International Survey of Clinical Engineering Professionals

By Y. David¹, S. Calil², N. Pallikarakis³, M. Poluta⁴, K. Stavrianou⁵, S. Bergamasco⁶, D. Clark⁷, T. Judd⁸, J. Wear⁹, T. Easty¹⁰

¹ Global Clinical Engineering Summit Chairman, USA
² Clinical Engineering Professor, Brazil
³ Chairman of the Institute of Biomedical Technology, Greece
⁴ Clinical Engineer, South Africa
⁵ IFMBE/Clinical Engineering Division Secretariat, UK
⁶ Italian Clinical Engineers Association (AIIC), Italy
⁷ Clinical Engineering, Nottingham University Hospitals NHS Trust, UK
⁸ IFMBE/Clinical Engineering Division Chairman, USA
⁹ Clinical Engineering Consultant, USA
¹⁰ Clinical Engineering Professor, Canada

ABSTRACT

To determine the maturity of a profession one must have knowledge of the individual attributes of the practitioners of that profession and the universal strength of unique skills among them. We have conducted an international survey of Clinical Engineering (CE) professionals associated with the management of technological tools developed for and deployed within the healthcare delivery system. The survey targeted participants who are practicing engineering tasks related to the safe and efficient management of technology used in the delivery of healthcare services. The participants consisted of a cohort of individuals whose contact information was collected from attendees at previous clinical and biomedical engineering events including: (1) presentation at congresses/regional meetings, (2) serving on international technical committees or task forces, (3) attending virtual clinical engineering events, or (4) subscribing to the Global Clinical Engineering Journal.

The purpose of the survey was to identify the state of organization of CE professionals and the potential gaps, if any exist, in meeting their professional development needs. The survey was developed and conducted using online internet apps and links that provided access to a questionnaire in six different languages to facilitate optimal participation and response accuracy in as many geographical regions as possible. The survey was conducted in the early part of 2020 over a period of 6 weeks. The overall response rate was over 5% (total of 14,400 individual contacts less estimated 1,750 contacts who did not open/bounced back). A total of 667 responses from 89 countries were received. This survey is considered an improvement, over previously reported international surveys, with regard to response volume and rate. The strength of this survey, having larger response volume and geographical representation, when compared with previously documented CE surveys has improved even with a narrower time window of data collection. The current survey consisted of twelve questions, beginning with information request about the respondent professional affiliation and moves on to request the ranking of the criticality of CE specific issues, while another question provided for comments in free formatting text style. The responses received were in all of the seven languages posted and included representation from all the continents. The analysis of the survey responses shows that about 60% of the responders identified themselves as clinical engineers, 16% as other type of engineers, 13% as technicians, and 12% as health professionals. Responses to particular questions demonstrate highest ratio of number of affirmative to negative responses. They were related to the perceived value responders placed on stronger international collaboration and on their willingness to engage in it. A conclusion, based on the analysis of the responses to this international survey, that the CE profession is awaiting the consolidation of the momentum generated by growing healthcare needs and present global conditions. The identified gap is lack of a dedicated international representation that is clearly identifiable within the CE field. Analysis of the survey data suggests the need of an international framework focusing on the various CE professional groups/associations and their members to face present challenges. The establishment of a global alliance to clearly identify the field of clinical engineering to promote public awareness; to form liaison with government agencies and other healthcare decision makers, will improve global cooperation and inter CE societal relations that will serve patients as well.

Keywords – Clinical engineering, survey, questionnaire, global, association, professional, technicians, health, international, alliance, collaboration.

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INTRODUCTION
The dependency of healthcare systems on technology for the delivery of their services is at an all-time high and projected to continuously grow. In addition, costs associated with the provisioning of healthcare programs are showing an increasing trend to consuming a large portion of total national gross product. To maximize patient care outcomes and to achieve optimal return on the investment in healthcare technology, it is important to manage the healthcare technology life cycle. This is the main area that clinical engineers, and related technologists and technicians are trained to apply their respective competencies to effectively manage and service healthcare technology.

To meet the need to determine how well optimal management of healthcare technology is improving the ability of care providers to practice their profession, fundamental data must be collected regarding how well the needs of the professionals who manage and service this industry are being met. The authors intended to gain new knowledge about the needs of CE practitioners. Specifically, how to overcome lack of opportunities for sustaining sharing of knowledge between international clinical engineering practitioners due to limited clinical engineering professional associations knowledge sharing and exchanging.

Other researchers attempted, in previous work, to determine availability and the extent of CE's responsibilities were deployed by using survey methodology and concluded that lack of harmonization and wide variation in requirements and values are evident in the management of hospitals biomedical technology around the world. Reported results of one of the early surveys looked at CE effectiveness at hospitals in developing countries included 163 responses from 43 countries mostly from Africa, Latin America and Asia. This survey states "This is the first study to collect and analyze data on the complexity and state of hospital equipment across the developing world; additionally, it is the first to collect significant responses from Africa. Prior to this study, only 10 developing countries had been profiled in international studies." To increase knowledge of a field of practice and to identify attributes of profiled in international studies. To increase knowledge of a field of practice and to identify attributes of profiled in international studies.

METHODOLOGY
One specific form of data collection method was an online survey consisting of a set of structured questions that can be clearly understood by the expected respondents. The online survey delivers advantages of being easy to respond to and efficient to analyze, having a low burden of respondents select buttons and can easily change or correct their choices prior to submission. Available on-line tools can be used to analyze the data in variety of determinants. In addition, the survey was offered online with applications that could be easily be read and responded to on a working station, tablet, as well as other mobile devices.

Most surveys have a goal of being able to make inferences about points of interest in the target population. In general, one is faced with the need to make assumptions that the persons in the data collection sample are similar to the general population. In short content without open ended style, and yet providing for free text format area at the end of the survey to collect additional information not included within the formal set of questions.

The optimal survey format to be used is based on literature of systematic survey and analysis of the use of international population surveying methods in various other fields. Our survey used a questionnaire template style following an introductory statement about its purpose and identifying its administrators and timetable for response acceptance. Clear and simple questions' language, together with a small number of questions and the use of multiple-choice questions style were all intended to help increase survey response rate. Since the total size of the international community of practicing C.E. is unknown at present and the response rate of previous survey was low the sampling methods for this research study was probability sampling where members of the community are chosen randomly. The survey questions were translated into six different languages, in addition to English, to facilitate better response rate from the different continents and countries. The languages used in included: English, Spanish, French, Arabic, Chinese, French, and Russian.

A short introductory that preceded the questionnaire explained for the community who received it the survey's purpose and the importance of completing the questionnaire. It is presented in figure 1 below.
The volume of responses to the survey that were collected over relatively short time (six weeks) suggests that the survey was clear to understand and that subject matter was of interest to responders. As a matter of fact, the average time to complete the survey was measured to be 11:27 minutes for desktops, over 3 minutes for tablets, and over 8 minutes for mobile devices all respectfully for the users of the English language. It is also interesting that although the number of responses from English speaking countries like USA, UK, Ireland, Canada, and Australia accounted for 121 participants, the number of survey responses in the English language was 282; suggesting that individuals found the survey questions to be sufficiently clear even as a second language.

Responses were received from all the continents and are shown in figure 2 below. The blue color indicates location from where responses were received, and the color intensity indicates volume of responses with darker blue means larger volume.

The first question was about the professional standing of the respondent. Of the total of 669 responses received: 59% of the respondents identified themselves as clinical or biomedical engineer, 16% identified themselves as other type of engineer, 13% identified themselves as clinical engineering technician, healthcare scientists were checked at 5%, healthcare professional at 4%, and other professional were marked 3%. A graphical presentation of the results of question number #1 is shown in figure 3 below.

The second question addressed information about the prevalence of CE national societies, where 73% answered that they have such an association or society, 20% did not, and 7% were not sure.

The fourth question asked if the respondent is a member of such an organization and do you participate in its meeting or activities: 48% responded that yes, they are members and participate. While 17% wrote that they are members but do not participate, while 20% said that they are not but planned to join in the future, and 15% replied with No, as shown in figure 4 below.

The fifth question asked about higher education-based programs being offered in the field of CE in your country? Responses were 74% Yes, 17% No, 9% I am not sure. The sixth question asked: Would you volunteer a few hours a month to help advance clinical engineering and its application and impact locally and globally? the answers show distribution of 86% Yes, 4% No, and 10% Not sure. The two questions that received the highest ratio of positive to negative responses were question number 7 and question 8, shown in table 3 below. Question number 7: Do you see value in an international organization focusing the needs of clinical engineering? This question registered the highest positive responses with 93% Yes, 2% No, and 5% Not sure. Question seven is important for the understanding of the respondents’ level of perceived value and need for global organization to unite the CE field. To the question eight: “Would you participate in the activities of such an organization?”, 94% replied with Yes, 4% with No, and 12% were not sure.

The results of question number #4: Are you a member of the Association/Society and do you participate in their meetings or programs? was of interest to responders. As a matter of fact, 84% replied with Yes; 2% with No, and 5% I am not sure. Question seven is important for the understanding of the respondents’ level of perceived value and need for global organization to unite the CE field. To the question eight: “Would you participate in the activities of such an organization?”, 94% replied with Yes, 4% with No, and 12% were not sure.

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Table 4. Questionnaire results show order ranking of top challenges in current CE field

| Challenge in CE field | Answers |
|-----------------------|---------|
| Education-Training    | 446     |
| Recognition           | 361     |
| Professional Standing-Credentialing | 337 |
| Engagement with leaders | 270 |
| Networking            | 230     |
| Career progression    | 299     |
| Publication opportunity | 184 |
| other                 | 31      |

Discussion and Conclusions
Most of previously reported surveys conducted in the clinical engineering field resulted in relatively small sample volume and rate. These surveys were discussed in the introduction segment of this manuscript. The present survey was distributed and available for response for shorter time duration than the previous surveys and yet the volume of the responses was higher. The results of this clinical engineering international survey provide representative data that suggest gaps in building sustainable global exchange of knowledge and professional networking between groups/associations of clinical engineering practitioners.

The survey essentially comprises of two parts. The multiple-choice questionnaire (part I) and the ranking of challenges and free text (part II). The results from part I, deem to suggest that a positive change taking place in the CE field reflected by growth in the volume of the number of national CE associations around the world as reflected by the relatively high confirmation response rate to question two “do you have CE association in your country?” (73%) and to question four about participation in such association (48%). In yet another demonstration, for same phenomenon observed by the data, is the high positive response to the question about availability of higher education-based program in your area (74%).

However, this stands in contrast to the results analyzed for part II – the ranking of the top challenges the responders are facing. The data clearly reveals that the most important challenges responders face are limited availability of education and training (446 responses), followed by lack of professional recognition (361 responses), and by absence of professional credentialing programs (337 responses). All other listed challenges recorded less than 200 responses each, placing higher significant on the top three.

The data also sufficiently demonstrate a clear and overwhelming positive response for the value seen in having international organization that will focus on CE needs (6.12 responses) as well as for responders’ intention to participate in such an organization (553 responses). It is also revealing to see that only 2% of the responders (13 responses) do not perceive of such a value. The combination of the results of (part I) of this questionnaire with the ranking of top challenges the CE field is facing (part II), with also the growing attendance at international CE congresses, and the most increase volume of CE publications – reveals a CE field in the midst of a professional evolution in need of leadership to further facilitate its important impact on healthcare programs. The survey highlighted the state of CE associations, networking, professional challenges, and the desire for more international cooperation that leads needed professional development programs. Programs that support expansion of skills, job responsibilities, and equal participation in healthcare teams. Patient care outcomes stand to improve when healthcare technology is optimally managed. Identifying the global challenges faced by international community of CEs is the first step towards overcoming them and the shared goal of better healthcare outcomes can then be better guided.

Establishment of global collaboration and structure to achieve partnerships will help to overcome barriers, support professional development, and increase recognition, as well as addressing other challenges facing the CE profession.

Based on the analysis of the survey data, one such initiative can be to unify the global CE field and provide a framework for the various professional groups/associations and their members with continuous opportunity for collaborations across areas and on issues better resolved on an international level. Assuch, the establishment of a global structure clearly identifying unified field of clinical engineering that will: promote public awareness; form liaison with government agencies and other healthcare decision makers; and improve international cooperation and inter societies relations and will ultimately support better patient care and wellness everywhere.

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References
1. M. Clark, M. Rogers, A. Foster, D. Pownach, F. Saadeh, J. Weaver, V. Mor: A Randomized Trial of the Impact of Survey Design Characteristics on Response Rates Among Nursing Home Providers. Eval Health Prof. 2011;34(4):464–466. doi:10.1177/0163278103797791.
2. L. Nascimento, S. Cali, T. Judd, Y. David: Analysis of IFMBE-CEC 2017 Worldwide Clinical Engineering Survey. Global Clinical Engineering Journal. Vol. 2, Issue 1, December 2019. https://doi.org/10.31354/cgce2019.170.
3. F. Frieze, C. Cao, I. Roy: Survey of Clinical Engineering in Developing Countries and Model for Technology Acquisition and Diffusion. Proceedings of IEEE, 2005 EMBS 27th annual conference, Shanghai, China, Sept. 1-4, 2005. https://ieeexplore.ieee.org/abstract/document/1616369.
4. J. Dyro: Clinical Engineering: Evolution of a Discipline, Clinical Engineering Handbook, Chapter 1, Elsevier Academic Press Series in Biomedical Engineering, USA, 2004.
5. Clinical Engineering Handbook, E. Ladanza (ed.), Chapter 1, Second Edition, Academic Press, Elsevier 2020. https://www.elsevier.com/books/clinical-engineering-handbook/ladanza/978-0-12-013467-2?countrycode=US&format=print&utm_source=google_ads&utm_medium=paid_search&utm_campaign=usaskoppings&gclid=CwKAw4r6f6BR-AvEiwAn2Q76u0DU1BXRJ0m7P5rTRmzmQWM-PIfjH6FXqjzkBi1km0rKlqmVguCl007RQAQ05BwE
6. American Institute for Medical and Biological Engineering, Wiley Encyclopedia of Biomedical Engineering. April 2006. https://www.wiley.com/en-us/Wiley+E+encyclopedia+of+Biomedical+Engineering;rc=6+Volume+1+Set-p-7980471249672.
7. de Leeuw, E. D., Hox, J., & Dillman, D.A. (Eds.). International handbook of survey methodology. Taylor & Francis Group/Lawrence Erlbaum Associates. (2008).
8. http://psychonet.apa.org/record/2008-04187-000.
9. M. Goshova, N. Pallikarakis: World Clinical Engineering Survey, Clinical Engineering Handbook, Chapter 15, Elsevier Academic Press Series in Biomedical Engineering, USA, 2004.
10. S. Mullav, M. Frie: Survey of clinical engineering effectiveness in developing world hospitals: equipment resources, procurement and donations, Conference Proceedings IEEE/EMBS 2008, doi: 10.1109/EMBS.2008.4650212.
11. Dorniciewicz, T. Clark, Y. David: A National Online Survey on the Effectiveness of Clinical Alarms, American Journal of Critical Care 17 (1):36–41, January 2008. https://aajcnournals.org/ajccoline/article-abstrac/17/1/36/643/A-National-Online-Survey-on-the-Effectiveness-ofRedirectedFrom-fulltext.
12. Part B Culture, Communication and Cognition in Response Survey Methods in Multinational, Multiregional, and Multicultural Contexts, edited by Harless et al. 2010, John Wiley & Sons, Inc. https://www.researchgate.net/profile/Daphne_Oyserman/publication/230015384_Cognitive_Communication_and_Cognition_Implications_for_the_Survey_Response_Process/title/59ecb648505139f983dec415/Cognition-Communication-and-Culture-Implications-for-the-Survey-Response-Process.pdf.
13. de Leeuw, E. D., Hox, J., & Dillman, D.A. (Eds.). International handbook of survey methodology. Taylor & Francis Group/Lawrence Erlbaum Associates. (2008).
14. The authors would like to thank all of the translators who helped convert the questionnaire from English into additional total of six languages. German Giles (Spanish), Saide Calli (Portuguese), Farid Riad (Arabic), Zheng Kun (Chinese), Andrei Issakov (Russian), Nicolas Pallikarakis (French).
APPENDIX I

The following question was selected as an example for the use of multilanguage translation (English, Portuguese, Arabic, Chinese, French, Russian and Spanish) and are shown in their original posting in the figures below.

APPENDIX II

Full questionnaire in English.

13. The Global Clinical Engineering Summit, 3rd ICEHTMC Congress, Rome, Italy, 2019. https://ced.ifmbe.org/blog/ifmbe-icedestatus-cesummit2019.html

14. International Clinical Engineering and Health Technology Management Congress, Rome, Italy, October 21-22, 2019. http://www.icehtmc2019.com/paper-submission.html

15. Making a Difference – Global Health Technology Success Stories: Overview of over 400 submissions from 125 Countries. Global Journal of Clinical Engineering, Vol.1, No. 1, 2018. https://www.globalce.org/index.php/GlobalCE/article/view/43

16. The Global Clinical Engineering Summit, 4th ICEHTMC Congress, Rome, Italy, 2020. https://ced.ifmbe.org/blog/ifmbe-icedestatus-cesummit2020.html

17. International Clinical Engineering and Health Technology Management Congress, Rome, Italy, October 12-13, 2020. http://www.icehtmc2020.com/paper-submission.html

18. Making a Difference – Global Health Technology Success Stories: Overview of over 400 submissions from 125 Countries. Global Journal of Clinical Engineering, Vol.2, No. 1, 2020. https://www.globalce.org/index.php/GlobalCE/article/view/100

19. The Global Clinical Engineering Summit, 5th ICEHTMC Congress, Rome, Italy, 2021. https://ced.ifmbe.org/blog/ifmbe-icedestatus-cesummit2021.html

20. International Clinical Engineering and Health Technology Management Congress, Rome, Italy, October 11-12, 2021. http://www.icehtmc2021.com/paper-submission.html

21. Making a Difference – Global Health Technology Success Stories: Overview of over 400 submissions from 125 Countries. Global Journal of Clinical Engineering, Vol.3, No. 1, 2021. https://www.globalce.org/index.php/GlobalCE/article/view/165

22. The Global Clinical Engineering Summit, 6th ICEHTMC Congress, Rome, Italy, 2022. https://ced.ifmbe.org/blog/ifmbe-icedestatus-cesummit2022.html

23. International Clinical Engineering and Health Technology Management Congress, Rome, Italy, October 10-11, 2022. http://www.icehtmc2022.com/paper-submission.html

24. Making a Difference – Global Health Technology Success Stories: Overview of over 400 submissions from 125 Countries. Global Journal of Clinical Engineering, Vol.4, No. 1, 2022. https://www.globalce.org/index.php/GlobalCE/article/view/230

25. The Global Clinical Engineering Summit, 7th ICEHTMC Congress, Rome, Italy, 2023. https://ced.ifmbe.org/blog/ifmbe-icedestatus-cesummit2023.html

26. International Clinical Engineering and Health Technology Management Congress, Rome, Italy, October 9-10, 2023. http://www.icehtmc2023.com/paper-submission.html

27. Making a Difference – Global Health Technology Success Stories: Overview of over 400 submissions from 125 Countries. Global Journal of Clinical Engineering, Vol.5, No. 1, 2023. https://www.globalce.org/index.php/GlobalCE/article/view/295
9. Please provide your Country *

Type or select an option

- United States
- United Kingdom
- China
- Canada
- United Arab Emirates
- Australia
- Andorra

10. Please provide your Full Name (optional)

Type your answer here...

11. Any other comments?

(Please list any key issues and challenges facing professionals working in clinical engineering in your country or region. How might a global organization representing the clinical engineering profession assist in addressing these?)

12. What are the top challenges we should address? (you can add your own at the end of the list)

Choose as many as you like

- Education-Training
- Recognition
- Professional Standing-Credentialing
- Engagement with leaders
- Networking
- Career progression
- Publication opportunity
- Other