are very different, four risk profiles have been established: Class I, IIa, IIb, and III (Table 2). The approval pathway of a device depends on the risk class and becomes increasingly more demanding with ascending risk. For Class I devices (low risk), scientific data are commonly not needed while (with a few exceptions) information from clinical research studies are essential for high risk Class III devices.

To simplify getting your product onto the market, it had until recently been relatively easy to use data from "equivalent devices" which look and function in a similar manner, instead of seeking new data from the investigational device itself. Expressing this in simple terms, you could claim that because your new urinary catheter was made of similar material to that of another urinary catheter on the market, approval was justified. This approval route has now been made more difficult by the recently released MEDDEV 2.7/1 Rev4 guideline (see below).[5] It now requires more technical details to be provided in an application in order to demonstrate equivalence. Such information is commonly not published and is unlikely to be made freely available by a competitor company. Therefore, in the future, more clinical trials will be required for market approval.

> The usual procedure is to first "bench-test" the device, e.g. study a certain physical property of a device such as the elastic recoil of a stent. Thereafter, research in animals may be required.

Once market approval is obtained, the product is allowed to display the *CE* (*Conformité Européene,* literally "European conformity") mark – the same sign you may see on the side of a hair dryer – allowing you to distribute your product throughout Europe subject to periodic review.

How is a medical device developed?

Medical devices are specifically developed to meet a clinical need; the first step is to come up with a possible solution for this need and the second step involves building prototypes. This is commonly undertaken by engineers, often in close cooperation with physicians. For instance, the first heart valve was developed by a retired engineer with a background in hydraulics and fuel pump technology in cooperation with a surgeon.[6]

The usual procedure is to first "bench–test" the device, e.g. study a certain physical property of a device such as the elastic recoil of a stent. Thereafter, research in animals may be required. While such studies work well for certain parameters, e.g. toxicity testing or assessing degenerative behaviour, they are often insufficient to predict ultimate behaviour in humans. For example, positioning of the device, frequency of rapid pacing, acceptance of paravalvular leakage, and degree of oversizing were just a few of the many issues that had to be addressed during the first transcatheter heart valve studies. Consequently, devices requiring complex implantation techniques are often subject to feasibility studies to see if the whole procedure works as intended before embarking on pivotal studies.

How do study types and clinical investigation plans differ for medical devices?

Medical device studies are not classified into Phase I to IV studies as in the pharmaceutical industry. Instead, a variety of terms with similar meanings exist. Table 1 offers some guidance on definitions and Table 3 compares the phases of drug and device development. For the latter, study numbers are usually smaller and healthy volunteers cannot be included for ethical reasons. Also, blinding or placebo treatment may be more challenging with certain devices.

The minimum content requirements for a clinical investigation plan are listed in the International Quality Standard document ISO14155: Clinical Investigation of Medical Devices for Human Subjects – Good Clinical Practice (ISO14155).[7] In contrast to drug research, the Medical Dictionary for Regulatory Activities (MedDRA) coding is rarely used. Instead, disease-specific endpoint definitions (e.g. the Academic Research Consortium Guidelines)[8] may be more relevant. Indeed, a number of disease-specific guidelines exist which provide recommendations on approval pathways for medical devices (e.g. the recommendations of the European Society of Cardiology – European Association of Percutaneous Cardiovascular Interventions Task Force on the Evaluation of Coronary Stents).[9,10] Adverse event definitions *per se* are basically the same as for drug studies, but in medical device research the term "device deficiency" is also relevant as it refers to product issues that did not necessarily lead to an adverse event (Table 1).

The reader may find it useful to see how a clinical investigation plan might look by visiting EMWA's webinar archive[11] or by searching journals which require the inclusion of a clinical investigation plan as supplemental material, e.g. the New England Journal of Medicine.[12]

A central issue for the safe and effective use of many medical devices is physician's experience. This in turn requires training and practice, particularly in relation to implantable devices. Such experience can in part be gained using simulators and animal models. In order to support adoption of their product, companies need to provide comprehensive and easily understandable training material. This physician-focused material contrasts with the patient-focused information leaflets encountered in pharmaceutical practice. However, nothing is as effective as hands-on experience. This may involve engineers or "clinical specialists" providing training and local support. Alternatively, experienced physicians may visit centres to "proctor"

Table 2. Risk classification of medical devices

Class	Risk	Examples
I	low	Sticking plasters, tongue depressor, thermometer
IIa	low to medium	Endotracheal tubes, dental filling material
IIb	medium to high	X-ray machines, peripheral vascular stents
III	high	Artificial heart valves, coronary stents

colleagues during their first few procedures. This is supported by MEDDEV 2.7/2 Rev 2, which recommends that when handling complex or unfamiliar devices, risks should be mitigated by adequate training and support during the first cases.[13] Such training should be featured in the clinical investigation plan.

What are the aspects of data analysis relevant to medical devices?

Device trials often comprise different analysis groups, particularly where implants are concerned. It is important to define them clearly upfront. For instance, should the term "intention-to-treat", be defined as patients who signed informed consent or as patients in whom an implant was attempted? While the former is the more common definition of intention-to-treat, the latter might be more suitable for implants. For instance, in coronary stent trials, the final eligibility of a patient is usually determined after patient informed consent during angiography and use of the term "implant attempted" avoids contamination of the intention-to-treat group. For randomised trials, the terms "patients per allocated treatment group" and "patients per treatment received" are comparable to the pharmaceutical industry.

Early clinical studies may include "roll-in" patients. These are the first to be treated in a particular centre using a new technique in which complications might be expected as part of the learning curve. Such individuals are commonly not counted as part of the primary analysis group.

Where complex procedures are involved, e.g. implanting a heart valve, outcomes are also related to the skills and experience of the operator. Analysis per centre might be advisable for clinical study oversight, but are commonly not reported.

It is worth emphasising that as for pharmaceutical reports, all post-hoc analyses should be appropriately labelled as such in any resulting manuscript or summary.

Overview of relevant European regulations

The Declaration of Helsinki and all general guidelines relevant to medical writing (e.g. the Consolidated Standards of Reporting Trials (CONSORT) statement, Good Publication Practice for Company Sponsored Medical Research (GPP3)) apply to drugs as well as to devices, along with the requirement for trial registration (see e.g. www.Clinicaltrials.gov).

While specific medical devices regulations were previously less stringent, this is changing following recent hip and breast implant scandals.[14] Central to the current European medical device regulations are the Medical Device Directive (MDD 93/42/EEC)[1] and the Active Implantable Device Directive (AIMDD 90/385/EEC). These will be replaced by the new European Medical Device Regulation (MDR). *(Note: just prior to publication, the MDR was released and is now accessible via http://eur-lex.europa.eu/eli/reg/2017/745/oj).* A draft document specifies requirements for items such as informed patient consent forms, clinical investigation plans, investigator brochures, and clinical study reports. These are similar to the specifications described in the current ISO14155:2011 guidelines[7] (see below). Furthermore, the MDR will require several novel documents and hence offers new opportunities for medical writers. For example, for Class III and implantable devices, companies will be required to publicly provide a lay summary of the main safety and performance aspects of the device along with clinical evaluation outcomes.

The MDD/MDR is supplemented by a number guidance documents, the MEDDEV guidelines. They refer to topics such as serious adverse event reporting, clinical investigations, and post-market clinical follow-up studies (see http://meddev.info/). Most relevant for medical writers is the new MEDDEV 2.7/1 Rev 4[6] guideline on writing clinical evaluation reports (CER) released in June 2016. The main features are an emphasis for an in-depth literature search and appraisal of relevant publications along with drafting of the CER by qualified authors. This new document also more clearly describes the frequency of CER updates required during the product life cycle.

Another important guideline for medical writers referred to above is ISO14155:2011,[8] the contents of which may be summarised as mirroring the International Conference on Harmonisation – Good Clinical Practice (ICH -GCP). This comprehensive document

Table 3. Main differences between medical devices and drugs at a glance

Aspect	Medical devices compared to drugs
Principal mode of action	Not by pharmacological means
	Less interaction with human body
	Some devices work exclusively outside the human body
Development	More technical, involves engineers
	Faster development cycle
	Less patients required in clinical studies
	More frequent product updates
Clinical studies	Commonly no studies in healthy volunteers
	Blinding is often not possible
	No classification in Phase I, II, III, and IV studies, but:
	-Feasibility,[9] Pilot-, First-in-Men-, First-in-Human studies are similar to Phase II studies
	-Pivotal-, Premarket-, CE-mark studies are similar to Phase III studies
	Postmarket studies, registries are similar to Phase IV studies[11]
Miscellaneous	Success of treatment may be related to physician's skills, particularly for invasive devices such as implants
	Often smaller companies, requiring an "all-rounder" mentality

describes how to conduct a clinical investigation, as well as provide details on the required content for patient informed consent forms, case report forms, clinical investigation plans, investigator brochures, and clinical study reports. An update is expected in 2019/2020.

What skills does a medical writer need to flourish in the device world?

It helps to have an "all-rounder" mentality, with a broad knowledge of clinical research, statistics, and medical writing skills. With the exception of global players such as Medtronic with nearly 100,000 employees worldwide[15] medical device manufacturers are generally smaller than pharmaceutical businesses, with a predominance of small to medium-sized enterprises. Smaller medical device companies such as start-up companies typically have less than 20 employees and may not possess individuals with the skills to clean, analyse, and present data in the required format for regulatory approval or scientific publications, so that this task may fall to the medical writer.

Furthermore, because patient numbers are generally smaller than in drug trials, another interesting aspect of working with devices is that the experienced writer may have the opportunity to dig deeper into the data, look beyond the endpoints and seek out potential interactions. Of note, the new MEDDEV 2.7/1 Rev 4 guidance document now specifies that authors of CERs should possess a mix of relevant skills such as knowledge of statistics, clinical research, etc.[5]

But do not be put off by these requirements; writing for medical devices can also be performed by the less experienced, particularly when working on lower risk devices and with the support of suitably qualified colleagues.

Conclusion

This article has provided a brief overview of the diverse world of medical device writing. Most new products are relatively straightforward and might cause the reader to misunderstand that this field is less taxing than developing documents for the pharmaceutical industry. This is far from the case, especially with less common devices requiring complex development and novel implantation techniques. This leaves the question which is a better job: writing for drugs or devices? A survey of medical writers in the pharmaceutical and device industries found no clear differences in terms of quality of life, stress, support, or remuneration.[16] If you like a more technical environment, working in smaller teams or at a faster pace, or being an all-rounder with some opportunity to develop your own ideas, then medical device writing might be for you. There are vacancies currently with many device companies seeking to expand their writing departments. This trend seems likely to continue with the increasingly stringent regulatory requirements described above. Perhaps device writing is the new "sweet spot" in the medical communications world? ■

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But do not be put off by these requirements; writing for medical devices can also be performed by the less experienced, particularly when working on lower risk devices and with the support of suitably qualified colleagues.

Clinical Evaluation Reports from the medical writer's perspective!

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Abstract
Clinical evaluation is a structured ongoing procedure to collect, appraise and analyse clinical data pertaining to a medical device. The clinical data include current knowledge of the condition to be treated, published literature about the target device and any equivalent devices, information held by the manufacturer about pre-clinical and clinical investigations, risk management, post-market surveillance, and the instructions for use. The clinical data are analysed for consistency between them to identify any gaps or uncertainties that require further evaluation, and to show conformity with the Essential Requirements of the Medical Devices Directive (to be superseded by the Medical Devices Regulation). The clinical evaluation report (CER) is the document containing this information to support initial CE-marking or CE renewal. The guideline determining the structure and content of the CER is MEDDEV 2.7/1 Rev. 4 (June 2016). This article provides an overview of how to write a CER according to this guideline.

What is clinical evaluation?
Clinical evaluation is a structured ongoing procedure to collect, appraise, and analyse clinical data pertaining to a medical device. The purpose of the evaluation is to assess whether the available clinical evidence is sufficient to confirm compliance with relevant Essential Requirements for safety and performance when using the device according to the manufacturer's instructions for use (IFU).[1] The stages of clinical evaluation are presented in Figure 1. Clinical evaluation is an ongoing process conducted throughout the life cycle of a medical device: the data collected are updated whenever new post-market surveillance (PMS) information is received that changes the current evaluation, annually when the device carries significant risks or is not yet well established, or every 2 to 5 years if the device does not carry any significant risks or is well established.[1]

Stage 0:	Scope and plan
Stage 1:	Identification of pertinent data
Stage 2:	Appraisal of pertinent data
Stage 3:	Analysis of the clinical data
Stage 4:	Clinical evaluation report, including PMS/PMCF plan

From: MEDDEV 2.7/1 Rev. 4 (June 2016) Section 6.3
PMS = post-market surveillance;
PMCF = Post-market clinical follow-up

Figure 1. Stages of clinical evaluation

The clinical evaluation report (CER) is the document containing this information, and is intended for review by the Notified Body (NB), who assess medical devices for initial or renewal of market approval (the CE-mark). The CER will form part of the Technical File or, for class III devices, Design Dossier submitted to the Notified Body. The guideline determining the structure and content of the CER is MEDDEV 2.7/1 Rev. 4 (June 2016).[1] This article provides an overview of what is included in a CER and how to write one according to this guideline.

The medical writer's role is to collect, assimilate, and objectively present data about the medical device in accordance with the requirements of MEDDEV 2.7/1. This will require input from other experts, e.g. the manufacturer for technical information about the device, librarian or information scientist for literature searches, quality specialist for complaints data, and safety scientist for PMS data.

How is the CER written?

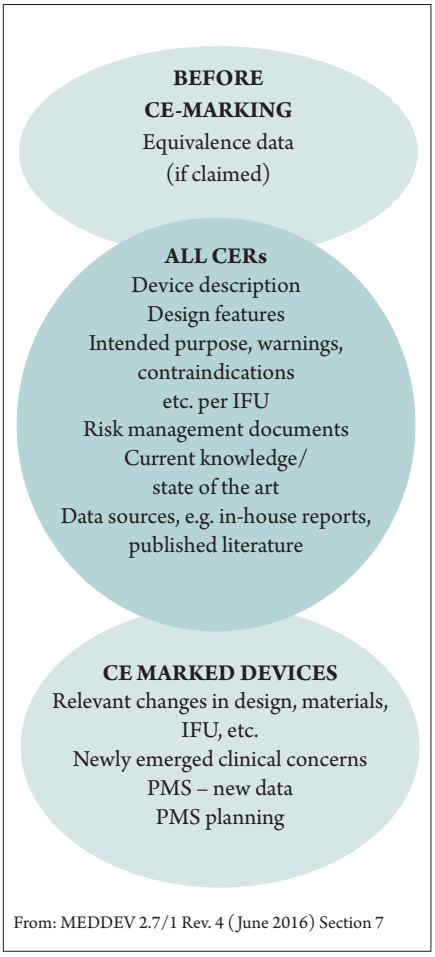
MEDDEV 2.7/1 Rev. 4 gives some indications for a structure for the report, but does not mandate one, and a proposed table of contents for a CER is shown in Figure 2. Some sections will contain more or less data depending upon the time-point in the product life cycle, e.g. in development, and what data are available e.g. published literature, clinical investigation data, post-market surveillance (PMS) information.

Summary

Although it is the first section to be read, the summary is the last to be written. The summary should give a succinct overview of the clinical condition and state of the art; brief details of the subject device and its indication; conclusions of the evaluation pre-clinical studies, pre-market clinical investigations, risk management, PMS, and published literature; risk-benefit profile conclusion. The summary is usually up to two pages in length.

Scope of the clinical evaluation

The scope sets out the objectives of the CER, what is included and which guidelines, standards and reference materials have been used. The objective is to support conformity of the device with the essential requirements for safety and performance as per the European Medical Devices Directive (MDD) 2007/47/EC, to be superseded by the Medical Devices Regulation (MDR). It should be stated whether the CER is in support of initial CE-marking, a CE mark renewal, or is at the request of the Notified Body (NB). The documents required for all CERs and those additional documents specific to CE-marked devices or to new devices, where equivalence with another devices is being claimed, are listed in Figure 3.



From: MEDDEV 2.7/1 Rev. 4 (June 2016) Section 7

Figure 3. Information to be included in the CER

1.	Summary
2.	Scope of the clinical evaluation
3.	Clinical background, current knowledge, state of the art
4.	Device under evaluation
	4.1 Type of evaluation
	4.2 Demonstration of equivalence (only if claimed)
	4.3 Clinical data generated and held by the manufacturer
	4.4 Clinical data from literature
	4.5 Summary and appraisal of clinical data
	4.6 Analysis of the clinical data
	4.6.1 Requirement on safety
	4.6.2 Requirement on acceptable benefit/risk profile
	4.6.3 Requirement on performance
	4.6.4 Requirement on acceptability of side-effects
5.	Conclusions
6.	Date of the next clinical evaluation
7.	Dates and signatures
8.	Qualification of the responsible evaluators
9.	References

From: MEDDEV 2.7/1 Rev. 4 (June 2016) Section A9

Figure 2. CER table of contents

Guidance documents used in addition to MEDDEV 2.7/1 include the following:

- EN ISO 14155:2011 – Clinical Investigation of Medical Devices for Human Subjects – Good Clinical Practice;
- EN ISO 14971:2012 – Medical Devices – Application of Risk Management to Medical Devices;
- MEDDEV 2.12/2 rev2 Post Market Clinical Follow-up – A guide for manufacturers and Notified Bodies (January 2012; to be superseded by MDR Annex XIV);
- NB Med 2.12 Rec1 – Post Marketing Surveillance (February 2000; To be superseded by MDR Annex III).

Depending upon the type of medical device other guidelines might also be relevant, e.g. MEDDEV 2.1/6 Quantification and Classification of Stand Alone Software (January 2012).

Reference materials used in preparing the CER include the IFU, literature review, clinical

investigation reports, risk management reports, PMS reports.

Clinical background, current knowledge, state of the art

Describing the current knowledge, or state of the art, has assumed much greater importance in the CER since the introduction of MEDDEV 2.1/7 rev. 4. A literature search is required in order to determine the state of the art for the subject device. This literature search is separate from the systematic literature search conducted to appraise the subject device. As it is intended to define the state of the art, the search terms should be broad and the timeframe recent, e.g. up to 2 years. NB – keep the state of the art bibliography separate from the literature review bibliography, even if there is some overlap between them.

Practice and consensus guidelines, health technology assessment reports, systematic review databases e.g. Cochrane, and Competent Authority websites and registries can be useful starting points when writing this section. Describe the condition to be treated, provide epidemiology data, explain how the disease is classified and managed, justify the choice of clinical endpoints and identify potential clinical hazards. What is the 'gold standard' treatment? What other treatments are available? This should include medical, surgical and other alternative forms of treatment for the target condition. What are the pros and cons of these treatments in different patient groups? What is the benefit/risk profile of other devices and treatments? How does the subject device compare with the state of the art? Information about competitor products and equivalent devices should also be obtained and any knowledge gaps identified.

Device under evaluation

The MEDDEV 2.4/1 Rev. 9 (June 2010) guideline (to be superseded by MDR Annex VIII) is used to determine device classification and contains the Rules by which devices are classified based on risk as I, IIa, IIb or III.[2]

The device should be described in sufficient detail so that compliance with Essential Requirements can be assessed. Always include photographs and diagrams of the device. The details to be provided are shown in Figure 4. Most of the information will be found in the IFU and, depending upon the nature of the device, additional information may be available in a Surgical Guide. The intended purpose should use the same wording as the IFU; this is because the IFU is part of the Essential Requirements of the MDD.

Usability testing of the device is a new requirement in MEDDEV 2.7/1 rev. 4 introduced because usability factors have either caused or contributed to many incidents. This means demonstrating that the device design and any risks relating to its use have been minimised, that the residual risks are acceptable, and that the information materials e.g. IFU, training guide, are suitable for use by the intended users.

If the device will be marketed based on equivalence to another device this must be demonstrated on the basis of clinical, technical and biological characteristics (see Figure 5). To be equivalent, all three characteristics must be fulfilled. Full details of the equivalent device and reasons why it is considered equivalent to the subject device should be given.

Clinical data generated and held by the manufacturer

This includes data from pre-clinical studies (e.g. bench testing), pre-market clinical investigations, risk management and PMS – see examples in Figure 6. All data should be made available, not just those data generated in Europe, and they should be summarised, appraised, analysed and referenced in the CER. Risk management and PMS reports are usually large documents containing spreadsheets of quality control reports, complaints, sales figures, and also information from external national databases, e.g. MAUDE in the US, MHRA device alerts in the UK. Obtaining these data requires liaising with various groups within the manufacturing company to ensure that reports are available in time for inclusion in the CER and to meet submission timelines, especially for CE-mark renewals with specific timelines.

Clinical data from the literature

The clinical literature review (LR) is a substantial section which can take as long to write as the rest of the CER. The LR can either be part of the CER or a separate document which is summarised in the CER. A separate LR has the advantage of limiting the size of the CER and making it more navigable: an LR can easily run to 100

- Name, models, sizes, components of the device, including software and accessories
- Device group to which the device belongs (e.g. biological artificial aortic valve)
- Whether the device is being developed/undergoing initial CE-marking/is CE-marked
- Whether the device is currently on the market in Europe or in other countries, since when, number of devices placed on the market
- Intended purpose of the device
  - exact medical indications (if applicable)
  - name of disease or condition/clinical form, stage, severity/symptoms or aspects to be treated, managed, or diagnosed
  - patient populations (adults/children/infants, other aspects)
  - intended user (use by health care professional/lay person)
  - organs/parts of the body/tissues or body fluids contacted by the device
  - duration of use or contact with the body
  - repeat applications, including any restrictions as to the number or duration of reapplications
  - contact with mucosal membranes/invasiveness/implantation
  - contraindications
  - precautions required by the manufacturer
  - single use/reusable
  - other aspects
- General description of the medical device including
  - a concise physical and chemical description
  - the technical specifications, mechanical characteristics
  - sterility
  - radioactivity

From: MEDDEV 2.7/1 Rev. 4 (June 2016) Section A3

Figure 4. Device description – information to be included

Clinical

- Used for the same clinical condition (including similar severity and stage of disease), and
- Used for the same medical indication, and
- Used for the same intended purpose, and
- Used at the same site in the body, and
- Used in a similar population (e.g. age, gender, anatomy, physiology etc.), and
- Not foreseen to deliver significantly different performances (in the relevant critical performances such as the expected clinical effect, the specific intended purpose, the duration of use, etc.).

Technical

- Be of similar design, and
- Used under the same conditions of use, and
- Have similar specifications and properties (e.g. physicochemical properties such as type and intensity of energy, tensile strength, viscosity, surface characteristics, wavelength, surface texture, porosity, particle size, nanotechnology, specific mass, atomic inclusions such as nitrocarburising, oxidability), and
- Use similar deployment methods (if relevant), and
- Have similar principles of operation and critical performance requirements.

Biological

- Use the same materials or substances in contact with the same human tissues or body fluids.

From: MEDDEV 2.7/1 Rev. 4 (June 2016) Section A1

Figure 5. Demonstration of equivalence – characteristics

pages. The main disadvantage of a separate LR is the need to ensure consistency between the LR and CER.

Unlike pharmaceutical development, few clinical investigations are conducted during medical device development and so the published literature is an important source of clinical data for equivalent devices during CE-marking/ renewal and for the subject device itself during CE-renewal.

MEDDEV 2.7/1 rev. 4 places increased emphasis on a quality assessment of the available evidence from the literature and on the scientific validity of the LR itself.

- Post-market clinical follow-up (PMCF) studies, device registries sponsored by the manufacturer
- PMS reports, including vigilance reports and trend reports
- The literature search and evaluation reports for PMS
- Incident reports sent to the manufacturer
- Complaints regarding performance and safety sent to the manufacturer
- Analysis of explanted devices (as far as available)
- Details of all field safety corrective actions
- Use as a custom made device
- Use under compassionate use/ humanitarian exemption programmes
- Other user reports

From: MEDDEV 2.7/1 Rev. 4 (June 2016) Section 8.1

Figure 6. Risk management and PMS – examples of data

Literature review protocol

An LR protocol should be developed which is consistent with the scope of the clinical evaluation and which uses objective, non-biased, systematic search and review methods, e.g. patient characteristics, type of intervention, control, and outcome queries (PICO process). Inputs for the review questions are found in the IFU and include the device description, its intended performance, any claims on clinical performance and safety, and information from the risk management process. The review questions should also address any gaps in the clinical evidence, e.g. comprehensiveness of the data, number and severity of adverse events. Example review questions might include: What interventions characterise the state of the art? What comparators can be identified? What clinical data are there to assess safety and performance and is the evidence sufficient for the clinical evaluation?

Choosing the right search terms, developing the search strategy and knowing how to search databases are essential for a successful literature search. The review questions above and previously conducted searches will inform the terms.

It is important to search more than one database. MEDLINE or PubMed have the advantage of being free to access and fairly easy to search but the search features are not sophisticated and there is incomplete coverage of some European journals. Therefore additional databases such as EMBASE/Excerpta Medica (https://www.elsevier.com/solutions/embase-biomedical-research/) and Cochrane Database of Systematic Reviews (http://www.cochranelibrary.com/cochrane-database-of-systematic-reviews/) should also be used. CDSR is free to access but EMBASE is not. The search strategy should define which databases will be searched and the time period to be covered. A ten year time period is reasonable for initial CE-marking whereas for CE-renewals the literature search is from the date of the previous search.

Having defined the search terms, the databases to be searched and the time period, the next step is to apply "limits", e.g. language, type of article, to the search results in order to retrieve a manageable number of relevant articles; thus the search strategy is developed. Literature searching is an iterative process and the strategy is adjusted until the researcher is satisfied that as many relevant papers as possible have been retrieved. It is strongly recommended that the search strategy is tested by ensuring that known key papers are consistently identified by iterations of the search; if not, the search strategy must be modified until they are found. The final search strategy, date the search was conducted and the search results showing the number of articles identified at each step should be documented in the LR protocol so that the search can be reproduced if necessary.

The literature search, screening and appraisal process is illustrated in Figure 7.

Appraising the literature

It is recommended that reference management software, e.g. EndNote™ (www.endnote.com) is used to manage the literature search results. Abstracts are initially screened for eligibility in order to exclude those that are obviously not

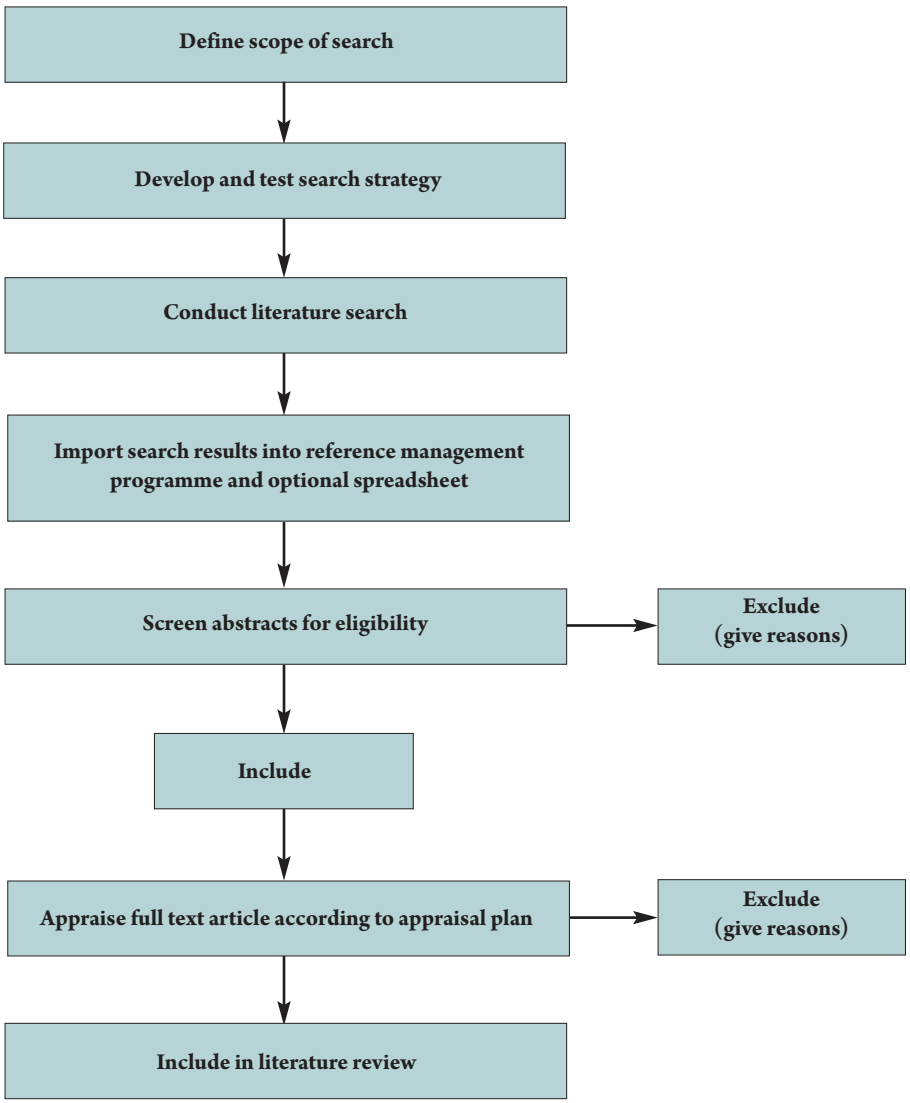


Figure 7. Literature searching, screening, and appraisal process

relevant. The full text articles are obtained for the remaining abstracts and assessed for relevance, i.e. do they directly demonstrate adequate clinical performance and clinical safety of the device (pivotal data), or do they serve an indirect supportive role. Questions that help determine whether data are relevant are listed in Section 9.3.2.c of MEDDEV 2.7.1 rev. 4 and are summarised as follows:

- To what extent are the data generated representative of the device under evaluation?
- What aspects are covered?
- Are the data relevant to the intended purpose of the device or to claims about the device?
- If the data are relevant to specific aspects of the intended purpose or claims, are they relevant to specific device models, user groups, medical indications, age group, and gender, severity of condition or time period?

Having established that an article is relevant its contribution to the clinical evaluation is weighted. There is no single, well established method for weighting clinical data and a method appropriate for the target device should be chosen, e.g. the OCEBM levels of evidence.[3] The OCEBM considers a systematic review of randomised trials to be the highest level of evidence. In practice, clinical evidence from systematic reviews may only be available for those conditions with an abundance of published literature e.g. heart valve replacement surgery, and most of the evidence will be from randomised controlled trials (Level 2) and non-randomised controlled cohort studies (Level 3).

Reasons for excluding papers might include lack of information about the study e.g. unable to extract safety or performance data, too few patients e.g. case reports, improper statistical methods, lack of adequate controls. The disposition of screened and appraised articles should be recorded; a spreadsheet or other programme, e.g. DistillerCER (www.evidencepartners.com), is a convenient way of doing this. The number of included papers and excluded papers, with the reasons for exclusion, can then be tallied and must be the same as the number of articles identified by the literature search.

The list of excluded papers with reasons for exclusion is attached as an appendix to the CER. The included papers are presented in a bibliography which should be separate from the state of the art bibliography. Note that the full text articles (as pdf) are part of the clinical evaluation and must be provided with the CER.

Analysing the literature

The goal of the analysis stage is to determine if the appraised datasets available for a medical device collectively demonstrate compliance with each of the Essential Requirements pertaining to the clinical performance and clinical safety of the device, when the device is used according to its intended purpose.[1]

Data from the appraised literature are extracted into tables, summarised and analysed. Data extraction tables are a convenient way of presenting papers; they give an overview of the literature and facilitate comparisons between papers but lack narrative detail. Due to their size data extraction tables are usually presented as an appendix to the CER and may be split into smaller tables in order to fit A4 page width. Tables can be presented as follows:

- Study details, e.g. evidence weighting, study design, treatments/interventions, devices used, follow-up period;
- Patient population, e.g. number of patients, demography, baseline disease characteristics;
- Performance, e.g. endpoints as determined by the disease under study;
- Safety, e.g. post-operative complications/adverse events, deaths.

Papers can be presented in groups, e.g. by study design, or simply listed alphabetically by author

Experienced medical writers have an important role to play in the clinical evaluation of medical devices.

or listed by publication year.

The data are analysed as a whole across the dataset so that comparisons can be made between studies and summarised in the CER. The analysis is objective and critical. A combination of descriptive text and in-text tables is used to present the data and to explain the outcome measures used. Narratives of each study are not required, but presenting important pivotal studies is helpful.

Analysis of the clinical data

Analysis of the clinical data explains if and how the information provides sufficient clinical evidence to demonstrate the clinical performance and clinical safety of the device under evaluation. The analysis also describes the benefits and risks of the device and explains the acceptability of the benefit/risk profile according to the state of the art. The analysis should also look for consistency between the clinical data, the IFU, risk management documentation and the state of the art to identify any gaps and discrepancies, residual risks and uncertainties or unanswered questions (such as rare complications, uncertainties regarding medium- and long-term performance, safety under wide-spread use) that should be further evaluated during PMS, including in post-market follow-up (PMCF) studies.

Conclusion

The current guidance on clinical evaluation of medical devices, MEDDEV 2.7/ rev. 4, explains how an evaluation is performed, what information is required and how this information should be analysed and presented in the CER. The importance of an overall evaluation of the device is emphasised with particular focus on ensuring that clinical data are evaluated in a systematic and objective way, that the benefit/risk profile is acceptable and that any knowledge gaps are identified and addressed.

Experienced medical writers have an important role to play in the clinical evaluation of medical devices. ■

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Conflicts of Interest and Disclaimers

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New EU medical device regulations: Impact on the MedTech sector

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Abstract

Regulation plays a fundamental role in the translation of innovative medical devices from concept to clinical application and ensures that only devices that exhibit the highest standards of safety and quality are released onto the EU Single Market for sale and clinical use. The impending introduction of a revised Medical Device Regulatory Framework in the EU will require an assessment of how stakeholders in the MedTech sector will be affected. Understanding the impact will be essential for maintaining compliance in the changing regulatory environment as well as for promoting commercial competitiveness and facilitating early access to innovative medical device technologies. In Ireland, a national initiative has been launched to centralise expertise on the regulatory requirements for medical devices in the EU and to analyse how the new medical device regulations will affect requirements for medical device clinical investigations and commercialisation of medical device technologies.

Background

Health is considered a key determinant of economic growth by the EU. This is reflected in the substantial contribution that the medical technology (MedTech) sector makes to the balance of trade within the EU: MedTech employs over 575,000 people across 25,000 companies, and medical devices ranging from plasters to dialysis machines are designed, manufactured, sold, and distributed on the European Single Market generating annual revenues in excess of 100 billion euro per annum.[1]

Device profile and EU regulatory framework

Approximately 500,000 medical devices are available for sale on the EU Single Market.[2] The variation in complexity, risk profile, and applications of these devices has complicated efforts to create a harmonised regulatory process across EU member states.

New approach to regulation

Medical device regulation in the EU is based on the "New Approach" to regulation, which was

established in the mid-1980s to harmonise regulation of the technical aspects of industrial products in the EU.[3] This approach is based on the concept of a minimum set of mandatory "essential requirements" for safety and performance for a product to be sold in the EU. This approach does not prescribe detailed technical specifications or solutions but promotes the use of voluntary standards ("harmonised standards") that are developed by recognised European Standards Organisations and are referenced in the *Official Journal of the European Union.* Compliance with such standards can be used to demonstrate conformance with essential requirements as appropriate.

EU medical device directives

The current regulatory framework for medical devices in the EU centres on Council Directives 90/385/EEC,[4] 93/42/EEC,[5] and 98/79/EC,[6] which are collectively known as the Medical Device Directives (MDD). These directives each define one of the three categories of medical device: active implantable medical devices, general category medical devices, and in vitro diagnostic medical devices. In addition, each directive outlines the scope and intent of the regulation for each device category with the associated obligations for the manufacture of medical devices for commercial, research, or clinical purposes.

Transposition into national law

The provisions of the directives must be written into national law by each member state and are then enforced through the appointment of a national "competent authority" that takes legal responsibility for regulation in that member state. Using directives as the legal instrument for regulating medical devices gives each EU member state some flexibility in how the regulatory obligations are written into law, allowing for specific national circumstances to be taken into consideration.

CE marking

Medical devices sold on the EU Single Market must be CE marked to certify that the device complies with the essential requirements of the relevant Medical Device Directive and any additional EU legislation (where applicable). This is achieved through a process (Figure 1) that takes into consideration the category of device, along with pertinent device characteristics and the device risk profile.

> Health is considered a key determinant of economic growth by the EU.

A manufacturer must first determine if the device is within the scope of regulation of the MDD. If applicable, the manufacturer applies to an organisation known as a "notified body" to demonstrate that the relevant obligations for CE marking have been met. Each EU member state's competent authority may designate one or more notified bodies to assess conformity for specified types of medical devices. However, a manufacturer is free to choose any notified body that has been designated[7] to assess conformity for their respective type of device. Examples of device types include: non-active functional implants (MD 0204), devices for wound care (MD 0300), and medical devices incorporating medicinal substances (MDS 7001).

In fulfilment of the requirements for CE marking, a manufacturer must identify and comply with the applicable essential requirements. This can be achieved through the use of harmonised standards. The manufacturer may be required to establish a quality management system covering some or all aspects of device design and production. Furthermore, the manufacturer must prepare technical documentation that captures the evidence required to demonstrate conformance. Depending on the risk profile of the device the manufacturer may self-certify that the device meets the essential requirements or may require an independent audit and certification by the notified body. The manufacturer draws up a written declaration of conformance and affixes the CE mark to the device as per the regulatory requirements.

Risk classification

Given the heterogeneity of medical devices on the EU Single Market, subjecting all devices to the same level of scrutiny during a conformity assessment is not considered practical or cost-effective. Consequently, medical devices are stratified using a risk-based classification system that considers the vulnerability of the human body and the potential risks associated with the medical device. The classification system[8] for general and active implantable medical devices is shown in Table 1.

Class I represents the lowest perceived risk and Class III represents the highest perceived risk. Devices are classified using a rule-based system that considers criteria such as the duration of contact, invasiveness, local vs. systemic effects, and the part of the body affected by the device.

Essential requirements and conformity assessment routes

A device's characteristics, such as the device's state of sterility (sterile or nonsterile), presence of a measurement function, incorporation of a medicinal product or software, along with the associated risk classification will determine the applicable essential requirements and available conformity assessment routes.

For example, a nonsterile Class I device without a measurement function only requires the manufacturer to self-certify conformance to the essential requirements. However, Class II-Class III devices require an independent conformity assessment to be conducted by a notified body. This may include an audit of the manufacturer's technical documentation, quality system or a product inspection and may focus on some or all aspects of the device design and production.

Table 1. Medical device classification examples

Class	Risk	Examples
I	Low	Plasters, wheelchairs, corrective glasses, stethoscopes
IIa	Medium Risk	Infusion pump syringes, devices intended for storage and transport of organs for transplant, fridges specifically intended for storing blood, surgical gloves, hearing aids, diagnostic ultrasound machines
IIb	Higher Risk	Long term corrective contact lenses, dressings for severe burns or ulcerated wounds, surgical lasers, incubators for babies
III	Highest Risk	Cardiovascular catheters, prosthetic heart valves, aneurysm clips, breast implants, hip replacement systems

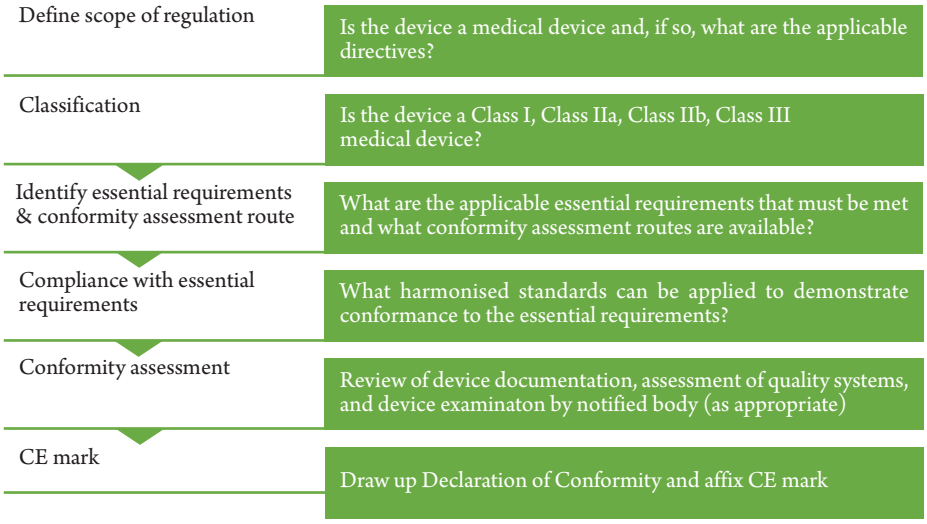

Figure 1. CE marking steps

The role of regulation and the need for change

The EU Medical Device Regulatory Framework plays a fundamental role in facilitating the work of the MedTech Sector. It also ensures that only devices that exhibit the highest standards of safety and quality are released onto the EU Single Market for sale and clinical use. This is critical for maintaining commercial competitiveness as well as for facilitating early access to innovative medical device technologies for patients and healthcare providers.

However, changes to the regulatory framework are needed because of advances in medical science and technology, expansion of the EU, and changing socio-economic conditions.[9] Furthermore, confidence in the system has been undermined by high-profile medical device problems, such as the misuse of industrial-grade silicone in breast implants manufactured by the company Poly Implant Prothèse.[10] This has precipitated a revision of the Medical Device Regulatory Framework[11, 12] that is scheduled for legal adoption in the EU in 2017.

Impact of scientific and technological advancements

Since the introduction of the MDD in the early 1990s, medical device science and technology has advanced significantly. Innovations in areas including information and communications technologies, minimally invasive surgical procedures, nanoscience, tissue engineering and personalised medicine are transforming healthcare delivery models and improving patient outcomes. These advances, however, are challenging the legally defined concepts of a medical device and the associated boundaries of regulation.

Impact of changing socioeconomic conditions

Due to the ageing population, the increasing prevalence of chronic diseases, and financial pressures on healthcare institutions, the mandate has increased for early access to high-quality, cost-effective, and safe innovative medical device technologies. This has placed competing demands on the regulatory system to adapt to technological and scientific developments while facilitating innovation and upholding the highest standards of quality and safety.

Impact of the EU political landscape, device scandals, and notified body oversight

The smooth and proper functioning of the EU Single Market is central to promoting internal trade and economic growth and for facilitating timely access to innovative medical devices in the EU. However, with the expansion of the EU and growth of the EU Single Market to 32 participating countries, important differences have emerged in how the provisions of the directives are interpreted. This has resulted in variation of how the EU Medical Device Regulatory Framework is applied across member states. Furthermore, in recent years, high-profile adverse incidents have badly damaged the confidence of key stakeholders in the EU Medical Devices Regulatory Framework and have highlighted shortcomings in the oversight of notified bodies.[10]

New medical device regulations

In 2012 the EU Commission published its proposals for the revision of the EU Medical Device Regulatory Framework with the replacement of the MDD by two medical device regulations: The Medical Device Regulation (MDR) and the In Vitro Diagnostic Regulation (IVDR).[11,12] In 2014, the EU parliament responded with a list of amendments for the proposed regulations and in 2015 the EU Council stated its informal position on the proposals. A discussion was then initiated between the EU Commission, EU Council, and the EU Parliament to reach an agreement on the proposed regulations. The agreed texts were published in June 2016.[13, 14] After translation into the official EU languages and associated legal-linguistic checks the regulations were formally adopted by the EU Parliament in April 2017.[15] The regulations were published in the *Official Journal of the European Union* in May 2017 and became legally binding on the 20th day after publication.

Key changes in the regulatory framework

The new regulations aim to make key changes in several areas to account for technological and scientific progress and to improve the clarity, robustness, transparency, and traceability of the regulatory system (Table 2).[16]

Entry into force, transition period, and date of application

After the new regulations are legally binding (Entry into Force) there will be a transition period of 3 years for the MDR and 5 years for the IVDR before they are fully applicable in EU law (Date of Application). This transition period is meant to allow all major stakeholders including the EU Commission, competent authorities, notified bodies, and manufacturers to meet their respective obligations from the date of application.

Aims of regulatory reform

Replacing the MDD with the MDR and IVDR is expected to improve the clarity of the regulatory requirements and to harmonise how the regulations are applied across EU member states. Furthermore, the increased scrutiny during conformity assessments and enhanced clinical evidence requirements throughout the medical device lifecycle are expected to translate into a

Table 2. EU Medical Device Regulation – Key changes

Change	Details
Legal Framework	Replacement of directives with regulations as the legal instruments for the regulatory framework
Scope	Extension of the scope of regulation to account for technological and scientific progress but also to include nonmedical devices with a similar risk profile such as cosmetic implants and medical devices sold as a distance sale or information service over the internet
Economic Operator Obligations	Clarification of the obligations of key stakeholders in the medical device supply chain and health care institutions involved in the manufacture of medical devices
Clinical Evidence	Re-enforcement of clinical evidence requirements throughout the medical device life cycle
Device Classification	Update of existing classification rules and the addition of new classification rules
Conformity Assessment	Increased scrutiny during conformity assessments
Notified Body Oversight	More stringent criteria for the designation and oversight of notified bodies by competent authorities and the EU Commission
Transparency	Increased reporting obligations for manufacturers and economic operators throughout the medical device life cycle
Traceability	Introduction of a Unique Device Identification system to improve traceability through the supply chain

more robust CE marking process. This should improve standards for safety and quality of medical device products released onto the EU Single Market.

Enhanced reporting requirements in the MDR and IVDR will also require that information about the approval and regulation of medical devices in the EU be publicly available. This should allow healthcare providers and patients to make more informed decisions.

The revised regulations also include introduction of a Unique Device Identification system. This is meant to improve traceability throughout the supply chain and thereby help authorities and manufacturers take prompt and appropriate actions in response to concerns about device safety.

Prospective impact on the MedTech sector

Compliance with the MDR/IVDR from the date of application will require that manufacturers assess the impact of, and plan for, changes in the regulatory framework. This might require manufacturers to gather additional clinical evidence, re-negotiate supply chain agreements, and alter documentation, quality management systems, and product labelling. The associated changes may affect operational costs, time to market, and staff competency requirements and therefore may also affect medical device product lines.

Analysing the impact

Ireland has launched a national initiative to centralise expertise on the regulatory requirements and pathways for conducting medical device investigations and commercialising medical device technologies. CÚRAM, the Science Foundation Ireland-funded Centre for Research in Medical Devices, is building on the strengths of the Irish MedTech sector to develop innovative medical device technologies. Based in the National University of Ireland, Galway, the centre comprises of six academic partnerships and 24 industrial collaborations with a strong focus on biomaterials, device design, tissue engineering, drug delivery, and regenerative medicine.

Molecular Medicine Ireland, as a funded partner in CÚRAM, is analysing how the introduction of the new medical device regulations is affecting the clinical research and commercialisation activities of CÚRAM and its industrial partners. The expertise they build will place CÚRAM in a position to influence the on-going development of the EU Medical Device Regulatory Framework through active engagement with key stakeholders at national and EU levels.

Concurrently, a variety of web-based information, training, and interactive tools are being developed by Molecular Medicine Ireland to ensure that CÚRAM and its partners are kept abreast of key developments.[17] This will ensure that CÚRAM's clinical research and commercialisation activities are adequately supported as the medical device regulatory environment changes in the EU. ■

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Medical Device Regulation:
A necessary step towards more patient and user safety

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Abstract
The new Medical Device Regulation (MDR) has recently been approved, and after a transition period of 5 years, all medical devices will be approved and marketed according to these new regulations. This article compares the main changes of the MDR to the still-valid Active Implantable Medical Device Directive (AIMD) and Medical Device Directive (MDD). Some changes will have a great impact on the way that devices are marketed, but many others are unpredictable and may disrupt the medical device market. Until manufacturers and authorities adapt to the changes, the transition years will pose difficulties for all stakeholders.

Introduction
The objective of this article is to provide the reader with an overview of the most important changes and additions in the Medical Device Regulation (MDR) that will replace the Medical Device Directive (MDD) and Active Implantable Medical Device Directive (AIMD), which are still valid. This article is NOT intended to guide the reader on how to work with the Medical Device Regulation (MDR) once it has been approved. The MDR is too complex to make a complete and in-depth analysis of its content within the context of this article.

First, let's take a look at a few simple numbers:

- The MDD has 23 articles, 12 annexes, and 60 pages. The AIMD has 17 articles, 9 Annexes, and 35 pages.
- Together that's 40 articles, 21 annexes, and 95 pages.
- The proposed MDR has 10 chapters, 97 articles, 16 annexes, and 352 pages.

I know that this is not particularly frightening for regulatory managers coming from the pharmaceutical industry, but it is quite scary for regulatory managers and medical writers that, like me, are used to working with the MDD. The

question if the MDD really needed such a thorough revision surely has many answers depending on whom we ask. The victims of the PIP scandal would most probably support the changes (for details please see the feature on page 39). The physicians willing to test and use the latest technological advances and gimmicks might not like all of the changes. The manufacturers that will be forced to generate, update, and manage a lot more documentation will be unhappy. The notified bodies in charge of evaluating this information might struggle with the new workload, but the competent authorities might welcome the new control mechanisms that protect patients and prevent future scandals.

There are many gaps and fuzzy terms in the MDD, and anybody with a bit of common sense would agree that they should be closed or redefined. The new MDR addresses these issues and reacts to developments in the medical device market, such as the increased use of software applications (apps), devices that include medicinal products or nanoparticles, and remote patient monitoring systems that work via the internet.

The following is a by-chapter analysis of the most relevant changes in the MDR:

Chapter I: Scope and definitions (articles 1-3)

The MDR adds some extra comments and conditions to the existing list of devices to which the MDD does not apply and clearly lists the corresponding regulations. Some new products – not currently covered by the AIMD/MDD – are now covered by the MDR, and other older products – currently on the market in some member states – are now excluded. Whether this regulation is self-consistent and complete has still to be seen in practice.

Altogether, the MDR provides 50 definitions (compared with the MDD's 14). Many of the new definitions are related to the concept of medical devices eg: "procedure pack" (devices to be used in a procedure), and "aggregate" (related with nanomaterials). Fortunately, the definitions are classified by concept of medical device, introduction in the market, economic operators and users, clinical evaluation, etc. Definitions will be aligned with the Global Harmonization Task Force (GHTF) guidance documents for medical devices.[1]

Chapter II – Making available and putting into service of devices, obligations of economic operators, reprocessing, CE marking, free movement (articles 4-22, Annexes I, II, and III)

This section has been expanded considerably and adds many new concepts and requirements. For instance:

1. A "qualified person" should be responsible for regulatory compliance within the manufacturer's organisation. This is similar to medicinal products and in the national laws of some member states.
2. The reprocessing of single use devices is regulated.
3. The "Essential Requirements" have become "General Safety and Performance Requirements" (Annex I) and include a list of up to 200 items to be checked.
4. Patient implant cards for implantable devices are required.
5. The concept of "State of the Art" is introduced.
6. Combination devices with software or substances to diffuse in the body are addressed.
7. Which stand-alone software are considered devices is defined.

The minimum contents of the technical documentation for the EU declaration of conformity are addressed in Annexes II and III.

Chapter III: Identification and traceability of devices, registration of devices and of economic operators, summary of safety and clinical performance, European databank on medical devices (articles 23-27)

This chapter addresses one of the main issues related with the medical device market: the difficulty to trace medical devices. In a complex market with more than 28[1] member states and many different local regulations, the Unique Device Identification (UDI) number[2] should improve traceability of medical devices. The UDI is a numeric or alphanumeric code for each medical device consisting of two parts: the device identifier and the production identifier. Proper labelling should contribute to market transparency, help during recalls, and discourage counterfeiting.

Manufacturers of class III and implantable medical devices will have to up-load summaries of safety and clinical performance to the central EUDAMED databases. EUDAMED will be accessible to manufacturers, notified bodies, competent authorities, and the EU Commission. All of these entities will have to input their "chunk" of required information, thus requiring a coordinated effort to implement it. These databases should organise data on devices being placed on the market, manufacturers, certificates, clinical investigations, UDIs, vigilance cases and post-market surveillance, information on the notified bodies, and device nomenclature.

Nobody really expects EUDAMED to be running when the MDR is approved. Unfortunately, many believe that it will take a long time before the EUMAMED is fully functional and can reduce administrative work and "regulatory compliance" costs.[3]

Chapter IV: Notified bodies (articles 28-40)

As notified bodies assess the clinical evaluation provided by the manufacturer, they play a key role in the approval and marketing process of medical devices. The MDR stresses the importance of their proper functioning and a coherent process to "designate" and monitor them throughout Europe. This should reduce discrepancies in the member states. The member states still "designate" and assess the notified bodies, but multinational teams will oversee these assessments. Notified bodies will be regularly controlled to ensure quality and ethical standards.

The workload for the notified bodies will increase substantially, since under the MDR the notified bodies will carry out unannounced factory inspections and conduct physical or laboratory tests on devices. The experts assessing medical devices are expected to rotate at regular intervals to ensure a neutral relationship with manufacturers. This is good news for regulatory experts, as experts with the background and experience described in Annex VI (see box with list of annexes) will be in high demand.

Chapter V: Classification and conformity assessment (articles 41-48, Annex VII, VIII to X)

Classification of medical devices has not changed very much. The MDD included 18 rules; the

MDR draft to which I had access includes 23 rules.[4] The new rules are:

1. Nano-materials and substances absorbed or dispersed in the body are classified according to their internal exposure potential.
2. Non-viable tissue of human or animal origin are class III.
3. Software devices can be of different risk classes.
4. Active therapeutic devices with integrated diagnostic functions that automatically influence the therapy delivered by the device are class III (typical example are external defibrillators, which sense the correct or incorrect functioning of the heart and react to this).

For conformity assessment of class III and class IIb devices that administer a medicinal product, the notified bodies will not be completely independent. They will have to send their clinical evaluation assessment of the device to an expert panel via the EU Commission (Annex VIII, Chapter II, Section 6.0). The notified bodies will only be able to certify the device once the expert panel has either issued comments or has not issued an opinion within 60 days, a procedure similar to the current regulation of medical devices that include animal tissues (Commission Directive 2003/32/EC).

Chapter VI: Clinical evaluation and clinical investigations (articles 49-59, Annexes XIII and XIV)

The clinical evaluation and clinical investigations in the MDR have a more stringent set of conditions and rules based on the MEDDEV 2.7/1 rev. 4 and parts of ISO 14155. This is particularly good news for freelance medical writers like me that have an engineering background and specialise in medical devices. But manufacturers will have to write more clinical investigation plans, reports, systematic reviews, and vigilance documents, meaning that the cost of regulatory management could increase so much that they might think twice before expanding their product portfolio.

Chapter VII: Post-market surveillance, vigilance and market surveillance (articles 60-75, Annex X)

The MDR addresses the need for a vigilance system for medical devices, particularly for implantable medical devices: "the Commission shall, in collaboration with the Member States, set up and manage an electronic system to collate and process" vigilance information. Manufacturers will have to report serious incidents and the corrective actions implemented. This information will be shared with the national authorities of other member states and similar incidents will be compared.

The MDR also defines vigilance documentation that includes the reporting of adverse events during clinical studies, the summaries of safety and clinical performance, and the market and surveillance reports.

At defined intervals, the manufacturer will have to issue a Safety Update Report for devices placed in the market that evaluates the risk/benefit of the device, provides PMCF data, sales volumes, and number of devices in use. The reports of class III and implantable devices will be reviewed by the notified bodies and then made available to the competent authorities.

Timelines are provided to report incidents (Article 61). Field Safety Notices and Field Safety Corrective Actions will likely be made public.

Chapter VIII: Cooperation between member states, medical device coordination group, expert laboratories, expert panels, and device registers (articles 76-83)

A Medical Device Coordination Group (MDCG) will be established with representatives of the competent authorities the member states. The MDCG will contribute to:

- The assessment of notified bodies.
- The effective and harmonised implementation of new regulations.
- The continuous monitoring of the technical progress and assessment of whether the general safety and performance requirements are adequate.
- The development of medical devices standards.
- The coordination of competent authorities and member state activities.

List of Annexes

I	General safety and performance requirements
II	Technical documentation and Technical documentation on post-market surveillance
III	EU Declaration of conformity
IV	CE marking of conformity
V	Information to be submitted with the registration of devices and economic operators in accordance with Article 25a and core data elements to be provided to the UDI data base together with the device identifier in accordance with Article 24a and the European Unique Device Identification System
VI	Requirements to be met by Notified Bodies
VII	Classification criteria
VIII	Conformity assessment based on a quality management system and assessment of the technical documentation
IX	Conformity assessment based on type examination
X	Conformity assessment based on product conformity verification
XI	Procedure for custom-made devices
XII	Certificates issued by a notified body
XIII	Clinical evaluation and post-market clinical follow-up
XIV	Clinical Investigations
XV	List of groups of products without an intended medical purpose referred to in Article 1(1a)
XVI	Correlation table

The MDCG will also provide advice for problems that arise in the implementation of these regulations and harmonise medical device administrative practice across the member states.

Chapter IX: Confidentiality, data protection, funding, and penalties (articles 84-87)

Personal data, commercially confidential information, trade secrets, and intellectual property rights are protected unless disclosure is in the public interest. Does this mean that the press will have access to sensitive information, concerning results of audits and inspections? This is not clear yet, and it depends on how public interest is defined or interpreted!

… as with all new legislations, the manufacturers and the authorities will adapt to the changes and finally settle into a reasonable cooperative scheme.

Member states may levy fees for the activities set out in the MDR. These should be set in a transparent manner and on the basis of cost recovery principles. Whether these fees will impose a considerable burden on small and medium local medical device manufacturers is not yet known. Eventually, this could lead to "fee's dumping" by the different member states to attract medical devices manufacturers or to a concentration of the business in the hands of a few big international corporations that can manage the regulatory costs.

Chapter X: Final provisions (articles 88-97)

This chapter lists amendments, defines transitional provisions, and sets date of application. The MDR will become applicable 3 years after its approval so that the member states, notified bodies, and manufacturers can adapt to the new legislation.

And the future?

So, that was it! Do I dare predict whether the MDR will make the use of medical devices safer? In general, I believe that it will. Will it have negative consequences, such as marketing approval delays due to lack of qualified personnel and increased health care costs? Most probably, yes. I use "in general" and "probably" because what will really happen depends on the interpretation of the different rules, new definitions, and changed words by the notified bodies and competent authorities.

For sure, the first year will be a struggle and a bit of a hazardous game with an open end, but as with all new legislations, the manufacturers and the authorities will adapt to the changes and finally settle into a reasonable cooperative scheme.

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Transparency – left to its own devices until now

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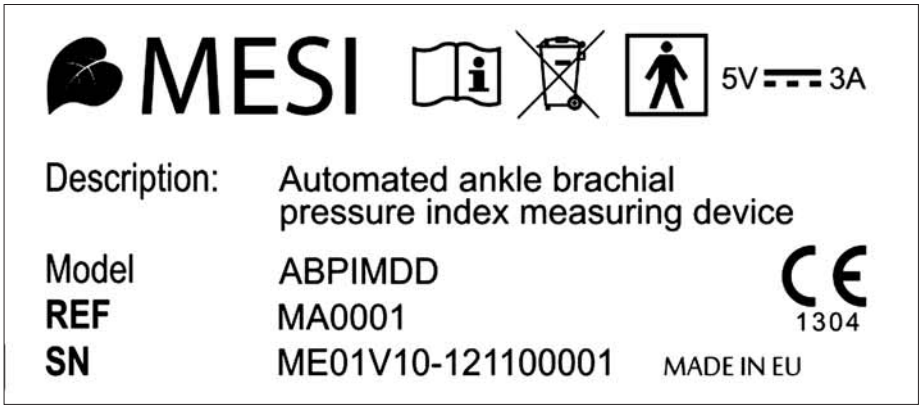
Abstract
Transparency has been an objective in the pharma world in recent years, culminating in the recent decision by the EMA to release full clinical study reports into the public domain. In spite of the publicity surrounding transparency and data sharing in pharma, the world of medical devices has largely flown under the transparency radar, but change is on the way. The final text of the long-awaited Medical Device Regulation was published in late February, and jumped the final hurdle of adoption by the European Parliament in April. This overhaul was prompted by scandals surrounding silicone gel breast implants and metal-on-metal hip replacements in the early 2010s that highlighted the lack of oversight and transparency. So why is this important and what are the implications for transparency?

Medical device approval in Europe – a fragmented process
Unlike approval of medicinal products in the US and Europe and medical devices in the US, approval of medical devices in Europe is not centrally regulated. In Europe, devices are generally assessed by one of over 50 privately owned "notified bodies" in different member states. If the notified body judges the device to conform with the relevant EU directives, a Conformité Européenne (CE) mark is issued and the device can be marketed in any EU country (Figures 1 and 2).[1,2]

Notified bodies are designated by national competent authorities such as the MHRA (Medicines and Healthcare Products Regulatory Agency) in the UK (https://www.gov.uk/government/organisations/medicines-and-healthcare-products-regulatory-agency). Until 2010, data on medical device approvals were held at a national level even though CE-marked devices can be marketed throughout the EU. This means that a device approved by a notified body and the competent authority in, say Portugal, could be marketed in any EU member state without that state's competent authority having automatic, easy access to regulatory information about the product.

Eudamed – the early years
The European Database for Medical Devices (Eudamed; http://ec.europa.eu/idabc/en/document/2256/5637.html) is a centralised



Source: medimedical.com

Figure 1. Example of a CE mark

web-based repository that was the first to address the lack of cross-talk between notified bodies and different member states throughout the EU. Eudamed started life in 1997 as a European-funded project managed by the DDMI (German Institute of Medical Documentation and Information; https://www.dimdi.de). The European Commission (EC) then took over Eudamed, updating it in 2009 and mandating in 2010 that it be used by all competent authorities.[3] Today, Eudamed serves as a centralised repository where national competent authorities submit information about manufacturers, certificates, clinical investigations, and vigilance/monitoring to the EC.[4] A 2012 survey carried out by the EC reported that competent authorities mostly used Eudamed to monitor the activity of notified bodies. However, most member states were not using Eudamed for market surveillance or clinical investigation decisions, arguing that the datasets were insufficient.[5]

Today, little information is publicly available about medical device CE marks received, denied, and withdrawn, whereas this information is readily available for medicinal products. For example, according to the EMA 2015 annual report, 93 medicines were recommended for marketing authorisation, including 39 new active medicines.[6] Comparable information simply isn't publicly available on a pan-European level for medical devices.

Figure 2. The far-reaching role of Eudamed under the new medical device regulation (MDR)

The rise of registries

Since the advent of Eudamed, clinical trial registries have emerged as a key tool for facilitating transparency in clinical trials. In the US, as with medicinal products, prospective controlled clinical studies to test health outcomes of medical devices must be registered on Clinicaltrials.gov. Pre-registration of trial protocols on public registries is designed to reduce the number of trials with unreported results and to prevent selective reporting of outcomes.

European trial registries have lagged behind Clinicaltrials.gov in encouraging sponsors to post results of registered clinical trials. Since 2014, sponsors of drug trials with at least one European site must upload study results to EudraCT (https://eudract.ema.europa.eu/), which then automatically populates the publicly accessible EudraCT Clinical Trials Register. Some sponsors voluntarily register trials of medical devices in the EudraCT registry, even if though they are not included in its mandate.

The reincarnation of Eudamed

This gap in registration of medical device trials has just been plugged by the new Medical Device

Medical device transparency on the up

Transparency of medical devices is moving forward.

Via the new Eudamed described in the MDR, the public will be able to access:

- Lists of devices on the market, the relevant economic operators and certificates
- Ongoing recalls and other field safety corrective actions
- A list of devices withdrawn from the market, or restricted
- A database of clinical investigations registered
- Clinical investigation reports and lay summaries of these reports

Regulation (MDR),[7] and big changes are planned for Eudamed. The repository will be completely overhauled, transforming it into a public-facing searchable database, with different levels of access for competent authorities, notified bodies, manufacturers, and the public. More information will be collected, including results of clinical investigations (Article 77.5 of MDR, see sidebar) and post-marketing vigilance data. According to a spokesperson from the Irish competent authority, the Health Products Regulatory Authority, "The sponsor of a clinical investigation will be required by the new MDR to upload the final report of their clinical investigation and a summary of the clinical investigation report (that is readily understandable to the public) to the European database Eudamed. The summary report will be available to the public."

The International Committee of Medical Journal Editors requires all clinical trials – for drugs and devices alike – to be pre-registered on clinicaltrials.gov or other registries before submitting the results to a peer-reviewed journal.

From posting to peer review

Currently, the results of medical device clinical investigations are not always published. However, medical device manufacturers rely on the scientific literature to prepare the clinical evaluation report when applying for the CE mark. According to the spokesperson from the Health Products Regulatory Authority, "The new MDR places an increased emphasis on data for peer reviewed journals when it is used as part of a manufacturer's literature review of similar devices." This is particularly true when a manufacturer wants to demonstrate compliance based on equivalence with another device.

Ronald Boumans, Senior Regulatory Consultant with Emergo Group, points out that fewer clinical investigations are needed for approval of a medical device than for a new drug. "Many of these investigations are published in articles," says Boumans, but he warns against directly comparing publication rates for devices and drugs. "The clearest way to describe it is to consider them as different universes," he says. "On average more new medical devices enter the European market in a single day, than new medicinal substances in a year. The sheer numbers require a different approach."

Despite the different paths to approval for drugs and devices, the International Committee of Medical Journal Editors requires all clinical trials – for drugs and devices alike – to be pre-registered on Clinicaltrials.gov or other registries before submitting the results to a peer-reviewed journal.[8] Their proposals to share the patient-level data underpinning the article will further encourage transparency of clinical trial data.[9]

Boumans adds that there is a gap in the MDR regarding data from clinical investigations on medical devices. If the study is done outside Europe, data do not have to be entered into Eudamed and the study results do not have to be made public, although the manufacturer can still rely on the data to demonstrate compliance. This could become more common as European hospitals are expected to be flooded with requests for medical device studies.

The countdown to implementation of the MDR

The final adoption of the MDR by the European Parliament in April has triggered a 3-year countdown to its implementation. Eudamed will then be under pressure to complete, test, and deploy its plans to improve its transparency within this time frame. The clock will also be ticking for medical writers to expand their knowledge and capabilities in the medical device arena to help in the push towards a more transparent system by providing clear, well written documents for the general public. ■

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Medical devices in the disclosure era and the role of medical writers

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Abstract
Increased transparency is one of the provisions of the Clinical Trial and Medical Device Regulations. This article discusses the impact of transparency and disclosure on medical devices. Many modern-day medical devices are software-driven. These, as well as the patients implanted with or wearing these devices, have become part of the so-called Internet of Things, and are therefore vulnerable to cyber attacks. Disclosure of information, data, and documents pertaining to medical devices will increase this vulnerability. In the rapidly changing regulatory landscape, the role of medical writers in anonymisation of patient data takes on a whole new magnitude. It is not only about protecting patient privacy, it is about ensuring patient safety.

Disclosure and devices
2016 was a big year for transparency and disclosure, starting with the release of the EMA Policy 0070 (*External guidance on the implementation of the European Medicines Agency policy on the publication of clinical data for medicinal products for human use)*[1] in March (and an update in December) and the public posting of the first redacted clinical reports in October.[2] As we come to grips with the impact of disclosure on the documents we write, we should not forget that clinical trials do not only involve drugs, but also medical devices. Devices are also subject to regulations that provide for increased transparency.

There was a time when clinical research and regulations on drugs and devices were considered worlds apart. If we consider the definition of a medical device as *"any instrument, apparatus, appliance, software, material or other article, whether used alone or in combination… which does not achieve its principal intended action in or on the human body by pharmacological, immunological or metabolic means, but which may be assisted in its function by such means"*,[3] this separation is not surprising. Over the years, however, drug-device combinations and drug delivery systems (ranging from insulin pumps to drug-eluting stents to nicotine patches) have been developed, and the delineation between drugs and devices used in healthcare has become blurred. A quick look at the database on EUDRACT will show many current clinical trials that involve devices. And regulations that govern drugs and devices are slowly but surely being aligned.

In the rapidly changing European regulatory landscape, the EU Clinical Trials Directive was revamped and replaced by the 2014 Clinical Trial Regulation (CTR). This year, the EU Medical Device Directive is going to be superseded by the Medical Device Regulations (MDR).[3]

But what does this have to do with disclosure and medical writing? Like the new CTR, the new MDR also requires increased transparency of clinical data, with some selected documentations made available to the public. Below are extracts from the February 2017 MDR draft[3] on the topic of transparency:

- "(4) Key elements of the existing regulatory approach, such as the supervision of notified bodies, conformity assessment procedures, clinical investigations and clinical evaluation, vigilance and market surveillance should be significantly reinforced, whilst provisions ensuring transparency and traceability regarding medical devices should be introduced, to improve health and safety.
- (43) Transparency and adequate access to information, appropriately presented for the intended user, are essential in the public interest, to protect public health, to empower patients and healthcare professionals and to enable them to make informed decisions, to provide a sound basis for regulatory decision-making and to build confidence in the regulatory system.
- (48) For implantable devices and for class III devices, manufacturers should summarise the main safety and performance aspects of the device and the outcome of the clinical evaluation in a document that should be publicly available."

The exact implementation of the MDR provisions is still unclear. But if the MDR transparency requirements closely follow those of the CTR, we may see implementation guidelines that will resemble the EMA Policy 0070.[1] This means that many of the medical device clinical documents we routinely write, ranging from the clinical investigation report to the clinical evaluation report, may be required to be posted for public access.

Dangers of disclosure
One of the main weaknesses of disclosure is the risk of patient re-identification. It has been demonstrated that anonymised personal and medical data, the type we collect in clinical trials and registries, can actually be used to re-identify individual patients, threatening their privacy and the confidentiality of sensitive personal data.[4]

In the world of medical devices, the risks that disclosure brings do not just stop at invasion of privacy but take a more ominous form – an attack on a device that is implanted in the patient. This endangers the patient's life. Hence, disclosure of CT documents dealing with medical devices does not only present a risk to patient privacy but also a major risk to patient safety.

Implantables and wearables
In the era of personalised medicine, there is nothing more "personal" than a device implanted in a patient. Implantables can range from stents to hip replacements to an artificial heart. Then there are the wearables (no, not iWatch and Google Glass), devices worn for diagnostic and therapeutic purposes. These range from hearing aids to continuous glucose monitoring (CGM) devices. The individual devices ("units") are highly specific to the patient wearing the unit ("users"). Each unit is identified by a serial number and can provide metrics that are specific

to the users. For example, there was the case of the pacemaker that gave away its user in an arson case. At the exact time of the fire on his property, the device did not record any cardiac activity indicative of stress or excitement expected under such circumstances. This pointed to a deliberate setting of fire by the wearer of the pacemake.[5] Then there was the case of the patient whose CGM system data revealed a deliberate overdose delivery of insulin by the user.[6]

On the flipside of the coin, identifying an implanted or a worn medical device from information such as device model, manufacturer, bar code, or serial number can lead to de-anonymisation of an anonymised patient. An additional complexity comes from the fact that many modern-day medical devices are software-driven, making patients wearing devices such as implantable cardiac defibrillators (ICDs) or insulin pumps a part of the so-called Internet of Things (IoT). Being in the IoT makes these devices vulnerable to hacking and breaches.

Hacking the heart helpers

In a review of medical device cybersecurity, Burns et al.[7] presented theoretical scenarios of murders committed by manipulating a pump to deliver the wrong insulin dose or re-programming a pacemaker to give incorrect pacing – remotely. Unlikely? Earlier this year, the US FDA issued a safety communication on the cyber vulnerabilities of a radio frequency-enabled ICD and the corresponding transmitter.[8]

Breaching the ER

Cyber attacks and hacking are not only restricted to portable devices. Large medical devices in clinics and hospitals, from the simple electro-cardiogram to the more complicated body scanners and surgical robots are all run by software. Again, being in the IoT, these devices can be breached by an experienced hacker hundreds of miles away.[9]

Regulations on cybersecurity

Regulatory authorities recognised these threats and are coming up with measures to mitigate them.

The US FDA has released two industry guidelines on medical device cybersecurity:

- Content of Premarket Submissions for Management of Cybersecurity in Medical Devices; Guidance for Industry and Food and Drug Administration Staff 2014
- Postmarket Management of Cybersecurity in Medical Devices; Draft Guidance for Industry and Food and Drug Administration Staff (draft) 2016

In the EU, the new MDR attempts to address cybersecurity in Section 17 of Annex I.[2]

Other regulations that also address security of medical devices are:

- Directive on Security of Network and Information Systems 2016
- General Data Protection Regulation (GDPR) 2016/679

Tasks of medical writers

So what is the role of the medical writer in all of this? As medical writers, it is our responsibility to protect patient data in the documents we write through appropriate anonymisation techniques. Looking at the above mentioned threats through medical devices, patient anonymisation takes a whole new meaning – it does not only protect patient privacy, it saves lives. In the absence of concrete guidance on the implementation of

transparency as required by the MDR, I would like to follow the lead of EMA Policy 0070[1] on CT disclosure and make the following suggested do's and don'ts when writing about medical devices:

- *Avoid using direct identifiers (IDs)*. Direct IDs are information that are directly attributable to a specific individual. Examples would be names, initials, addresses, phone numbers, social security numbers, etc. In clinical data, direct IDs, with the exception of patient study ID, have no scientific utility[1] and need not be in the documents that we write. This may seem obvious to those who are aware of data protection legislations in Europe. However, in other parts of the world, data protection legislations are less stringent. I would like to cite the following example: The abstracts and case reports presented at the Annual Cardiovascular Summit TCTAP are later on published in the Journal of American College of Cardiology. Many of these abstracts start with a patient ID, which could be numbers, but also initials or even names (see a sample abstract TCTAP C-042).[10]
- *Mask, aggregate, or generalise quasi-IDs,* attributes that can indirectly identify individuals. Unlike direct IDs, quasi-IDs do provide important data. Examples are sex, race, birth dates, clinic visit dates, geographic location, or socio-economic information. If possible, only those quasi-IDs (e.g. age group, gender, maybe race or ethnicity) that have scientific utility should be included in a case report or narrative. Relative study dates should be used in lieu of calendar dates. EMA Policy 0070 recommends techniques like masking, generalisation, or aggregation of quasi-IDs to avoid patient re-identification.[1]
- *Do not provide specific medical device information* such as serial numbers and device identifiers. To improve device traceability, the MDR requires Unique Device Identification (UDI) numbers.[2] While traceability enables tracking the safety of each individual device, the specificity that UDI presents also increases the risk of patient re-identification several fold. The routine use of the medical device trade name and model is also to be questioned. Whereas journals and regulatory agencies specify that the generic name or the recommended International Non-Proprietary Name (rINN) of a drug be used in publications and regulatory documents, the nomenclature of medical devices are unclear. In fact, if one looks at publications in biomedical journals, it is common practice to use the proprietary names of devices, followed by the name and location of the manufacturer (example: Medtronic iPro2 blinded CGM system using an Enlite sensor [Medtronic, Northridge, CA]).
- *Finally, practice proactive anonymisation*. This entails using appropriate anonymisation techniques as one writes, with the goal of producing a document that provides optimal privacy protection and requires minimum redaction. Only then can we ensure that the scientific utility of our document is maintained even after disclosure.

Conclusions

Many medical devices are life-saving instruments that patients cannot do without. Despite the threats discussed in this article, the benefits of using these devices far outweigh the risks involved. As medical writers, our task is to reduce risks to privacy and safety as much as possible, but at the same time produce scientifically sound documents that will enable regulators to assess the safety and performance of these devices.

As a reminder of our responsibilities as medical writers, I would like to quote the EMA Policy 0070: "what [we] ultimately want to achieve is to retain a maximum of scientifically useful information on medicinal products for the benefit of the public while achieving adequate anonymisation."[1] ■

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Conflicts of Interest and Disclaimers

Raquel is an employee of Clinipace Worldwide. The views and opinions in this article are those of author alone and do not necessarily reflect those of her employer.

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Does standardisation improve animal testing of medical devices?

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Abstract
Compliance with European regulatory standards in animal research could be viewed as a way of dotting the i's and crossing the t's, rather than actually holding the research to scientific scrutiny. Standardisation is important and needs improvement for *in vivo* testing of medical devices, so that it can be more than basic guidelines. Innovative research must go beyond the requirements set out in regulatory standards to enable research practices to be improved and updated.

Introduction to animal testing of medical devices
Thorough scientific testing of a medical device, such as an orthopaedic implant, requires several approaches (Figure 1), including biological testing. Testing of a novel device material involves *in vitro* assays in cell cultures and *in vivo* tests using animal models. The purpose of *in vitro* tests is usually to assess cell toxicity and DNA damage in animal and human cell lines and in primary human cells. Animals studies must be undertaken when cell studies are inapplicable – for example to study the systemic toxicological response, elimination pathway of a material, local and systemic immunological responses, or carcinogenicity of a material. Animal models can also be used to study *in vivo* chemical interactions or degradation of a material. The device materials may be injected or implanted in laboratory animals to study animal behaviour and physiology over short or long time frames. Extensive biochemical analysis can be carried out by harvesting various organs and tissues from the experimental animals.[1]

Standards for animal testing
What are the standardising bodies?
In Europe, the major standards bodies include the International Standards Organisation (ISO) and the European Committee for Standardisation, which co-operatively provide quality management systems and standard operating procedures for various types of scientific testing of medical devices. The standards are updated as new requirements and more effective procedures are established. These facilitate compliance with EU Directives 90/385/EEC,[2] 93/42/EEC,[3] and 98/79/EEC,[4] which concern active implantable devices, other medical devices, and *in vitro* diagnostic devices respectively. Fulfilment of the appropriate directive(s) and any supplements/revisions is the basic requirement to allow European conformity (CE) marking of a medical device, which enables its sale in Europe.

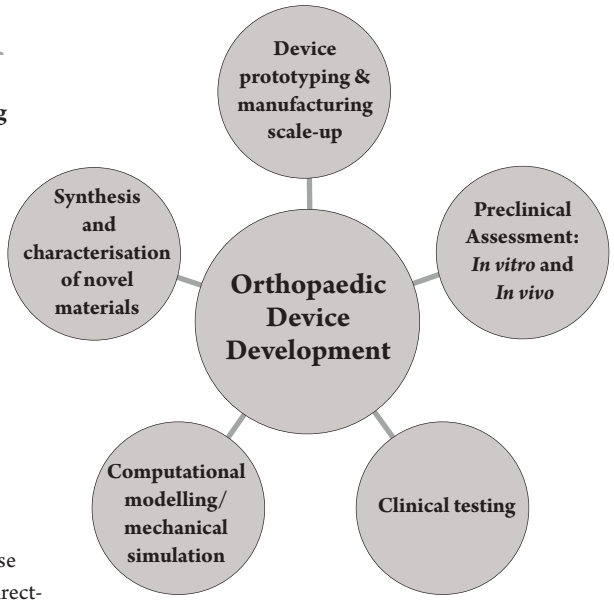
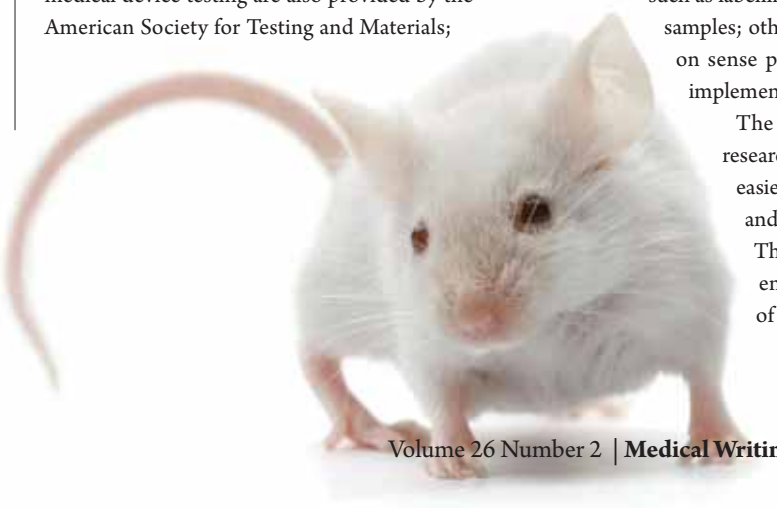


Figure 1. Orthopaedic device testing – key research processes involved in development and testing of a novel orthopaedic device

What are the main ISO standards for animal testing of medical devices?
The main ISO standard which covers quality management of animal testing, in addition to the quality management of all stages of medical device development, is ISO13485;[5] substantial documentation is required. Both animal testing and *in vitro* testing are covered by the ISO10993 series[6] that is comprised of 18 parts including general evaluation, animal welfare requirements, tests for DNA damage, interactions with blood components, etc. Several *in vivo* standards for medical device testing are also provided by the American Society for Testing and Materials; however, these are not integrated into European device testing regulations.

Advantages of standardisation
The ISO standards facilitate the use of replacement, reduction, and refinement in animal research, for example, by defining the minimum sample size for studies, and indicating where *in vitro* assays can be used instead. Together with the EU directives, the standards help to prevent poorly tested and potentially unsafe products from reaching the European market. The documentation of device testing required by ISO standards ensures accurate records of any testing procedures carried out. The ISO standards also remind researchers of good laboratory practices, such as labelling and traceability of samples; otherwise these common sense practices may not be implemented thoroughly.

The standardisation of research methods makes it easier to compare devices and the results of testing. The standards may also encourage the use of "gold standard"



techniques, rather than less effective methods. For example, with regard to the evaluation of local effects surrounding an implant, methods for quantitative scoring of soft tissue reactions by counting immune cell types within tissue sections are provided for by ISO10993-6;[6] researchers might otherwise evaluate the local effects by purely qualitative means. Standards also provide a balance between the production of quality research and research that may be too time consuming or impractical.

Limitations of standardisation

Perhaps the main problem with ISO standards is that they can become quickly outdated – especially as there is a time lag between the validation and implementation of a new ISO standard. As such, important testing methods may be overlooked. For example, analysis of animal tissues could include quantitative polymerase chain reaction (qPCR), a technique considered a gold standard for quantifying gene expression.[7] Furthermore qPCR requires very little tissue, is relatively fast, and reliable if designed properly. Reliance on an outdated ISO standard may prevent quality research from being carried out if institutions work to meet the ISO recommendations rather than design their own, more extensive investigations. ISO standards may not always be compatible with the unique aspects of a study, or be too general to be fit for purpose. The standards sometimes lack detail, leaving room for interpretation – meaning that experimental methods may differ between labs and make comparison of results difficult, defeating the main purpose of standardisation. For example, ISO 10993-11[8] states that there is no absolute criterion for selecting a particular animal species for systemic toxicity testing of medical devices. Similarly, with regard to the microscopic evaluation of tissue samples surrounding an implant material described in ISO10993-6, the types and amounts of tissues to be harvested and subsequent details of tissue processing is unspecified. The scoring systems offer no guidance on how to distinguish the different cell types – for example, whether cells should be labelled with chemical markers, or simply analysed by morphology.

Lastly, institutions may not afford to purchase access to standards, and uncertified institutions lacking the funds for ISO accreditation or the equivalent, may be penalised despite producing good research. Similarly, certified institutions are seen to have attained a "badge of quality" and so may be held to less scrutiny. However, ISO standard compliance does not remove the possibility of poor work being carried out, since departures from ISO standards may not be recognised and experimental errors may not be apparent from documentation.

Standardisation in other areas of preclinical device testing

Other areas of preclinical testing may benefit from more up-to-date and informative ISOs; for example ISO14242 on the wear of total hip joint prostheses has a 2012 version, which was revised in 2014, with some evidence of improvement in clinical outcomes.[9] In contrast to the *in vivo* modelling, ISO10993 includes many more specific test parameters for *in vitro* testing. Complete cell toxicity protocols are contained in ISO 10993-5 detailing specific cell lines, time points and reagents to be used; for example the use of BALB/c 3T3 cells for the Neutral Red Uptake cell toxicity test.[10] This may be a reflection of the relative ease of standardising a simpler test system such as cultured cells, versus entire animals with complex tissue structures and numerous cell types.

Conclusions

Validated and standardised methods for testing various aspects of the use of an implantable medical device are as important as for pharmaceuticals. While the ISO-recommended tests are in place, for *in vivo* testing they need to be updated or replaced with newer methods to increase the reliability of medical device testing. Once validated, these tests need to be adapted to the specificities of the given device.

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Puns, promises, and metaphors: Medical device trade names

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Abstract
Medical writing covers not only drugs but also medical devices. This article looks at the lighter side of writing about medical devices. It shares observations about the vocabulary used and especially focuses on trade names. It also looks at the use of metaphors, analogy, and puns in medical device nomenclature and in describing techniques and concepts used in interventional cardiology.

Writing for medical devices
Medical communicators write documents that cover medical therapies involving drugs, procedures, and medical devices. I started my medical writing career preparing regulatory documents for drugs. Four years ago, I had the opportunity to manage a project to write clinical evaluation reports for medical devices used in interventional cardiology. That was when I discovered certain differences in the vocabulary we use when writing about drugs vs. devices.

As starting point, let's have a look at the text below:

We first advanced a BMW Elite and then deployed a Taxus Express… However, the Navifocus WR did not work… The procedure was eventually achieved using a Xience Xpedition followed by a Sprinter.

No, this text is not something out of Sports Car Illustrated or Autosport magazine, but a paragraph describing a hypothetical percutaneous coronary intervention (PCI); the commercial names are those of devices used in this procedure.

Like drugs, medical devices also have generic or non-proprietary names and these are found in the Global Medical Device Nomenclature database (https://www.gmdnagency.org/). When writing documents about drugs, we almost invariably use the generic name as required by biomedical journals and regulatory authorities. This is not the case for medical devices, where trade names are commonly used in publications. The American Medical Association (AMA) Manual of Style states that for equipment and devices, nonproprietary names are preferred but trade names, as well the manufacturer and location, are to be provided to enhance clarity, especially if several brands of the same products are compared.[1]

Written correctly with the generic names and additional information as recommended by the AMA, the text above should read:

We first advanced a Balance Middleweight (BMW) Elite coronary guide wire (Abbott Vascular, Santa Clara, CA) and then deployed a Taxus Express paclitaxel-eluting stent (Boston Scientific, Natick, MA)… However, the Navifocus WR intravascular ultrasound (Terumo, Tokyo, Japan) did not work… The procedure was eventually achieved using a Xience Xpedition everolimus-eluting stent (Abbott Vascular, Santa Clara, CA), followed by post-dilation with a Sprinter balloon dilatation catheter (Medtronic, Minneapolis, MN).

What's in a name?
The rules governing approval of proprietary names are similar for drugs and devices. In theory, trade names should not a) be confusingly similar to names of other products, b) imply unique effectiveness, or c) exaggerate effectiveness or superiority claims.[2]

In practice, the evaluation of proprietary names is much more stringent for drugs than for medical devices. This is due to the high rate of medication errors associated with drugs. Most drugs come in standard formulations for oral use (pills or solutions) or for injection or intravenous infusion and similarity in physical appearances is not uncommon. Strict control of proprietary names aims to avoid look-alike preparations having sound-alike brand names to minimise medication mix ups. This type of error is rarely encountered in medical devices, where a health practitioner is highly unlike to confuse an insulin pump with a pacemaker.[2]

Metaphors and analogy
Devices used to be named after their inventors. The Grüntzig balloon catheter was named after Andreas Grüntzig, who successfully performed the first balloon angioplasty, and the Palmaz Genesis stent after Julio Palmaz, who invented the balloon-expandable stent.[3] But this practice has now become passé. Because of the relatively relaxed nomenclature rules, medical device names nowadays tend to be racier, more exciting, and less abstract compared to those of drugs. Real (not coined) words are often used but metaphorical and analogous names abound.

For example, Fox, Coyote, and Mustang are not occupants of a menagerie, but commercial names of balloon catheters. Freestyle, WaveSense

Jazz, and BGStar are not music bands, but glucose monitoring devices.

Buddy wires and kissing stents

If you think these names are fascinating, check out the metaphors used in describing some of the techniques and concepts in PCI: buddy wires, kissing stents, monorails, and mother-and-child are just a few examples I have found in interventional cardiology. See Table 1 for the definitions of these terms. The metaphors get more interesting as the interventions become more complicated, such as the "double-kissing crush" approach[4] or the "4-in-5 mother-child" technique.[5]

Promises to keep

A lot of device names are superlatives and imply strength and power: Supera is a peripheral stent, Quantum Apex a balloon catheter, Conquest Pro a guide wire, and Tornado an embolisation coil. The surgical robots Zeus and Da Vinci follow the Greco-Latin naming route to imply superpower and genius, respectively. But can the Miracle guide wire family deliver the promise its name implies? What about the knee replacement devices Journey and Triathlon? Or the TRUEresult glucose meter?

Unique and punny

As device manufacturers scramble to find that blockbusting brand name, it is increasingly difficult to come up with something unique and catchy. Still, I can appreciate a punny brand name like the InsuLinx glucose meter or the Guidezilla guide extension catheter. And just when I thought no device name could surprise me, see what I came across the other day – the Chocolate percutaneous transluminal angioplasty balloon catheter, with its special features of "pillows and grooves" (see Table 1).[6]

Opportunities

Metaphors and puns aside, writing about medical devices requires the same skills and expertise as writing about drugs. For medical communicators, there is a lot of opportunity and fun in writing for medical devices (see p. 71).

Conflicts of Interest and Disclaimers

Raquel is employed as a medical and regulatory writer at Clinipace Worldwide, a global contract research organisation. In this professional capacity, she has written regulatory documents for some of the medical devices mentioned in this article. The views and opinions in this article are those of the author alone and do not necessarily reflect those of her employer.

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Table 1. Use of metaphors and analogy in percutaneous coronary intervention

Term	Definition
Buddy wire technique	Use of an additional guide wire along with the one being routinely used to advance balloons, stents, or other devices to help accomplish otherwise challenging procedures during percutaneous coronary intervention (PCI)[7]
Kissing or snugging technique	Technique that deploys two or more balloons or stents in arterial bifurcations; these devices eventually meet in the vasculature where they "kiss" or "snug." [8,9]
Mother-and-child configuration	Technique wherein a small catheter (child) is inserted into a larger conventional guiding catheter (mother) during PCI[10]
Monorail balloon shaft and guide wire	Concept named after the monorail train system of the 1980s, with the balloon catheter running over the guide wire[3]
Pillows and grooves	Balloon segments that make contact with the blood vessel walls and function to minimise local forces, interspersed by grooves[6]

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French breast implants, the Medical Device Regulation, and a theoretical case study

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Abstract
The 2010-2011 Poly Implant Prothèse scandal triggered a review of the Medical Device Directive. This resulted in a new Medical Device Regulation that was approved this year. It contains many changes, and many questions will arise when medical device companies start certifying their medical devices per the new regulation. The solution to many unclear cases will depend on how the new regulation is interpreted. Medical writers can play a key role by creating precedents that are coherent, well documented, and useful for all stakeholders.

Poly Implant Prothèse (PIP) was a French manufacturer of silicone gel breast implants. The company was founded in 1991 and liquidated in 2010 after it became public that they had been using low-quality industrial silicone gel for the implants. The company sold an average of 100,000 sets of breast implants per year over 20 years. After a site inspection in 2000, the FDA prohibited sale of PIP's silicone breast implants on the US market, which led to a considerable decrease in sales worldwide. PIP reacted with dramatic cost cuts and by replacing the high-medical quality silicone gel with low-quality industrial silicone without following the regulations for production of medical implants or performing preclinical tests. The new implants had a 500% higher risk of breaking or losing content and were considered to be related to several deaths and to have caused breast cancer. December 23, 2011, the French government recommended surgical removal of PIP breast implants, affecting 30,000 women in France.[1] An estimated 30,000 - 40,000 women were affected in the UK, 1,000 in the Netherlands, 2,500 in Sweden, and many women in other European countries, Latin American countries, and Australia.[2] After this scandal, breast implants were reclassified as Class III (high risk) medical devices.

PIP was not the only "bad guy" in the market: the M-Implants manufactured by the Dutch company Rofil and the TiBREEZE breast implants manufactured by the company formerly known as GfE Medizintechnik GmbH were also found to be of low quality. Obviously, something in the marketing approval process and post-market surveillance was wrong and made it easy to get low quality devices approved.

The advent of the Medical Device Regulation (MDR)
As a result of the PIP scandal, the public, European governments, and competent authorities all asked for more transparency in the medical device market and an improved marketing approval process. Finally, in 2011-2012, the competent authorities started working on the topic, resulting in the MDR in 2017,[3] which ultimately should increase the patient and user safety.

As I mentioned in my other article in this issue ("The Medical Device Directive: a necessary step towards more patient and user safety", page 25), how the MDR will affect the medical device market and whether it will improve the patient and user safety remains to be seen. This depends on how the notified bodies and the competent authorities interpret each and every word, paragraph, and definition in the directive's text. Just only one word might make quite a difference.

A case study
To illustrate this uncertainty, I would like to go through one "case study". A small but interesting difference between the MDD and the MDR is found in the Annex 1 Essential Requirements under the General Requirements:

"…devices can be made available to the market if they are safe and effective…"

The word "effective" was not used in the MDD, which instead said that a device could be marketed if it was safe and performed according to its "intended use" as defined by the manufacturer. Does this mean that manufacturers will have to demonstrate clinical efficacy when the intended use is intimately related to the treatment of a specific disease or symptom as is the case of cardiac pacemakers? Will medical device companies be more cautious when defining the intended use of new devices? For example, will the implantable pump that delivers intrathecal baclofen now do only that and no longer "relieve spasticity symptoms due to cerebral palsy"?

Assume that a manufacturer wants to market a new and revolutionary wonder device that "stimulates the increase of factor XXX thereby shortening the healing time of acute non-infected wounds". What type of efficacy evidence will be required by the notified bodies? Only in vitro studies that show that the device effectively stimulates the increase of factor XXX? Or at least one serious clinical study that shows that the healing time of acute non-infected wounds to be shorter when compared to the standard treatment? As a scientist, I would answer, "Yes, exactly that". Just for the sake of understanding what this means, try to define what an acute non-infected wound is. One idea: surgical wounds are acute and non-infected (or at least should not be!). So, it is clear: the manufacturer should run a clinical study with surgical wounds … but, in which surgical wounds would a clinical study make sense? The surgical wound after a thoracotomy? Or a limb amputation? Or a simple appendicectomy? Should the clinical study include thousands of patients with all types of surgical wounds? Will the manufacturer be able to derive from one surgical wound to all the rest? Or will the intended use end up being "stimulates the growth of XXX thus shortening the healing time of the surgical wounds that result of the following procedures: X, Y and Z"?

One could argue that the same would apply to a new wonder drug, with the same difficulties arising when the correct set of pre-clinical and clinical studies must be defined, but there is a great difference: pharmaceutical companies have a different financial capacity, years of experience in evidence-based medicine, infrastructure to provide study centres with investigational products, and very long planning processes. Medical device companies are often small, have very little experience in clinical research, investigational devices are often only a few prototypes, and the manufacturers have very short timelines in their marketing plans. So, the wonder device manufacturer will probably think twice before embarking on such an adventure.

You might think that this is a very specific case (and a theoretical one), but as I mentioned before, this "case" is the result of only a one-word difference. Most probably, a long list of questions will arise from the many differences between the MDD and the MDR. I believe that the answers will slowly crystalise from sets of precedent cases and accumulated practical experience in working with the authorities and the notified bodies.

How medical writers can help

Medical writers can play a significant role. What and how the notified bodies and competent authorities decide for difficult cases will be the result of the quality of the documents provided by the manufacturers and us, the medical writers responsible for writing clinical evaluations, clinical study plans, and market surveillance documents. Complying to the most possible extent with the requirements of the MDR and clearly explaining, in specific cases, why we cannot will be key to creating sets of precedent cases that are coherent, well documented, and useful for all stakeholders.

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Science journalism: In search of a new identity

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Abstract
Science journalism is undergoing a major transition due to changes in the relationship between science and society and dissemination via digital and connective technologies, as is the case with other branches of journalism. The changes occurring in science journalism may concern medical writers who deal with communication targeted at non-experts, in particular patients. This article presents a number of scenarios and a series of significant results of research that fuel the debate on the future of the information systems dealing with science, technology, and healthcare. Although the outlines of a new professional identity are still indefinite, some distinctive features emerge with more clarity than before. Science journalists will, on the one hand, have to integrate their traditional science translator skills with those of organisers and *curators* of the knowledge generated by different communities; on the other, they could become more and more the generators of new knowledge themselves.

Introduction
Medical writers should consider what has happened in science journalism in recent years, since at the intersection between the two realms, namely the production of material addressed to a non-expert audience (in particular patients), they may face similar requests for change as those their colleagues are facing. Increasingly, science journalists are expected to broaden their cultural, technical, and relational skills, and to show greater professional flexibility. This is because

they may have to face the growing demand for democratic participation that manifests itself in social controversy over scientific and technological issues. Also, like all other journalists, they have to respond to changes in the modalities of information production and distribution in the digital era.

Science journalism between tradition and present-day challenges
Although the use of mass media to disseminate science dates back to the birth of newspapers in the 17th century, the emergence of editorial figures specialised in reporting scientific facts only occurred about a century ago.[1-3] For a long time, science journalism was basically intended to reconfigure technical information through words and images to make it accessible to individuals lacking expertise and specialised terminology. The context of the research and the social implications of knowledge were not explored, at least until the 1960s, when environmentalists, pacifists, and animal rights activists started disseminating in the press images of science that were less reassuring than those seen before.[4,5] As a consequence, a series of limitations to traditional news reporting were singled out, spawning a debate on the crisis of science journalism that is still relevant today. Disseminators of scientific information are in fact often criticised for their excessive closeness to their sources, the lack of a critical outlook, and failure to contextualise information.[6] These criticisms are also signals of a transformation in the relationship between science and society. Over 20 years ago, a number of sociologists spoke of new forms of knowledge production that required a new "contract" between researchers and citizens. If science has traditionally been expected to produce reliable knowledge and communicate its discoveries, the new contract must ensure that scientific knowledge is "socially robust", and that its production is seen by society to be both transparent and participative.[7-9] Such changes represent a challenge for the communication of science.

An inescapable conversation
The practices of science journalism, according to which scientists know things that the public is ignorant of and the media is expected to translate the complex to the simple, reflect the assumptions of the so-called deficit model of science communication. Alternatives to this longstanding unidirectional and paternalistic approach are based on the results of sociological and ethnographic research that, in the 1990s, started to examine for the first time the distinct sets of audiences in science. Such investigations demonstrated that non-experts have an ability to comprehend, discuss, evaluate, and generate knowledge that had been previously underestimated.[10-12] The impact of such studies coincided with a call from relevant institutional bodies to shift to more dialogic science communication between researchers and citizens. A review of the dialogue-promoting

activities was identified, for instance, in an influential report published at the beginning of the 21st century in the UK by the House of Lords Select Committee on Science and Technology.[13] The report recommended that increased openness from scientific institutions should play an integral role in scientific decision-making. Thanks to this sort of initiative, "involvement", "bidirectionally", and "interaction" gradually became new keywords in the science communication field that express an increasing demand for public participation in the governance of science and technology.[14]

It is worth underlining the leading role played by patient associations and health rights movements. For those who work in the field of medical writing, it is relevant to observe the growth in the number and visibility of patient advocacy groups in recent decades. Such groups ask to take part in decision-making regarding not only therapy but also research protocols and medical ethics. A seminal work in this context is a sociological investigation published in 1996, which shows that non-scientist AIDS activists gained enough of a voice in the scientific world to shape medical research.[15] The growing role of patient advocacy groups created a momentum that has had a significant impact on communication strategies and that, according to various commentators, reflects the dominance in recent decades of a more sceptical attitude towards doctors, scientists, and other experts. It also brought about new concepts of the rights of patients that are the basis of current bioethics debates.[16] Patients' mistrust is combined with another media-related phenomenon that is relevant to those operating in the biomedical field: the so-called medicalisation of scientific news, according to which news relevant to biomedicine not only dominates public communication of science, but also (despite not always having been dominant) has become the prototype of science in collective perception.[17]

In such a framework, in which lay knowledge is more highly valued and public priorities are seen to be relevant to science, one has to consider the difficulties arising in the implementation of more dialogic science communication practices. While there is no doubt that requests from non-experts to take part in decision-making relating to science and technology are a current issue, it is hard to say whether the practices aimed at strengthening participation and public engagement are just rhetorical devices that do not reflect true empowerment.[18] Besides, not everyone may be in favour of giving non-experts opportunities to shape and transform scientific research. The solution is not simple. Without doubt, however, the answer to these challenges cannot be found in a diminished, restricted interaction between scientists and citizens, now intrinsically unfeasible, but in reinforcement of the public forum for debate.[19] Whatever the dynamics of social control over science may be, the dialogue between researchers and citizens will only function if there emerge new science mediators who are able to handle communication processes that reflect a multidirectional and more dynamic interaction with participatory audiences. This scenario requires that communicators and journalists fine-tune, or in many cases acquire, new relational skills and, at the same time, possibly generate content in an even more specialised manner than today.

Science journalism and information systems

Digital platforms and social networks have introduced a series of innovations that have brought into question the legitimacy and usefulness of a great part of traditional journalism.[20] This is also true for science writing, as shown by many recent analyses on how the landscape of science journalism is changing in the digital era.[21-26] The emergence of scientific blogs, written by researchers or science enthusiasts often willing to generate quality content without demanding adequate compensation, together with the ever-increasing trend for universities and research centres to communicate directly with their audiences, bypassing mediation by journalists, strongly compete against the work of professional science writers. In addition to competition from bloggers and institutions, science journalists, like other journalists, face new challenges, which include the learning of multimedia and digital skills, tighter deadlines, and a 24-hour news cycle. Professional science writers are paid less than before, work under more stressful conditions, have fewer opportunities to get inside a newsroom (because the newspaper sections dedicated to science and technology are often the first to be cut), and must acquire new technical expertise not required in the past.[27]

New roles and professional practices

In response to the above-mentioned trends, new models of science journalism education are currently being studied.[28,29] The future of journalism education in general is also being discussed. Possible scenarios include creating digital-first journalism schools to promote greater collaboration between practitioners and scholars in order to define new curricula.[30,31]

Among the most interesting projects that resonate with the debate on scientific and healthcare information is so-called knowledge-based journalism, whose distinctive features were outlined in 2015[32] by American researcher Tom Patterson, director of the Journalist's Resource project of Harvard Kennedy School's Shorenstein Center. According to Patterson, the problem of the decline in news quality requires a new way for journalists to relate to knowledge, in other words a new way to employ knowledge and practices traditionally linked to the academic world, and in particular to science, in order to produce "journalistic" content. This creates a scenario

Table 1. Differences between conventional and emerging science journalism

Type of journalism	Main roles	Main competencies	Main mission
Traditional science journalism	Translator of scientific information for lay persons	Writing, knowledge of scientific disciplines, storytelling	To popularise science in order to stimulate comprehension of scientific advances for the sake of economic and social progress
Emerging and future science journalism	Curator and generator of new knowledge	Multi-media and digital production, numeracy, multi-disciplinarity, understanding of social media	To penetrate the social, political, and economic dimensions of the knowledge-based society

wherein journalists become producers of new knowledge, and not simple mediators.

Other research suggests that journalists should acquire new skills such as audience analysis, the ability to read and interpret data and statistics, and the comprehension of metrics.[33] More broadly, such studies reinforce the idea that there are many opportunities nowadays to create models of journalism informed by the scientific method, especially with the rise of the web.

Another area of discussion, focussed more specifically on science communication, underlines that future science communicators need multidisciplinary skills to penetrate the social, political, and economic dimensions of the knowledge-based society.[34] It is no coincidence that some researchers believe that today "the challenges of independent science journalism lie more than ever in interpretation and contextualisation, or, as we might say, information about information".[35] However, it is also true that one of the most obvious recent changes in public communication of science is the rise of public relations activities – and of active suggestions of communicative content and materials – as an increasingly meaningful component of research institutions' communication initiatives. This means more professional opportunities for science writers, although at the same time it marks a "shift from a logic of journalism towards a logic of corporate communication".[36]

In a more general context, one needs to consider the extent to which all these considerations are reflected in the reality of present-day production. There are few studies on this topic, but it is worth mentioning research from a few years ago which mapped the ecosystem of online science journalism in US and UK elite media. The people behind the research concluded that, compared to over 10 years ago, present-day science journalists play a plurality of roles, "including those of curator, convener, public intellectual and civic educator, in addition to more traditional journalistic roles of reporter, conduit, watchdog and agenda-setter".[37] They also underlined that, compared to traditional science journalists, online science writers established more collaborative relationships with their audiences and sources and, in general, showed a more critical attitude towards scientific communities, industry, and political organisations. Table 1 summarises the differences between conventional and emerging science journalism.

Conclusions

More specialised and closer to scientists' ways of thinking and working, yet at the same time more oriented to social media and more interactive. More precarious, more independent of newsrooms, but freer to propose themselves as opinion leaders. More concerned with the issues of science democratisation, but also more integrated in and suitable for the promotional logistics of research institutions. Endowed with the traditional professional tools of the translator, but also driven to broaden their horizons towards a multidisciplinary approach and the acquisition of technical and productive skills belonging to the online world. The picture of science journalists of the future that emerges from this review of research and discussions reflects an ecosystem inhabited by an increasing number of true techno-scientific hybrids. There is probably still a long way to go before a new professional identity for those who were once called science writers is defined, but it is clear that if new professionals want to maintain a significant role in the public discourse on science, they can't, as in the past, refer only or almost only to the tools of the translator to characterise their profession. They will have to carry out tasks that are increasingly more varied and less linear. ■

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Can a medical writer submit a manuscript on behalf of a corresponding author?

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Abstract
Medical writers are frequently asked to submit manuscripts to journals using the corresponding author's login information. However, according to the Recommendations of the International Committee for Medical Journal Editors, this is not acceptable. This can put the medical writer in an awkward position of having to disregard the Recommendations or refuse and possibly upset the client. This article discusses some possible solutions.

In addition to writing publications, medical writers are frequently asked to submit manuscripts on behalf of the corresponding author. This happens because the corresponding author is often too busy or does not have sufficient experience or English language skills to handle uploading the article and other tasks required for submission. Typically, the corresponding author will provide their login information to the medical writer. This is common practice, but is it acceptable?

The Recommendations of the International Committee for Medical Journal Editors (ICMJE), the main ethical guidelines on authorship for journal articles, state:[1]

> *The corresponding author is the one individual who takes primary responsibility for communication with the journal during the manuscript submission, peer review, and publication process, and typically ensures that all the journal's administrative requirements, such as providing details of authorship, ethics committee approval, clinical trial registration documentation, and gathering conflict of interest forms and statements, are properly completed, although these duties may be delegated to one or more co-authors.*

In other words, having a medical writer complete the submission on behalf of the corresponding authors is *not* considered acceptable. In practice, though, it is difficult for a medical writer to refuse to do this for a client. What are the options?

Option 1: Insist that the corresponding author completes the submission

The best solution to this problem is to insist that the corresponding author complete the submission. Unfortunately, the corresponding author is often not chosen for their availability, ability to communicate in English, or ability to manage the submission and correspond with the journal. Instead, the corresponding author is often the first author and therefore considered an "honour role", making it difficult to shift the corresponding authorship to a secondary author.

In this situation, the medical writer should explain that the corresponding author is a *functional* and not an honour role, describe the responsibilities, and insist that not being able to perform them will create severe problems for the article's publication. If this approach does not work, the medical writer can (very diplomatically) explain that this could be considered an ethical breach by the journal and grounds for rejection or later retraction. Many clients and corresponding authors will appreciate this advice, although others will not, which can strain the relationship between the medical writer and the client.

Option 2: Grant authorship to the medical writer

An interesting alternative might be to include the medical writer as a co-author. This would allow the medical writer to serve as the corresponding author or to perform the tasks on the corresponding author's behalf.

This implies that the medical writer can fulfil the ICMJE's requirements for authorship, which are:[1]

1. Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND
2. Drafting the work or revising it critically for important intellectual content; AND
3. Final approval of the version to be published; AND

4. Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Whether medical writers can fulfil these requirements and be listed as an author continues to be debated.[2-4] Medical writers clearly fulfil the second ICMJE criterion and can fulfil the fourth, which basically means that if contacted about the study or article, the medical writer must provide contact information for someone who can provide answers. Granting authorship to a medical writer therefore largely depends on whether they have fulfilled the first and third criteria. In my experience, medical writers always fulfil the first criterion (substantial contributions) because they have to interpret the data, although they may not wish to fulfil the third criterion (agreement to be accountable) because they do not want to act as a guarantor for data or conclusions not their own.

Even in cases where a medical writer can and is willing to fulfil all four criteria – and therefore should be granted authorship – clients or co-authors are often unwilling. Some journals, such as *Dermatologic Surgery*,[5] have tried to address this and improve transparency by requiring that medical writers be listed as authors.

Option 3: Change the system to reflect reality and Good Publication Practice (GPP)

In practice, the corresponding author often needs the assistance of a medical writer to upload the files and complete the submission. Changing the ICMJE Recommendations to allow a medical writer to perform these tasks would avoid this awkward situation. In fact, GPP,[6] the main ethical guidelines for industry, states:

With the corresponding author's permission, and if allowed by the journal or congress, a medical writer (or an appropriately supervised delegate) may complete the administrative tasks associated with submitting the publication to the journal or presentation to the congress.

This means that journals are the only barrier to allowing medical writers to upload articles on behalf of corresponding authors. Therefore, to avoid this complicated situation, two things should happen: (1) journals should update their submission systems to allow medical writers to upload articles and (2) the ICMJE Recommendations should be brought in line with GPP.

Conclusions

Should a medical writer submit a manuscript on behalf of a corresponding author? According to the ICMJE Recommendations, no, but according to GPP, yes. To sort out this mess, journals should update their submission systems to allow it, and ICMJE Recommendations should be brought in line with GPP.

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Abstract

Today's world of research and development could not survive without the help of competent medical and scientific writers. The need for such services has increased steadily over the past decades, and pharmaceutical companies as well as academic institutions rely heavily on the contributions made by both internal and external science writers. Many medical and scientific writers are of non-native English origin but are nonetheless expected to deliver high-quality work, both from a science and language perspective. This is not always easy, and it may be worthwhile to consider some of the difficulties that writers with a language background other than English may encounter.

Working as a medical writer in Basel, Switzerland, I have been dealing with such issues for many years. With this article, I wish to draw attention to the main pitfalls encountered, with the aim of helping to improve the quality of medical and scientific texts produced by non-native English speakers.

Does it make a difference whether or not you have learned a language in your childhood? It goes without saying that someone who plays an instrument well will be able to produce pleasant music. This works for languages too. Thus, writers who do not have a good command of the English language will find it harder to write with virtuosity. On the other hand, many non-native English speakers are careful writers because they are far more conscious of possible mistakes than are their native English colleagues. Many writers of non-English origin have learned the English language systematically and thoroughly and may thus be able to name the underlying rules and principles far better than those whose mother tongue is English.

Nonetheless, there are some typical problems

To be or not to be – Are medical and scientific writers of non-native English origin at a disadvantage?

encountered by science writers whose native language is not English. These are referred to as English-as-second-language (ESL) mistakes (Table 1). Please note that the list in Table 1 is by no means exhaustive; depending on your experience and working field, there may be other issues experienced. You may wish to consult the self-help guide titled "Mastering Scientific and Medical Writing"[1] that provides more details and helpful examples relating to most of the issues described here.

The following sections address those issues I consider to be most troublesome to scientific communicators with a language origin other than English.

Choice of correct verb tense

As pointed out in Table 1, using the correct tense is one of the most important aspects of clear scientific writing in English, in that unambiguous distinction between *new* and *old* knowledge is mandatory. This is in contrast to some other languages, e.g. German, where the tense appears to be less critical to meaning. The main tenses used in science reporting are the present tense and past tense, with other tenses, such as the perfect tenses or future tense, used rather sparingly. Essentially, we merely have to know when to use the present or past tense (Table 2).

In scientific documents, the present tense indicates known facts, general knowledge, or established findings. We usually have no problems identifying known facts and general knowledge because they concern, to all intents and purposes, information with which we tend to be familiar. Here are some examples:

Today's analytical methods differ markedly from those used 10 years ago.

Vaccination in children prevents the spread of childhood diseases.

MRSA infections are difficult to treat because they resist the effects of many common antibiotics.

However, it may be more difficult to recognise *established* findings. The textbook definition of an *established finding* is "any result that has been published in a credible primary source". But what is a primary source? And what makes it credible? Primary sources are documents that provide a full description of the original research. For example, a primary source could be a journal article reporting original research findings. A secondary source could be an article commenting, analysing, interpreting, or contradicting these research findings. A good example of a secondary source is a review paper that usually includes all current and pertinent studies in connection with the research question addressed. The definition of *credible* is, of course, somewhat more arbitrary. Within the sciences, a credible source could be a peer-reviewed journal or other recognised scholarly source, such as an article issued by a university publisher.

For describing the materials and methods applied in the study being reported, we apply the past tense since this section gives an account of how the work was conducted. Although some authors would argue that their method should be viewed as a general *recipe* and should, therefore, appear in the present tense, method description for the current study must be in the past tense even if the method used is an established procedure.

The use of the past tense to describe new findings, including our own, is perhaps the most important aspect of proper writing. By using the past tense, you indicate to the reader that these are new, previously unpublished findings. Many authors are highly enthusiastic about their findings and are tempted to use the present tense for reporting them, as in "The new method is superior to the old one." This is clearly incorrect since the finding is neither published nor a generally known fact. Here are some examples of proper use of tense when reporting results:

Method A was superior to Method B in our study.

We observed large intra- and interindividual variability.

The authors concluded that the trial population was too small and terminated the study prematurely.

When you refer to a table, figure, or other visual aid contained in your manuscript, make sure to use the present tense, e.g.

Table 2 lists the individual percentages.

Figure 1 shows the concentration versus time profile.

Appendix A contains the raw data.

It helps to use active voice in such sentences since the passive voice may encourage erroneous use of the past tense. Thus, we have two good reasons for applying the active voice here (see also below).

Finally, make sure to use the past tense when referring to other researchers or attributing previous findings to other authors:

Jones et al. reported similar findings.

Miller et al. did not use the same study design.

Some authors prefer to use the present perfect for attributions, as in: *Jones et al. have reported similar findings.*

This is not wrong by any standard, but if we want to limit the tenses to the simple present and simple past, it makes sense to use the past tense also in attributions.

Avoiding wordiness

Wordiness is a serious problem in science writing because unnecessary words obscure the message. Inexperience and language problems may be the cause of wordiness and redundant text because a more eloquent formulation may not be to hand. Uncertainty about the significance of our findings may also lead to wordiness; the author may welcome the vagueness resulting from using overly long sentences in the absence of a clear understanding of the results. Remember though that science writing is about informing, rather than confusing, the reader. Any unnecessary word may get in the way of clarity. With this in mind, wordiness must be avoided and any unnecessary word or filler discarded. Table 3 provides a few tips on how to avoid wordiness in scientific texts.

Active versus passive writing

Barely another topic is as heatedly debated as active versus passive writing. For some reason, many authors hold a strong view on the tradition of passive writing, and sometimes they can hardly be convinced of the many advantages of active writing. Proponents of passive writing claim that the *doers* (e.g. the scientists) are not of relevance, and the main emphasis should be on the outcome. Although the notion of modesty is appealing, this view no longer complies with the scientific community's expectations. These days, our peers demand to know who carried out the

work reported, and they require the transparency and clarity that comes with using the active voice. However, the active voice is more than just using the personal pronouns *I* or *we*; it also concerns the use of active verbs in place of the ubiquitous verb *to be* (see also Table 3).

Let us look at some examples:

The trial was conducted in 30 healthy subjects. (passive voice)

We conducted the trial in 30 healthy subjects. (active voice using the personal pronoun "we")

The trial involved 30 healthy subjects. (active voice using an active verb)

What are we learning from these statements? The first sentence tells us that someone had conducted a trial in 30 healthy subjects, but we do not know whether or not the authors themselves carried out the study. The second sentence makes this clear by using the personal pronoun *we*. The third sentence would actually win the top prize in a competition of word economy and clarity, although it remains unclear who carried out the study. This may become clear from the context if the authors generally use personal pronouns in the article.

It is good advice to apply the active voice wherever possible and to limit the passive voice to statements that are more *natural* in the passive than the active. Consider a sentence like this:

After the terrible accident in the mountains, he was rushed into hospital by helicopter. (passive)

Although you may be able to rephrase the sentence in the active voice, especially if you were the nurse or pilot involved, there is little sense in making a truly passive situation grammatically active. The rule usually applied in science writing states that no more than 30% of all verbs in the article should be passive.[2] In a standard research paper, we tend to use most of the (allowed) passive verbs in the section describing the methods. Here, active sentences involving *we* are sometimes stilted if used throughout.

In conclusion, the best guide is your common sense, as long as you use the active voice in the majority of your sentences.

Non-essential and essential clauses

The pronouns *which* and *that* introduce either a non-essential or essential clause. This seems easy enough – all the more surprising that erroneous use of these two pronouns causes considerable confusion in medical and scientific texts. Life used to be fairly straightforward when *which* exclusively introduced a non-essential clause and *that* was reserved for the essential clause, but this rule appears to have gone out of fashion. This, in

Table 1. The most common English-as-second-language mistakes in science writing

Trouble makers	Comments
Choice of tense	The choice of tense is critical to the meaning in English science writing, contrary to other languages (e.g. German). The present tense indicates known facts or established knowledge or both. The past tense indicates new findings, including your own.
Wordiness	The tendency to use two or three words when one would do is a common English-as-second-language (ESL) mistake. Quantity does, however, never compensate for quality, and short sentences help to make messages clear.
Passive writing	Language uncertainties may predispose to passive writing. Passive writing tends to make statements longer and vague; thus, active writing almost always conveys the message more readily.
***Which* versus *that* (non-essential and essential clauses)**	*Which* and *that* are frequently used pronouns in scientific texts. *Which* is used when the information being added is not essential to the meaning of the sentence (non-essential clause). If you use a *which clause*, be sure to separate it from the main sentence with a comma. *That* is used when the information being added is essential to the understanding of the sentence.
Use of *respectively*	Few words cause as much confusion as does the adverb *respectively*. *Respectively* should be used exclusively in sentences where there is a clear relationship between pairs of variables.
Translating terms (*lost in translation*)	Translating terms from other languages may be a problem if the target language is not our mother tongue. A thesaurus may be helpful, but it can become a problem when homonyms (words with identical spelling but different meaning) are not understood. Make sure you have a firm understanding of the definition of a word before you try to find an alternative.
Definite versus indefinite article	The only definite article in the English language (*the*) is used when referring to something known by both the writer and reader. If you discuss a specific method, you would refer to it as *the* method. In contrast, the indefinite articles (*a* or *an*) are used with nouns that are not specific. For example, you may develop *a new method* that subsequently becomes *the* method in your text. *A* is used for words that begin with a consonant sound (e.g. a method), and *an* is used for words that begin with a vowel or vowel sound (e.g. an analysis or an hour).
Transitional phrases	Over-reliance on transitional phrases gets in the way of conciseness and clarity. If two statements are logically related, do not use a transitional link. For example, "The pharmacologists determined the pharmacokinetics of the new drug. Consequently, we obtained values for the half-life." Here, *consequently* is unnecesary because the causal relationship is clear to the reader.
Positioning adjectives and adverbs (syntax)	Adjectives used in a series usually follow a specific order: 1. article, 2. judgement, 3. size, 4. age, 5. shape, 6. colour, 7. nationality, and 8. material. Thus, "a tall, 20-year old French patient" would be correct. Keep adverbs close to the verb to avoid confusion. In the past, placing an adverb between the infinitive (known as a split infinitive; e.g. to quickly determine) was not acceptable practice. Nowadays, you may split an infinitive if you have a good reason for placing the main emphasis on the nature of the action (e.g. to randomly allocate patients to treatment groups). In most situations, however, we are still on safer ground when placing the adverb after the verb.
Vague statements	Writers who are insufficiently confident in their writing skills tend to avoid definitive statements. Non-committal messages are, however, not compatible with the accuracy we apply in science and medicine. Do bear in mind that you facilitate the transfer of the intended message by using clear and definitive statements.

Abbreviation: ESL, English-as-second-language.

Table 2. The* tense *rules

Part of paper	Tense
Established knowledge, previous results, generally known facts	Reported in the present tense
Methods applied, materials used in the current study	Reported in the past tense
Description of results	Reported strictly in the past tense
Description of tables, figures, and other displays	Referred to in the present tense because they are part of the actual report or manuscript
Attribution	Given in the past tense, but the present perfect may also be used

turn, leads to the liberal use of *which* in essential as well as non-essential clauses. The distinction is, however, important because of the commas that are needed in case of a non-essential clause. Let us look at an example:

The cells sedimented to the bottom of the tube which was associated with a change of colour.

Does *which* introduce an essential or non-essential clause? The statement is ambiguous because it is not entirely clear whether *which* refers to the bottom of the tube or the process of cell sedimentation. A useful test is to replace *which* with *that*; if the message of the sentence remains unchanged, *which* introduces an essential clause.

The cells sedimented to the bottom of the tube that was associated with a change of colour.

From a grammatical point of view, this sentence makes it absolutely clear that the bottom of the tube changed its colour. But is this what the author intended to say? It is highly unlikely that a glass tube changes its colour simply because cells in the mixture sedimented to the bottom of the vial. Thus, *which* in the original sentence most likely introduces a non-essential clause that must be separated from the main sentence by a comma. If we place a comma before *which*, the reader knows that the colour change was the result of cell sedimentation.

The cells sedimented to the bottom of the tube, which was associated with a change of colour.

If there is any doubt about such a sentence, rephrase it completely. The above sentence could be rewritten as follows:

Cells sedimented to the bottom of the tube, resulting in a change of colour.

Table 3. Strategies for eliminating wordiness

Tip	Examples
Avoid *there is*, *there was*, or *this is* etc., at the beginning of the sentence. Use action verbs rather than forms of the verb *to be*.	It was our intention to study the in vitro mechanism of gastrointestinal absorption. (wordy) We intended to study the in vitro mechanism of gastrointestinal absorption. (revised)
Use active rather than passive voice because active sentences are clearer and usually shorter.	The results were analysed using several statistical tests. (unclear because passive) We analysed the results using several statistical tests. (revised)
Make the real subject the actual subject of the sentence; make the real verb the actual verb.	In their review, there is ample evidence of the discrepancy in findings reported by the various institutions. (wordy) Their review clearly documents the discrepancy in findings reported by the various institutions. (revised)
Limit multiple adjectives and adverbs	The stain we observed was large, red in colour, irregularly shaped, and very extended. (wordy) We observed a large red stain of irregular shape. (revised) The effect was very highly statistically significantly more pronounced in the second experiment than the first. (wordy) The effect was significantly greater in the second than the first experiment ($p = 0.001$). (revised; actual p-value given)
Avoid redundancies, e.g. *in my personal opinion*, *for the purpose of*, *in an attempt to*, *at the present time*, etc.	At the present time, there are no guidelines with regard to quality assurance of these proteins as far as we know. (wordy) Currently, no guidelines exist for the quality assurance of these proteins. (revised)
Delete unnecessary phrases and clauses, e.g. *in the event that*, *due to the fact that*, *the reason why is that*, etc.	Because of the fact that there were many leaking cells in the event when they were incubated overnight, the incubation times were adjusted by means of shortening them for subsequent experiments. (wordy) Because many cells leaked in overnight incubations, we shortened the incubation times in subsequent experiments. (revised)

Or: Cell sedimentation to the bottom of the tube led to a change of colour.

Here is another example:

Our laboratory, which has two dark rooms, is located in the city centre. (non-essential clause)

Our laboratory that has two dark rooms is located in the city centre. (essential clause)

The first sentence tells us that the laboratory is located in the city centre, and that it possesses two dark rooms. The latter information is, however, not essential to the main message. The main sentence simply says that the laboratory is located in the city centre. In contrast, the second sentence implies that there are several laboratories, and the one that has two dark rooms is located in the city centre. If you were to replace *that* in this sentence with *which*, make sure not to use a comma before *which*. If you use a comma nonetheless, your sentence is misread as to imply the meaning of the first example above.

The rule then would be to be sensitive to the change of meaning that occurs by using or omitting a comma. To make things easier, at least for you as a writer, stick to *that* in essential clauses and reserve *which* for non-essential ones.

Use of *respectively*

The word *respectively* is frequently misused by native and non-native English-speaking authors alike, and, as with the other elements described above, its misuse can lead to confusion and ambiguities. The main reason for such misuse is the fact that other languages have a word that resembles *respectively* but may mean something else. For example, the German *respektive* usually simply means *or* in English, and *respectively* is thus inappropriate.

A sentence without *respectively* is often clearer, but if we wish to economise on words in sentences containing two corresponding lists, the term *respectively* may be useful. Here is an example:

The mean time to disease progression in groups 1 and 2 was 5 weeks and 9 weeks, respectively.

This means that the patients in group 1 experienced disease progression after a mean of 5 weeks, while those in group 2 had a mean time to progression of 9 weeks. When describing a term that is shorter than *the time to disease progression*, such as average weights for example, *respectively* is not necessary.

Mean body weight was 72 kg in group 1 and 83 kg in group 2.

This is preferable to a construction with *respectively* because the sentence without *respectively* is shorter and is readily understood anyhow. Thus, the rule would be to use *respectively* sparingly, i.e. only in those situations where the word helps to clarify the relationships. In sentences that are clear without the additional *respectively*, do not use the term.

Lost in translation

Nowadays, most biomedical and other scientific publications are written in English. Authors who are insufficiently acquainted with the English language sometimes opt for their native language when drafting a manuscript. In a second step, the text is translated into English, usually by a professional translator or colleague whose native language *is* English.

Clearly, the quality of the final manuscript depends substantially on the language skills of the translator. You may have written an impressive paper in your own language whose beauty may be lost in translation. Thus, translators should be selected with the greatest possible care. In most cases, it does not suffice to know the language well; for the translation to be accurate and precise, the translator must fully understand the science and concepts described. Many terms may be correctly translated but may be inappropriate for the intended meaning. In this way, ridiculous, if not dangerous, confusion may arise. An example that springs to mind is the frequently used phrase *not statistically significant*. In a translation from German to English, the translator had used the term *statistically insignificant*, which is linguistically correct but scientifically inappropriate. If statistical testing revealed the absence of a statistically significant difference between groups, the result is said to be *not statistically significant*. To call this finding *insignificant* is incorrect because the result may be of considerable meaning and significance although it was not statistically significant.

In short, *correctness* and meaning are two different things, and the professional who transfers your reasoning into another language must be able to fully understand the meaning that you have intended. Much confusion in medical and scientific papers originates from careless, incomplete, or even incorrect translation. Authors sometimes have an insufficient understanding of a term even in their own language; thus, when translating it with the help of a dictionary or thesaurus, they may pick the wrong translation for the term. In addition, words may have the same spelling and pronunciation, but their use may vary considerably. Writers with a language origin other than English have a disadvantage here because correct usage of terms clearly comes from experience. Moreover, not being familiar with the proper use of terms can predispose to rather exotic translations involving fancy words and uncommon formulations. Remember, we do not show off our scientific writing skill by using words that no one knows; rather we impress readers if we succeed in conveying the message with few (well-known) words and short sentences.

Literal translation of scientific texts often results in complicated, long, and obscure sentences. English is a highly precise and powerful language requiring fewer words than others to express informative contents. At any rate, every manuscript written by non-native speakers of English should be scrutinised for spelling and grammar mistakes, and an experienced writer or editor with a sound knowledge of English should edit the article before submitting it for publication.

In conclusion, are medical and scientific writers of non-native English origin really at a disadvantage? It seems reasonable to conclude that the drawbacks these writers may have is compensated by their vigilance and awareness of potential pitfalls. Finally, good writing comes from fully understanding the subject you write about, coupled with the willingness and ability to apply the principles of clear writing.

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Author information

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Winners of the Geoff Hall Scholarship Essay Competition

The Geoff Hall Scholarships (GHSs) are given in honour of a former President of EMWA. Geoff was a very special person, an extremely valued member of EMWA, and a very good friend to many EMWA members. He firmly believed that the future of EMWA lies in our new and potential members, and so it's a very fitting legacy that we have the scholarship awards in his memory.

The scholarships are awarded annually on the basis of an essay competition, and the title of this year's essay was "Good Medical Writing Saves Lives". There were even more entries than last year, and it was not an easy task to choose just two winning entries. However, two were eventually chosen, and the very worthy winners were Sophia Whitman and Cirsten Verleger.

FOR CORRESPONDENCE

Lisa Chamberlain James
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Sophia Whitman obtained degrees in immunology and psychology, and then went on to coordinate studies in the field of health psychology, which gave her an appreciation of the importance of robust research. She then left this career to follow her dream to become a doctor. The reality was very different and she began to look for a career where she could still make a difference to patients' lives without sacrificing the quality of her own life. Following the birth of her son, she took part time work as an intern medical writer with Stgilesmedical. She gained a wide range of medical writing experience and was offered a permanent position after 6 months. Sophia tells me, "entering the competition for the GHS was not so much an essay writing exercise, but more like a personal mission to justify the incredibly hard decision I took to leave medicine. I also found the process of writing the essay had crystallised what I enjoyed most about medical writing and facilitated my decision to take the next step along my career path".

Cirsten Verleger trained as a doctor in Germany, and then went to the UK and France to work as a junior doctor. She had been in love with foreign languages since her adolescence, and working in the UK and France brought this love to full blossom and led her to change careers to become a translator for medical and pharmaceutical texts with a degree in business translation. Cirsten explains, "Since I experience the importance of good medical writing on a daily basis during my work as a translator, I couldn't agree more with the title of this year's GHS Award: Good Medical Writing Saves Lives. I know first-hand how easily a message can become ambiguous by grammatical carelessness and I am passionate about well-structured texts that help the reader to follow the narrative in the best possible way. Being one of the two winners of this year's award is first of all a great honour for me. It is also very encouraging and a wonderful jump-start into my new career as a medical writer. I am very much looking forward to regularly attending the EMWA conferences and to engaging fully in EMWA's rich training programme in the upcoming years."

Sophia's and Cirsten's winning essays are presented overleaf, and we wish them the very best at the start of their very promising medical writing careers. For those of you inspired by their achievements, this year's essay title is "Creative Medical Writing: An Oxymoron?"

I hope to read your essays soon! Bestest.

Lisa

Good medical writing saves lives: The perspective of a former medic

Making the decision to leave medicine was the hardest of my life. What if all those years of study, thousands of pounds of debt and sacrifices I made were not wasted but instead prepared me for my most gallant career yet – medical writing? Believing the statement "good medical writing saves lives" is how I sleep at night. The objective of this essay is to substantiate this claim with evidence, so I can obtain some solace that the decision I made 3 years ago was justified.

Some of the first examples of how good medical writing saves lives come from the great physicians such as Hippocrates and Galen, who were the first to chronicle their medical findings and methods. This historic medical writing allowed the emerging knowledge to be perpetuated and developed into what we know as modern medicine. It served as the progenitor for all medical teaching and the number of lives it has saved is unquantifiable.

Medical writers today are tasked with translating the increasingly complex scientific research for myriad audiences. If this writing is of good quality, examples of how it can save lives may include effective drugs reaching patients quicker, more health care professionals learning about current research that affects their patients, and patients themselves becoming equipped with the knowledge to recognise the signs of life-threatening disease earlier.

Taking the first example above, what difference does good medical writing make to the availability of new drugs? To have a New Drug Application approved by the US Food and Drug Administration, a drug sponsor must submit a vast array of documentation about the drug's pharmacology, the results of multiple animal and human studies, and how it is manufactured, processed, and packaged.[1] Medical writers are employed either directly or via an agency to prepare these materials. They are responsible for the interpretation of the data and conveying the key messages accurately and succinctly. Failing to scrupulously review the data could lead to, for example, missing a correlation of increasing levels of liver enzymes with higher doses of the drug, or misplacing a decimal point in a p-value of a significance test comparing the regression of tumours between the treatment and control group.

The rapidly advancing progress in the treatment of melanoma – considered the deadliest form of skin cancer – is an example of how medical writers are instrumental in saving lives by ensuring the right drug reaches the right patients in a timely manner. Promising new immunotherapies and gene-targeted drugs are in the pipeline[2] and medical writers are optimising the development process at each stage: from preparing the regulatory documents for the US Food and Drug Administration, to assisting with the efficient publication of the research. Once approved, medical writers become involved in the delivery of a salient message to educate health care professionals involved in the treatment of melanoma patients. In addition, writing the patient education materials, including the potentially serious side effects of the drugs, empower patients to make informed decisions about their treatment. Once the drug is post-marketing, medical writers continue to play an important role in the surveillance of the drug's safety and feeding this back to the relevant regulating bodies.

What happens when medical writing is of poor quality? Just as how good medical writing saves lives, poor medical writing can lead to the loss of lives. One of the most infamous examples being the measles, mumps and rubella (MMR) vaccine scare, engendered by the publication of erroneously interpreted data and this message being propagated by the media. In 1998 an article was published in the Lancet claiming that the MMR vaccine was responsible for the development of autism.[3] These were picked up by reporters who sensationalised the message, while at the same time neglecting to report the more robust research published that completely disproved the link.[4] Since this controversy, which peaked in media coverage in 2002, the fall in uptake of the MMR vaccine has correlated with the many outbreaks of measles and mumps, with the most severe being in Swansea where 800 people contracted measles and one person died.[5]

The work of good medical writers described in this essay alone will save hundreds of lives per year. Compare this to the estimate that a general practitioner will save approximately 4.71 lives per year[6] and suddenly the medical writing profession draws gravitas and the size of the responsibility they bear swells. As the discontent of doctors in the NHS intensifies,[7] perhaps more will choose to apply their knowledge by becoming medical writers; a profession reported to have a high level of satisfaction.[8] This essay has described some of the ways in which good medical writing saves lives: I may have traded my stethoscope for a keyboard but my passion and commitment to bring real benefit to patients has never been stronger and the responsibility I bear has never been greater.

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Good medical writing saves lives – and even a little comma can make a difference

Hello, I am a comma, and I dedicate this essay to the medical writer who gave my life a new meaning and direction. He might even have saved me. I was in quite a depressed state because people did not seem to care about me anymore. Then this guy came along and offered me a completely new perspective. Let me proudly add that I helped save the lives of many patients during the adventure I am going to tell you about.

The first day – a non-defining relative clause

I was hired by the medical writer because he needed to insert a comma in a text he was editing. The text was about HLA-compatibility testing in people considering bone marrow donation for patients with leukaemia. Before I came in, the text said that "especially first-degree relatives who have a higher probability of being HLA-compatible will be tested".

Having read this, I wondered how many first-degree relatives might be put off getting tested since they would not know if they fulfilled this criterion and would not know how to find out. Of course, the sentence meant to say that any first-degree relative would fall in the category of priority testing. Fortunately, together with a befriended comma, I was able to fix the sentence; it then read: "especially first-degree relatives, who have a higher probability of being HLA-compatible, will be tested". This sounded much more encouraging for first-degree relatives to undergo testing, I would say.

Luckily, the text had not yet been published, translated, or copied by other writers, and the mistake had not been propagated and got out of control.

The second day – a clear and concise manuscript

While I was sitting in my text on compatibility testing, I was able to watch the medical writer work on a manuscript about a promising new therapy for some rare metabolic disease leading to premature death. Apparently, the therapy had the potential to turn the so far life-threatening disease into a chronic, non–life-threatening one. Obviously, the researchers who had identified the new therapy were eager to make their discovery available through a renowned medical journal as quickly as possible.

My noble medical writer, though being considerably pressed for time, did not rush, but carefully drafted each paragraph to make the important point stand out. He equally carefully met any editorial requirements. This was clever since writing the draft properly would only take two days longer and was likely to save the manuscript from being subjected to a revision cycle. Anybody knows that submitting a revised version can easily cost months – and thereby the lives of many patients, if you think about it. Additionally, a clear message is more likely to be taken up by fellow researchers, who might then take the research a step further.

I decided that I wanted to help make this important information available to other researchers, doctors, and patients as soon as possible. Unfortunately, it took some time to find a comma willing to replace me in the compatibility-testing text, and so I was late and did not manage to get into the manuscript.

A couple of weeks – catching public attention

But luck was on my side: I saw this other text lying on the desk; it was entitled *Take a moment for life* and started with "You could save the lives of your loved ones just by reading two pages". Who would not want to be in that text? It was not easy to get in, because my medical writer friend never missed any mandatory comma; however, I did find a spot where I could sneak in.

This was such a beautifully drafted text. Subheadings led the reader dutifully through it, and the rhythm created a smooth flow. It did not take long before the text was published – and wow! – I never had so many people visit me. Anybody who read the title wanted to read the text, and anybody who started to read the text read it through to the end. Thousands of readers learned the important message of what to do in the event of somebody suddenly collapsing.

Obviously, medical journalists were happy to draw on this resource, and translators loved it because it was unambiguously written. Thereby, the message was spread even more: in only a couple of weeks, there was nobody on the planet who had not become an expert in this aspect of first-aid.

"[It] was such a beautifully drafted text. Subheadings led the reader dutifully through it, and the rhythm created a smooth flow. It did not take long before the text was published and wow! – I never had somany people visit me. Anybody who read the title wanted to read the text, and anybody who started to read the text read it through to the end".

The climax – arriving at the forefront of research

But the best part of my adventure was still to come. Believe it or not, I made it into a research project worth a few billion dollars. I have to omit the details on how I got there; of course, my dear medical writer played a part in it.

The story is remarkable since one of the main reasons for getting the grant was the good reputation the researchers had gained for their clear and concise publications and for the accurate and reliable reports of their results. It did also help that their research papers were indeed read as important information resources and not merely subjected to data-extraction tools.

I would make the bold claim that the investigation of the relevant therapy might never have received funding – and the patients might never have received this life-saving remedy – if it was not for the fact that some medical writer did a really good job.

Not the end – the future

You probably noticed that I have become a big fan of my medical writer friend. He is a lovely person altogether and seems distinctly happier with his job than were the writers I had been working with before. I hope my essay helps to spread the message: good medical writing does save lives – those of patients, mine, and maybe yours.

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Abstracts from 44th EMWA conference Poster session

At this year's Spring Conference in Birmingham, UK, EMWA held its second annual poster session. Six poster presentations were selected from abstracts submitted to the Educational Committee. Abstracts could be on any subject related to medical writing or of relevance to medical writers. The poster session is an excellent way for EMWA members to see the latest thinking and research in a "snapshot", and has been introduced as an annual addition to the educational offering from EMWA. Entry to the poster session is included in the conference registration fee.

SECTION EDITOR

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P1 - EMA Policy 0070: Perspectives on today's implementation and the expectations for future implementation

Lora Killian, Synchrogenix

Introduction: European Medicines Agency (EMA) Policy 0070 requires regulatory documents submitted as a part of a Marketing Authorisation Application (MAA) as of 01 January 2015 to be made public. Sponsors must anonymise these documents prior to publication. Anonymisation is the act of altering the text so that individuals (patients and study administrators) cannot be personally identified.

Methods: The pharmaceutical industry has experience utilising various anonymisation techniques to de-identify data sets, but has limited experience using these techniques on unstructured data or text based documents. Given this and the fact that anonymisation is being conducted retrospectively on documents that were written prior to publication of Policy 0070, most sponsors are relying upon an anonymisation technique called redaction. This technique requires replacing personally identifying information with shaded boxes.

Results: This method can effectively protect privacy, but it limits data utility – the EMA's primary purposes for publishing these documents. With each submission, sponsors must provide an anonymisation report explaining their anonymisation methods and how data utility was maintained.

I have overseen the preparation of 4,000+ redacted documents. In the past year, I have supported the preparation of 10+ submissions for Policy 0070. I am able to present the challenges with the redaction technique, the challenges created by the anonymization report, and thoughts on the future direction of Policy 0070.

Conclusions: Policy 0070 created a new era in clinical trial transparency. The current method of meeting this requirement is thorough redaction. There are challenges with this technique and balancing data utility, but future innovations will create options for other techniques.

P2 - Orphan drug development: The regulatory writer's role in paving the road to approval

Kelley Hill, Synchrogenix Information Strategies, Inc.

Introduction: Pharmaceutical companies have increasing interest in pursuing development of treatments for rare diseases. Regulatory agencies across the world have offered incentives to encourage drug development for orphan diseases. While most of the same extensive documentation is required as for more common disease treatments, there are additional regulatory processes and document requirements unique to orphan drug development. Regulatory writing is required throughout the process to build the evidence supporting eventual approval of drugs for rare diseases.

Methods: Currently approved documentation and guidance for orphan drug development will be reviewed and summarised. Agency requirements will be compared between the EU and US. Case studies will be identified and presented to provide examples of specific types of challenges.

Results: Unique documentation is required for orphan drug development, from designation of orphan drug status through submission of the regulatory application to agencies. Issues specific to development of rare diseases are known and can be addressed. Similarities and differences between the EU and US will be highlighted.

Conclusions: Developing drugs for the treatment of rare diseases presents a unique set of challenges. The regulatory writer is an integral component of the cross functional development team, providing strategic input and high quality documentation that supports the demonstration of effectiveness and safety required for orphan drug approval.

P3 - Creation of patient-centric patient lay summary in the local language

Satoru Mogami, Rika Morita, Atsuko Shiotsuki Toshiaki Hagi, Hiroe Hasegawa, Chikara Lida, Mina Izuchi, Fumiharu Naganeo, Mikiko Noyes, Junko Tanabe, Kyoko Uno, Medical Writing and Documentation Management, Pfizer Japan

Introduction:
Prior to this project, no patient lay summary (PLS) had ever been developed locally in Japan. Although we had distributed PLSs for two clinical studies, they were originally written in English and translated into Japanese. In order to create a PLS that is more tailored to local patients, we attempted to develop a PLS in Japanese from scratch for the first time in Japan. We will introduce how we developed a PLS, along with the lessons learned during the process.

Methods: We formed two teams: one was for drafting a PLS, and the other for researching and developing a template and patients communication.

A PLS was drafted based on disclosed information including Basic Results. We took a composite approach in refining the PLS by researching lay language and patient-friendly design, ensuring scientific accuracy with experts such as physicians and statisticians, conducting due diligence on regulatory and legal aspect, and incorporating patients' voice by consulting with a local patient advocacy group.

Results: The locally-developed PLS was more patient-centric in language, content and design as well as non-promotional. Our attempt also resulted in a patient-friendly template with default text in Japanese as well as a process document, though some issues still remain to be solved. The PLS was posted on a public website with access limited to study participants.

Conclusion: We successfully created a PLS in the Japanese language for the first time in Japan. The locally-developed PLS was more patient-centric than those translated from another language.

P4 - Medical writing services – review of the selection criteria

Paneet Nand, PHASTAR

Introduction: Outsourcing activities have increased over the last two decades and recent analyses suggest the Contract Research Organisation (CRO) market will grow at an annual rate of 9.83% between 2014 and 2019. In parallel, there is an increased demand for experienced medical writers, but do companies actually know what they are getting when selecting a medical writing service provider? If companies go down the route of selecting a service provider, rather than a freelancer, what attributes qualify and which are considered to be most important? Do these same attributes apply to a freelance writer? This review analyses some of the challenging attributes a service provider may or should consider when prospecting a new client.

Methodology: We selected pharmaceutical and biotech companies that had various R&D expenditure to compare the typical criteria used for evaluating medical writing service providers between high- and low-spending companies.

Results: Fifty-two companies provided information regarding what evidence they would expect to see regarding capability. The results were broken down into seven categories, presenting results in which large pharmaceutical companies followed a strict approach for their selection process; a process where capability focused more than just experience and qualifications.

Conclusion: Many service providers miss and perhaps overlook many aspects of a criteria used by large or small pharmaceutical/biotech companies. Meticulous and rigorous methods are in place, therefore service providers should be detailing and organising the evidence needed to provide assurance for a potential client.

P5 - Commitment to data sharing by pharmaceutical companies: The evolving environment

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Introduction: With requirements for data transparency becoming more extensive, we assessed the status of responsible clinical trial (CT) data sharing by European Federation of Pharmaceutical Industries and Associations (EFPIA) member and non-member companies.

Methods: EFPIA membership was determined for the top 50 pharmaceutical companies by 2014 global sales (EvaluatePharma). Public global company websites were searched in August 2016 using the terms "EFPIA", "data sharing", "clinical trials" and "transparency". If no relevant results were obtained, websites were searched manually for statements relating to CT data sharing and EFPIA compliance.

Results: Of the top 50 companies, 27 were EFPIA members (including three affiliates). A CT data sharing policy was found on all EFPIA member and 4/23 non-member websites, with an explicit reference to EFPIA principles found for 22/27 members and 1/23 non-members. References to all five EFPIA principles were found for 15/27 members and 1/23 non-

P5 - Commitment to data sharing by pharmaceutical companies: The evolving environment *Continued*

members. For EFPIA members and non-members, respectively, references to sharing CT data with researchers were found for 25/27 and 2/23 companies, making Clinical Study Report (CSR) synopses publicly available for 23/27 and 1/23, making CT results available to trial participants for 24/27 and 1/23, publicly certifying the adoption of EFPIA commitments for 26/27 and 1/23, and committing to the publication of CT data for 26/27 and 3/23.

Conclusions: The majority of pharmaceutical companies investigated have publicly committed to responsible CT data sharing. All EFPIA members have made such commitments compared with few non-members.

P6 - Ladles and jellyspoons: involving children and young people in the assessment of informed assent and consent form comprehension

Danielle Yuill, Rachel Barron, GW Pharmaceuticals Ltd, Jennifer Preston, NIHR Alder Hey Clinical Research Facility

Introduction: Writing for lay audiences is recognised as a particular skill in clinical research. However, no matter how experienced the writer, the real experts in lay writing are considered to be the target audience. Listening to patients has been at the heart of GW Pharmaceutical's (GW's) research efforts since the company was founded. In line with this ethos, we sought the opinions of children and young people regarding our informed assent form (IAF) and consent form (ICF) templates.

Methods: Using published best practice techniques regarding formatting and writing style of patient information sheets, we redesigned GW's clinical trial IAF and ICF templates, focussing on overall readability whilst still ensuring compliance with ICH GCP. We consulted experts in the understanding of how children interpret clinical trial information at the Young Person's Advisory Group (YPAG) at the NIHR Alder Hey Clinical Research Facility; requesting their assessment of the overall comprehension of the templates (i.e., format, clarity, readability).

Results: Two IAFs written for children with chronic and debilitating conditions, and one ICF written for parents were assessed. Overall the feedback from YPAG was positive and the templates were considered easy for children to understand. However, guidance was provided regarding design and imagery used in the IAFs, as well as pointing out unnecessary repetition within the ICF. The templates were adjusted accordingly.

Conclusions: Best practice alone is not sufficient when writing clinical trial information for lay audiences. The involvement of lay groups is recommended during trial development to ensure material is fit for purpose.

The daily life of a medical writer in medical devices

A Monday morning

8:55am: red light, keycard, the door clicks, I open it and my dog trots up the stairs. I follow her up and through the common area to my office where she's greeting an officemate who's just back from an off-the-grid holiday in the Balkans. He has his 2-year-old daughter with him because the day-sitter is at the dentist until 9:30. I turn on my computer, put the dog's blanket on the floor, fill her water bowl, and make myself a bowl of muesli from my muesli stash. Back up to the office, my two other officemates have arrived. I log in to my computer and have to change my expired password. The just-back-from-holiday officemate has given me two cans of beer. We have a tradition where we bring each other back local beer and/or wine from our travels. I was in Italy over the weekend so there's a bottle of artisanal Italian beer on his desk from me. I'll be in Bavaria this week, I'll get him something to redress the imbalance. The dog has finished

silently greeting the other officemates and has lay down. The tail is now at rest.

Eight or nine emails: trip reports, company announcements. 1 piece of junk mail. I turn my attention to the immediately relevant: feedback from a Powerpoint presentation I made for some authors. I had sent it to the representative of our company on Wednesday. She's the contact person between me at headquarters and the surgeons at the clinics. I work through the feedback/questions (probably from the surgeon) which strike me as foolish; I'm irritated to have worked hard to make the presentation on their data then have them ask me questions that are the result of having given it only a cursory reading. What other emails? The statistician resolved an issue, good. Something else I can address later; an invitation to an e-learning. I write a testy email to the contact person, hesitate, soften it a bit but don't send it. I complain to my officemate. I get a coffee and return to the office. Other co-workers

have come in and are talking about something work-related; I put on my headphones and a YouTube playlist. Which ongoing paper(s) can/should I work on today? Six are ongoing but four of them are with the authors or contact people either for QC or to resolve ambiguous or contradictory info. That leaves two, both case studies. One co-worker has come in to introduce a new co-worker to my officemate who'd been on holiday.

Has the weekend brought any success? I check on the status of a paper I submitted about a month ago on behalf of the authors. Open the Excel file of author user names and their passwords for various journals, journal website: still "under review". If there had been a decision the authors may not have let me know about it; I've never worked with this author before so I don't know how he is. How about the articles I worked on but that the authors submitted? I open up the draft email where I keep the list, Pubmed, copy and paste the titles: nothing new published. Hope I didn't work on those for nothing. I'm glad I don't get paid per paper. 17 papers I wrote, edited, or proofread were published last year, 11 so far this year. Some of them acknowledged me.

An email from HR. One person cancelled their interview for tomorrow. Still have four interviews to do this week with the other medical writer. I've never interviewed anyone before, but they've applied to be a medical writer and I've been here almost 5 years so I should be able to evaluate them. One would hope. We don't have any decision-making power but we are, after HR vets the CVs, the gatekeepers. They'll have a set time after the interview to do the writing tests we made. Let's see how clearly and concisely they can write. One test is purely to evaluate if they use parallel structure.

I send the toned-down-but-still-testy email to the contact person. I'm ok if they think I'm difficult if it makes them think about their own work before they send questions. I kick the tennis ball. The dog's feet didn't evolve to negotiate smooth wooden floors but she catches it and returns to her blanket.

Departmental coffee break at 10. Twelve people here today. The two smokers go outside; 10 of us, two couches, a large bean bag, and the seven or eight long wooden steps that function like a veranda. The espresso machine's electric grind and the chatter of people in their 20s and 30s.

A Thursday, 11:13 am

Got to work at 8:55 today – flexitime limit is 9am. Emails. R&D is going to take a case study paper off my hands, excellent. They want it right away and we writers all have a backlog of papers. I email them the list of journals I had recommended to the author and confirm that I'm available to proof the English in the manuscript when they're done. It's better this way, R&D will know exactly what the paper is talking about without having to the do the background research that I would.

I'm reading up on cortical auditory evoked potentials (CAEPs) – have to be able to properly edit a paper in which they play a major role. Chatted over Lync with a friend of mine in R&D about them. He wanted to read the article, said he'd look over the paper and return it to me today or tomorrow – a great stroke of luck for me! A day of delegation — very rare! I spent a long time yesterday on the paper, assembling Fig. 2 from over 20 pdfs and extricating the Methods from the Results and vice versa. It's really helpful to have friends in R&D that you can check with.

I have a paper coming up on microphone directionality and wind noise reduction settings or I could start on a case study involving ototoxic medication and bilateral auditory brainstem implants. I start on the former: MD & WNR. Behind me my officemates are discussing CRFs. An officemate keeps mispronouncing "acronym"; it must be hard to spend your workday in a second, third, or even sometimes fourth language. I increase the music volume.

Michael Todd

A Tuesday

What happened yesterday? I emailed back and forth about the CAEP paper with my friend in R&D – got his comments and clarifications. I heartily thanked him (I'll buy him dinner if he and his wife and me and my wife go out to eat again, he's helped me before and the occasional English help I give him seems insufficient compensation) and performed more surgery on the Methods and Results – rewrote and rearranged it so it as clear and follow-able, I hope, as a recipe. Sent it back to the author for her comments before I do the Intro and Discussion. The author and I have a good working relationship, we're on a first name basis, although we're unlikely to ever meet since I don't (thankfully) go to conferences, symposia, etc. other than EMWA conferences. I prefer this sort of total quality approach, this back-and-forth working with the author rather than me getting the paper and writing/editing it in its totality and then sending it back. With some authors that's possible, others not, in which case the paper will probably have an avalanche of comments. Hopefully she'll come back with the answers soon (tomorrow ideally) so I can stay in the mental space of this paper.

The department head came back from a meeting a Belgium. Brought a box of chocolates for the department. One of the research managers made a cake because it was someone in the department's birthday. People noticed that I had changed the department (Clinical Research Department, CRD) office news whiteboard from "CRD

Facebook" to "CRD Gnus" and taped up pictures of gnus. Most people didn't get the, admittedly puerile, joke because the 'g' isn't silent in German.

A Sunday

Thursday, Friday, Saturday, and Sunday: didn't do any work. Thursday, I took a "joker day": I called the office manager at about 8:30am and told him I was taking a joker day. In our department we can do that twice a year if we have no meetings that day. Friday, I don't work. Saturday and Sunday: no one takes work home with them. Departmental philosophy; absolutely no overtime unless there's an exceptional situation. As (non clin eval) writers we almost never have tough and sudden deadlines.

Actually I did do something work-related this weekend: an officemate and I helped another officemate (the fourth officemate was in Zurich visiting a former member of the department) move to a new apartment. On Saturday, the helping officemate and his wife (visiting from Berlin) invited the helped officemate and me for lunch. Homemade gnocchi cooked by an Italian – it's good to work in an international office.

A Wednesday

Bieber-bombed an officemate while he was at a meeting. The two other officemates got into it and put tiny pictures of Justin Bieber under his mouse and on the earpiece of his office phone. He'll take revenge – we deserve it.

A Wednesday

What have I not done today? One of the medical writers is out sick and I wrote a 2-minute summary for her on a case series paper about tip fold-over in cochlear implantation. Interesting study. Had a chat with Rehabilitation about a recently published paper that I had worked on 4 (!) years ago and hadn't seen since. Seems its publication was rather a surprise. A follow-up paper is coming – wonder if I'll be working on it. Hopefully, papers on questionnaire development and validation are easier for me than technical (e.g. eABR) papers.

Five papers I could work on. One paper I'm passively aggressively procrastinating on because I had already written it, then the authors took a close look at the data and changed the study groups (and the data set) so I have rewrite the paper. For one paper I have to implement comments from R&D but that doesn't need to be done in a hurry. Of the other two papers: one is a retroactive study and will probably never be published because of the study design; and the other languished with the authors for over a year for minor corrections. Other papers in my manuscriptsphere are with their authors.

Monday, a heavily edited 7,500-word paper landed in my inbox. It was from a guy in R&D (who knows me from a German class we had – 2 years ago, which is why he's written to me) asking if I have time in the near future to check the English. The journal asked for it to be "checked by a native speaker". He's a co-author. Can he send me a "cleaned version" for me to make the language changes on? This is the first time I had ever heard of the paper. This is not the normal protocol for incoming papers, their distribution is supposed to be top-down but the departmental head is on holiday and the medical writing team leader is coming back from maternity leave and working 5hr/wk. In their absence, we two medical writers have been distributing work between us as seems reasonable, which has worked well. I wrote him back saying ok send the cleaned version and I'll take care of it in the next 1½ weeks. A few hours later the lead author emailed with the clean version and the message to "Please feel free to contact me directly, if you have any questions". Here's someone that's going to be easy to work with.

My checklist

Opening the word file reveals that the subject matter is not the usual thing I work on: the keywords start with "neurotrophic factor; encapsulated cells". Helpfully there is a table of acronyms. German authors – good, that means the study design will be rational. I'll look out for false friends like "control" and "so-called".

I wrote down the sections as a checklist. Yesterday and today I worked through the paper. Checking off sections as I finished them. When I encountered passages where I wasn't sure of the intended meaning, I left comments that started with something like "does this mean the same as…" and then what I thought it meant. When I wasn't sure at all, I highlighted them and moved on. The English is generally excellent.

Sent it to the statistician to check the stats language. Checked the highlight parts with an officemate because he has a PhD in molecular biology. Something like: "*glial cell line-derived neurotrophic factor (GDNF), a distant member of the transforming growth factor-β (TGF-β) superfamily that activates intracellular signaling cascades, was applied via the RET receptor tyrosine*

kinase by first binding the glycosylphosphatidylinositol-anchored GDNF family receptor GFRa1" has a meaning to him. By the late afternoon I had finished and sent it to the author.

The next morning (Thursday)

Lead author replied:

Hello Michael. Thank you very much for your fast and comprehensive revisions! I could follow all your comments and there was always a correct option (contentwise) among your suggestions. Also the comment from your statistician was very helpful. The parts in the introduction, that, as you mentioned, should be moved to the methods section, where "produced" during the major revisions. Otherwise, I will follow your suggestions closely (and try to memorize my false friends ;).

I can't believe that all my suggestions were correct content-wise. That's a really nice email to get. Much better than the one I got a few months ago about an analytical mistake I had made in a discussion section. That generated a published letter to the editor from other authors and necessitated the writing of a response saying *yes, you're right, but…* . The shame.

The *neurotrophic factor; encapsulated cells* paper was a nice diversion. I'm happy, the author's happy, R&D is, presumably, happy. I add it to my list of papers that went out but I'm not involved in the submission process. I hope I can add it to my published list soon. I have to shift myself my attention now to the other four papers I've put off. It's raining outside and the mountains are blocked by a thick gauze of clouds.

The colleague who was out sick is back in today. She thanked me for doing the 2-minute summary. She's going to be out for the next 5 weeks and her workload is being shifted to me and the new medical writer.

As I'm finishing this article an email comes in. An author I've been working closely with will send me the final version on Monday for me to proof; after 1+ years and rejections from a series of journals, we (or rather: he and the other authors) are very close to an acceptance.

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News from the EMA

The articles included in this section are a selection from the European Medicines Agency's News and Press Release archive from January 2017 to March 2017. More information can be found on the Agency's website: www.ema.europa.eu

Conditional marketing authorisations give patients access to important new medicines earlier

January 23, 2017 – Conditional marketing authorisation (CMA) can speed up access to medicines for patients with unmet medical needs in the European Union (EU). It allows the authorisation of medicines if the public health benefit of their immediate availability to patients outweighs the risk of an authorisation on the basis of less comprehensive data than normally required. The European Medicines Agency (EMA) has published a report on the CMA experience based on the data collected over 10 years since 2006. Since 2006, a total of 30 medicines have received a CMA. Over this 10-year period, no medicine with a CMA had to be revoked or suspended. Medicines that were granted a CMA target seriously debilitating or life-threatening conditions such as HIV infection, breast cancer, severe epilepsy in infants, or multi-drug resistant tuberculosis. Fourteen were orphan medicines, providing patients suffering from rare diseases with new therapeutic options.

A CMA is valid for 1 year. As part of the authorisation, the company is obliged to carry out further studies to obtain complete data. EMA's Committee for Medicinal Products for Human Use (CHMP) assesses the data generated by these specific post-authorisation obligations at least annually to ensure that the balance of benefits and risks of the medicine continues to remain positive. At the end of its assessment, the Committee recommends either the renewal or not of the CMA or its conversion into a standard marketing authorisation.

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The report shows that it took an average of 4 years to generate the additional data needed and to convert a CMA into a full marketing authorisation. This means that patients with life-threatening or seriously debilitating conditions can access promising medicines earlier.

The report identifies a number of possible areas for improvement. These include:

- Prospective planning of CMAs and early dialogue with EMA to support the generation of high-quality data, timely discussion of additional post-authorisation studies and their feasibility, and better data generation for completion of specific obligations.
- Engaging other stakeholders involved in bringing a medicine to patients, in particular Health Technology Assessment bodies, to facilitate the generation of all data needed for decision-making through one development programme.

The full report together with an infographic that highlights the key findings of this analysis is available online on the EMA website.

It's time to reduce, replace, and rethink the use of antimicrobials in animals

January 24, 2017 – Reducing the use of antimicrobials in food-producing animals, replacing them where possible, and rethinking the livestock production system is essential for the future of animal and public health. Antimicrobial resistance (AMR) is one of the world's most pressing public health issues and the use of antimicrobials in animals contributes to this problem.

Experts from the European Food Safety Authority (EFSA) and EMA have reviewed the measures taken in the EU to reduce antimicrobials use in animals and stress that there is no one-size-fits-all solution. Successful strategies follow an integrated, multifaceted approach which takes into account the local livestock production system and involves all relevant stakeholders – from governments to farmers.

Measures

Control strategies that have been important drivers for change include setting of national targets to reduce antimicrobial use. The use of antimicrobials in animals should be reduced to the minimum that is necessary to treat infectious diseases. Other than in exceptional cases, their use to prevent such diseases should be phased out in favour of alternative measures. Critically important antimicrobials for human medicine should only be used in animals as a last resort.

Alternatives to antimicrobials that have been shown to improve animal health and thereby reduce the need to use antimicrobials include vaccines, probiotics, prebiotics, bacteriophages, and organic acids.

Further, there is a need to rethink the livestock system by implementing farming practices that prevent the introduction and spread of the disease into farms and by considering alternative farming systems which are viable with reduced use of antimicrobials. Education and awareness of AMR should be addressed to all levels of society but in particular to veterinarians and farmers.

What is the impact on animals and food?

Experts concluded that it is reasonable to assume that reducing antimicrobial use in food-producing animals would result in a general decrease in antimicrobial resistance in the bacteria that they carry and the food products derived from them. However, they could not quantify the impact of single reduction measures or alternatives to antimicrobials on levels of antimicrobial resistance in food-producing animals and food due to lack of data.

First hormone replacement therapy for parathyroid disorder recommended for conditional marketing authorisation

February 24, 2017 – The EMA has recommended granting a CMA in the EU for Natpar (parathyroid hormone) that is proposed as a treatment for patients with chronic hypoparathyroidism who cannot be adequately controlled with standard treatment with calcium and vitamin D. It is the first approved replacement therapy with parathyroid hormone for this rare condition, for which no treatment options are available currently.

Hypoparathyroidism is a hormone disorder where the parathyroid glands in the neck produce too little parathyroid hormone, in most cases because of damage to the parathyroid glands during surgery. This results in too little calcium and too much phosphate in the blood, which affects the normal functioning of nerves and muscles leading to symptoms such as tingling sensations and muscle spasms or even seizures and heart rhythm disorders. In the longer term, uncontrolled hypoparathyroidism increases the risk of bone fractures and calcium deposits, particularly on the kidney, brain and eye lens.

The safety and effectiveness of Natpar were evaluated in a clinical trial of 124 participants who were randomly assigned to receive Natpar or a placebo, in addition to the standard treatment with calcium and vitamin D. The trial was designed to determine whether Natpar can be used to help reduce the amount of calcium or vitamin D taken by the participants, while maintaining acceptable calcium and phosphate serum levels. Results showed that 54.8% of participants treated with Natpar were able to reduce the doses of calcium and vitamin D supplements by more than 50% while maintaining acceptable blood-calcium levels, compared to 2.5% of participants who received the placebo treatment.

As part of the CMA, the applicant for Natpar is required to conduct a 26-week clinical trial to further study the safety and efficacy of the medicine, confirm the dosing schedule and assess the effects of treatment on symptoms of the disease and on patients' quality of life. The study will also look at how calcium and phosphate are processed in the body during treatment.

Because hypoparathyroidism is rare, Natpar received an orphan designation from the Committee for Orphan Medicinal Products (COMP) in 2013. Orphan designation is the key instrument available in the EU to encourage the development of medicines for patients with rare diseases. Orphan-designated medicines qualify for 10 years' market exclusivity. In addition, orphan designation gives medicine developers access to incentives, such as fee reductions for marketing authorisation applications and for scientific advice.

European and US regulators agree on mutual recognition of inspections of medicines manufacturers

March 02, 2017 – Regulators in EU and the United States (US) have agreed to recognise inspections of manufacturing sites for human medicines conducted in their respective territories on both sides of the Atlantic.

Each year, national competent authorities from the EU and the US Food and Drug Administration (FDA) inspect many production sites of medicinal products in the EU, the US and elsewhere in the world, to ensure that these sites operate in compliance with good manufacturing practice (GMP). Under the new agreement, EU and US regulators will rely on each other's inspections in their own territories. In future, the need for an EU authority to inspect a site located in the US, or vice versa, will be limited to exceptional circumstances.

The agreement will enable both the EU authorities and the FDA to make better use of their inspection resources to help them to focus on other parts of the world where active pharmaceutical ingredients (APIs) and medicines for the EU or US markets are manufactured. This will ensure that patients can rely on the quality, safety and efficacy of all medicines, no matter where they have been produced. Around 40% of finished medicines marketed in the EU come from overseas and 80% of the manufacturers of APIs for medicines available in the EU are located outside the Union.

In the EU, inspections of manufacturing sites are carried out by national competent authorities from EU Member States. The EMA plays an important role in coordinating these activities in collaboration with Member States.

The agreement is underpinned by robust evidence on both sides of the Atlantic that the EU and the US have comparable regulatory and procedural frameworks for inspections of manufacturers of human medicines. Teams from the European Commission, EU national competent authorities, EMA and the US FDA have been auditing and assessing the respective supervisory systems since May 2014, and have worked closely together to reach this agreement.

PRAC review finds evidence of gadolinium deposits in the brain after MRI body scans but no signs of harm: suspension of marketing authorisations recommended for some gadolinium agents

March 10, 2017 – EMA's Pharmacovigilance and Risk Assessment Committee (PRAC) has recommended the suspension of the marketing authorisations for four linear gadolinium contrast agents because of evidence that small amounts of the gadolinium they contain are deposited in the brain. The agents concerned are intravenous injections of gadobenic acid, gadodiamide, gadopentetic acid and gadoversetamide, which are given to patients to enhance images from magnetic resonance imaging (MRI) body scans.

The PRAC's review of gadolinium agents found convincing evidence of accumulation of gadolinium in the brain from studies directly measuring gadolinium in brain tissues and areas of increased signal intensity seen on MRI scan images many months after the last injection of a gadolinium contrast agent. The companies concerned by this review have the right to request the PRAC to re-examine its recommendations.

Although no symptoms or diseases linked to gadolinium in the brain have been reported, the PRAC took a precautionary approach, noting that data on the long-term effects in the brain are limited. Deposition of gadolinium in other organs and tissues has been associated with rare side effects of skin plaques and nephrogenic systemic fibrosis, a scarring condition in patients with kidney impairment. Furthermore, non-clinical laboratory studies have shown that gadolinium can be harmful to tissues.

The four agents recommended for suspension are referred to as linear agents. Linear agents have a structure more likely to release gadolinium, which can build up in body tissues. Other agents, known as macrocyclic agents, are more stable and have a much lower propensity to release gadolinium. The PRAC recommends that macrocyclic agents be used at the lowest dose that enhances images sufficiently to make diagnoses and only when unenhanced body scans are not suitable.

For those marketing authorisations recommended for suspension, the suspensions can be lifted if the respective companies provide evidence of new benefits in an identified patient group that outweigh its risks or show that their product (modified or not) does not release gadolinium significantly (dechelation) or lead to its retention in tissues.

Journal Watch

Journal Watch is based on the French-language blog *Rédaction Médicale et Scientifique*, by Hervé Maisonneuve available at http://www.redactionmedicale.fr.

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We need more recommendations to report adverse events in publications

Reporting guidelines, such as Consolidated Standards of Reporting Trials (CONSORT) Harms Extension exist, but the overall communication of adverse event data in publications is suboptimal. Data was collected via in-depth phone interviews with 28 experts (18 industry experts, 6 journal editors, 4 clinical investigators) by medical publication professionals and journal researchers. After analysis of the data, the authors have made five recommendations to improve the quality of adverse events reporting in clinical research publications:

1. Identify and communicate the most clinically relevant drug adverse event data as part of a comprehensive safety profile;
2. Report timing, frequency, duration, and other potentially relevant descriptors when clinically appropriate;
3. Use statistical analysis for clinically relevant adverse events (where appropriate);
4. Avoid use of overly general text descriptions for adverse events, including in abstracts;
5. Discuss adverse events findings in the broader context of available evidence and maintain consistency of data across different public reports. These are intended to supplement existing guidelines for reporting adverse event data.

Reference: Lineberry N, Berlin JA, Mansi B, Glasser S, Berkwits M, Klme C et al. Recommendations to improve adverse event reporting in clinical trial publications: a joint pharmaceutical industry/journal editor perspective. BMJ. 2016;355:i5078

Online service identifies sponsors who have failed in their duty to make results of clinical trials available

Based on data uploaded on https://clinicaltrials.gov, the TrialsTracker tool was successfully built and is now running online at https://trialstracker.ebmdatalab.net with the title "Who's not sharing their results?". Users can rank sponsors by number of trials missing, number of trials conducted, and proportion of trials missing. Users can click on a sponsor name to examine the number and proportion of trials completed and reported from each year for that sponsor.

Reference: Powell-Smith A, Goldacre B. The TrialsTracker: Automated ongoing monitoring of failure to share clinical trial results by all major companies and research institutions [version 1; referees: 2 approved]. F1000Research 2016, 5:2629.

Plagiarism! Plagiarism!

Three recent articles have discussed plagiarism in scientific/medical literature:

- *Genetics in Medicine* has published its data, and the core results were: *In 400 consecutively submitted manuscripts, 17% of submissions contained unacceptable levels of plagiarised material with 82% of plagiarised manuscripts submitted from countries where English was not an official language. Using the most commonly employed commercial plagiarism detection software, sensitivity and specificity were studied with regard to the generated plagiarism score. The cutoff score maximising both sensitivity and specificity was 15% (sensitivity 84.8% and specificity 80.5%).* As usual, titles, abstracts, methods and references were not included in the software search for plagiarism.
- A reviewer stole and published data of a paper he rejected for the *Annals of Internal Medicine.* The plagiarised author's letter entitled "Dear plagiarist" is revealing.
- The Office of Research Integrity (USA) has updated its guide on ethical writing: an excellent resource for teaching, with 28 recommendations. It's a revised edition of a popular learning module. The new edition includes revision throughout and adds cultural linguistic issues.

References:

Higgins JR, Lin FC, Evans JP. Plagiarism in submitted manuscripts: incidence, characteristics and optimization of screening—case study in a major specialty medical journal. Res Integr Peer Rev. 2016;1:13.

Dansinger M. Dear plagiarist: a letter to a peer reviewer who stole and published our manuscript as his own. Ann Intern Med. 2016, December 13 doi: 10.7326/M16-2551.

Roig M. Avoiding plagiarism, self-plagiarism, and other questionable writing practices: A guide to ethical writing. Office of Research Integrity. November 7, 2016 https://ori.hhs.gov/avoiding-plagiarism-self-plagiarism-and-other-questionable-writing-practices-guide-ethical-writing.

Series of articles on "The Changing Face of Clinical Trials"

In June 2016 the *New England Journal of Medicine* inaugurated a series of articles with the aim to examine the current challenges in the design, performance, and interpretation of clinical trials. The series deals with contemporary challenges that affect clinical trialists. It is not meant to be a course in clinical trial performance, rather to stimulate thought and discussion. The NEJM already covered 12 topics that are accessible at http://www.nejm.org/page/clinical-trials-series: Comparative effectiveness studies and patient care (June 2, 2016); Adaptive designs for clinical trials (July 7, 2016); Pragmatic Trials (August 4, 2016); The primary outcome fails – What next? (September 1, 2016); Considerations when the primary outcome is positive (September 8, 2016); Data monitoring committees – Expect the unexpected (October 6, 2016); Lessons from clinical trials involving hypertension (November 3, 2016); Geographic variations in randomised, controlled trials (December 8, 2016); The large pharmaceutical company perspective (January 5, 2017); Drug-development challenges for small companies (February 2, 2017); Informed consent (March 2, 2017); An FDA viewpoint on medical-device clinical trials (April 6, 2017); and there's more to come…

Reference: Woodcock J, Ware JH, Miller PW, McMurray JJV, Harrington DP, Drazen JM. Clinical trials series. N Engl J Med. 2016;374:2167.

Ensuring scientific integrity in the age of Trump

There are indications that the Trump administration plans to distort or disregard science and evidence. Most of the leading scientific journals have published papers warning scientists in all domains. For example, the anti-vaccine lobbies were acclaimed by Trump who invited Andrew Wakefield (the fraudulent 1998 research paper suggesting a link MMR/autism). If you enter the key-word "Trump" in journals' search engine (April 10, 2017), you get 733 results for the *BMJ,* 186 for the *New England Journal of Medicine*, 426 for *Nature,* and even more for *Science*. All journals describe the perils of Trumping science. The Journal of Alternative Facts has been launched with Trump as chief editor, with the mission: "the greatest scientific research peer reviewed by politicians and approved by public relations/ submissions via tweet" (https://twitter. com/journalaltfacts).

Reference: The above title was copied from a *Science* paper (17 Feb 2017; vol 355, issue, 6326, page 696-698).

Relative Citation Ratio: A new bibliometric indicator

Researchers at the National Institutes of Health (NIH), USA, have described an improved method to quantify the influence of a research article by making novel use of its co-citation network. A Relative Citation Ratio (RCR) is calculated, which is an alternative to using journal impact factor to identify influential papers. RCR can provide valuable supplemental information, either to decision makers at funding agencies or to others who seek to understand the relative outcomes of different groups of research investments. A web tool for RCR calculation is available at *iCite,* https://icite.od.nih.gov/. It "provides access to a dashboard of bibliometrics for papers associated with a portfolio. Users upload the PubMed IDs of articles of interest (from SPIRES or PubMed), optionally grouping them for comparison. iCite then displays the number of articles, articles per year, citations per year, and Relative Citation Ratio (a field-normalised metric that shows the citation impact of one or more articles relative to the average NIH-funded paper). A range of years can be selected, as well as article type (all, or only research articles), and individual articles can be toggled on and off. Users can download a report table with the article-level detail for later use or further visualisation."

Reference: Hutchins BI, Yuan X, Anderson JM, Santangelo GM. Relative citation ratio (RCR): a new metric that uses citation rates to measure influence at the article level. PLoS Biol. 2016;14(9): e1002541.

Experts in research integrity are more concerned about sloppy science than scientific fraud

A survey was conducted among attendees of international research integrity conferences. They were asked to score on a five-point scale, 60 research misbehaviours according to their personal assessment of: frequency of occurrence, preventability, impact on truth (validity), and impact on trust between scientists. Two hundred and twenty-seven participants completed the survey. The rankings suggest that selective reporting, selective citing, and flaws in quality assurance and mentoring are viewed as the major problems of modern research. The "deadly sins" of fabrication and falsification ranked highest on the impact on truth but low to moderate on aggregate level impact on truth, due to their low estimated frequency. Plagiarism is thought to be common but to have little impact on truth although it ranked high on aggregate level impact on trust. The top 5 misbehaviours according to frequency were:

1. Selectively cite to enhance your own findings or convictions;
2. Insufficiently supervise or mentor junior co-workers;
3. Not publish a valid "negative" study;
4. Demand or accept an authorship for which one does not qualify;
5. Selectively cite to please editors, reviewers, or colleagues.

Reference: Bouter LM, Tijdink J, Axelsen N, Martinson BC, Riet G. Ranking major and minor research misbehaviors: results from a survey among participants of four World Conferences on Research Integrity. Res Integr Peer Rev, 2016;1:17.

Academic spam invitations are common and irritating, with 2.1 invitations received daily by each investigator

Predatory journals use robots to generate spam academic invitations to publish research. Five Auckland academics (endocrinology, rheumatology, biostatistics, and women's health specialist) with 10 to 24 years of professional experience analysed all the spams received between February and April 2014: 312 spams per month for the 5 researchers, or 2.1 spams per day per researcher, including weekends! Spam invitations were characterised by inventive language, flattery, and exuberance, and were sometimes baffling and amusing. The origins of these spams were: Bentham Science, Herbert Publishing, Jacobs Publishers, OMICS Group, Open Access Publications, and Science Domain. The incidence of spam invitations was modestly reduced in the first month after unsubscription and the effect waned after 1 year; 16% of spam invitations were duplicates and 83% were of little relevance to the recipient.

Reference: Grey A, Bolland MJ, Dalbeth N, Gamble G, Sadler L. We read spam a lot: Prospective cohort study of unsolicited and unwanted academic invitations. BMJ. 2016;355:i5383.

Misspellings of drug names impede searches for published literature

When researchers perform literature searches, they should include misspelling among their search terms. Drug names are frequently misspelt by healthcare professionals, and spelling errors are common in databases such as Medline/ Pubmed. This study published in the Christmas issue of the British Medical Journal (BMJ) was correctly done. The authors performed searches with gentamicin, amitriptyline, and other drugs commonly misspelt. In these cases, professionals use y instead of i and vice versa. This study confirmed that spelling errors must be considered when searching the literature: "For example, 18 variants of amitriptyline returned 179 hits that would have been hidden using only the standard name." The paper advises using truncated search terms: "The textword "am#tr#pt#l*.af." truncated at the letter l uncovers variants of the last few letters (for example, ending in "lin," "line," "llin," "lline") without sacrificing specificity, and gives further hits."

Reference: Ferner RE, Aronson JK. Nominal ISOMERs (Incorrect Spelling Of Medicines Eluding Researchers) – variants in the spellings of drug names in PubMed: a database review. BMJ 2016;355:e4854.

Publication bias in animal research, its extent, its predictors, and its potential countermeasures are increasingly discussed in the literature.

PLOS Biology has published papers on the poor quality and waste in animal research. Three papers contribute to the debate with new proposals:

- Recent reports and conferences highlight the potential strengths of animal study registries (ASRs). A literature review and 21 international key-informant interviews were used to identify 130 ASR-related strengths, weaknesses, facilitators, and barriers. All stakeholder groups agreed that ASRs could in various ways improve the quality and refinement of animal studies while allowing their number to be reduced, as well as supporting meta-research on animal studies. The comprehensive information gathered could help to guide a more evidence-based debate and to design pilot tests for ASRs.
- That most animal research undergoes peer review or ethical review would offer the possibility to detect risks of bias at an earlier stage, before the research has been conducted. For example, in Switzerland, animal experiments are licensed based on a detailed description of the study protocol and a harm–benefit analysis. Similar to manuscripts getting accepted for publication despite poor reporting of measures against bias, applications for animal experiments may often be approved based on implicit confidence rather than explicit evidence of scientific rigor.
- There is surplus material remaining that is frequently never revisited but could be put to good use by other scientists. Recognising that most scientists are willing to share this material on a collaborative basis, it makes economic, ethical, and academic sense to explore the option to utilise this precious resource before generating new/additional animal models and associated samples. To bring together those requiring animal tissue and those holding this type of archival material, a framework called Sharing Experimental Animal Resources, Coordinating Holdings (SEARCH) was devised with the aim of making remaining material derived from animal studies in biomedical research more visible and accessible to the scientific community.

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Vogt L, Reichlin TS, Nathues C, Würbel H. Authorisation of Animal Experiments Is Based on Confidence Rather than Evidence of Scientific Rigor. PLoS Biol. 2016;14(12): e2000598.

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Morrissey B, Blyth K, Carter P, Chelala C, Jones L, Holen I, et al. The Sharing Experimental Animal Resources, Coordinating Holdings (SEARCH) Framework: Encouraging Reduction, Replacement, and Refinement in Animal Research. PLoS Biol. 2017;15(1): e2000719.

Gained in Translation

SECTION EDITOR

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Medical translation training around Europe

It's been said a thousand times, yet, many are still not fully aware of the importance that translation has in our daily lives. Rather than merely supplanting one form of words with another, the translator has the capacity to enhance our understanding of indigenous cultures by mediating ideas across cultural and national boundaries.[1] This is not always intuitive and specialised translation courses are a must, both for those with a degree or experience in the chosen specialisation domain – medical communication, regulatory documentation or other clinical texts – and those with a degree in translation wanting to specialise in a given field.

The range of specialised courses available across Europe is not as broad as expected, at least, not when addressing our field of interest, that is, medical or scientific translation on a country by country basis. Yet, there are some interesting online courses that you may follow from any place with a decent internet connection.

The aim of this article is to list the courses that, in the authors' opinion, may be more relevant. This article does not feature all European countries, leaving the door open to any future contribution from fellow colleagues to create a wider and more complete listing.

France

Master's Degree in International Communication in Healthcare Sciences – Lumière University Lyon 2

The *Master Communication Internationale en Sciences de la Santé* (CISS) is a 2-year degree awarded by Lumière University Lyon 2. All classes are held at the university's waterfront campus.

Students receive training in specialised translation, terminology, Computer Assisted Translation (CAT) tools, and business aspects of translation (freelancing, working for agencies, legal issues, taxation, etc.). Cellular biology, pharmacology, and biological research are among the specialisations on offer.

The courses in the programme are taught by faculty members and guest lecturers (doctors, pharmacists, industry professionals, etc.).

All students must complete an internship of 3 to 6 months at a translation agency, company or public organisation.

For more information, visit **Master CISS – Lyon 2** (https://sites.univ-lyon2.fr/master_ciss/ presentation.html; site in French only).

SFT Medical English Seminar

SFT (France's professional association of translators and interpreters; https://www.sft.fr/formation-traduction-sam2016.html) offers training in medical translation by way of its Medical English Seminar (known in France as SAM) every 2 years.

This 5-day conference is open to all English–French translators and interpreters regardless of their level of experience. It is held every other year in Lyon, France, and features specialist guest speakers, terminology sessions, and hands-on translation exercises. The next one will be held in 2018.

The registration fee for SAM 2016 was €750 for members of SFT and its affiliated associations (ATA, ASTTI, etc.) and €990 for non-members. An early-bird rate is also available.

SAM is the only hands-on medical conference organised by SFT. However, the association is looking to expand its offering in the near future.

For a first-hand glimpse of SAM 2016, we suggest reading two online reviews – one by participant Claire Harmer (*Séminaire d'Anglais Médical 2016: a review*; https://inthedeepend.org/2016/05/03/seminaire-danglais-medical-2016-a-review/) and the other by co-organiser Stephen Schwanbeck (A Review of the 2016 Medical English Seminar; https://sites.google.com/site/caduceusnewsletter/reviews/a-review-of-the-2016-medical-english-seminar – by-stephen-schwanbeck).

More information about SAM and documents from the conference can be found on the home page of the 11th Medical English Seminar (https://www.sft.fr/formation-traduction-sam2016.html#.V6NO3ZOZe52; site in French only).

United Kingdom

In the UK, your first point of call should be the ITI Medical Network (ITIMedNet), since they organise conferences and workshops and offer other training activities. ITIMedNet Membership is open to any ITI member interested in medical translation (check ITI: www.iti.org.uk). This organisation runs 1-day medical translation workshops twice a year and a mentoring scheme. It is also worth checking the list of university courses suggested by the ITI if you are a scientist looking to develop your translation skills: http://www.iti.org.uk/about-industry/ universities-courses

Another recognised medical translation training opportunity is the MSc in Specialised Translation run by University College London that includes a module for medical translation: https://www.ucl.ac.uk/centras/study/postgraduate-taught/specialised-translation-scientific-technical-medical-msc. Holders of this Master's indicated that it really helped them develop basic medical knowledge and the right techniques for terminology search, translation of medical concepts, etc. Also, the MSc opened many doors as some translation agencies mentioned that they specifically looked for translators who completed this MSc.

Spain

Online Master's degree in Medicine and Healthcare Translation – University Jaume I

The Master's has a duration of 1 year, from September in the first year to October in the second year, for a total of around 1,500 to 1,800 training hours.

The different subjects addressed during this time vary from theoretical approaches to translation, methodology and semantics, to an introduction to medicine and technical translation. At the end of the first year, students may choose between two different specialisation domains: academic research or translation methodology.

For more information, visit their website: http://www.tradmed.uji.es/es/content/presentaci%C3%B3n

The Masters in Scientific, Medical and Environmental Communication is aimed at university graduates.

Online Master's Degree in Scientific, Medical and Environmental Communication – University Pompeu Fabra

The Master's takes 1 year to complete, beginning in September the first year and ending in December the second year, for a total of around

1,500 to 1,800 training hours.

The Master's prepares students to produce, manage, and transmit scientific knowledge and the ideas and opportunities that derive from its application, and from its related technologies.

Throughout the course, students analyse the main sources of scientific information, their forms of transmission, the nature of the relationships between the expert world, technological industries, and society, how these affect discoveries in people and the ethical problems associated with the whole process of how knowledge is handled. The medical communications module provides students with a detailed understanding on how medical and health knowledge is communicated. In the field of environmental communications, students analyse the major environmental issues and the challenges of biotechnology and genetic engineering. In addition, thanks to the collaboration of *la Caixa* Social Foundation, students are able to participate in Campus Gutenberg, which involves more than 300 scientific communicators and experts in scientific culture from Spain and Europe each year.

The Master's in Scientific, Medical and Environmental Communication is aimed at university graduates.

For more information, visit their website: http://www.barcelonaschoolofmanagement.upf.edu/master-in-scientific-medical-and-environmental-communication-online

Italy

There are two very interesting master's programmes in Italy, one of which is held online:

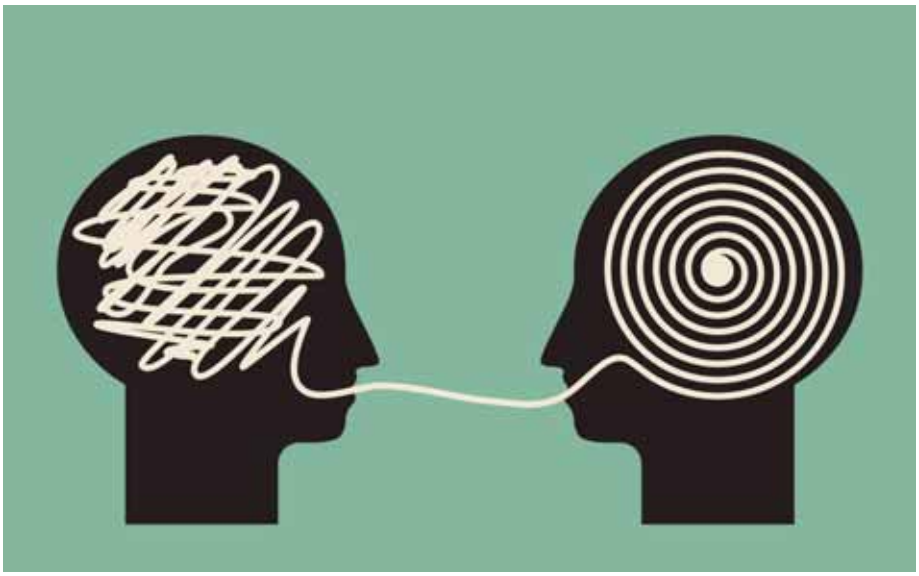
Medicine and pharmacology master's program for translators and interpreters – Communication Trend Italia (Milan)

The Master's takes 5 months to complete, with 8 hours of attendance each week held on a single day.

Various subjects are covered including the norms governing technical translation, practical translation exercises from English into Italian on the subjects taught and presentation of innovative technologies: automatic identification and terminology management, computer assisted and automatic translation. The programme is divided into theory and translation lessons.

The following are taught during the workshop: use of professional tools for assisted translation, automatic identification, terminology management and glossary creation.

Masters' teachers are successful and expert professionals working in the field; they include doctors with excellent knowledge of English and other languages.



To request information, send an email to: formazione@cti-communication.it.

For more information, visit their website: http://www.cti-communication.it/en training/masters-in-medicine-and-pharmacology/

Online Master's Degree in Specialized Translation – Consorzio Icon (Italian Culture on the Net) and several Italian University

The Master's takes 1 year to complete and runs from January to December for a total of around 1500 training hours and is aimed at university graduates. The source language is English.

After the first 6 months of theory, students may choose two specialisation domains from the following: Information Technology and Localisation, Medicine and Pharmacology, Law, Environment, Economy.

The different subjects that are addressed during the year range from theoretical approaches to translation, methodology, semantics, linguistics, communications, etc. A particular focus is translator training (CAT tools, working as a freelance, legal issues, etc.) and specialisation domain areas, with modules (both theory and practical) taught by professional translators specialised in the specific field taught. A large number of hours are spent on the main linguistic issues in the target language, Italian, focusing on grammatical, syntax and communications skills.

The students who choose Medicine and Pharmacology focus on an online introduction to medicine and pharmacology translation; both scientific and educational texts are approached. The second part of the course provides practical tutoring focusing on translation activity in the specific field chosen, addressing and evaluating all aspects of the assigned tasks, including translation instructions, respect for deadlines, preparation of glossaries, and addressing reviewers' comments.

In October, the students spend 1 month at a translation agency, company or public organisation, such as DG Translation, the European Commission's in-house translation service.

At the end, students discuss their final dissertation on a translated, specialised text and relevant glossary.

For more information, visit their website: http://www.traduzione.icon-master.it/it

Conclusion

As mentioned previously, some European countries are not featured here and this is rather noticeable. Ultimately, this means that many medical translators do not have the opportunity to receive technical training before starting hands-on work. Little by little, things are changing and will probably continue to do so in the future. Fortunately, we have a broad range of professional associations providing continuing education in the field!

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Getting Your Foot in the Door

Editorial

Congratulations to the Internship Forum (IF) team for the success of the second *Live* IF event in Birmingham. Special thanks to our new IF lead Derek Ho and our new EMWA Honorary Secretary Beatrix Doerr and a bunch of dedicated volunteers. Because we have to get this MEW edition out shortly after the Spring Conference, details of the Birmingham *Live* IF will be provided later in the year. Promise!

In this June edition of GYFD, we are presenting the first part of a series on visa regulations and work permits related to internships in the EU. I would like to thank Van-Anh Dao for doing the legwork of researching the German requirements. We will tackle those of other countries in upcoming issues.

Remember Sara and Zuo Yen, IF participants who contributed to our September 2016 GYFD? Well, we are happy to receive postcards from them in this edition, giving us updates on their medical writing journey 6 months after their participation at the IF in Munich. Way to go, ladies!

Raquel

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Berlin

Visa regulations for internships in Germany

An internship normally differs from employment and may therefore be subject to regulations that are different from (and sometimes less stringent than) standard labour legislations. In Germany, an internship that a) lasts longer than 3 months, and b) is not organised and financed by a public or educational body is regarded as an employment.[1] In principle, an internship in the framework of the EMWA Internship Forum is subject to certain visa regulations as described below.

EU citizens who want to do an internship in Germany do not require a visa or permit. However, applicants from non-EU countries who do not have the necessary EU or German work permit are required to obtain a Schengen visa. This visa requirement applies to interns who are students as well. Foreign students are allowed to take an internship in Germany only after they have completed at least four university semesters or 50% of the study time. Another requirement for students is that the subject of their study has to be relevant to their internship of interest.[2] For example, some appealing candidates for medical writing internships are biology, pharmacy, and medicine students.

For most applicants, the Schengen visa must be issued by the German Embassy in their home countries before they come to Germany. However, people from some countries such as Australia, Israel, Japan, Canada, New Zealand, South Korea, and the US can simply register at the local authorities after they have arrived in Germany. Important documents for the visa application are proof of finances (in this case, the internship contract), accommodation and/or travel details, and passport and/or travel documents. Visa application form in German, English, and many other languages are available online. It is possible that a 3-month visa is issued by the German Embassy first, before the Schengen visa that is valid for the intended period of the internship is given when the applicant arrives in Germany.[3]

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Brussels

Postcard from Belgium

The last time I wrote for MEW, I had just started an internship in a medical consultancy company in Cambridge (UK), thanks to the EMWA *Live* Internship Forum that took place in Munich in May 2016. And here I am, on the move a few months later, enjoying the (not-so-bad) Belgian weather in my very first full position as a medical writer.

I started working as a publication writer in a contract research organisation, XPE Pharma & Science, in mid-December 2016. Since then, I have gone through an extensive training period and taken up diverse projects: manuscripts, conference abstracts, drug dossiers, minutes of symposia… As we do work for different clients across a range of indications, I need to get familiar with new therapeutic areas, which definitely keeps my brain fed on engaging topics.

The social part of the job is a huge detail not to be missed: I have a vibrant team of writers and publication managers around me, with whom I interact (and learn from) every day. I frequently hold meetings with clients who are leading experts in their fields; it is always a great opportunity to be updated with the latest breakthroughs in pharmaceutical research.

In this new step of the journey I am doing nothing but start to discover the ins and outs of being a medical writer. I clearly have a long road ahead… but the farther I go, the more exciting it gets. I am looking forward to describing the landscape I will be seeing in a few months' time!

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Postcard from Taiwan

Greetings from Taipei!

Six months of intensive hunting for an opportunity to becoming a medical writer have come to fruition. I am now a medical and regulatory writer in Clinipace Worldwide Taiwan and I moved from Zurich to Taipei in February! It is exciting as I am finally part of the medical writing family. At the same time, starting my new life in Taipei is equally fascinating!


Taipei

As a new medical writer, I am undergoing a training stage with well-structured training modules which provide an overview of the pharmaceutical industry, an introduction to working in a CRO, insights of various documents involved in drug development, and the techniques of writing these documents. As part of the training, I get the chance to work hands-on on real projects. So far, I have been writing clinical study reports, informed consent forms, and drug safety update reports. From the writing process, I start to appreciate the complexity of drug development and the amount of effort being channelled into each report to ensure high quality and compliance with regulatory requirements. Furthermore, I find that this is the best time and place to bolster my time management skills, as delivering documents according to timelines is of utmost importance to keep up with the clinical development plan.

I am in the middle of the steep learning curve in my new function, and I am enjoying it so far! I see each assignment as a new challenge, and I look forward to expand my medical writing experience to be able to receive every task with increasing confidence.

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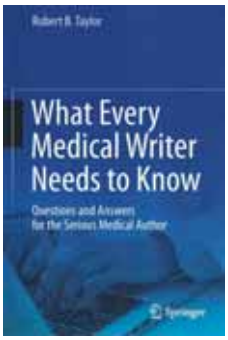
In the Bookstores



What Every Medical Writer Needs to Know: Questions and Answers for the Serious Medical Author

By Robert B. Taylor
Springer International Publishing, 2015.
ISBN 978-3-319-20263-1 (paperback)
31.99 GBP. 220 pages.

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They say "*don't judge a book by its cover*", but the title of this book lends itself to curiosity. In *What Every Medical Writer Needs to Know*, Dr Robert B. Taylor uses his 40 years of experience to present some of the fundamentals of medical writing: why we do it and how we do it, along with important problems and questions that many writers face daily, such as, How can you improve your writing? What are the rookie mistakes? What should you do if you cannot get published? What are the issues concerning copyright and plagiarism? What are the ethical issues surrounding your work? This book caters for writers from different fields of medical writing and at various stages of their careers; whether you are a physician, a professional medical writer, or a student looking to enter the field of medical writing, this book provides a range of practical information to help improve your writing and highlight potential pitfalls.

The book is divided into 10 chapters, with Chapter 1 providing a fascinating history of medical writing from Hippocrates to Sir William Osler, William Carlos Williams, and more recent medical writers such as Elisabeth Kübler-Ross. In addition, this chapter looks at how the process of medical writing has changed over the years, with primary responsibility for medical writing having shifted from physicians to professional medical writers in the contemporary setting. It also describes the typical personality traits of medical writers according to the Myers–Briggs Type Indicator (MBTI), as well as the strengths of the different personality types and the challenges they have to face. Readers may be particularly interested to see how their own personality type may influence their writing and how it compares to the personality types of other medical writers.

Chapter 2 is tailored towards new writers and looks at how to get started in the medical writing industry, including the value of a good mentor, the various types of writing opportunities (such as letters to the editor, research letters, case reports, newsletters, and blogs), when in the day you should write, what to write, and the tools needed. It also includes an interesting insight into famous authors' practices, some rather frank views on the challenges of freelance medical writing, and information on the associations that may help your career, namely the American Medical Writers Association and the European Medical Writers Association.

Chapter 3 goes further to look at the process of medical writing and tackles issues such as organisation of the text, punctuation, and how to make your writing easy to read. Noteworthy parts of this chapter cover how to multitask effectively depending on your MBTI type, how to manage references effectively using citation management systems such as *Endnote*, and the importance of considering the journal impact factor when selecting a target journal.

In Chapter 4, Dr Taylor delves into his decades of experience to share some of the pitfalls that writers may experience in their careers, and provides tips on how to avoid them. In particular this chapter highlights the importance of following journal guidelines, the importance of author sequence on the manuscript, and common errors (such as excessive use of adverbs, adjectives, and abbreviations, excessive paragraph length, deviation from the main topic, and presenting facts without citations), as well as focusing on how to manage complications arising from having multiple authors. This chapter also looks at how language has changed over the years and introduces the Gunning Fog Index, a measure of text readability that is used to improve an author's writing. Although the Gunning Fog Index is not always appropriate for medical writing due to the fact that medicine has a broad and complex vocabulary, the principle that writing should be clear and not unnecessarily complex means it may be a useful tool for writers who work on lay summaries.

Topics covered in Chapter 4 are complemented nicely by Chapter 5, which looks at how to get your work into print; in particular it focusses on the peer-review process, open-access publications, and how to avoid "predatory publishers", whose goal is to profit from a writer's need to publish. This chapter also offers valuable advice on how to handle rejection from editors and how to improve your chances of publication. It further highlights the unfortunate bias in favour of particular institutions (such as elite universities) and the potential limitations of the peer-review process.

Chapter 6 discusses some of the major ethical issues surrounding medical writing, including the prevalence of gift and ghost authorship and the reasoning behind it. Despite screening with software such as CrossCheck, plagiarism remains an issue in medical writing today. This chapter offers valuable advice for readers regarding copyright and the avoidance of issues with plagiarism, stressing the importance of declaring conflicts of interest, seeking permission to use borrowed material (such as tables, graphs, and text), and accurately referencing sources when reproducing the work of others. This chapter is a particularly worthwhile read as it addresses some important concepts.

The focus on techniques to improve writing skills in the earlier chapters is complemented by real-life examples of classic and modern medical writing in the later chapters. Chapter 7 looks at some of the more noteworthy medical books and journal articles of the past as well as some of the more absurd published articles. Chapters 8 and 9 provide both a collection of interesting backstories from renowned writers and their opinions on medical writing. Chapter 10 concludes the book with a selection of interesting facts that do not fit into any of the preceding chapters. Notably, this chapter advises writers to exercise due diligence when approached by both well-known and especially unknown publishers with offers of work, and provides useful book and website references to those wishing to become medical writers.

Overall this book is well-structured, with each chapter flowing nicely into the next. With over

30 medical books and several hundred published articles to his name, Dr Taylor is highly practised in medical writing and uses both his own knowledge and that of renowned writers to highlight some of the pitfalls medical writers have experienced or may experience in their careers. My only criticism would be that the examples in this book are arguably tailored more towards physicians rather than professional medical writers and are also more applicable to writers whose work focuses on manuscripts, literature reviews, book chapters, and books, rather than regulatory writing. I would recommend this book primarily to freelance writers and writers who specialise in medical communications, rather than regulatory writers, and would especially recommend it to those wishing to become medical writers.

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Regulatory Matters

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Brexit and the European Medicines Agency

The British government has formally triggered Article 50, setting in motion Brexit and negotiations can begin in earnest. If before, politicians could gloss over the complexities, they are now obliged to start getting to grips with the details (where the devil often is if the popular saying is to be believed). With such a complex process, some unintended consequences will inevitably start to become apparent. One example is the future of the European Medicines Agency, currently located in Canary Wharf in London. During the referendum campaign, I don´t recall any talk about what fate might befall this prestigious agency. Obviously, with the UK leaving the European Union, it seems untenable to keep the EMA headquarters in London, regardless of how "soft" Brexit finally turns out to be. In fact this seems one of the few aspects of Brexit where there is some agreement.

The loss of the EMA will have a big impact for London and the UK. In addition to the prestige of hosting such an important Agency, the revenue generated by the Agency is not negligible. Indeed, the EMA budget for 2017 is €322 million, much of which would be money spent in the UK. Currently, 900 permanent agency employees (who pay taxes and spend EU money in the UK) work in prime premises in central London. The decentralised nature of the Agency also means that many others need to travel to and stay in London on a regular basis, where they occupy hotel beds. Although this may be a relatively small amount compared with the famous €350 million a week the Brexit campaign claimed was being sent to the EU, at least the EMA was a tangible economic benefit for the UK, but that is water under the bridge now…

Given the prestige and potential economic boost that hosting the EMA could bring, it is not surprising that a long queue of countries have formed, jostling for position to be the chosen one. Denmark, Ireland, Italy and Sweden have all formally launched their candidacies, while others such as Spain, Portugal and Croatia also seem to be in the running.

Those who make the decision will take into account a number of factors. Good travel connections and plenty of hotel beds will clearly be major considerations. Given that morale at the EMA is already said to be low as a result of Brexit, and the current uncertainty has hastened the exit of senior figures, the impact on current staff will need to be minimised to limit any further loss of expertise (I suppose that this is code for establishing the headquarters somewhere that people would want to live). These practical considerations may, however, be surpassed by political calculations. Countries that already host a major European agency may be ruled out (despite the clear opportunity for synergy with the European Centre for Disease Prevention and Control in the case of Sweden, for example). It may also be politically expedient to host the EMA in an Eastern European country.

Whatever the decision, there is some pressure to make it quickly. As mentioned above, the EMA is already facing loss of staff and nobody wants to see this further exacerbated, with the potential negative impact on the quality of such a crucial Agency´s work. Ultimately, this is a question of public health and should not become a game of political football.

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The New EU Medical Device Regulation: New opportunities for regulatory writers

The new EU Medical Device Regulation (MDR)[1] has recently been released. The key changes that MDR brings (compared to its predecessor the Medical Device Directive of 2001) include more stringent requirements for manufacturers, more responsibilities for Notified Bodies, and more transparency and traceability. And I would like to add – more opportunities for medical writers because of additional regulatory requirements that entail writing more regulatory documents, some of them new in the field of medical devices. Some of these documents are described below.

Clinical evaluation reports (CERs)

As part of the implementation of the MDR, the new MEDDEV 2.7/1 revision 4 was released in June 2016.[2] This guidance explicitly mentions the necessity for medical writing expertise in the preparation of clinical evaluation reports (CERs) as follows: *"As a general principle, the evaluators should possess knowledge of the following: – research methodology (including clinical investigation design and biostatistics);- information management (e.g. scientific background or librarianship qualification; experience with relevant databases such as Embase and Medline); – regulatory requirements; and – medical writing (e.g. post-graduate experience in a relevant science or in medicine; training and experience in medical writing, systematic review and clinical data appraisal)."*

The requirements to submit CERs (MDR Article 61) have become more stringent, with higher frequency of updates for certain device classes.

Clinical trial documents

In addition to the CERs, more clinical trials are required for CE marking and recertification of medical devices, hence it is expected that there are more clinical investigation plans (study protocols) and clinical investigation reports (study reports) to write (MDR Articles 61, 62).

Post-marketing documents

The preparation and submission of post-market surveillance plans (MDR Article 84) and reports (Article 85) for all devices classes will now be closely implemented by the new MDR.

Periodic safety update reports (PSUR) – new requirement

The periodic safety update report PSUR was a regulatory requirement for drugs for many years (now replaced by the Periodic Benefit-Risk Evaluation Report [PBRER]). The new MDR requires device manufacturers to prepare PSURs (MDR Article 86), to be submitted every 2 years for class IIa and annually for class IIb and class III devices.

Summary of safety and clinical performance (SSCP)

The MDR also requires submission of a summary of safety and clinical performance (SSCP, Article 32) for implantables, class III devices, and other than custom-made or investigational devices. The SSCP is supposed to be written with the intended device user and the patient in mind and shall be made available to the public.

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The Webscout

Medical devices

Medical devices range from things as simple as an injection needle to implantable pacemakers and MRI imaging devices. A video by the WHO (http://t1p.de/WHOVideo) gives you an impression of the variety of medical devices and their importance for health; it reminds you as well of the unequal access to life-saving medical equipment. The WHO publishes a compendium of devices (http://t1p.de/WHO-compendium) that could be afforded in low-resource settings to offer solutions to health care issues, especially in developing countries. Such devices include an electrochlorinator designed to provide safe drinking water, but also mobile ECG devices. A film produced by Trinity College Dublin illustrates the role of medical devices in health care and the research efforts made to develop next-generation medical devices: http://t1p.de/TrinitiyVideo.

In the EU, medical devices are regulated by three directives that distinguish between active implantable medical devices, in-vitro diagnostic medical devices and all other medical devices. The regulatory framework can be found on the website of the European Commission (EC) (http://t1p.de/Framework).

It is not always easy to decide whether a product is a medical device or not. The decision generally falls to national authorities. However, to harmonise interpretations and protect the EU single market principle, the EC issues and updates a manual on so-called borderline products. The manual describes borderline classification cases, which serve as a decision tool for the member states. It can be found on the EC website: http://t1p.de/EC-Borderline. As the manual shows, the classification depends not only on the product itself, but also on the purpose it serves. The decision on shoe covers distributed in hospitals illustrates this point. Shoe covers "intended by their manufacturer to be used in operating rooms, intensive care units or immunodepressed patients to protect the patient from potential contamination are medical devices." However, "shoe covers for visitors even in a hospital are products of control of environment". Discussions on whether a tool is a medical device or not can appear rather odd. This is illustrated by a discussion on YouTube videos for treating insomnia: http://t1p.de/Video-Insomnia. The videos contain relaxing noises intended to help patients with insomnia to calm down and fall asleep. They do not differ much from videos for meditation, which would not be subject to a medical devices discussion. The insomnia videos, by contrast, would formally fulfil the criteria for medical devices due to the claim that they can be used to treat an illness. It might seem a little strange to classify a video as a medical device. However, with the increasing number of health applications on mobile devices, the classification of eHealth tools might become a regulatory issue.

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Regulatory issues are not the only potential problems with medical devices. As they can be highly sophisticated, their use can be a costly burden for health care systems. Therefore, medical devices are subject to health technology assessment (HTA). To guide manufacturers and health policy decision makers, the WHO is working on a technical series on HTA for medical devices. A reference document at www.who.int/medical_devices/assessment/en/ gives an introduction to HTA.

The methods applied in HTA for pharmaceutical products are often inappropriate for medical devices. Drummond et al. summarise the additional challenges associated with assessments of medical devices. For example, the value of a diagnostic device is inextricably linked to the benefit of a subsequent treatment and therefore hard to assess. Further, designing studies according to the principles of pharmacological interventions can be difficult. For example, sham procedures for a double-blind study design become unethical for surgical interventions when you have to assess the value of devices used in surgery. To learn more about the issues in HTA of medical devices you can download the full article here: http://t1p.de/Drummond.

So what can be done to overcome these issues? Tarricone et al. discuss the role of real-world evidence in medical device assessments in a review that is available at http://t1p.de/ Tarricone. They describe the case of MitraClip, an implant for patients with moderate-to-severe mitral regurgitation. For this device, a sound randomised controlled trial (RCT) was not possible. The authors argue for the acceptance of real-world data, at least in cases where RCTs cannot be performed.

As you can see, medical devices are a complex topic. Regulations will continue to be updated to address unsolved classification and assessment issues. It is worthwhile to follow the changes, as medical devices are a great source of business for medical writers.

Did you like this Webscout article? Do you have any questions or suggestions? Please feel free to get in touch and share your thoughts.

Good Writing Practice

Syntactic Structure

Dissonance

Nonparallelism: Comparison

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Introduction

Dissonant nonparallelism occurs in two patterns of comparison: the typical adjective-based pattern (*x is similar to y; there is more x than y*) and the less common correlative conjunction-based pattern (*the more x… the more y*). In this article, examples of adjective-based (Parts 1 and 2) and correlative conjunction-based (Part 3 and 4) nonparallelism are analysed.

Part 1: Adjective-based comparison: ellipsis-caused noun nonparallelism

Example: Introduction section: research problem pertinent background

The masticatory apparatus of a bird is similar to a human.

Revision 1

The masticatory apparatus of a bird is similar to ***that*** *of a human.*

Revision 2

There is a similarity between the masticatory apparatus of a ***bird*** *and a* ***human****.*

Notes

In the Example, the noun phrase (noun + modifier) *masticatory apparatus of a bird* is nonparallel when compared to only the noun *human*. That is, the *apparatus* appears to be compared to the *human*, rather than to the *masticatory apparatus of a human*. Such comparisons often lack (ellipsis) the second noun (or noun phrase) of the comparison, but it is implied. In the Example, the underlined entities cannot literally be compared, even though the frequency of this pattern may render the implicit meaning understandable.

In Revision 1, the demonstrative pronoun *that* replaces the missing *masticatory apparatus* so the comparison is parallel. The *that* does elicit backtracking, but the sentence pattern is familiar. In Revision 2, the nouns being compared are structurally equivalent and at the sentence-end position of emphasis.

Related Examples

The masticatory apparatus of a bird and a human are similar. In this example, *similar* elicits the question *similar to what?* The agreement in number between the singular *apparatus* and the plural *are* is grammatical because of the plural modifiers *of a bird and a human*. This extrinsically directed plurality of the subject may be notational, that is, singular in form but plural in context.

A bird's masticatory apparatus is similar to a human's. In this example, although the possessive nouns are parallel, the infrequency of this pattern may result from the informality of and distance between the possessive nouns. Also, just like ending a sentence with *similar*, a sentence ending of *human's* seems to be incomplete.

Part 2: Adjective-based comparison: ellipsis-caused verb nonparallelism

Example: Results section: data-based observation

Renal erythrocytes transferred more DHA to the foetus than foetal plasma.

Revision 1

Renal erythrocytes transferred more DHA to the foetus than ***did*** *foetal plasma.*

Revision 2

More DHA was transferred to the foetus ***by renal erythrocytes than by foetal plasma****.*

Revision 3

There was more DHA transferred to the foetus ***by renal erythrocytes than by foetal plasma****.*

Notes

In the Example, it seems that there was more transfer of DHS than transfer of foetal plasma. In a comparison, verb ellipsis causes confusion as to what is being compared, when the comparison is missing the second verb in the comparison. To avoid verb repetition in a comparison, the verb *do* is often used; however, a limitation of *do* as with other such concision techniques (e.g. *vice versa*) is backtracking to determine the exact meaning of *do*.

In Revision 1, parallel verbs are present, but *did* elicits backtracking and the unfamiliar subject-to-verb inversion. In Revision 2, the comparison is emphasised by the sentence-end-position of the compared nouns and by the repetition of the preposition *by*. Also, Revision 2 involves a shift from the active to passive voice. In Revision 3, the expletive *there* conveys a typical sentence pattern in a Results section by first identifying an observation and then by stating the comparison. In Revisions 2 and 3, the pattern is thematically focused on *more DHA transferred* rather than the narrative something *does this and another thing does that*.

Part 3: Correlative conjunction-based comparison: verb nonparallelism

Example: Introduction section: hypothesis

From a security perspective, the more that paths are used for routing, the more secure that the network is.

Revision

From a security perspective, the more paths for routing, the more secure the network.

Notes

The passive voice verb phrase *are used* in the first dependent clause conveying the condition is nonparallel to the linking verb *is* in the second dependent clause conveying the consequence.

In the Revision, the verb-free (elliptical) compound sentence is not uncommon and not ungrammatical. Its combination of succinctness and parallelism is memorable. Some readers may question whether the syntax of the compound dependent clauses structure is grammatical; however, the frequency of this pattern mostly in its elliptical form is evidence of its grammaticality.

Part 4: Correlative conjunction-based comparison: correlative conjunction nonparallelism

The more… the more functions as a correlative conjunctive, similar to *not only… but also*.

Example: Introduction section: research problem pertinent background

The more that collagen is in a triple helical arrangement, the more that it resists denaturation, and the less that it is solubilised by acetic acid.

Revision 1

The more that collagen is in a triple helical arrangement, the more that it resists denaturation, and the ***more that it resists solubilisation*** *by acetic acid.*

Revision 2

The more collagen in a triple helical arrangement, the more its resistance to denaturation and ***solubilisation*** *by acetic acid.*

Notes

If the first two clauses of a correlative conjunction-based comparisons are in one direction (e.g. positive) and the third is in another (e.g. negative), the nonparallelism is distracting. If there are only two correlative conjunctions, the relation in the opposite (reciprocal) directions (e.g. *the more… the less*) is slightly distracting, but a third dependent clause in the opposite direction to the first two is distracting.

In Revisions 1 and 2, the progressive ellipsis of the compound dependent clause sentence is visualised: Revision 1, the full form; Revision 2, deletion of the complementing *that* and the redundant *the more it resists*. In both the Example and Revision 1, the narrativism is in contrast to the verb-free elliptical Revision 2. Note also that in Revision 2, the parallelism between the correlative conjunctions enables the coordination of *denaturation* and *solubilisation*.

Summary

Adjective-based comparison distractions may not be section-specific, because one example occurs in an Introduction and the other in the Results section. However, the correlative conjunctive-based examples both occur in the Introduction section.

The cause of the nonparallelism may also be different between the two comparison patterns. Ellipsis of either of the compared nouns or compared verbs seems to be the cause of the nonparallelism of the adjective-based comparison. Thus, revision for such nonparallelism involves addition of the ellipsed noun (with the demonstrative pronoun *that*) or verb (with the filler verb *do*) or a syntactic transformation to an end-of-sentence comparison, which enables a thematic subject.

In contrast, the lack of ellipsis may be the cause of nonparallelism for the correlative conjunction-caused comparisons because revision involves a shift to an elliptical verb-less option. For the nonparallel correlative conjunction example, replacement of the nonparallel conjunction is a facile revision as it is for nonparallel coordination.

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Profile

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The new European medical device regulation and guidance document on clinical evaluation

An Interview with Dr Bassil Akra

The successor of the currently applicable Medical Device Directives (MDD 93/42/EEC and 90/385/EE) combines both directives into one Medical Device Regulation (MDR).

At the time of the interview, the MDR publication date had been scheduled for the second quarter of 2017. (The MDR has now been published and is accessible at http://eur-lex.europa.eu/eli/reg/2017/745/oj). The new MDR adds new requirements to the quality management system of medical device manufacturers, clinical evaluations and post-market surveillance. Moreover, this regulation influences the classification of several devices that are currently on the European market and covers new device categories such as devices for cosmetic purposes and non-viable human tissue. Furthermore, the MEDDEV 2.7/1 Rev 4 guidance document on clinical evaluation of medical devices has been released in June 2016. This revision is more detailed and particularly provides further guidance on the writing and update of clinical evaluation reports. Moreover, this guidance document includes essential details on the type of clinical data that can be used during this process and the responsibilities of the notified bodies.

We are delighted to have the chance of interviewing Dr Bassil Akra, who is a representative of the European Notified Bodies on various clinical task forces and participated in the development of this new guidance document, to gather first-hand information on the matter. He is the Global Director of the Clinical Focus Team at the largest Notified Body, TÜV SÜD Product Service GmbH, and has extensive experience in research, development, quality management and regulatory approval of medical devices, combination devices and Advanced Therapy Medicinal Products (ATMP).

He is a senior expert and internationally renowned speaker on European regulations and a member of the European Clinical Investigation and Evaluation working group. Dr Akra is representing Team NB and NB MED in several European discussions regarding clinical requirements such as MEDDEV and other Guidance Documents on Innovative Devices, as well as a member of the European task force on Safety Update Reporting.

MEW: What was the rationale for the new revision of MEDDEV 2.7/1, while a new MDR is under development?

Dr Bassil Akra (BA): It should be mentioned upfront that the MEDDEV is legally not binding but it reflects the current state-of-the-art method on how to conduct and assess clinical evaluations. Manufacturers are free to either apply the MEDDEV or other comparable methods when showing compliance to the applicable directive(s).

The new MEDDEV was developed as a result of several scandals in Europe and aiming to unify Notified Bodies and Member States, the European Commission decided to put several recommendations and regulations into force. In the Commission Implementing Regulation (EU) No 920/2013, it was required to have a common method and view of designation towards ensuring a uniform interpretation of the requirements. The result of this regulation and the joint assessment was the reduction of the number of Notified Bodies from 83 to less than 60. During these joint assessments, the main finding of the designated Member States and the Joint Research Centre auditor team was related to the clinical evidence and the qualification of the involved resources in the evaluation and assessment of this evidence. Given that the full implementation of the MDR was expected to take several years, the Member States and other stakeholders decided to clarify the requirements drawn by the current medical device directive(s) in an update of the relevant guidance document on clinical evaluation (MEDDEV 2.7/1).

MEW: Which are the expected release date and changes of MEDDEV 2.7/1 Rev 5?

(BA): It is still unclear if a new revision of this document will be prepared and published, as the intention of the European Commission is to draw a clear and detailed regulation avoiding additional guidance documents. Nevertheless, we should say that regulations are never clear for the final user, leading to multiple interpretations. Therefore, guidance documents are always helpful. My opinion is that such a document revision will be necessary when the MDR will be officially published and a new revision referring to this regulation can be drawn.

> The only advice that I can give to the industry and the medical writers is to check all available clinical data for all devices regardless of classification.

MEW: The new MDR mentions several documents which have not been previously required. For which documents do you imagine medical writers could be particularly useful?

(BA): The number of qualified professionals needed for the preparation of these documents is expected to increase dramatically in the next 2 to 3 years. In the beginning, mainly the Clinical Evaluation Report (CER) will require medical writers and professional experts to fulfil the requirements of the new revision of the MEDDEV guidance document. As soon as the MDR is implemented, an increased number of reports will be required, such as the periodic safety update report, the post-market clinical follow-up report and the summary on safety and clinical performance document. All these documents should be combined with an updated CER, as they also include an updated conclusion on the benefit-risk profile of the affected device. Moreover, it should be considered that these reports will be needed annually for devices that are either in

class III or are implantable, requiring further resources on all sides i.e., the manufacturers, the notified bodys and the designate member states.

MEW: With two new regulations, uncertainties are unavoidable. What could medical writers do if they do not know how to apply/interpret the regulations correctly?

(BA): The most important at this point, is communication. TÜV SÜD is performing roadshows worldwide presenting the requirements expected out of these regulations and discussing their implications for the medical device industry. Medical writers that are affected by the regulation changes should continuously get in contact with their Notified Bodies and responsible authorities to understand their expectations and requirements.

MEW: What has been your experience with the new MEDDEV revision so far? Has the rejection rate of CERs increased? Which are the most common mistakes you observe?

(BA): The MEDDEV was published without a transition period leading to many burdens for the medical device industry. To address this issue, as a selected representative of the European Bodies on various clinical task forces and a member of the CIE Task Force, I have tried to agree on implementation timelines with the members of Team NB and NB MED that were communicated to the industry immediately after the implementation of this guidance document. The following steps were recommended:

1. *Manufacturers should prepare an impact assessment and implementation plan within 6 months after the publication of this document.*
2. *Manufacturers should have – latest by the beginning of January 2017 – started to implement the new Revision of the MEDDEV by updating their CERs accordingly. The CERs update schedule should be prioritized based on the establishment and risk levels associated with the device. New device submissions shall be prepared from January 2017 on, following the new MEDDEV Revision expectations.*
3. *Latest by December 31, 2018, all CERs should reflect contents in line with the new MEDDEV Revision.*

Nevertheless, in the case of compliance issues regarding requirements of the applicable directive(s), Notified Bodies will, of course, continue applying case-specific deadlines. Earlier actions may be necessary to resolve compliance issues.

The recommendations from the Notified Bodies were helpful to the industry to prepare themselves for the new regulations. Nevertheless, they did not solve the problem of having enough qualified professionals to update all CERs accordingly. Moreover, new expectations on devices may affect approval plans for new products. For instance, fulfilling the expectations on devices that plan to follow the equivalence approach, using data from similar devices rather than data from the device in question, has become more challenging since it is now indirectly expected to have an access level to the technical documentation which is usually not possible for competitor devices.

MEW: What advice would you give to medical writers?

(BA): The only advice that I can give to the industry and the medical writers is to check all available clinical data for all devices regardless of classification and decide if compliance to the requirements of the current directive(s) and the future MDR can be shown, meaning that the requirements of the new regulations can be fulfilled. In the case of compliance issue, the manufacturer should immediately run a corrective and preventive action (CAPA) and, in the worst-case scenario, rationalize the device. They have to concentrate their efforts on devices for which sufficient clinical data are available, and compliance with current essential requirements and future safety and performance requirements of the MDR can be shown.

MEW: Thank you for taking the time to share this important information with us. Interesting times are ahead, and the opportunities for medical writers will certainly grow!

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Out on Our Own

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Editorial

Greetings, readers. As I write this, the EMWA spring conference is on the horizon and I hope I will have met as many of you as possible at the Freelance Business Forum in Birmingham. In this edition of the *OOOO* you will find two interesting articles – one which deals with expanding our scope as communicators of medical science to patient education, and the other a story of a newbie freelancer setting up his business in South America.

The EMWA community is truly pan-national and I find it interesting to read stories of our members on how they came into the medical writing profession, sometimes moving across not just nations but also continents. It is also encouraging to note that medical writing as a profession is fast becoming a first-choice option for a number of academic researchers following their graduate studies. However, to do all this as a freelancer is indeed a feat requiring courage, fortitude, and steadfastness. In his story, Ricardo Wilches gives us his narrative on choosing to be a science communicator following his stint in academia and starting his own freelance consultancy in Colombia after having spent a number of years in Germany.

In recent years, a substantial amount of weightage has been given to patient engagement and involvement in the process of clinical research, especially from a regulatory standpoint. In this regard, the role of a medical writer becomes paramount in successfully conveying the science to the final consumers of the medical research process – the patient, in a language that is devoid of unnecessary technical jargon and easy to understand. While this can be quite daunting, the ultimate benefit is a well-informed patient who can make educated decisions and participate actively in the research process. In her article, Elisa Sala writes about the various avenues through which freelance medical writers can contribute to patient education and her personal experience with it.

I hope you find these articles instructive and an enjoyable read. Please continue to send in your contributions to and suggestions for the *OOOO* so that we may share these with other readers. Last, but not least, my personal thanks to Elisa and Ricardo for their educative and inspiring articles, and to Paul Wafula for helping with editing these.

Satyen Shenoy

Becoming a science communicator – in my own words

For a life scientist, the decision to move from academia to industry or public service may be regarded as a safe move in terms of financial stability and a built-in pipeline to career growth. However, for those who embark on the freelance pathway, the call for having control of their own destiny and to create their niche in society is possibly the main driving force. It is a choice that entails a great deal of risk, yet it may also lead to success, entrepreneurship, and innovation. My personal conviction is that, it is possible to build a successful career as a freelance medical writer and scientific communicator. The determining factors for this success are passion for what one does, a vision, useful habits, endless joy at learning, ability to build and work in teams, and a desire to push oneself into exploring uncharted territories.

Finding the path

Realising that my period in academia only meant the beginning of a bigger adventure was a slow process and it implied discovering my call and professional purpose. As I progressed through my education and training as a researcher, I enjoyed every step along the process of generating new knowledge; from designing and conducting experiments, analysing data, to writing up and communicating my results. I learnt the value of planning, persistence, and of cultivating good relations with fellow scientists, especially with my supervisor. However, these were not the only attitudes and skills that were instrumental to completing my doctoral studies.

Since my childhood, I have always enjoyed scribbling, sketching, and drawing – I grew up surrounded by people with a sensitivity for art and handicraft. Therefore, communication through drawings and sketches has always come naturally to me, and having a visual approach to understanding concepts and ideas has been central to learning science and communicating it to my peers. Furthermore, the activities that I best enjoyed during my graduate school, in Munich, included preparations for meetings or teaching activities, giving talks, and drawing on the board to illustrate concepts of processes in genetics and evolutionary biology – my fields of expertise. In the years as a doctoral student, I very often found myself organising scientific meetings and seminars at my institute.

After my 1 year as a post-doc working on quantitative genetics in southwestern Germany, it became clear to me that my career would focus on helping others to communicate and transfer knowledge. The next step was to initiate the process to make that vision I had created of myself come true.

The first steps to re-inventing myself as a science communicator were to understand what job offers were available outside academia, to identify what roles fit my profile, what my strengths and weaknesses were, and to move to Berlin – I have always wanted to experience living there. I addressed the first two tasks through re-connecting with former graduate school colleagues who were working in pharmaceutical and biotechnology companies. I inquired about their transition experience and the positive and not-so-positive sides of their current positions. This allowed me to gather information to help me formulate my goal. In addition, I started to reach out to medical and scientific communicators via LinkedIn. Thanks to this I encountered, for the first time, the term "medical writer".

Approaching medical writers was fun; they were easy to approach and happy to share their experiences and offer advice. Almost all the writers I got in touch with advised me to join EMWA through which I could meet writers with different levels of expertise and identify opportunities. Additionally, I could attend foundation courses at EMWA conferences to gather the knowledge and skills in the art of medical writing and science communication. Eventually, I joined EMWA, and next I found

myself back in good old Munich in May 2016, listening to talks about medical writing, participating in foundation workshops, and talking to scientists during coffee and lunch breaks about their previous research and how happy they are now in their many roles related to medical writing. Attending Munich's EMWA meeting also allowed me to meet with industry representatives. All in all, I left the venue filled with optimism, convinced of the importance of networking, and focusing on a new task – creating a niche for myself. Back in Berlin, I got in touch with leading members of EMWA's freelance group Berlin-Brandenburg. I participated in their informal gatherings and was fortunate to receive advice and mentorship from senior freelance writers in my area.

In addition, I started to work on my writing skills, chiefly in English, as well as participating in webinars at the EMWA website, and using online resources at Coursera. I decided to focus on the following topics: clinical research, epidemiology, public health, drug development and commercialization, and cancer. And as I worked on building my skills and approached industry from different fronts, the idea of pioneering as a medical writer in my country of origin, Colombia, started to cross my mind. My dream is to live on both continents, but to get to that point I felt it was necessary to create amenable conditions in one location. So, after long pondering over the pros and cons, I decided to continue this adventure in Colombia. In January 2017, I was commencing a new year in Bogota; the city where I was born and the vibrant capital of Colombia.

Advantages and disadvantages are context-dependent

Heading back to my country after having spent almost 10 years in Germany, meant being back with a suitcase full of good credentials, skills, and a lot of uncertainty. I came back with a good deal of international experience and habits, such as being punctual, that could or could not come in handy in the new business venue. Interestingly, one feels a little out-of-place after such a long stay abroad; fortunately, I can speak the local language "like a local". At first, words would not come easily but it is only a matter of practice. I think several EMWA members can relate to this.

Besides powerful personal reasons, I chose to move back to Colombia because of the consolidating presence of global pharmaceutical and biotechnology companies; implying that organisations such as CROs were also on demand with concomitant new opportunities for projects. Soon I realised that I was terribly optimistic and unprepared to seize my chances. After my long absence from the country, I identified two threats to my plan: firstly, I knew very little about Colombia's health system and policy, and second, I had to face a long tradition of only crediting physicians for pharma and clinical research jobs. The latter is understandable, since a workforce holding doctoral degrees in life sciences is of a very rare kind in Colombia. I was not disheartened by this reality. Instead, I saw opportunities and decided to make use of my strengths: solid research background, bilingual communication skills, determination, and my fast learning abilities. I knew the game had other stakeholders to whom my services would be useful.

So, I set to explore the market better and to identify the possible niches in which a scientific communicator could be of good use. Besides public organisations (policy makers and regulatory authorities), academia, health care providers, and, very importantly, the patients (patient associations), and healthy population. All these stakeholders do have the need to communicate with one another.

The messenger's mission

Once you identify who you can write for and on whose behalf, it all boils down to adapting one stakeholder´s message to ensure that target audiences will get it right. Clarity is always paramount regardless of who your target stakeholder is. In addition, if you are targeting messages to payers, medical bodies or regulatory authorities, then you should master the techniques of structuring information in the right way, but, if you are assisting the delivery of messages to patients or the general population, creativity will be your best ally.

This realisation and a doubled-up networking effort landed me to my first professional role as scientific communicator and medical writer in Bogota. I am currently providing services for a consultancy in the development of an exciting project on knowledge transfer framed within paving the way to personalised medicine.

I would like to see myself as a pioneer and as someone who looks for challenges and opportunities. When I joined EMWA, I was probably the first Colombian to do so, and now, in Colombia, I may be one of the few scientists who goes around advocating for EMWA and sharing ideas about medical writing and the importance of scientific communication. Although there are already hundreds of professionals who are currently doing medical writing and who chiefly come from the medical field and those who do scientific journalism, many of them are unaware of the tremendous scope of our chosen profession. Our contribution as scientists and communicators can be of benefit to the development of a country like Colombia and Latin America as a whole.

I am happy that I found in my new EMWA friends in Europe and South America, a guiding hand and moral support to redirect my path as a scientist towards medical and scientific writing. I look forward to maintaining my contribution to the association and through their support, embark on creating new bonds between medical writers in Latin America, Europe, and the world at large.

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Writing for patients – plenty of opportunities for freelance medical writers

Writing for patients is a novel challenge for freelance medical writers, not only for those who specialise in regulatory writing but also for those who work in medical communications. It offers plenty of opportunities to improve communication skills, expand scientific background, be engaged in medical and social initiatives, create novel and more personalised networks, and last but not least often write in one´s own native language. Freelance professionals are flexible, easy to contact, and free – sometimes – to accomplish projects for intellectual pleasure or scientific curiosity; therefore, they represent the ideal candidates to collaborate with patients' associations.

Since the first European Medicines Agency (EMA) workshop on clinical trial transparency, held in 2012, patients' associations have also been identified as stakeholders, together with academics, industry representatives, editors, and lawyers, to set the milestones for EMA initiatives towards transparency. Patients' engagement and a novel patient-centred attitude has led the EMA to increase the ethical responsibility towards these principal players in clinical trials, by introducing the layperson's summary in the Market Access Authorisation procedure.

The lay-person summary is a regulatory document that summarizes the main results of a trial in an understandable and accurate manner. The debate about its structure and content is still ongoing and sharing medical writers' experiences on writing this document would be of outstanding importance to improve its quality in the future. Basically, to write a layperson´s summary, a perfect knowledge of clinical trial and the ability to summarise and highlight the most important information and communicate them in a clear, concise, and appropriate way are required.

Another document specifically addressed to patients is the informed consent. At the 4th EMWA Symposium held during the spring conference in Munich last year, Jan Geissler – Director, European Patients' Academy on Therapeutic Innovation – proposed a novel version for the informed consent, structured and written with patients in mind. The document has a clear structure in which trial-related information, organisational information and consent and data confidentiality are well classified; the readability is improved by using short sentences, figurative and lay language, and explanatory schemes and pictures. The TIGER Study[1] on chronic myeloid leukaemia has already used this patient information consent in more than one hundred trial centres in Germany.

Both lay-person´s summary and the informed consent must be patient-centred to be effective and valuable; a professional medical writer should modify his/her style and language to meet and inform the patient, and this may present a very big challenge!

The involvement in patients' association initiatives, such as awareness campaigns, website updates, and scientific meetings, may be also of interest to medical writers. I was personally called to collaborate with five patients' associations involved with rare diseases which started an awareness campaign on the use of sunscreen products. We were committed to identifying the scientific rationale that justifies the mandatory use of sunscreen in each of these rare diseases and bring it to the attention of the *Ministero della Salute* – the Italian Ministry of Health. It was an inspiring and enriching experience in all aspects: I found expertise, high commitment to achieve the final goal, and professional friendship that helped me improve as a medical writer and woman.

I strongly recommend exploring the world of patients' associations and looking at writing for patients as a great opportunity to grow.

References

1. ClinicalTrials.gov. Tasigna and interferon alpha evaluation initiated by the German Chronic Myeloid Leukemia Study Group – the TIGER Study (TIGER). 2017 [cited 24 Apr 2017] Available from: https://clinicaltrials.gov/ct2/show/NCT01657604.

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CONTACT US

If you have ideas for themes or would like to discuss any other issues, please write to **mew@emwa.org.**

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