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Short Communication

WoundCareLog APP – A new application to record wound diagnosis and healing

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ABSTRACT

The incidence of chronic wounds has been increasing over the past 20 years. However, the standardized diagnosis and treatment practice of chronic refractory wounds have not been established. In addition, the properties of the wound are characterized by morphology and thus correct description of the wound in medical history collection plays a vital role, which directly affects the definitive diagnosis. To develop more accurate format of clinical history record which can correctly reflect a patient's course and treatment progress, and to standardize the medical history record of chronic refractory wounds, at the national or regional level, we designed the WoundCareLog APP. It acts as a recording and communication tool for wound healing specialists at all levels of medical institutions in China. The WoundCareLog APP is fully compatible to meet the criteria and requirements of conventional medical records by embedding 9 modules. In addition, the demands for morphological description of wounds in wound healing diagnosis and treatment have been fulfilled by enroll of digital imaging technology to overcome the inadequacies of traditional medical history records.

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Introduction

Over the past 20 years, as the spectrum of disease changes, the incidence of chronic wounds gradually increases.[1] The *status quo* of clinical medical staff, especially those in the primary or community hospitals, tend to deal with wounds, especially for chronic wounds, according to their own experience. The wound is only treated as a simple wound, and the etiology of chronic refractory wound and the discipline of chronic wound repair are ignored, and the effect of etiological treatment is not achieved. In addition, the properties of the wound are characterized by morphology, and the description of the wound plays a vital role in the correctly medical history collection and diagnosis.

Therefore, the description and record of the wound should be based on morphological description. However, it is difficult to add morphological imaging data to the traditional paper medical records. Electronic health records (EHRs), on the other hand, are lack of tailored contents dedicated to wound description.

In order to further standardize the diagnosis and treatment practice of chronic refractory wounds, and to develop more accurate format of clinical history record which can correctly reflect the patient's course and treatment progress, and to standardize the medical history record of chronic refractory wounds that can be deployed at the national or regional level, entrusted by the Expert Panel of Chinese Medical Doctor Association (CMDA), we designed the WoundCareLog APP as a recording tool for wound healing specialist at all levels of medical institutions in China.

The WoundCareLog APP, which was approved by the Expert Panel of CMDA, was designed with the core philosophy of "Thoughts and principles of diagnosis and treatment of chronic refractory wound in China",[2] that are: 1. Etiological diagnosis and treatment for chronic refractory wounds; 2. Phase and selectivity-dependent treatment; 3. Linkage of specialist and wound therapist, that is, a combination of surgical treatment and conservative treatment of chronic refractory wounds.

The WoundCareLog APP is fully compatible in form to meet the criteria and requirements of traditional medical records. In addition, the demands for morphological description of wounds in wound healing diagnosis and treatment have been fulfilled by the embedding of digital imaging technology to overcome the inadequacies of traditional medical history records.

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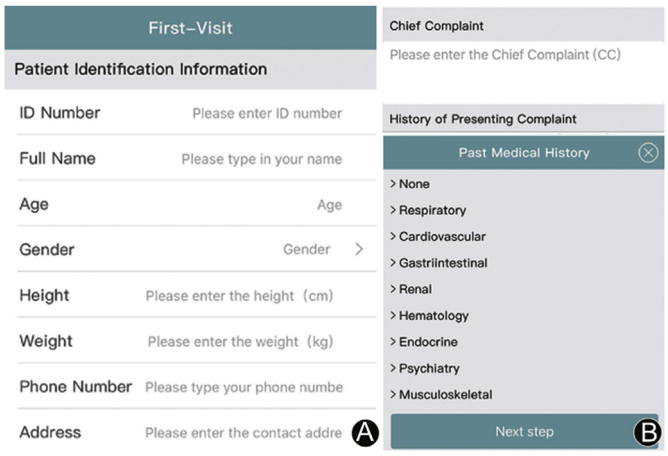

Fig. 1. (A) Personal identification Information; (B) Chief complaint, history of presenting complaint, past medical history.

The entry of WoundCareLog APP information, according to the logical sequence of the medical history record, is divided into 9 modules as follows:

Personal identification information module (Fig. 1A)

Users need to fill in the patient demographics, including: National ID number, name, date of birth, gender, phone number, home address, first admission time, etc. Age is one of the important factors interfering with wound healing.[2] Elderly patients may experience delayed wound healing compared to younger people, and the elderly are often accompanied by a variety of age-related diseases, such as cardiovascular disease, hypertension or arrhythmia, etc. At different stages of child development, skin regeneration and repair also have characteristics different from those of adults. There are many wounds that adults do not have or rarely occurring, such as neonatal toxic epidermal necrolysis (TEN), and the treatment strategy should not be copied from adults' patient treatment. Therefore, information such as patient age is to understand the prevalence of different age levels and to understand the pathological features of the wound at different ages. The entry of the ID number and the mailing address allows the medical staff to carry out post-discharge follow-up work for the patient.

The chief complaint (CC), history of present complaint (HPC), past medical history (PMH) module (Fig. 1B)

Etiological diagnosis and treatment is one of the core ideas of chronic refractory wounds treatment. CC is usually the main reason for the patient's visit and the main contradiction of the disease. The HPC is the records of entire process of diagnosis and treatment. The PMH refers to the total sum of a patient's health status prior to the presenting problem especially the diseases closely related to the current disease. Accurate record of the information can help users determine the priority of the wounds and the etiology analysis related to the formation of the wounds.

At present, it's not surprising that the knowledgement of properly recording patient medical history is not satisfactory of the wound healing specialist among the medical institutions at all levels in China. In order to enhance the ability to write medical history, WoundCareLog APP users are required to fill the CC and HPC information in the text box under each category and to choose the corresponding PMH values from pre-set options.

By doing so, it can help us establish a standard and specific medical history record format for wound healing specialist.

Wound assessment module (Fig. 2)

Accurate wound assessment is a critical component of effective wound management. Wound assessment includes: wounds location, the date of wound occur, physical examination (PE) of arterial and venous conditions at relevant sites, wound factors (such as dimensions, tissue types, exudate), periwound skin factors (such as dry/scaling, erythema, fragile, pain, skin pigmentation, cellulitis, etc), wound photographs.

The above-mentioned wound information covers almost all the content that needs to be collected for wound diagnosis and treatment. Detailed wound information supplemented by high-definition images before and after cleaning and before and after debridement can more accurately reflect the true condition of the wound before and after treatment, which is more intuitive and effective than the written record. It can help wound healing specialists to further accurately record wound and to help to establish a specialist medical history specification for the wound healing department.

Laboratory test results module(Fig. 3A)

Laboratory tests include: common clinical laboratory examinations and special examinations related to refractory wounds.

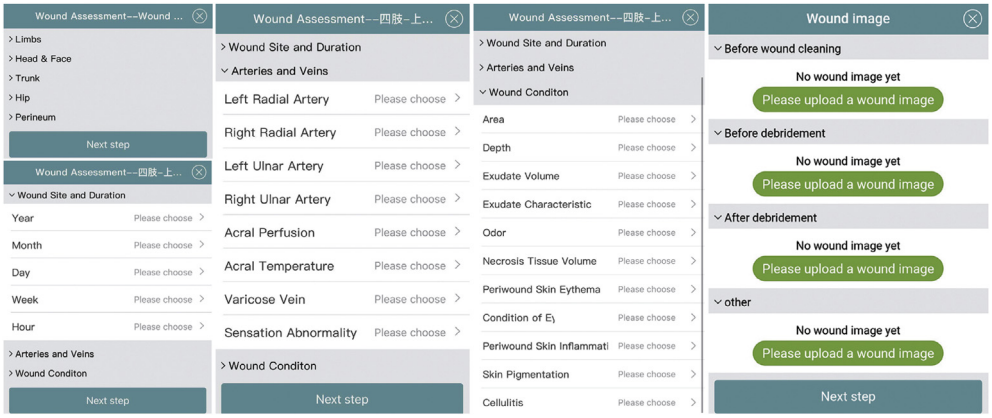

Fig. 2. Wound assessment.

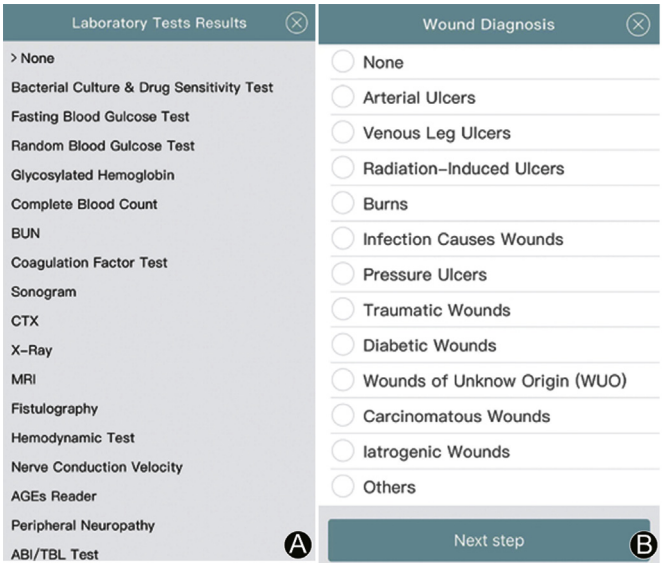

Fig. 3. (A) Laboratory test; (B) Diagnosis.

"Diagnosis and treatment of chronic refractory wounds based on its etiology" is one of the core ideas in the article "Thoughts and principles of diagnosis and treatment of chronic refractory wound in China". It is especially important to give targeted examination, diagnosis and differential diagnosis to patients with chronic refractory wounds for different pathogenic factors.

For example, most chronic refractory wounds contain bacterial infections.[3] When bacteria form biofilms, they can reduce the phagocytic ability of phagocytic cells to bacteria, enhance microbial ability to resist human immunity, and make chronic refractory wounds stay in the inflammatory phase for a long time and the massive proliferation of bacteria with the secretion of toxic factors block the wound healing process. Therefore, it is important to have bacteriology and drug sensitivity of isolated bacteria obtained from wound site.

Lower extremity vascular ulcer is divided into arterial ischemic ulcer, venous congestion ulcer and mixed ulcer. Lower extremity vascular disease can be diagnosed by means of lower extremity vascular color Doppler ultra-sonography and arterial digital subtraction angiography.

For neuropathy and lower extremity ulcers caused by diatete, diagnosis can be made by means of sensory quantitative measurement, electromyography or tuning fork vibration sensory examination.

The relevant laboratory test reports can be uploaded by users of WoundCareLog App in the form of images.

Wound diagnosis module (Fig. 3B)

The user makes diagnosis of the disease and its pathological reasons based on the above-mentioned chief CC, HPC, PMH and related laboratory tests. At present, the main common wound etiological factors include: infections, pressure, trauma, diabetes, burns, intravenous, arterial, iatrogenic, malignant tumor and radiation injury, etc.[1,4] Users can select the above ten etiological factors results, or choose other self-filling according to the specific situation.

Wound treatment plan module (Fig. 4A)

The user of WoundCareLog APP can reasonably choose the methods of wound treatment, surgical or conservative according to the diagnosis. Medical care linkage, that is, the combination of surgical treatment and conservative treatment is one of the core ideas of Dong et al.[2] Treatment of chronic refractory wounds is often comprehensive, including conservative dressing changes for wounds, adjustment of systemic nutritional status and treatment of underlying diseases, physiotherapy and hyperbaric oxygen, and surgical treatment. The corresponding treatment methods have detailed instructions, and strive to enable wound healing professionals to quickly and accurately obtain product information, so as to be able to meet the core ideas of "Thoughts and principles of diagnosis and treatment of chronic refractory wound in China", indicated as phase and selectivity-dependent treatment.

The bookmark function, for transferring the patient to a different department, is for the unit that is currently engaged in the treatment of wound repair specialists, which medical care linkage is limited by the medical institution's limitation and the medical care linkage cannot be effectively carried out. In the case, the referral module is set in WoundCareLog APP, making it possible to carry out medical care linkage within the region (within Shanghai city center area).

Rehabilitation and health education module (Fig. 4B)

Rehabilitation and related health education is particularly important for chronic refractory wounds,[5] especially chronic refractory wounds represented by pressure ulcers[6] and diabetic foot ulcers.[7] The user of WoundCareLog APP is required to fill in the relevant content. Take pressure ulcers patients as an example, users should teach the individual and family about risk for pressure

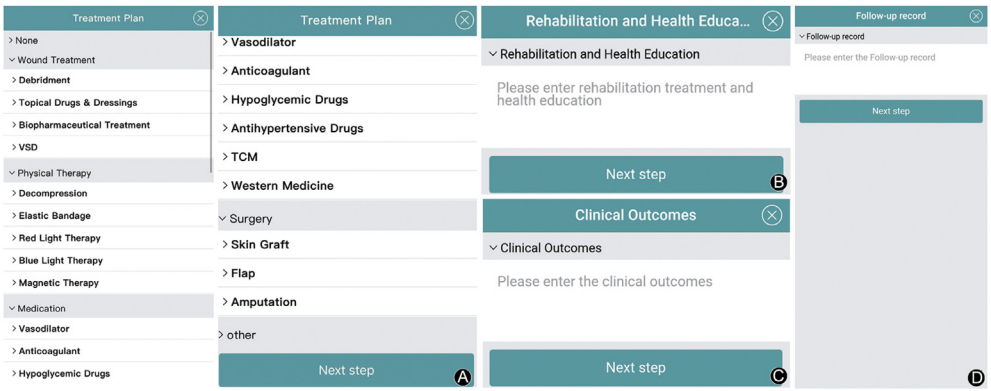

Fig. 4. (A) Treatment plan; (B) Rehabilitation and health education; (C) Clinical outcomes; (D) Follow-up record.

injury and engage individual and family in risk reduction interventions. As for diabetic foot ulcers patients, users should provide information on basic foot care advice including advice on appropriate foot wear and wound care.

Clinical outcomes module (Fig. 4C)

The clinical outcomes of wounds, as shown in studies,[8,9] include: 1– healed; 2– more than 85% healed; 3– patients lost to follow-up; 4– palliative (wound has no change for more than 8 weeks); 5– patients transferred department or hospital; and 6– malignant degeneration of chronic wounds into cancer. The user of WoundCareLog APP can make the selection accordingly.

Follow-up record module (Fig. 4D)

Many chronic wound patients still need to follow up after treatment and heal, so the importance of clinical follow-up is self-evident.

The clinical follow-up time point of patients with chronic refractory wounds is different based on the etiology. For example, if the patient's nutritional status is not improved or the partial pressure is not removed, the pressure ulcer is easily recurred; if the blood sugar condition is not well controlled or the high pressure under the foot is not adequately reduced, ulcers may occur. Therefore, the users of WoundCareLog APP are required to make a clinical follow-up record in the text box under this category at the time of three months or six months after the patient is healed and discharged.

Conclusion

Since the launch of the WoundCareLog APP in January 2018, there are currently more than 1000 medical institutions, and nearly 3000 wound healing medical professionals are in use. The number of cases in the database exceeds 10,000. The WoundCareLog APP is designed to require users to enter the key information before submitting the current case information. To our best knowledge, WoundCareLog APP is the first tool in the world which emphasis on the standardization of medical history record of chronic refractory wounds that can be deployed at the national or regional level. Relevant data analysis work is in progress, and more related articles are being drafted.

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Ethics statement

Approved by Expert Panel of Chinese Medical Doctor Association (CMDA).

Conflicts of interests

The authors declare that they have no competing interests.

Authors' contributions

Lu SL and Dong W designed and carried out the development of the APP. Nie LJ, Wu MJ, Xie T, Liu YK, Tang JJ, Dong JY, QC participated in drafting the manuscript.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.cjtee.2019.07.003.

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