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Analysis of Patent Awareness of Residents Receiving Standardized Training

Shangqian Wang, Gong Cheng*

Urology Department, The First Affiliated Hospital of Nanjing Medical University, Nanjing, 210029, China
**Corresponding author: chengsuccess2020@163.com*

Abstract: *For residents receiving standardized training, integrating patent-related contents into innovation/entrepreneurship education will help strengthen the cultivation of their innovative thinking, and is of great significance to improving their innovation/entrepreneurship ability. In this work, we investigated the patent awareness of residents receiving standardized training in the First Affiliated Hospital of Nanjing Medical University. Statistical analysis and comparative methods were used to analyze the current situation and existing problems of the residents' participation in patent activities, and relevant suggestions are put forward to help guide administrations to carry out patent-related activities and develop the innovative capabilities of residents.*

Keywords: *Standardized training for residents, Patents, Cultivation of innovative talents*

1. Introduction

Since the State Council promulgated the Compendium of China National Intellectual Property Strategy in 2008, China has attached great importance to the cultivation of patent-minded innovative talents and has achieved rapid growth in the number of effective invention patents[1]. Translated from innovations, patents are important intellectual properties and intangible assets. Innovative talents must not only know how to turn innovative thinking into concrete results but also know how to apply for patents and use the law to protect these results [2]. The affiliated hospitals of medical universities are one of the main forces for China's production of original innovations in basic research and high-tech areas. The patent-related performance of these hospitals affects the innovation capacity and overall competitiveness of the universities, indicating in a big way that they are participating in the creation of the national innovation system[3].

In recent years, the First Affiliated Hospital of Nanjing Medical University has attached great importance to education efforts for improving students' innovation capacities and entrepreneurship. The hospital has achieved fruitful results by actively conducting innovation/entrepreneurship competitions and entrepreneurship/career mentoring aimed at improving students' creative thinking and hands-on practical skills. However, there are still many problems with respect to patent research and development by students receiving standardized training, including lack of awareness, lack of channels, and difficulties in making applications, which seriously restricts their performance in patent applications and intellectual property protection[4]. In order to gain an in-depth understanding of the situation, we distributed questionnaires among the hospital's resident physicians in different years of residency and analyzed how they understand and participate in patent-related activities. Of the questionnaires distributed to the resident physicians, 417 were deemed valid after recovery.

2. Residents' patent awareness

In addition to understanding how well residents know about patents, we also need to know the channels through which they can learn about patents. To understand the extent to which residents know about patents, we have designed one subjective question and three objective questions. To understand where they can access patent-related information, we have also designed three questions.

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2.1. Level of awareness

2.1.1. Self-assessment

Of the residents who answered the questions, only 2.63% thought they "knew very well" about patent applications, and 59.66% thought they had "a little knowledge" about patents, while 25.12% and 12.8% of them thought they "roughly understood" and "did not know" patents, respectively. It can be seen that most residents of the First Affiliated Hospital of Nanjing Medical University believe that they only have a "slight understanding" of patent-related matters, indicating that they subjectively lack self-confidence in this regard.

To understand the difference in the level of patent understanding among residents of different grades, we divided patent awareness into three levels – highly aware, slightly aware and completely unconcerned. By analyzing and comparing the levels of awareness of residents in different grades (Just starting the residency, After the 1st year of residency, After the 2nd year of residency and After the 3rd year of residency), we obtained the results shown in Table l.

Table 1: Awareness of patents among residents in different grades

	Highly aware	Slightly aware	Completely unconcerned
Before residency	24	63.2	12.8
1-year-residency	25.l	60.6	14.3
2-year-residency	31.1	56.9	12
3-year-residency	36.5	55.7	7.8

Through analysis of the results of residents' self-assessments, we can see that, overall, from the beginning of the residency to the end of the 3rd year of residency, the proportion of physicians with higher patent awareness gradually increased, but only to a small extent. Among physicians who have completed residency training, the vast majority still do not have a high level of awareness of patents; the proportion of those having a high awareness of trained physicians is only 12.5% higher than that of those residents who have not yet completed training. This may be because some of the best resident physicians have learned things about patents on their own in clinical work. It can be seen that most residents do not know much about patents, and the hospital has performed poorly in promoting patent-related knowledge to residents.

2.1.2. Objective assessment

Of the residents surveyed, only 12.6% knew the type of patent, 25.35% had heard of "patent agents" and 27.5% had some knowledge (including very good knowledge) about how to apply for a patent. It can be seen that most residents do not understand the basics of patents and the patent application process. Results of objective assessment are consistent with those of the subjective assessment, indicating that most residents do have low patent awareness, which needs to be improved.

2.2. Channels for learning

According to the recovered questionnaire, residents gain access to patent-related information mainly through the Internet (73.65%), peer residents (50.85%), lecturers (48%), and lectures (47.5%). Most of the hospital's academic lectures revolve around medical literature, while those on patents were low in number and poorly promoted, and as a result, most of the residents have never attended such lectures.

2.3. Patent search

Patent search is an essential step of the patent application process. However, a whopping 71% of resident physicians say they are not capable of doing a patent search. The lack of patent-related education may be the reason why residents know little about the various elements of patent literature and therefore are clueless about patent search.

3. Residents' Participation in Patent Activities

3.1. Willingness and motivation to participate

Of the residents surveyed, 44.5 % have thought about applying for patents. For these residents, the reason for trying to file a patent includes "cultivating their ability to innovate" (76.97%) "putting their

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ideas into reality" (5.84%) "proving their ability by obtaining a patent certificate" (64.04%). From the above, it can be seen that, for the residents, the main purpose of the patent application is to cultivate innovative thinking and improve innovation ability.

3.2. Results

3.2.1. Number and type of applications

Of all the residents surveyed, only 3.09% had ever applied for a patent. Among them, 6 have completed the application, and they have completed at least the 2nd year of residency. Of the remaining 9 residents who have not yet completed their applications, the number of people who are in the 2nd, 3rd, and 4th year of residency is all 3. It can be seen that, while 43.9% of residents have thought about participating in patent activities, only 3.09% of them actually took action, indicating that they would encounter more difficulties when actually engaged in the patent application.

China's Patent Law stipulates that there are 3 types of patents, namely invention patents, utility patents and design patents. Invention patents require substantive examination and generally have more creative and scientific and technological values than utility and design patents. The patents applied for by students are all utility patents.

3.2.2. Sources of ideas and conversion potential of patents

Among 14 resident physicians who have applied for patents, 42.85% (6) got the idea mainly from teachers, 35.7%(5)from self-thinking, and 21.42% (3)from peer residents.

Among those who have applied for patents, most got the idea from teachers. There are many reasons for this, including lack of knowledge in related fields, lack of innovation ability, lack of ability to apply theory to practice, and so on. If residents can gain more experience through practical activities, some improvements can be made in this regard.

The real value of a patent lies in its ability to be converted into an actual product/solution, and the vast majority of residents surveyed believe that the patents they have applied for have a high conversion potential and can be used to solve practical clinical issues. Therefore, learning about residents' ideas and helping them realize patent applications can effectively improve the quality of their patent applications.

3.3. Difficulties encountered in the patent application process

From the above analysis, we can see that it is difficult for residents to apply for a patent. Among residents who have thought about applying for patents but never took action, when being asked "What is stopping you from applying for a patent?", most chose the answers including: "lack of guidance" (75.15%), "not knowing how to prepare the required materials" (58.18%), "lack of innovative ideas" (55.15%), "not knowing the application process" (49.7%). For the open question: "What do you think is the biggest difficulty for residents right now to get involved in patent filing or innovative startups?" the answers given by the respondents included: lack of guidance (24), lack of innovative ideas (I3), lack of free time (9), lack of funding (9), lack of access (8), not knowing the exact patent application process (6), and lack of practical approach (6). It can be seen that, when it comes to the patent application, most residents do not know where to start and can not get needed guidance. And, due to a lack of sufficient practical experience, most residents are unable to identify problems in clinical work or scientific research or come up with innovative ideas. Even if some residents have some innovative ideas, they would not be able to complete corresponding patent applications due to a lack of guidance, funding, and mentors as well as not knowing the process and requirements.

Students who had completed their patent applications also cited a number of difficulties they had encountered, including lack of guidance (79.1%), unclear how to write a specification (74.23%), ignorance of the application process and requirements (46.67%), and lack of funding (40%). Due to the lack of corresponding courses, these residents have almost no prior knowledge related to patent applications. Although some of them had mentors, most of the mentors were too busy to help with the applications. As a result, the residents had to learn almost everything via self-study through the Internet, the superficial nature of which had led to various difficulties in preparing the required materials. In addition, filing and maintaining a patent requires paying corresponding fees, which can be rather expensive for residents. If sufficient funding can’t be obtained, resident physicians might fail to apply for patents or maintain the validity of the patents granted (8).

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4. Discussion

4.1. Awareness and other relevant status quo

Through the above data and analysis, it can be found that the residents generally lack basic knowledge and awareness of patents. Moreover, although they become gradually more aware of patents with the growth of residency years, the magnitude of the actual increase is fairly small. The residents mainly learn about patents through the Internet, and generally know less about the school's patent-related incentive policies.

4.2. Status of patent applications

Among the residents of the First Affiliated Hospital of Nanjing Medical University, very few have ever applied for patents and all of them are utility patents. Among those who have applied for patents, most got the idea from teachers, and some of their patents have a certain conversion potential[5].

4.3. Key issues

First, there is insufficient policy support for residents to participate in patent activities. Because of the low value of utility patents, incentives provided by the hospital often apply only to invention patents, which can be too difficult to obtain. This situation has led to residents' reluctance to participate in patent applications. The patent-related policies of the hospital surveyed can encourage some residents to try patent applications to develop their own capabilities, but they were not enough to incentivize more residents to participate in patent activities[6].

Second, there are fewer lectures and courses related to patents and residents lack adequate professional guidance. These result in residents not knowing the basics, filing process, and requirements of patents. In addition, the lack of access to more information, less practical experience, lack of background knowledge in various areas of expertise, and the absence of patent databases for students to access patent-related information all contribute to residents' inability to come up with innovative patents and turn them into reality.

4.4. Recommended solutions

First, in order to encourage residents to participate in patent activities, patent evaluation and incentive mechanisms should be further improved and simple evaluations based on patent types should be abandoned. In terms of evaluation, we recommend adding further value assessments on top of evaluations based on patent types, which can be conducted from multiple angles such as practicality, level of expertise, and economic value. In terms of incentives, we recommend the establishment of special bonuses, which can be granted based on the value of the patent. We believe that these methods will help to encourage more residents to participate in patent activities[7].

Second, it is recommended that hospitals include patent-related content in their internship education, and at the same time carry out more patent-related lectures to improve residents' understanding of patents, so that they can eventually learn how to design and apply for patents. In addition, it is also recommended to encourage teachers to engage in patent-related education and guidance through the establishment of a reasonable incentive mechanism, and to establish a patent education platform for residents, so that willing residents can successfully complete the design and application of patents under the guidance of tutors. On the basis of the above measures, we are also recommending greater support for innovation competitions, encouraging students to actively participate in these competitions and improving the quality of their projects through fair competition [2].

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