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COMMENTARY

DIAMAP: A Road Map for Diabetes Research in Europe

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Abstract

The DIAMAP Project, which has drawn up a road map for diabetes research in Europe, has now concluded, and the results are available in the form of a report and searchable databases. The DIAMAP road maps provide strategic guidance for diabetes research activity and investment in Europe, with the person with diabetes and a broad approach to research being integral to the process.

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Diabetes mellitus has reached global epidemic proportions, and numbers continue to rise. Although new drugs and a holistic approach to treatment have improved prognosis and quality of life, morbidity and mortality from complications remain. The response of EURADIA, the Alliance for European Diabetes Research, was the DIAMAP Project, competitively funded by the European Commission Seventh Framework Programme for Research and Technological Development, to undertake a survey of the current European diabetes research and funding landscape and carry out a strategic road mapping exercise to develop a plan for diabetes research in Europe for approximately the next 10 years.[1] The final report, launched and available from the DIAMAP website (*www.diamap.eu*) is intended to guide research investment and suggest means for improved coordination of European diabetes research. The report is intended to inform future research funding calls at both European and national levels, public and private, and indicates where funding can provide immediate, medium, or long-term support and what the results are likely to be in specific fields. Wider, crosscutting issues are also addressed that impact the progress of research along the pathway from early stages of development to treatment delivery, such as ethics, governance, and training. Partnerships between academia and industry and the means to foster such relationships are discussed. Harmonization of the European research environment is also considered, with specific recommendations being made to create a European platform for clinical research in diabetes (EPCRD), which would facilitate such developments.

Methods

The aim of the European Commission FP7-funded DIAMAP Project was to undertake a survey of the current research and funding landscape for diabetes research in Europe and to map a future strategy diabetes research, ensuring it was clearly of benefit for people with diabetes.

The method of road mapping and major aims of DIAMAP have been described in detail.[2–5] Seven expert groups comprising leaders in different fields of diabetes research from across Europe were brought together to carry out the mapping under the guidance of a strategic planning consultant and the DIAMAP staff. When individuals

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Abbreviations: (CGM) continuous glucose monitoring, (EASD) European Association for the Study of Diabetes, (EPCRD) European platform for clinical research in diabetes

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were invited to participate in DIAMAP, every effort was made to ensure that as many European countries were represented as possible. However, some countries remain unrepresented for various reasons. A limit was put on the number of individuals in each expert group for practical reasons. Issues specifically relating to national research were not considered to be within the remit of the DIAMAP Project. Specific guidance was also provided in the form of a written manual with examples from previous road maps. Each group individually addressed research in their field beginning with listing major scientific advances from the previous 10 years (that still had an impact on current thinking), which acted as the entry point to each road map track. They then addressed future overarching research goals and identified milestones along the research track toward each goal. The groups were encouraged to think creatively and not be bound by limitations of funding at this stage.

DIAMAP undertook the strategic mapping of diabetes research from a broad European perspective. The survey of research funding was able to provide information about both European and national resources, although obtaining information from government ministries was challenging, and we acknowledge that these data may not be complete. The researcher survey collected information about individual research activity, although this again cannot be considered complete for the whole of Europe, as it relied upon the willingness of researchers to volunteer information.

When the total responses were displayed graphically together with information on numbers of European Association for the Study of Diabetes (EASD) membership and EASD abstract submission (DIAMAP Report, Chapter 8, Figure 8.2), there was concordance indicating that DIAMAP had obtained a measure of representation in the responses.[1]

All aspects of diabetes research, from molecules to clinical science and care, were embraced where possible within the overall road mapping strategy. It is acknowledged that not every aspect can be covered in such a report; however, the maps are flexible and open to further input at a future date.

People with diabetes were represented on the Steering Committee and included in the DIAMAP process where possible. A period of public consultation was held at the end of the project (April–June 2010) when all the documents were made available on the DIAMAP website, and invitations were sent to all individuals and organizations that had taken part in the survey. Organizations represented within EURADIA such as the International Diabetes Federation Europe, which represents people with diabetes in the European region, and incoming comments were addressed.

Demographic trends and lifestyle factors were considered as well as ethics, health economics, and public health in a multidisciplinary approach that included both industry and academic research.

Results

Road Maps of Future Research Strategy

The final road maps are available for download from *www.diamap.eu* as both the full report or in sections. There is also a brochure version that presents the maps with a brief summary of the report.

Each research field is considered individually with an introduction, scientific advances, and the road maps, each of which begins with the road map diagram. The research tracks progress toward an overarching research goal considered important for treatment or prevention of diabetes and its complications, with the feasibility of individual research milestones being considered along the way. Roadblocks, including broader issues such as ethics, which prevent progress at various places along the research pathways, were identified, as well as specific opportunities for European research in academia or industry.

Basic research is translated into clinical studies, with epidemiology and genetics, islet research, pathophysiology and integrative physiology, clinical science and care, and microvascular and macrovascular complications featured in separate chapters. Personalized "tailored" medicine is an integral part of several of the maps. The Horizontal Issues report suggests ways to address the major roadblocks to competitive research in Europe.

The creation of a European Platform for Clinical Research in Diabetes (EPCRD) is recommended to allow centralization of information, improved access to data and biosamples, and increased involvement of people with diabetes. Cross-fertilization between academia and the private sector is recommended, as well as bridging the gap between researchers, patients, and health care providers. Finally, a central virtual institute or academy is suggested to provide coordination and to monitor the outcomes of the DIAMAP report.

Type 1 and type 2 diabetes were not addressed as separate entities in the project overall; however, individual research maps in different fields make reference to the diabetes type when this is appropriate.

DIAMAP Research and Funding Databases

Survey information was based on questionnaires returned by investigators and major funding agencies across Europe. For the research database and survey (DIAMAP Report, Chapter 8), a large number of researchers were contacted using the EURADIA network [for example, the EASD membership was contacted by email—around 5000 eligible—and questionnaires were placed in the bags of conference delegates to the EASD annual meeting in 2008 in Rome (17,500)]; as such, this was a sample of convenience, and it is not possible to ascertain with any precision the number of people who received the questionnaire.[1] It was also not known how far the questionnaire was spread outside the sample by word of mouth and within research groups. Criteria for completion of the research questionnaire was that the respondent should have reached the seniority to lead their own research group and be in receipt of independent research funding. However, there was no way of ascertaining the veracity of this information, and we had to rely on the honesty of the respondent.

A total of 1420 completed replies were received that could be included in the DIAMAP survey of research activity. The survey is reported in detail in the DIAMAP report (Chapter 8, pages 170–180).[1]

For the funding database, government ministries and nongovernmental organizations that provide research funding were also surveyed by contacting agencies already on the EURADIA database of research funding organizations, and then carrying out an Internet search of the ministries of health, science, and education for each of the countries in the European Union. A total of 430 possibly eligible organizations were identified, and of these, 398 were individually contacted by email and telephone. Completed questionnaires, with information suitable for analysis, were received from 113 organizations. The survey is reported in detail in the DIAMAP report (Chapter 9, pages 181–191).[1]

The DIAMAP website hosts the publicly accessible research and funding databases that allow the research community the possibility to include their details and to be able to search and contact other investigators in their field using specific keywords. The funding database holds information on organizations providing support to diabetes research in Europe.

Summary Overview of Road Maps with Specific Relevance to Technology in Diabetes

The Clinical Science and Care Road Maps (Chapter 4, pages 73–112) focus on the major areas in clinical research and include societal issues, special populations, and novel technologies.[1] It is acknowledged that this is a huge field with the limitation that only selected areas can be included. Future strategy takes into account the multidimensional aspects of diabetes care and translates ideas from the basic science road maps into advances in care of people with diabetes. Advanced technology will play an important part in this strategy, but this will depend on closer collaboration between academic and industry research groups and better coordination of European activity in this area. DIAMAP should not be considered the endpoint but rather the start of a new strategic approach to diabetes research with full involvement of key stakeholders.

Societal Issues Addressed to Support Research Developments

The maps take into account the wider societal implications of the research and how such developments can be supported to improve care for all people with the disease, including special populations such as children and older adults. For this reason, socioeconomic issues were addressed from the point of view of inequalities across Europe, lack of good medical records, and access to education in areas of deprivation. Schools in some areas are not equipped to deal with children with monitoring devices. Advances in technology, such as continuous glucose monitoring (CGM) devices, are not readily accessible in all countries or regions. Access to diabetes education, both for the person with diabetes and for health professionals, is closely linked with effectiveness of technology, and this is also impacted by financial resources and access. DIAMAP concludes that a wide range of research programs could emerge from such areas of study.

Mathematical modeling has been pioneered since the 1980s and is now an established research area with the potential to greatly improve the accuracy and convenience of phenotyping patients in terms of insulin secretion and action and to support the newer technologies. Preventing islet deterioration is a major goal for the prevention of diabetes and the prevention of progression of preexisting

diabetes. Understanding the causes of islet impairment, developing simple methods to measure impaired islet function, and developing improved strategies for intervention are critical to helping the person with diabetes manage their own condition and live a healthier life. This road map complements and cross links with the road maps for islet biology research that are focused on the islet/beta cell itself.

Insulin pump therapy is a rapidly evolving field where pumps have become much smaller and have more sophisticated software and hardware. In the area of glucose sensors and CGM devices, sensors have improved but remain a niche area and are still not widely available. Noninvasive sensors are still under development, with the connection of CGM with continuous subcutaneous insulin infusion by a mathematical algorithm to form an "artificial pancreas," the ultimate goal. Provision of access to the devices and development of education programs to support this technology are integral to the development of the maps as milestones toward the overarching goal.

A much wider issue was also addressed by the Clinical Science and Care Group, that of developing a EPCRD. This would allow the research community and other stakeholders to be proactive in addressing many of the barriers known to hinder clinical research. There remains a huge variation in the quality and quantity of diabetes clinical research and health care provision within Europe as a consequence of many factors, the most significant being the social and cultural differences and lack of structured networks.

Such a platform would take the form of a large network to include all types of clinical research, including technological aspects, with a central formalized management structure, much of which could be undertaken virtually. Issues of ethics and governance and access to data and biobanks, and to specialist knowledge would all be facilitated. Information on clinical trials in diabetes could be made available in a consolidated manner to people with diabetes and interested volunteers. Information on advances could be made more accessible and may encourage a greater participation in clinical research. The EPCRD could also begin to address issues of professional equivalence across Europe, and specific training relevant to diabetes research could be provided.

Standardization of laboratory assays (such as hemoglobin A1c) and the development of alternative metrics of ongoing metabolic control (such as average blood glucose) are key new developments that will change diabetes care in the next 10 years, and the EPCRD could provide valuable support and input in this area.

Conclusions

The road map report addresses areas for research and innovation both in academia and industry. The multiprofessional approach means that the focus is not entirely on high-cost investigation, but also on alternative methods to translate research outcomes for the benefit of people with diabetes.

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