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REVIEW

An effective model in the health innovation ecosystem: TUSEB technology transfer office

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ABSTRACT

In the study, it was aimed to present the current situation of Technology Transfer Offices (TTO) and their examples in different countries, to give information about the pioneering studies of the Health Institutes of Türkiye (TUSEB) in the field of health science and technologies, to include the scope, duties and the organizational structure, stakeholders and the holistic studies of TUSEB TTO carries out. TUSEB TTO, which continues its activities within a strategic plan that takes into account the development plan objectives and the priorities determined by the Presidency and the Ministry of Health; prioritizes objectives such as meeting Türkiye's need for advanced technology and innovation in the field of health science and technologies, and supporting all processes from idea to product. In addition, TUSEB TTO is a health-focused coordination center where health professionals, engineers, academicians, and students with innovative ideas, as well as various public institutions, investors, universities, technoparks, incubation centers, and important organizations such as active institutions and NGOs can collaborate. TUSEB TTO plays an active role in the creation of the health innovation ecosystem with its activities such as leading studies in the field of health science and technologies, raising awareness with trainings that will cover all processes of health innovation, coordinating innovative ideas at all stages leading to the product, and creating the necessary collaborations.

Keywords: Ecosystem, health, innovation, P&D, R&D, technology transfer.

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INTRODUCTION

Nowadays, the importance of health sector is increasing more and more for the economies of the countries and the studies for innovations in this sector are contributing to sustainable development. It is of great importance to implement innovative efforts in health with an integrated national strategy, to support the commercialization of research outputs, and to establish cooperation networks with institutions and organizations in different fields.[1–3]

Even though there have been some initiatives aimed at improving innovation and R&D activities in health in Türkiye, it is seen that the current initiatives are insufficient due to a rapidly changing and aging society structure, and the rapid change and development of the health sector in the world. Therefore, there is an urgent need for new ideas, new practices, and pioneering structures that support the innovation process in health, which are much faster, more effective, and make great differences in services delivery.[3,4]

The process of innovation in health gains momentum with health institutions, universities, and technology transfer offices (TTO) that are accepted as the meeting points for public and private sectors, technopolis, science parks, and the activities in industrial clusters. While establishing innovation ecosystem, effective communication culture among these institutions and cooperation processes provides a basis.[5,6]

To provide a sustainable growth in health economy, it is required to adopt an approach, which accepts the necessity of innovation within the sector, to increase the capacity to develop innovation skills, and to create an innovation ecosystem in health. To support this process, it is essential to establish TTOs or the centers that enable the organization of R&D and innovation activities and the commercialization of products, both in universities and in institutions involved in technology development processes.[4–7]

Although there are TTOs in so many universities and institutions that play a role in technology development processes in Türkiye, there are no TTOs and integrated centers that support innovation processes only at the focus of health.[4,5] This deficiency causes disruptions in consultancy, cooperation, and awareness at all stages from idea to product in health, and also prevents the transformation of R&D and innovation studies into advanced technological products and high value-added production structure in the industry.[2,4]

TUSEB was founded to serve our country and humankind in the field of health sciences and technologies, and to provide support to planned and sustainable development.[8–10] For this purpose, TUSEB put into practice "TUSEB TTO" which maintains its studies at the focus of health and provides the methodological and systematic transformation of information into socioeconomic-cultural-environmental benefit by acting in accordance with the needs of internal and external stakeholders.

As an organization and cooperation center of innovation ecosystem in health, TUSEB TTO provides support to all processes from idea to product covering the whole stages of health entrepreneurship and innovation. It is targeted to contribute to the reduction of external dependency on products that are indispensable for human life by supporting and commercialization academic studies in these fields within the framework of "TUSEB TTO" activities and to provide solutions to the problems in the field of health with effective and innovative technologies.[8,9,11]

In this article, it is aimed to mention about the leading activities carried out by TUSEB, whose scope is just to develop health sciences and technologies in Türkiye; the current status of TTOs and samples of country; the scope, organizational structure of TUSEB TTOs, and the integrative activities, it has conducted.

SCOPE AND DEVELOPMENT OF TTOs

TTOs play some roles in such as supporting entrepreneurship in academy, raising awareness with trainings, providing opportunities for using the promotions, and increasing cooperation in national and international arena.[12] Moreover, TTOs have also important roles in putting the inventions and innovative ideas of researchers into practice; organizing and utilizing sources that may be necessary in adapting for industry.[13] TTOs emerged in the United States of America (USA) for the 1st time because of the interface mechanisms needed and the problems that arouse during the transformation of R&D activities conducted in universities and research centers (Table 1).[13–15]

TTOs are such institutional establishments that have resource and human power specialized in organizational processes, cooperation activities, project management, and training conducted in the field of R&D. It has become compulsory for TTOs of the research universities, which are effective, can compete in the fields of entrepreneurship and innovation, contribute into the society with efficient services, to make cooperation with industry.[16,17]

Country Examples in Development of TTOs

USA

Universities and industry-focused cooperation activities were first emerged in the USA. When compared to other countries, the initiatives, projects, and regulations that the USA initiated in terms of university-industry cooperation have been effective in the fact that the USA has an important and wide place in technology and innovation today.[18,19]

While the universities obtain the authority for licensing and commercialization of intellectual and industrial property rights with Bayh-Dole Law, which was enacted at the beginning of this period, they are obliged to establish more professional units to augment and manage intellectual and industrial property rights.[20] Detailed topics such as federal budget support, research outputs, intellectual property rights, and cooperation results in the USA are included in this law.

Bayh-Dole Law lent impetus to TTOs and left the duties of entitlement, licensing and commercialization of studies and distribution of revenues to beneficiaries to TTO structures within universities. Moreover, improvement works carried out ensured the establishment of a multi-faceted harmonization mechanism between TTO and all stakeholders.[20,21]

Germany

Technology transfer in Germany gave momentum after World War II. TTOs play a role as interfaces which carry out its activities among universities, research institutions, and industry companies on developing R&D projects and project management.[19]

Table 1: Duties of TTO

- Informing on R&D promotion and supports,
- Providing knowledge and support to researchers on intellectual property rights, licensing, and registration,
- Establishing networks with national and international universities, and other institutions; and supporting the development of projects,
- Taking on an interface task for the academicians and industrialists.[15]

One of the crucial outcomes of "Knowledge Creates Market" initiative launched in 2001 was to transfer the intellectual property rights of the research, which have been conducted within the university, to the university, and to inform the university on the studies of the lecturers. In 2002, Patent Marketing Agencies (PVA) were founded to make TTOs, which were established at universities, more functional and to support commercialization processes.[3,22]

Regional patent agencies, which were enabled to be established by law in Germany, enabled TTOs to make integrative studies by increasing its functions, and to make highly effective improvements in numbers of R&D projects and patent/project market idea.[3]

England

Positive outcomes of academy and industry cooperations, which were first launched in the USA, played a triggering role in the studies of the UK on these processes. In 1972, first science parks were established at Cambridge and Herriot Watt Universities, and professional intermediate mechanisms were created.[13] TTOs were managed through state-sponsored funds till 1900 in England. In 1998, the Ministry of Industry and Trade provided an incentive of 3 million pounds for every 1 million pounds, to encourage cooperation between universities and industrial organizations and the number of projects.[3,13]

In England, TTOs, licensing offices, and university-industry cooperation centers are improving and increasing in terms of quality and quantity day by day. Even though TTOs operating as an independent company are increasing day by day, the number of TTOs in university structuring is higher.[13,23]

China

In 2002, the laws similar to Bayh-Dole law in the USA were entered into force in China. TTO structures in China are conducted centrally from a single source. This structure named National Technology Transfer Centre (NTTC) is conducted all the processes of TTO activities. Although this integrity seems to be positive at first sight, TTOs in China are insufficient in terms of functionality, when evaluated in terms of content. NTTC, which is the responsible interface structure, is not sufficiently involved in the process, both in cooperation activities and in coordination processes between academics and industry.[13,24]

Japan

There are Technology Licensing Organizations (TLO) in Japan. These structures were built by affecting from Bayh-Dole. In 1998, "TLO Support Law" was enacted to set up TLO structure, and the five most successful TLO structures were financed and supported by the law. In addition, 87 public universities were granted autonomy in 2003.[13]

TLO system in Japan is the most similar TTO structure in our country. Basically, it is aimed to commercialize the research, which are state funded, and to create added value. The research projects were managed successfully with TLO structures, and more effective results were obtained.[25]

TTO in Türkiye

TTOs in Türkiye carry out such activities as supporting academic entrepreneurship and functioning as an interface in technology transfer between university and industry. TTOs also support entrepreneurs in providing incubation centers, and inventors in protecting their ideas.[16,26] TTOs impact positively on the training of professionals working in this field and the development of the R&D and innovation ecosystem.[3,27]

The first TTO established in Türkiye was Inovent Inc., which was put into practice by Sabancı University in 2006.[28] Inovent Inc. takes part in activities that will enable academicians and students to take part in innovative processes and establish companies, and in this context, it provides venture capital support to entrepreneurs by becoming a member of national and international angel investor networks.[28]

In 2007, Middle East Technical University (METU) -TTO within METU Technopolis Inc. was established as the second technology transfer office in Türkiye.[29] The majority of the TTOs in Türkiye were established after 2011. After the initiatives launched by the supporting institutions in 2012, a significant increase was achieved in the number of TTOs in Türkiye (Table 2).

With the increase in the number of TTOs, there have been important developments in industrial cooperation at the regional level; in the numbers of R&D projects, academic and young entrepreneurs; and in the numbers of intellectual and industrial property rights obtained as a result of R&D projects.[13]

When the literature results are examined, it is seen that TTOs make valuable and increasing contributions into innovation ecosystem of Türkiye. To make this contribution, TTOs are expected to have a high level of innovation management skills focused on economic development.[3,12,15,17]

Table 2

TTO structuring in Türkiye	Activities of TTOs in Türkiye
• The units established within university for the activities of TTO, • The companies that university is a partner of and established for the activities of TTOs, • For the activities of TTOs, management companies established in the technology development zone or other companies in which technology development zone management companies are partners.[3,19]	• Training and awareness activities for R&D and innovation processes, • Information and cooperation services for support programs and fundraising processes, • University – industry cooperation services, • Information, process organization and licensing services for intellectual and industrial property rights, • Entrepreneurship and incubation services.[15,19]

R&D ACTIVITIES AND SUPPORTS OF TUSEB

TUSEB was founded with the mission of pioneering the studies for innovation conducted on a systematic basis in the field of health sciences and technologies; providing scientific, technical and financial support to practitioners and researchers in these fields; and increasing localization and nationalization to meet the needs of our country in line with developing technologies.[9] TUSEB is a robust R&D institution with nine research institutes all related to health technologies including Türkiye Cancer Institute, Türkiye Biotechnology Institute, Türkiye Maternity, Child and Adolescent Health Institute, Türkiye Public Health and Chronic Diseases Institute, Türkiye Traditional and Complementary Medicine Institute, Türkiye Health Care Services and Accreditation Institute, Türkiye Health Policies Institute, Türkiye Vaccine Institute, Türkiye Health Data Research, and Artificial Intelligence Applications Institute, the units focused on technology development and orientation, research centers and departments. TUSEB has a dynamic structure that can update its structuring in the field of health research by adding new institutes to its structure in accordance with the requirements of time and conditions and expand its cooperation network with national and international health and research institutions.[8,9,11]

Role of TUSEB in Developing Innovative Health Technologies

To transform R&D and innovation studies in the field of health into advanced technology products and a high value-added production structure in the industry, establishing cooperation networks with institutions and organizations in different fields and transforming them into structures that feed innovation activities are among the priority areas of our country. One of the focal points of the Eleventh Development Plan and included in the Tenth Development Plan of Türkiye is the dissemination of localized technologies to the sector base, especially SMEs, in sectors such as defense, health, and energy, where foreign dependency is high. Policies and plans made to create the national health innovation system in Türkiye should be handled at the regional level; internal dynamics should be determined for activating and disseminating innovation; and an integrative ecosystem should be formed by establishing health-oriented centers that will lead the system.[2–5]

TÜSEB, the only institution whose scope is just to develop health sciences and technologies, plays a leading role in establishing health innovation ecosystem. TUSEB continues its activities and supports to carry out end-to-end R&D studies for the development of vaccines, drugs, medical devices, diagnostic kits, and biomaterials in our country, in other words, all processes from idea to product.[9,10]

Among the primary R&D areas of support programs of TUSEB are maternal, child and adolescent health, vaccines, brain computer interfaces, bioinformatics, biomaterial, biotechnology, public health and chronic diseases, traditional and complementary medicine, wearable heath technologies, drugs, cancer, artificial organ, diagnostic kit, and neuroscience.

TUSEB, which leads the way for R&D activities in the field of health, establishes cooperation with the public, private sector, and universities. In this context, it provides scientific, financial, and technical support to the studies in health through the project calls.

Acting with the notion of developing innovative products and supporting all kinds of initiatives in this field by considering health-related needs and technologies on a global and national scale, TUSEB encourages not only academicians and entrepreneurs but also students studying in the field of health, and health professionals providing services in this field to take part in R&D processes, continues awareness studies, and coordination activities for this process. These activities increase the participation of health professionals in the innovation process and support their integration into a cost-effective, targeted, and quality health care system. Resolving an important deficiency in our country with its integrative studies, TUSEB is also the first and only health-oriented coordination center of Türkiye in leading studies that activate health innovation and in carrying out awareness, consultancy, and cooperation studies in all steps from idea to product.

As a center of innovation center in health, TUSEB conducts all its processes from idea to product with TUSEB TTO, which carries out services correspondingly, Project Management and Support Department (PYDDB) and Localization of Health Industries and Project Development Department (SEYDB). The holistic studies carried out by these departments ensure the development, certification, support, production, localization, and nationalization of innovative products in health sciences and technologies (Fig. 1).

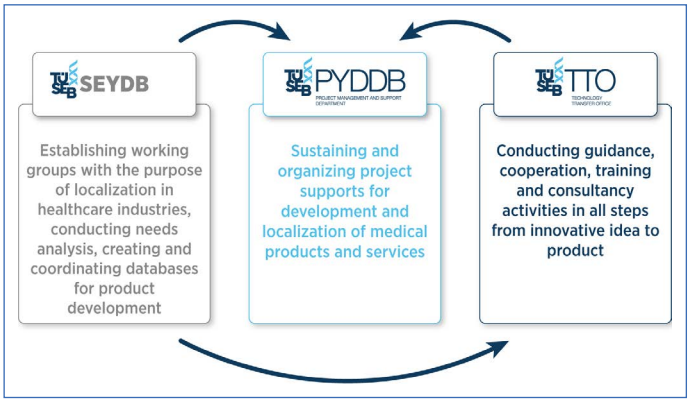

Figure 1: TUSEB innovative health technology development process.

TUSEB TTO takes place among the departments that carry out its activities in a triple helix manner in the process of developing innovative health technologies. It carries out activities such as initiating training, consultancy, and awareness studies at all stages from innovative idea to product in health, and creating cooperation mechanisms between health professionals, academics, engineers, and students with ideas and effective institutions in the field.

PYDDB takes part in project support processes and provide fund at various levels from R&D stage to production stage, for development, localization, and nationalization of medical products and technologies needed by our national health system, especially pharmaceuticals, vaccines, medical devices, biomaterials, and diagnostic kits.

SEYDB carries out processes such as establishing relevant working groups and/or units in the fields of vaccines, drugs, medical devices, biotechnological products, digitalization in health and similar fields, and conducting needs and field analysis for the purpose of localization in the health industries. Moreover, it also carries out the processes such as evaluating and following the real manufacturing capacity of our country, conducting feasibility and screening studies for the future, creating and coordinating databases for product development, producing and presenting projects in line with the needs analysis to be submitted to the Health Industries Steering Committee (SEYK), and carrying out studies in line with the demands of SEYK.

TUSEB TTO

Türkiye prioritizes such issues as increasing innovation, taking an important role in research and development on an international scale, and bringing technical expertise to the country. To make progress in this sense in Türkiye, it is of great importance to systematically implement an institutional structure that will cover the end-to-end health innovation processes, similar to other countries, and practices that will integrate and reinforce the institutional structure.[4–6]

Within the scope of health innovation, Türkiye needs novel formations and studies for the localization in the field of pharmaceuticals, treatment, vaccine technologies, and medical devices. To create innovative products in health, it is necessary to increase the awareness of health professionals about innovation. For health-care professionals having innovative ideas, steps such as developing these products, obtaining patent documents, creating prototypes, and cooperating with engineers and other partners are effective but not sufficient in the realization of their products. Furthermore, there is a need to contact the private sector or the Ministry of Health directly at the point of finding guiding centers in the validation and clinical studies of the innovative products, they have developed and the commercialization of the products. Therefore, In Türkiye, there is a great need for leading health-oriented centers and TTOs that will activate health innovation and entrepreneurship, where trainings are provided, innovation skills are developed, industry-university-public cooperation, and all steps of innovation from idea to product are supported.[2–6,8,14,30,31]

Established in line with all these requirements, TUSEB TTO plays a role in increasing the use of artificial intelligence, innovative thinking, and innovation processes in health service delivery, and supporting localization and nationalization in a way that will meet the needs of our country in line with the developed technologies. Furthermore, TTO aims to initiate awareness, consultancy, and cooperation studies in all steps from idea to product in health, and to establish an ecosystem that will cooperate with health professionals, academics, engineers, and students as well as important institutions such as active institutions, NGOs, and investors.[32]

To transform the R&D and innovation studies carried out in the field of health in our country into advanced technology products and a high value-added production structure in the industry, the establishment of cooperation networks with institutions and organizations in different fields and their transformation into structures that feed innovation activities are among the activities of TUSEB TTO.[32]

The operating model of TUSEB TTO organizational structure is given in Figure 2. As seen here, the units of TUSEB are involved in an interaction with entrepreneurs, academics, health professionals, health institutions, institutes, universities, private sector, and public institutions such as Social Security Institution (SGK), SEYK, and TURK PATENT. It functions as a bridge among all the elements involved in the journey from the beginning of R&D to the product. In addition, the necessary training and mentoring activities are organized and carried out by TUSEB TTO in all the stages.

When the organizational structure is examined in figure, it is seen that academicians, entrepreneurs, and health-care professionals can apply for TUSEB TTO with their ideas and prototypes. It is very important that health-care professionals who do not have a TTO or similar unit in their institutions act as a supportive and guiding institution to which they can apply. After TTO examines the ideas and prototypes, which are applied for, the ideas at the basic R&D stage and the prototypes that need to be developed and improved are directed to (PYDDB), and application is made to the appropriate project supports. The prototypes whose R&D processes were completed are directed to the appropriate hospitals for clinical tests and phase studies. At this stage, it is possible to benefit from the clinical research supports provided by PYDDB. Furthermore, guidance support can be obtained from the Turkish Medicines and Medical Devices Agency and various accreditation institutions. The necessary certification and documentation support can also be provided by the PYDDB for the conversion of the studies, the effectiveness of which has been demonstrated as a result of clinical tests, into commercial products and commercialization. The relate appli-

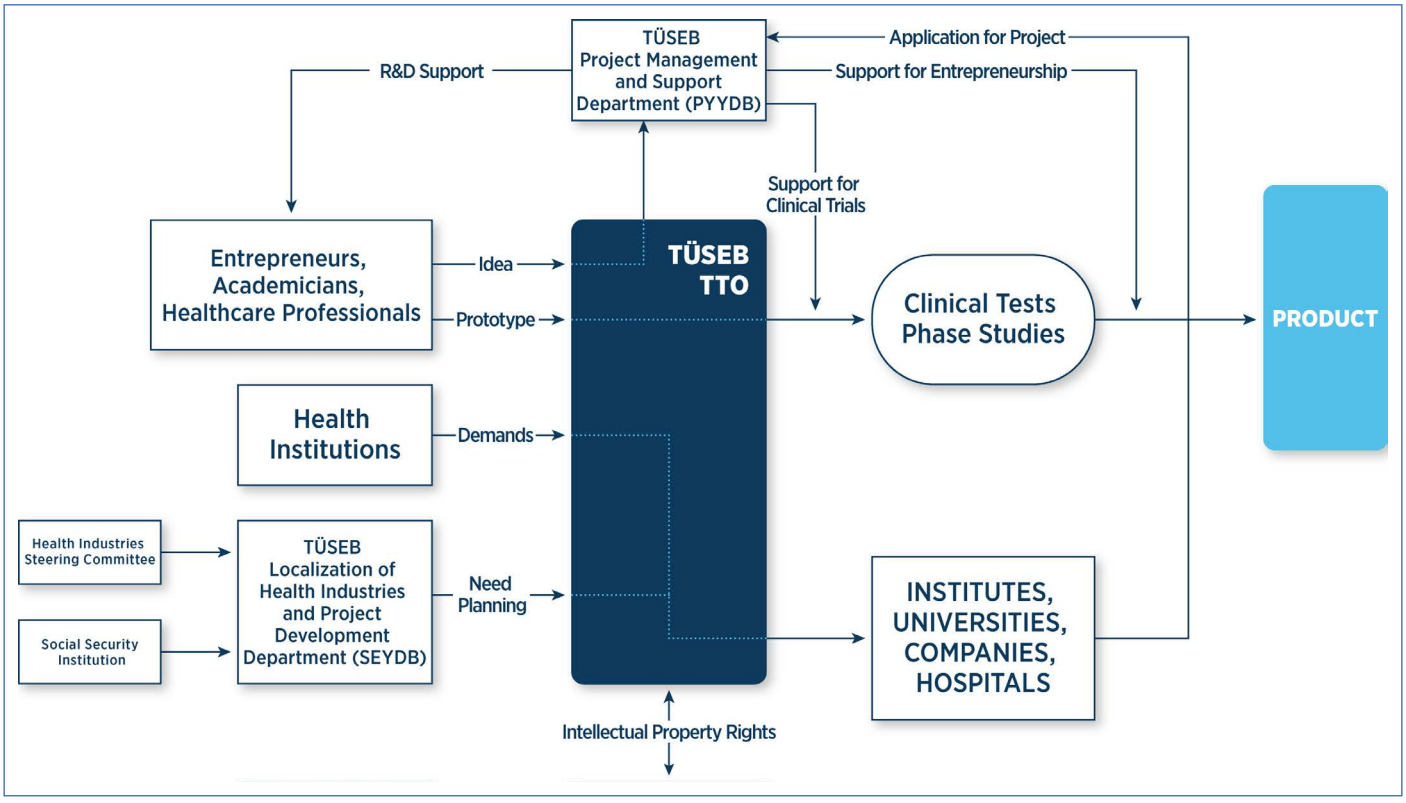

Figure 2: Organization and operating model of TUSEB TTO.

cations are evaluated by the leading experts during all the support processes of PYDDB; the quality, technological value, and benefits of projects are supported by taking into consideration the needs and priorities of Türkiye. In addition to the project applications made to TUSEB TTO, the activities are also carried out to meet the needs revealed as a result of various plans. The activities for need planning are carried out and reported by TUSEB SEYDB. In these activities, the future foresights put forward by SEYK, sales and demand data provided by SGK, academic studies and technology trends are taken into account. These reports put forward by TUSEB SEYDB are evaluated as TUSEB TTO; and a proposal is submitted to PYDDB to launch project calls for products that are urgently needed and that will reduce our dependence on foreign sources. Furthermore, the leading institutes, universities, hospitals, and companies are called for some projects; and they make cooperation with each other to prepare project proposals and apply to PYDDB for evaluation. The management of all intellectual and industrial property rights emerging in all processes is also performed through TUSEB TTO. The necessary support is obtained from TUSEB Office of Legal Affairs for legal processes. As a result of all the said activities, it is aimed to present high value-added, technological products and services that provide solutions to problems in health institutions and increase the efficiency and effectiveness of processes. These products will not only enable our country to diminish foreign dependency but also contribute into the growth of our economy and country to have a say in the field of health thanks to export opportunities. There are various units of TUSEB TTO, which are assigned to operate in the activities. These units are given in Figure 3.

Entrepreneurship and Innovation Unit

It is aimed to lead the studies on innovation carried out on a systematic basis in the field of health sciences and technologies in Türkiye, to provide scientific and technical support to practitioners and researchers in these fields, and to support the development of products and services with high added value that will fulfill the needs of our country in line with our near and far goals with developing technologies. In this unit, such activities are carried out to identify current problems and potential problems that may arise in the future, especially in the health practices of Türkiye, to create strategies for the solution of these problems, and to plan innovative products and services with high added value. Project calls in the R&D and P&D fields determined as a result of these studies and planning are made available via TUSEB PYDDB.

This is a unit where R&D processes have been completed by TÜSEB or with support from different public and private funds, to create solution-oriented ideas for these problems, health professionals are informed and consultancy services are carried out, and health professionals who apply with their ideas are supported. In addition, within this unit, such activities as conducting collaborative meetings where innovative ideas put forward by health professionals are shared with other professionals (engineers, R&D teams, etc.); the development of innovative products in value-based ideas, certification, formation of prototypes, validation studies, realization of all stages of training, research and application activities up to the execution, and implementation of clinical studies, if necessary, or establishment of necessary collaborations are carried out.[32]

Localization and Commercialization Unit

Implementing innovative studies in the field of health with a national integrated strategy, revealing which sub-sectors, should be focused on in the short-, medium, and long-term, supporting cooperation and commercialization with national and international stakeholders, play an important role in increasing the competitiveness and capacity of the health sector. It is essential to determine sectoral strategies and collaborations that include solutions specific to our country and that mobilize our trained manpower and financial resources in the most efficient way.[5,31]

Localization and Commercialization Unit, included within TUSEB, performs such duties as determining the products with the highest foreign dependency in the field of health in Türkiye, identifying consumables, software and devices of strategic importance, making project support calls for the production of domestic equivalents of the determined products, through consultations with public institutions. Furthermore, it also fulfills the duties of bringing together various sector representatives and researchers, establishing partnerships, and implementing support programs to carry out the commercialization processes of products and services whose R&D processes have been completed with various supports. In addition, it also plays a role in providing services such as training, courses, seminars, and mentoring support that researchers need to commercialize the products they have developed.

Within the unit, cooperation studies and models are developed among all actors involved in the innovation and entrepreneurship process in health. In the implementation and commercialization of innovative products and services needed in the health sector, activities are carried out to ensure that health professionals, engineers, and sector representatives are matched on a common platform, and to carry out and coordinate efforts to transfer the knowledge obtained from research institutions to the industry.[32]

Intellectual and Industrial Property Rights Unit

Industrial property rights mean that ensure that the first implementers of innovations, inventions, new designs and original works in the industry, or that the signs and phrases on the goods produced and sold in the field of commerce are registered in the name of their owners, so that the first implementers have the right to produce and sell the product for a certain period of time. Intellectual and industrial property rights are one of the most important factors that show the level of development of countries. Global changes, developments in industry, and trade have increased the importance of industrial property rights in rapidly increasing competition.[2,4]

Today, the development of national economies is possible by increasing inventions and patents and creating strong brands and designs. In this axis, intellectual property rights play an important role in the production of new information and technologies.[5]

TUSEB is a pioneering institution that aims to lead innovative studies carried out on a systematic basis in the field of health sciences and technologies, to provide scientific, technical, and financial support to practitioners and researchers in these fields, and to increase localization and nationalization in a way that responds to the needs of our country in line with developing technologies. The development and certification of innovative products, especially in the field of health, are among the priorities of our institution as well as our country's priorities. It is among the objectives of TUSEB to initiate

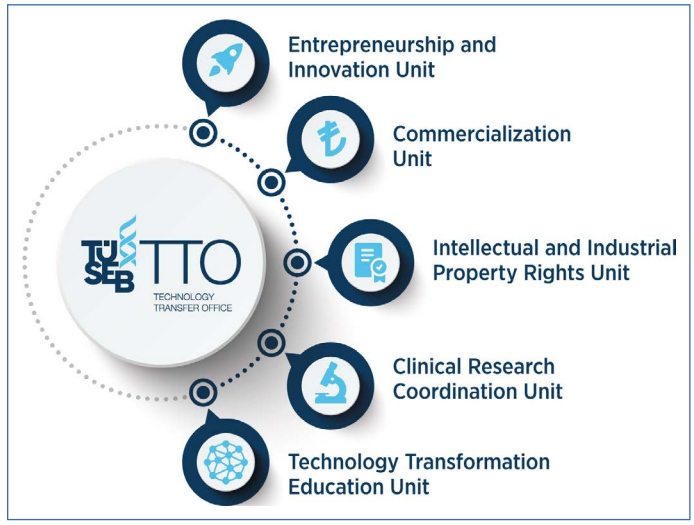

Figure 3: TUSEB TTO units.

and maintain awareness, consultancy and cooperation studies in all stages of an innovative technology in the field of health from idea to product, and to support the certification of products within the scope of intellectual and industrial rights. The Intellectual and Industrial Property Rights Unit has such roles as carrying out the registration procedures at national and international level, executing the incorporation procedures regarding license permit, production, and sales, carrying out the patent application and post-application procedures, coordinating the certification processes, and organizing cooperation studies in other processes related to the registration of inventions.[32]

Clinical Research Coordination Unit

Clinical trials are important in terms of offering new biotechnological studies, diagnostic, and therapeutic technologies such as drugs, vaccines, and medical devices to the service of patients. In addition to providing better treatment opportunities for patients, clinical research aims to provide timely diagnosis and treatment methods such as drugs and vaccines, developed by using up-to-date technologies. Accordingly, TUSEB supports clinical research and the elements that are part of these studies to bring patients together with innovative diagnosis and treatment methods. Within the framework of the 11th Development Plan, issues such as ensuring that Türkiye becomes the leading country in the region in clinical research, inclusion of clinical research in the scope of R&D activities, and raising awareness about clinical research are envisaged. Along with the studies carried out by TUSEB, it is planned to increase the number and quality of clinical trials in Türkiye in line with the targets set in the 11th Development Plan (Fig. 4)

The Clinical Research Coordination Unit, integrated with the Clinical Research Centre established within TUSEB, undertakes tasks such as raising awareness about clinical research and carrying out studies that will ensure that the clinical research potential in our country is recognized in national and international platforms. Moreover, it also provides support on directing researchers who want to conduct clinical trials to the institutions where they will carry out the studies, monitoring and supporting the studies under the umbrella of TUSEB, management of budget and central permission processes in the field of clinical trials, protocol writing, ethics committee processes, and legislation/approval/permission processes.[32,33]

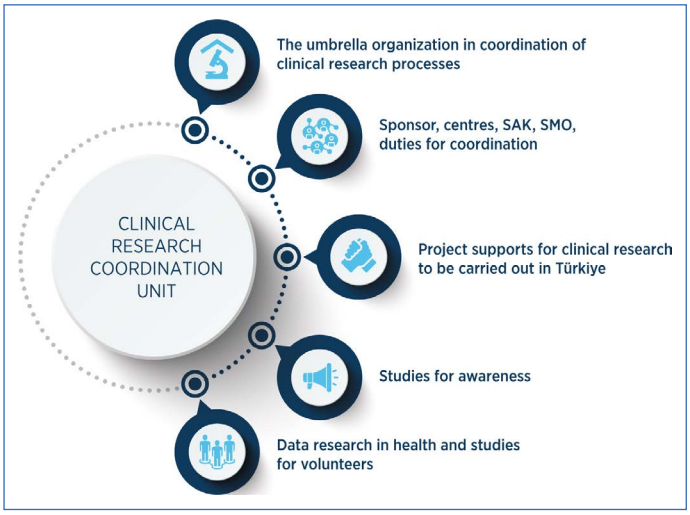

Figure 4: Clinical research coordination unit.

Technology Transformation Education Unit

The main mission and vision of TUSEB TTO is to ensure the dissemination of innovative approaches in health under the coordination of TUSEB, to activate cooperation in health innovation processes, to act as a bridge between all stakeholders in the field of health, to support the target of increasing localization, and to support the target of increasing annual export figures in the health sector. With the activities to be carried out in this context, it will also contribute to the achievement of the targets of a Global Economy, High Added Value Producing, Innovative and Creative Economy and Fair, Sharing, Inclusive, and Learning Society specified in the 2014–2023 Istanbul Regional Plan. In addition, it will serve as an interface to disseminate innovation activities both inside and outside the institution, and a common cooperation platform will be created in the field of health, where information and technology, new ideas, and innovative products will be developed. Training activities are of great importance within the scope of raising awareness in the realization of the targeted processes.

With the Technology Transformation Education Unit, in addition to the trainings to be given in the fields of innovation in health, biotechnology, medical devices, and artificial intelligence, trainings that support the transformation from idea to product in the field of health, trainings and information studies are also carried out on clinical studies. These trainings will include all stakeholders of health technologies such as engineers, academics, students, and companies who will take part in this process, as well as health professionals.[32]

CONCLUSION

In the health system of Türkiye, there have been important developments in health science, technologies, and innovation in recent years. In particular, increasing the quality of health care, meeting the expectations of the applicants, using resources effectively by providing cost efficiency in service delivery, and using health information and technologies that will ensure the efficiency of the processes have been steps that will accelerate the service delivery. The main purpose of these steps is to facilitate the functioning of the health system, to provide people with quality and affordable health services, to respond to the health needs of the society, and to improve health outcomes.

It is very important that our country, which has a comprehensive and effective health infrastructure, also sets its health-related technological infrastructure as an example to the world. Pioneering healthcare processes and innovative domestic production, in which TUSEB also took part, during the COVID-19 pandemic period in Türkiye have made essential contributions to our country's fight against the pandemic. The continuation of this acceleration experienced during the pandemic period is very important. To support the continuous change and value process in health, it is necessary to implement these innovative efforts with a national integrated strategy, to focus on sub-sectors and value chain stages in the short-, medium, and long-term, to conduct change analysis, to cooperate with international actors, and to support the commercialization of innovative products.

Founded to support domestic and national production process of Türkiye, based on all these requirements, TUSEB TTO plays an active role in the creation of the health innovation ecosystem with its activities such as leading studies in the field of health sciences and technologies, raising awareness through trainings that will cover all processes of health innovation, coordinating innovative ideas at all stages leading to the product, and creating necessary collaborations.

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