

Present status and prospect of skin imaging equipment in some public hospitals in China

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To the Editor: The continuous development and maturity of imaging science and technology have made skin imaging one of the essential specialties of dermatology. This has had an objective and comprehensive impact in changing the dermatology diagnosis mode. Thus, skin imaging has become one of the diagnostic skills that all dermatologists must master. Skin imaging equipment plays a crucial role in clinical and scientific research. It is not only a necessary aid to correct diagnose of skin diseases, but also a crucial link and hardware foundation for skin imaging capacity strengthening. Dermoscopy, reflectance confocal microscopy (RCM) and very high frequency (VHF) skin ultrasound imaging diagnostic system (VHF skin ultrasound) have become skin imaging equipments commonly used in Chinese dermatological practice. In recent years, with the growing emphasis on dermatology in hospitals at all levels, investment in medical equipment has been increasing and skin imaging equipment has been continuously optimized. As far as we know, there is no literature report on the skin imaging equipment current status in Chinese public hospitals. This study intended to investigate and analyze the current status of skin imaging equipment in the country, and to provide an objective basis for further standardizing and strengthening the development of skin imaging equipment and dermatology construction. In this way, it is expected to lay the foundations to meet clinical needs and achieve the optimal allocation of medical resources.

A self-filled questionnaire was sent to the dermatology departments of public hospitals at all levels, using various forms, such as the Internet, mail, and paper form. The questionnaire had to be completed by the person in charge of the department that performs the skin imaging exam or by a designated person. The questionnaire content included, among the main information, the hospital name, the medical institution level, the type, model and time of use of the skin imaging equipment, and the number and

qualification of professionals engaged in skin imaging. The leader of this study reviewed the data collected and incomplete information was requested by phone to ensure the accuracy and reliability of the statistical data. After manual correction, the questionnaire was classified and summarized using Excel tables and a database was established. SPSS21.0 software (IBMSPSS, Armonk, NY, USA) was used for the general descriptive statistical analysis of the data.

As of July 31, 2019, 360 public hospitals nationwide participated in the survey, covering 29 provinces, autonomous regions, and municipalities. The classification obtained according to hospital grade revealed that 28 non-graded dermatological prevention and treatment stations and dermatological hospitals, eight primary hospitals, 43 secondary hospitals, and 281 tertiary hospitals, of which 238 were grade A tertiary hospitals.

In this survey, there were 351 hospitals equipped with dermoscopy and the number of grade A tertiary hospitals equipped with dermoscopy was significantly higher than that of other grade hospitals, representing 66.38% of all hospitals. There were a large number of hospitals equipped with domestic dermoscopy devices. The number of tertiary, secondary, and dermatological hospitals equipped with desktop dermoscopy was significantly higher than those equipped with portable dermoscopy. On the other hand, the number of primary hospitals equipped with portable dermoscopy was greater than those equipped with desktop dermoscopy [Table 1]. There were 826 dermoscopy devices sets in use, including 294 domestic desktop dermoscopy devices, 199 domestic portable dermoscopy devices, 47 imported desktop dermoscopy devices, and 286 imported portable dermoscopy devices. Desktop dermoscopy was the most common domestic equipment found; while portable dermoscopy was the most frequent imported equipment. The average time of using the dermoscopy equipment was 2.64 ± 2.27 years

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Table 1: Distribution of public hospitals equipped with dermoscopy (n = 351).

Hospital grade	Hospitals equipped with dermoscopy at each hospital grade		Hospitals equipped with domestic dermoscopy		Hospitals equipped with imported dermoscopy		Hospitals equipped with both imported and domestic dermoscopy		Hospitals equipped with desktop dermoscopy		Hospitals equipped with portable dermoscopy	
	n	%	n	%	n	%	n	%	n	%	n	%
Grade A tertiary hospital	233	66.38	159	68.24	36	15.45	38	16.31	198	85.00	86	36.91
Grade B tertiary hospital	42	11.97	29	69.04	6	14.29	7	16.67	33	78.57	17	40.48
Secondary hospital	43	12.25	36	83.72	4	9.30	3	6.98	35	81.40	11	25.59
Primary hospital	8	2.28	4	50.00	3	37.50	1	12.50	2	25.00	7	87.50
Dermatological hospital	25	7.12	20	80.00	3	12.00	2	8.00	18	72.00	10	40.00

[Supplementary Table 1, <http://links.lww.com/CM9/A263>].

Sixty-four hospitals equipped with RCM and another eight hospitals were currently bidding for equipment. The number of hospitals equipped with VivaScope[®] 1500 (Caliber Imaging and Diagnostics, Rochester, NY, USA; Lucid Inc., Rochester, NY, USA; or Lucid Inc., MAVIG GmbH, Munich, Germany) was greater than those equipped with VivaScope[®] 3000. The hospitals equipped with RCM were concentrated mainly among grade A tertiary hospitals, accounting for 82.81%. Primary and secondary hospitals participating in this investigation were not currently equipped with RCM. There were 73 RCM sets in use in the public hospitals, all imported equipment, among which 61 were VivaScope[®] 1500 (83.56%), and 12 were VivaScope[®] 3000 (16.44%). The average time of use of RCM was 4.66 ± 3.16 years [Supplementary Table 2, <http://links.lww.com/CM9/A263>].

There were 47 sets of VHF skin ultrasound devices in use in public hospitals, 26 of which were imported and 21 were domestic. The average use time of VHF skin ultrasound was 3.00 ± 2.76 years. There were 43 hospitals equipped with VHF skin ultrasound and another ten were in the process of purchase or bidding. The hospitals equipped with VHF skin ultrasound were mainly grade A tertiary hospitals, accounting for 81.39% of the hospitals evaluated. The number of hospitals equipped with imported VHF skin ultrasound was slightly higher than those equipped with domestic equipment [Supplementary Table 3, <http://links.lww.com/CM9/A263>].

Regarding the China geographical division, East China presented the highest rate of dermoscopy availability, accounting for 32.20% of the country, followed by North China, accounting for 24.33%. East China also had the highest rate of RCM availability, accounting for 30.14% of the country, followed by Central China, accounting for 24.66%. North China has the highest availability rate of VHF skin ultrasound equipment (31.91% of the country), followed by East China (25.53%).

Histopathology is the gold standard technique for diagnosing skin diseases; however, biopsies are invasive and can cause pain, infection, and scarring. The skin

imaging technology has the advantages of being real-time and non-invasive, and for this reason, it has become one of the main means of dermatological diagnosis. Skin imaging technology can objectively observe the morphological changes of skin diseases, play an assistant role in diagnosis and differential diagnosis of many skin diseases, and improve disease diagnosis accuracy,^[1,2] especially in the case of skin tumors. Skin images can be used in pre-operative evaluation to determine the tumor boundary, reduce unnecessary biopsies, and prevent medical accidents caused by diagnostic errors. For hospitals that perform teaching activities at colleges and universities, skin imaging can also be used to enhance the learning interest of the students and deepen their understanding and memory of dermatosis.^[3] In addition, combining skin imaging with tele dermatology can provide diagnostic help and guidance for primary dermatologists.^[4]

The current survey reveals that the current distribution of public hospitals equipped with skin imaging equipment in China is unbalanced, mainly concentrated in tertiary hospitals and hospitals in first and second-tier cities. This can be related to the level of urban economic development, the development planning of hospital departments, the reserve of skin imaging talents, the awareness of residents about dermatological treatment, and other factors. Consequently, the market potential for skin imaging equipment in China is vast since the quantity and quality of skin imaging equipment currently in existence in the country are far from meeting medical needs.

Dermoscopy is known as the “stethoscope” of dermatologists, especially the portable dermoscopy, which has the advantages of being easy to transport and operate, to present high performance and to be easily popularized. According to this survey, portable dermoscopy in China is mostly imported equipment. National dermoscopy manufacturers, therefore, should strengthen the research, development, and promotion of portable dermoscopy to improve the competitiveness of their product. Furthermore, portable dermoscopy is connected to the smartphone, and artificial intelligence-aided decision system software can help doctors diagnose skin diseases and cause improvements in the pattern of medical behavior.^[5] The RCM equipment currently in use in China is all imported and has relatively high prices. An RCM prototype was

developed by domestic research institutions and through its development, it is expected to break the monopoly of the international market and greatly reduce production and sales costs. VHF skin ultrasound is produced by national enterprises and domestic equipment is present in a certain amount of Chinese public hospitals.

Medical institutions should pay close attention to three main points when purchasing skin imaging equipment:

- (i) Skin imaging equipment should be reasonably configured and integrated with different equipment. Each skin imaging equipment type has its advantages and limitations. Dermatology departments should configure the skin imaging equipment sufficiently according to their own needs and promote the integration of different types of equipment. Thus, it is possible to take advantage of the complementarity between them and maximize their utilization rate;
- (ii) The construction of skin imaging talents should be strengthened. The skillful use of skin imaging equipment and accurate diagnosis based on the images require a long period of training and experience accumulation. Therefore, dermatologists should be encouraged to participate in online or offline skin imaging training courses;
- (iii) The management of skin image data should be well performed. The storage, management, transmission, and archiving of images are also very essential issues. Attention should be paid to data privacy and security and also make full use of multidimensional and multitemporal skin image data to promote clinical research.

In general, the total amount of skin imaging equipment in public hospitals in China is still insufficient and unevenly distributed and may not meet growing medical needs. Skin imaging equipment is a critical part of medical equipment planning. This study is conducive to providing the objective basis for how to reasonably outfit skin imaging equipment and offer all the comprehensive benefits of the equipment. This survey has not yet covered all hospitals

equipped with skin imaging equipment in China, but it preliminarily reflects the status of skin imaging equipment in the country. It is intended to conduct a more comprehensive investigation of skin imaging equipment in China in the future.

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Conflicts of interest

None.

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