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Young ERC article

The Young European Resuscitation Council Resuscitation Science Masterclass – Concept and implementation

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Abstract

Nurturing the development of the next generation of resuscitation scientists is essential for creating a vibrant and enabled community equipped with the necessary knowledge, attitudes, and skills to transform resuscitation practice and improve outcomes.

In this concept paper we will describe the development and implementation of the first Young European Resuscitation Council Resuscitation Science Masterclass. The masterclass aims to connect, inspire, and support the growth of the next generation of resuscitation scientists through education, networking, and joint scientific work. The masterclass provides 20 international, multi-professional early career resuscitation scientists with the opportunity to expand their knowledge and network as well as conduct joint scientific work over the course of one year. This is achieved by interactive webinars, innovative online workshops, engaging online journal clubs as well as an educational in-person event to conclude the masterclass.

The Young European Resuscitation Council Resuscitation Science Masterclass aims to strengthen the global resuscitation community and next generation of resuscitation scientists by facilitating opportunities of broader international initiatives and collaboration for early career resuscitation scientists, potentially leading to accelerated recruitment of future resuscitation leaders. Ultimately, this masterclass may enable early career researchers to produce high impact research that can shape the future of resuscitation science and improve cardiac arrest patient care globally.

Keywords: Resuscitation science, Education, Cardiopulmonary resuscitation, Early career, Masterclass, Young ERC, European Resuscitation Council

Introduction

Resuscitation scientists aim to improve survival from cardiac arrest by building a thorough understanding of the pathophysiology and epidemiology of cardiac arrest, the systems in place to detect cardiac arrest, lay-person response, well-functioning healthcare teams, intra-arrest and post-arrest care, as well as education and survivorship.[1–4]

However, cardiac arrest is challenging to study due to the disease and treatment complexity as well as the unpredictable occurrence of cardiac arrest often outside of well-controlled environments.[5,6] This requires a multi-professional, interdisciplinary approach that employs various research methods including basic science, animal studies, registry studies, simulation studies and clinical trials.[7,8] Therefore, it is crucial that the next generation of resuscitation scientists builds on and expands interprofessional and international collaborations to improve scientific output which aims to more neurologic intact survival from cardiac arrest.

As a supporting committee of the European Resuscitation Council (ERC), the Young ERC aims to engage early career members in the resuscitation community by developing initiatives to support the

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growth of the next generation of international resuscitation leaders across professions and disciplines.[9] Early career members of the resuscitation community are persons with a strong interest in resuscitation but who are students, remain in training or are at the early stages of their professional or research career. They are not defined by age or professional background.

Resuscitation science provides multiple opportunities for early career individuals to contribute. However, early career and junior researchers might experience difficulties connecting to the larger networks of the international resuscitation science community. There might also be significant discrepancies in the national opportunities for aspiring resuscitation scientists. This might be in part explained by the varying development stages of national resuscitation communities resulting in discrepancies of support for early career individuals. Additionally, there is no targeted and broadly accessible curriculum to train and develop the next generation of resuscitation science experts that fosters collaboration between cultures and countries.

To bridge this educational gap, the Young ERC developed the "Resuscitation Science Masterclass" aiming to connect, inspire, and support the growth of the next generation of resuscitation scientists through education, networking, and joint scientific work. In this concept paper we describe the creation of the first Young ERC Resuscitation Science Masterclass that was launched as a pilot in fall of 2023.

Young ERC Resuscitation Science masterclass

Development process

The pilot version of the Young ERC Resuscitation Science Masterclass was developed under the following four main provisions. First, it should be of high value to all its participants. Second, it must be feasible in its implementation. Third, the masterclass should hold the potential to become a recurring event that is improved with every cycle. Fourth, the masterclass must be inclusive, aiming to reduce ethnic, professional and gender disparities in resuscitation science.[10–14]

A working group composed of Young ERC Committee members developed the Young ERC Resuscitation Science Masterclass program over more than one year. It was refined through feedback and discussions with further Young ERC Committee members, ERC Board members, and Resuscitation Plus Journal editors. A collaboration has been established with Resuscitation Plus aiming to support and encourage junior researchers to publish their scientific results.[15] This includes the Young ERC Resuscitation Science Masterclass journal club articles for Resuscitation Plus.

Participant selection process

The Young ERC Resuscitation Science Masterclass offered 20 spots to aspiring resuscitation scientists from all over the world at no direct cost to the participants, which is possible through the collaboration with the ERC and the Resuscitation Plus Journal.[15–17]

To ensure a diverse group of masterclass participants, we opened an equal number of spots for physicians, nurses, paramedics, and students, including other professions. All complete applications received within the application period were reviewed by two independent members of the Young ERC Resuscitation Science Masterclass Selection Committee. The Selection Committee members were not allowed to review applications coming from their own countries to minimize bias. Applicants were scored on a scale of 1–5 points in four categories: 1) overall application quality, 2) compelling motivation, 3) dedication and commitment, 4) appropriate clinical and/or scientific experience. The applications with the highest sum of points of each professional category were selected. To promote diversity within the next generation of resuscitation scientists, the selection process not only considered the participants' professional background but also took aspects such as gender and geographical background into account which was intended to be used to decide between equally qualified applicants. If a professional group would have had an insufficient number of qualified applications, it could have been filled up by the highest scoring applicants from other professional categories.

Delivery and contents

The masterclass contents are delivered online and in-person at an optional educational in-person event over the course of one year. The three main masterclass tracks are monthly interactive webinars, journal clubs and online workshops. An overview of the masterclass online formats is provided in Fig. 1.

Webinars

The masterclass webinar track has 10 thematic sessions that are held monthly by a multi-professional group of internationally renowned resuscitation science experts who are supported by Young ERC moderators.

All webinars are structured with a general introduction, followed by an expert talk, a participant networking session, a subsequent expert question & answer part and a closing statement (Fig. 1). The expert talks are delivered by one or more speakers depending on the topic.

The topics for the masterclass were selected to grant specific insights into the many facets of resuscitation science and should emphasize the multi-disciplinary perspectives involved. A full overview of the webinar titles is provided in Fig. 2. These topics should guide the participants towards developing their own resuscitation science research proposal which should ultimately lead to actual research activity. The learning outcomes for the webinar sessions are described in Table 1.

Workshops

The masterclass workshop track aims to strengthen the participants' presentation and communication skills. It consists of 4 workshops that emphasize the three main themes of presenting scientific results in person, visually and via new media as well as in written form. As participants develop their own research proposal throughout the year, the final workshop gives them the opportunity to present their proposal to their peers and invited resuscitation science experts who provide them with detailed feedback on their proposal. As some of the workshops include individual coaching, the participants are split into multiple groups for the respective workshops. The learning outcomes for the workshops are described in Table 1.

Journal clubs and special article

The masterclass participants attend 5 online journal clubs to critically appraise a selected resuscitation science article together with their peers and an experienced journal club moderator. For each journal club a group of 4 participants prepares a structured presentation of a resuscitation article with engagement of all participants describing

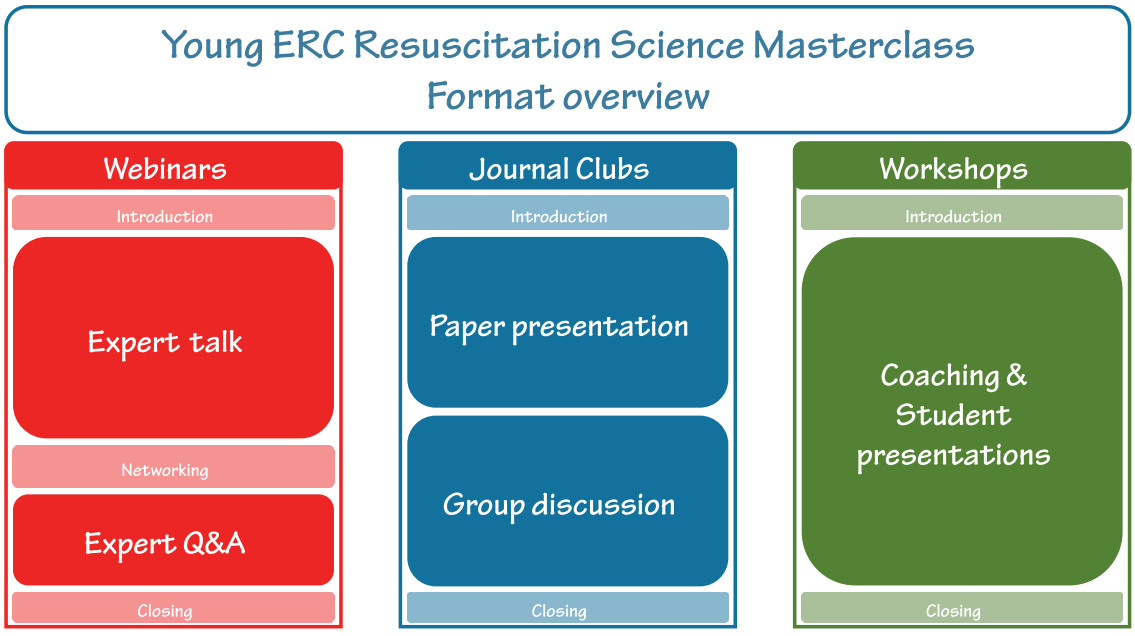

Fig. 1 – Young ERC Resuscitation Science Masterclass format overview. Abbreviations: Q&A: Question and Answer.

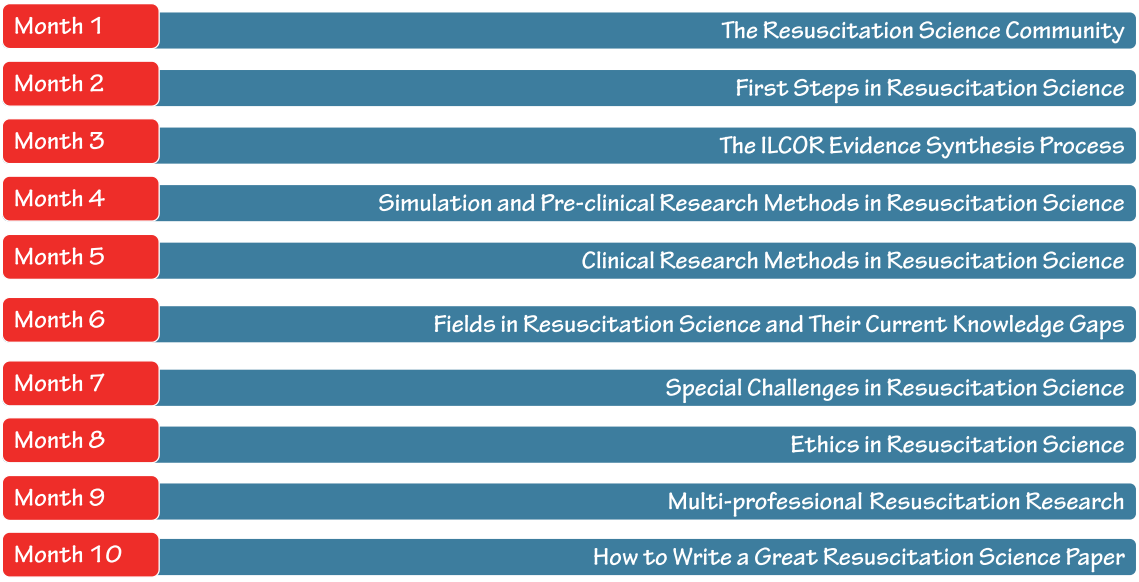

Fig. 2 – Young ERC Resuscitation Science Masterclass webinar titles. Abbreviations: ILCOR: International Liaison Committee on Resuscitation.

the population, intervention, comparator, and outcomes of the paper. Following that, the participants and the moderator discuss key methodological issues and critically appraise the paper. The learning outcomes for the journal clubs are described in Table 1.

Following the journal club, the presenting participants and the moderator write a Young ERC journal club article submitted to Resuscitation Plus. The Young ERC journal club articles are up to 1,200 words explaining the design of the paper, the key findings, limitations, methodological learning points, and perspectives for clinical practice and science. The journal club articles are invited by the Young ERC Resuscitation Plus Editor and are to be peer reviewed.

In-person event

The Young ERC Resuscitation Science Masterclass aspires to offer an in-person event towards the conclusion of the online program. The purpose of this event is to enrich the acquired skills and knowledge as well as to strengthen the connections made during the online portion of the masterclass. Over the course of multiple days, actionable research proposals are to be developed by the masterclass participants which will be facilitated through in-depth workshops, discussion rounds, and stimulating resuscitation science keynote lecturers. The developed research proposals should include future contributions of the other masterclass participants and are

Table 1 – Learning outcomes for webinars, journal clubs and workshops.

Learning Outcomes: Webinars	
Session title	**On completion of the masterclass the participants will know**...
The Resuscitation Science Community	- The history, general structure and scientific mission of the ERC and ILCOR. - The function and structure of the Science and Education Committees and Task Forces - The formal and informal networks and the hidden structures of the resuscitation science community. - Future perspectives and opportunities to get engaged with the ERC and ILCOR as a young scientist.
First Steps in Resuscitation Science	- The process of developing a research question. - The importance of finding a mentor and support. - The process to design a scientific project. - The process to write a grant proposal or a research protocol. - The steps to get funding for a research project.
The ILCOR Evidence Synthesis Process	- The general process of evidence synthesis in ILCOR. - The structure and interpretation of systematic reviews, scoping reviews and evidence updates. - The fundamentals of the GRADE system. - The steps to develop a CoSTR.
Simulation and Pre-clinical Research Methods in Resuscitation Science	- The fundamentals of pre-clinical research methodologies and models. - The translational aspects of pre-clinical research. - The applicability and limitations of pre-clinical research methodologies. - Both laboratory and simulation methodologies.
Clinical Research Methods in Resuscitation Science	- The fundamentals of clinical research methodologies. - Which study design can address which question. - The process and threshold to change clinical practice. - The applicability and limitations of clinical research methodologies. - Both epidemiology and clinical trials.
Fields in Resuscitation Science and Their Current Knowledge Gaps	- The different fields of resuscitation science. - What are current knowledge gaps in these fields and how can they be addressed.
Special Challenges in Resuscitation Science	- The common challenges in resuscitation science. - What are potential errors that require special attention to avoid them. - The relevant biases and limitations in resuscitation science. - The relevant challenges in different study designs in resuscitation science.
Ethics in Resuscitation Science	- The fundamentals of ethical considerations when conducting resuscitation research. - The importance and feasibility of informed consent during medical emergencies and cardiac arrest. Different legal situations regarding ethical approval for research in Europe. The available ethical conduct guidelines and how these might guide researchers when planning or conducting research.
Multi-Professional Resuscitation Research	- The relevant aspects of a multi-professional research environment. - The strengths and challenges of multi-professional collaborations. - Different pathways for different professional backgrounds to become a successful researcher in resuscitation science.
How to Write a Great Resuscitation Science Paper	- Principles of writing a scientific manuscript. - What editors and reviewers are going to look at in a submitted manuscript. - The common errors to avoid. - How to write a good cover letter. - How to respond properly to reviewers and editors during the revision process.
Learning Outcomes: Journal Clubs	
Participation	**On completion of the masterclass participants will know and/or will be able to**...
Journal Club Presentations	- Apply the fundamentals of critical appraisal. - The thematic learning points of the current resuscitation literature. - The fundamentals of scientific discourse. - The in-depth aspects of critical appraisal of the respective article. - To present the current literature to their peers and experts. - To discuss the current literature with their peers and experts. - To collaborate with an international research team.
Journal Club Article	- To write a special journal article for a peer-reviewed journal. - To collaborate with an international research team.
Learning Outcomes: Workshops	
Workshop name	**On completion of the masterclass participants will know and/or will be able to**...
The Art of Presenting: How to present scientific results in person	- To generally conduct online presentations. - To improve their individual online presentations. - To critically appraise and give feedback on other presentations.

Table 1 (*Continued*)

Learning Outcomes: Workshops	
Workshop name	**On completion of the masterclass participants will know and/or will be able to...**
The Art of Presenting: How to present scientific results visually and communicate them via new media - Introduction	- The fundamentals of good visual communication of scientific findings. - The basic tools to create a visual communication for their research projects. - The fundamentals of good practice for new media communication of scientific findings.
The Art of Presenting: How to present scientific results visually and communicate it via new media - Participant Presentations	- To improve their individually designed visual communications. - To critically appraise other visual communications.
The Art of Presenting: How to present scientific results in written form	- To apply the basics of proposal writing. - To formulate a good research question. - To present a project proposal. - To improve their individual proposal. - To critically appraise a project proposal.

Abbreviations: ERC: European Resuscitation Council; ILCOR: International Liaison Committee on Resuscitation; GRADE: Grading of Recommendations, Assessments, Development and Evaluation; CoSTR: Consensus on Science with Treatment Recommendations.

mentored by a resuscitation science expert. This should lead to research collaboration extending beyond the masterclass program.

Participant support

The masterclass participants are offered continuous individual and group support by the Young ERC masterclass team who serves as a point of contact for organizational and administrative questions. Additionally, the Young ERC team arranges an optional orientation meeting at the beginning of the masterclass to ensure a smooth onboarding process for participants. After 6 months, an optional mid-term meeting to facilitate a successful second half of the program and satisfying learning experience is offered to the participants.

Course completion and diploma

Upon satisfactory completion of the Young ERC Resuscitation Science Masterclass, the participants receive a Young ERC Resuscitation Science Masterclass diploma. The requirements for satisfactory completion of the masterclass are defined in Fig. 3.

Implementation

During the first call for applications for the Young ERC Resuscitation Science Masterclass, we received 191 applications. Applications from 45 different countries were submitted with the majority (63%) coming from European countries. The largest number of applicants were physicians (57%), and most applicants were male (63%). The majority of applicants had less than 3 years of research experience (74%), and only 8% had no research experience. Detailed results on the applicants' geographical, professional and research backgrounds can be found in Fig. 4.

Following the selection process, 5 participants from each defined professional group were selected resulting in a total group of 20 participants, 10 male and 10 female participants, from 11 countries forming the first Young ERC Resuscitation Science Masterclass.

Evaluation and perspectives

The current Young ERC Resuscitation Science Masterclass pilot program serves as an opportunity to further develop and refine the masterclass program. We will evaluate each session and the masterclass overall, incorporating feedback by participants and faculty. The obtained feedback will inform future iterations of the masterclass by critically evaluating the applied learning methods, including the degree of interaction in an online teaching environment and the content focus of the masterclass sessions.

In the future, we hope to expand the different formats of content delivery as well as overall availability of masterclass seats so that a larger group of motivated early-career individuals can participate in the learning and networking opportunities, ultimately benefiting the global resuscitation science community at a larger scale. This could be achieved by applying blended learning methods with the use of e-learning platforms, expansion of interactive online elements with further integration of in-person or hybrid events making the core teaching materials widely available to resuscitation scientists all over the world. We envision that this will benefit the global resuscitation community and next generation of resuscitation scientists by facilitating broader international initiatives, increased international collaboration, as well as accelerated recruitment of future resuscitation leaders locally and internationally. This might particularly benefit resuscitation systems with fewer resources as it strengthens the development of future local resuscitation science leaders.[18] Hopefully, the expanded Young ERC Resuscitation Science Masterclass can improve the overall diversity in international organizations such as the ERC and the International Liaison Committee on Resuscitation.

Conclusion

The Young ERC Resuscitation Science Masterclass is a novel initiative that will offer an international and multi-professional network, combined with the extensive educational experience to facilitate the development of the next generation of resuscitation science leaders enabling them to build the future of resuscitation science and improve patient care globally.

Funding

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DIPLOMA TASK LIST

WEBINARS	Due date	Diploma req.
Attendance	Monthly	8/10
Webinar surveys	Monthly	8/10

JOURNAL CLUBS	Due date	Diploma req.
Attendance	Every other month	4/5
Presentation	Individual arrangement	1/1
Journal club article for Resuscitation Plus	optional	optional
Surveys	Every other month	4/5

WORKSHOPS	Due date	Diploma req.
Attendance	Individual arrangement	3/4
Submission of research proposal	Before month 9	1/1
Presentation of research proposal	Month 9	1/1
Workshop surveys	Individual arrangement	3/4

GENERAL	Due Date	Diploma req.
Overall masterclass survey	Month 10	1/1

Fig. 3 – Young ERC Resuscitation Science Masterclass diploma task list. Abbreviations: Diploma req.: Diploma requirements.

CRediT authorship contribution statement

Johannes Wittig: Writing – review & editing, Writing – original draft, Visualization, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Bernhard Kowalski:** Writing – review & editing, Writing – original draft, Visualization, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Robert Greif:** Writing – review & editing, Supervision, Funding acquisition, Conceptualization. **Gavin D Perkins:**

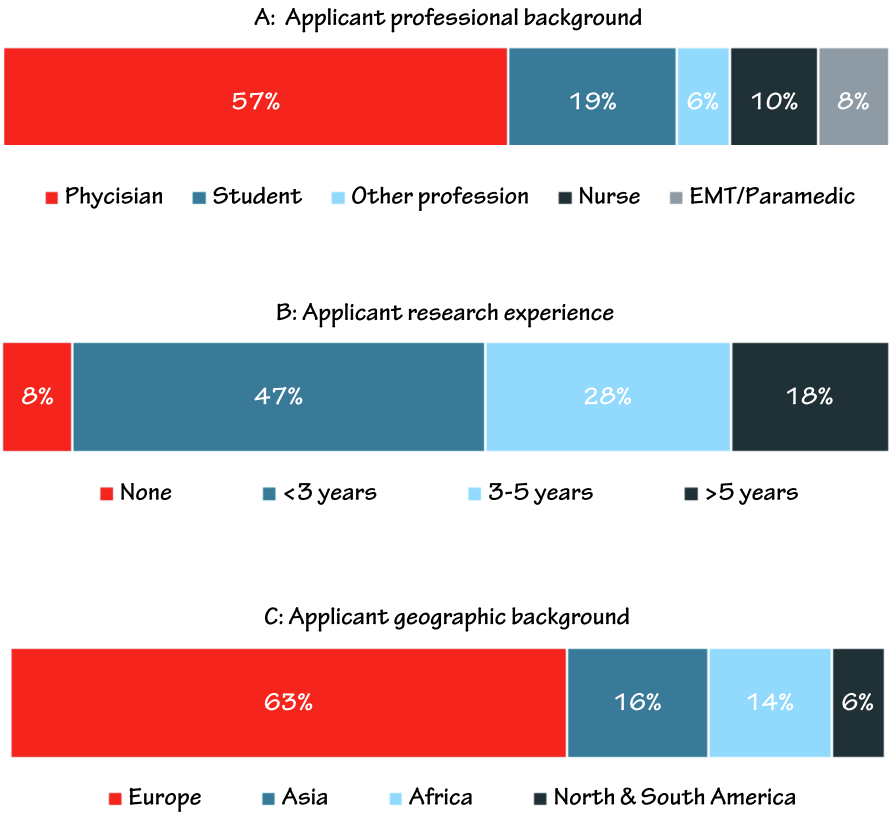

Fig. 4 – Applicant characteristics Young ERC Resuscitation Science Masterclass 2023. Abbreviations: EMT: Emergency Medical Technician.

Writing – review & editing, Supervision, Funding acquisition, Conceptualization. **Kasper G Lauridsen:** Writing – review & editing, Writing – original draft, Supervision, Funding acquisition, Conceptualization.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: **JW** serves as the Interim Chair of the Young ERC; **BK** serves as the Young ERC Young Investigator Representative; **RG** serves as the ERC Director of Guidelines and ILCOR, and is the Task Force Chair Education, Implementation and Team of ILCOR. He is an editorial board member of Resuscitation Plus. **GDP** serves as the ERC Director of Science and Research and is the Editor-in-Chief of Resuscitation Plus; **KGL** serves as the Young ERC Neonatal Life Support Representative, Young ERC Resuscitation Plus Editor, and ERC Advanced Life Support Science and Education Committee member.

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Appendix 1

Non-author collaborators: The Young European Resuscitation Council Committee. (Enrico Baldi, Anna Bichmann, Jacqueline Eleonora Ek, Ahmed Elshaer, Maria Georgiou, Cristina Jorge-Soto, Vlasios Karageorgos, Franziska Markel, Jessica Rogers, Sebastian Schnaubelt, Anastasia Spartinou, and Kaushila Thilakasiri.)

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