



## CONSTRUCTION OF A MULTIMEDIA APPLICATION IN A MOBILE PLATFORM FOR WOUND TREATMENT WITH LASER THERAPY

### CONSTRUÇÃO DE UM APLICATIVO MULTIMÍDIA EM PLATAFORMA MÓVEL PARA TRATAMENTO DE FERIDAS COM LASERTERAPIA

### CONSTRUCCIÓN DE UN APLICATIVO MULTIMEDIA EN PLATAFORMA MÓVIL PARA TRATAMIENTO DE HERIDAS CON TERAPIA DE LASER

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#### ABSTRACT

**Objective:** to describe the development of a mobile application for treatment of wounds with laser therapy. **Method:** this is a methodological study, developed between April and September 2017, involving literature review, planning and production of didactic content, definition of the navigation structure, and construction of an environment for downloading and installing the application on mobile devices. **Results:** fifteen articles, two books, and one dissertation were selected from literature research. The developed application registers the sociodemographic characteristics of the patient, and from the data of evaluation of the wound and of risk factors obtained by the health professional, the parameters to be used in laser therapy were proposed. **Conclusion:** the developed application has potential for use in clinical practice, and may help in the selection of laser therapy parameters in wound treatment, as well as in nursing education. **Descriptors:** Mobile Applications; Software; Lasers; Wounds and Injuries, Evaluation; Algorithms.

#### RESUMO

**Objetivo:** descrever o desenvolvimento de um aplicativo móvel para tratamento de feridas com laserterapia. **Método:** estudo metodológico, desenvolvido entre abril e setembro de 2017, envolvendo revisão da literatura, planejamento e produção do conteúdo didático, definição da estrutura de navegação e construção de um ambiente para *download* e instalação do aplicativo em dispositivos móveis. **Resultados:** quinze artigos, dois livros e uma dissertação foram selecionados a partir de pesquisa da literatura. O aplicativo desenvolvido registra as características sociodemográficas do paciente e, a partir dos dados de avaliação da ferida e de fatores de risco obtidos pelo profissional de saúde, propõe os parâmetros a serem utilizados em laserterapia. **Conclusão:** o aplicativo desenvolvido tem potencial de utilização na prática clínica, podendo auxiliar na seleção de parâmetros de laserterapia no tratamento de feridas, bem como na educação em enfermagem. **Descritores:** Aplicativos Móveis; Software; Lasers; Ferimentos e Lesões; Avaliação; Algoritmos.

#### RESUMEN

**Objetivo:** describir el desarrollo de un aplicativo móvil para tratamiento de heridas con terapia de laser. **Método:** estudio metodológico, desarrollado entre abril y setiembre de 2017, envolviendo revisión de la literatura, planeamiento y producción del contenido didáctico, definición de la estructura de navegación, y construcción de un ambiente para *download* e instalación del aplicativo en dispositivos móviles. **Resultados:** quince artículos, dos libros y una disertación fueron seleccionados a partir de investigación de la literatura. El aplicativo desarrollado registra las características sociodemográficas del paciente, y a partir de los datos de evaluación de la herida y de factores de riesgo obtenidos por el profesional de salud, proponen los parámetros a ser utilizados en laserterapia. **Conclusión:** el aplicativo desarrollado tiene potencial de utilización en la práctica clínica, pudiendo auxiliar en la selección de parámetros de laserterapia en el tratamiento de heridas, así como en la educación en enfermería. **Descriptores:** Aplicaciones Móviles; Programas Informáticos; Rayos Láser; Heridas y Lesiones, Evaluación, Algoritmos.

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INTRODUCTION

Skin wounds affect people of any age. The body uses intrinsic, dynamic, organized and extremely complex biological processes to repair tissue damage that can be rapid when the clinical situation is favorable, and the extent and degree of tissue loss are reduced. However, several wounds become chronic and negatively affect the individual's life in all aspects, causing a series of problems such as pain, changes in self-esteem, self-image and spirituality, reducing the quality of life and causing functional impairment, shame and embarrassment in the social life.<sup>1-3</sup>

The therapeutic approach of wounds is curative and it is related to the repair of the lesion involving cleaning procedures, wound coverage and adjuvant treatments, always with the objective of promoting wound healing and preventing the proliferation of bacteria in the affected places.<sup>4-6</sup>

Several types of adjuvant treatment are available for the management of acute and chronic wounds. Several research highlighted the use of laser, ultrasound, and phytotherapy. The choice of the best treatment depends on intrinsic and extrinsic factors and consists of a dynamic process and depends on the clinical situation found at each moment and the evolution of the healing phases.<sup>7-9</sup>

Laser is currently one of the main resources used by health professionals in the treatment of wounds. The laser system is a device capable of emitting a light beam from the excitation of a solid, liquid or gaseous medium. This device can be classified into two categories: high-power lasers or surgical lasers, with thermal effects such as cut, vaporization and hemostasis properties, and low-power lasers or therapeutic lasers with analgesic effect and anti-inflammatory and bio-stimulating properties.<sup>10</sup> Laser therapy stimulates the proliferation of fibroblasts, osteoblasts and epithelial cells, and the synthesis of collagen, which is fundamental for good healing.<sup>11-3</sup>

The professionals who use the laser in the treatment of wounds should develop clinical skills for the adequate choice of treatment modality, to know absolute and relative contraindications, physiological effects, complications, application techniques and Brazilian standards of biosafety. In this way, the professional will be offering a topical treatment of lesions with safety, contributing to the process of wound healing. Professionals should acquire technical and scientific knowledge through validated courses, training

programs, reading of up-to-date scientific articles and, above all, adopt practices based on clinical guidelines, protocols, and applications so the practice is always based on evidence.<sup>14</sup>

The use of nursing care applications, such as computerized care planning streamlines the collection, registration, storage, manipulation and retrieval of patients' data under the responsibility of the nurse. Besides the ease of data access, the application enables administrative instrumentation and assists in decision-making.<sup>15</sup>

For the construction of an application for use in nursing, it is necessary that the researcher carefully define the development processes to avoid the low quality of the final product, dissatisfied customer and high maintenance cost. There are different models of software processes for developing an application, but some steps are fundamental, regardless of the model chosen. The steps are: software specification, design and implementation, and validation and evolution.<sup>16</sup>

The development of applications for laser therapy in wounds that aid in the evaluation, cleaning, determination of the parameters to be used in laser therapy and primary dressing in wound is very important, since these instruments can contribute to a more objective analysis of the characteristics of the area examined and the choosing the technique of laser application most appropriate to the client, facilitating the recording of the characteristics of the lesion, ensuring the monitoring of the evolution of the wound and assisting in the evaluation of treatment results.

OBJECTIVE

- To develop a mobile application for the treatment of wounds with laser therapy.

METHOD

Study applied in the mode of technological production and literature research carried out at Samuel Libânio Clinical Hospital after approval by the Research Ethics Committee of the Faculty of Health Sciences "Dr. José Antônio Garcia Coutinho ", University of Sapucaí Valley (UNIVÁS), under the opinion number 1,154,935.

The application development methodology used was the Contextualized Instructional Design (DIC), which presents a constructivist proposal, consisting of the intentional action of planning, developing and applying specific

didactic situations, incorporating mechanisms that favor contextualization.<sup>16</sup>

The multimedia application in mobile platform for wound treatment with laser therapy was developed in 4 steps: analysis, design, development, and implementation.

The analysis step involved the evaluation of the educational problem and the elaboration of a solution according to the DIC methodology. A search was made in the databases of the Health Sciences, including the Cochrane Library, Scientific Electronic Library Online (SCIELO), Latin American and Caribbean Literature in Health Sciences (LILACS), Medical Literature Analysis and Retrieval System Online / US National Library of Medicine (MEDLINE), International Nursing Index (INI) and Cumulative Index to Nursing and Allied Health Literature (CINAHL), in journals of the Coordination of Improvement of Higher Education Personnel (CAPES), and in books, dissertations and area published in the last 10 years, using the descriptors in Portuguese and English: injuries and injuries, healing, laser therapy.

The inclusion criteria for selecting the content of the publications to be used in the construction of the application were primary studies that had direct link to the theme, to be available in its entirety, and studies published in the last 10 years. After the abstracts were read, articles describing wound evaluation, wound cleaning, primary dressings, and laser application parameters were selected for the treatment of wounds. The application was developed in three parts from the selected studies.

The first part of the application presents the steps of wound evaluation, such as measurement, type of margin, type of tissue, type and amount of exudate present and signs of inflammation. The second part describes the procedures that precede laser therapy and suggests wound cleaning techniques according to the type of tissue found in the wound bed, which can be classified as devitalized, granulated or epithelialized. The third part suggests parameters for Laser Therapy according to the type of tissue and exudate identified in the lesion. In the fourth part, the application suggests that the primary dressing be performed according to the prescription of the professional and that the coverage standardized by the institution be used.

Also in this step, the technological infrastructure was defined and a diagram was created to guide the construction of the instrument.

In the design step, the planning and creation of the didactic content, the definition and writing of the topics, the media selection and the interface design were carried out. The texts were structured in topics and connected by hypertexts (links).

In the development stage, the selection of the application tools, the definition of the navigation structure and the planning of the environments configuration were carried out.

The implementation step comprised the configuration of educational technology tools and resources and the construction of an environment for downloading and installing the application on mobile devices.

## RESULTS

The diagram created to guide the construction of the instrument is shown in Figure 1.

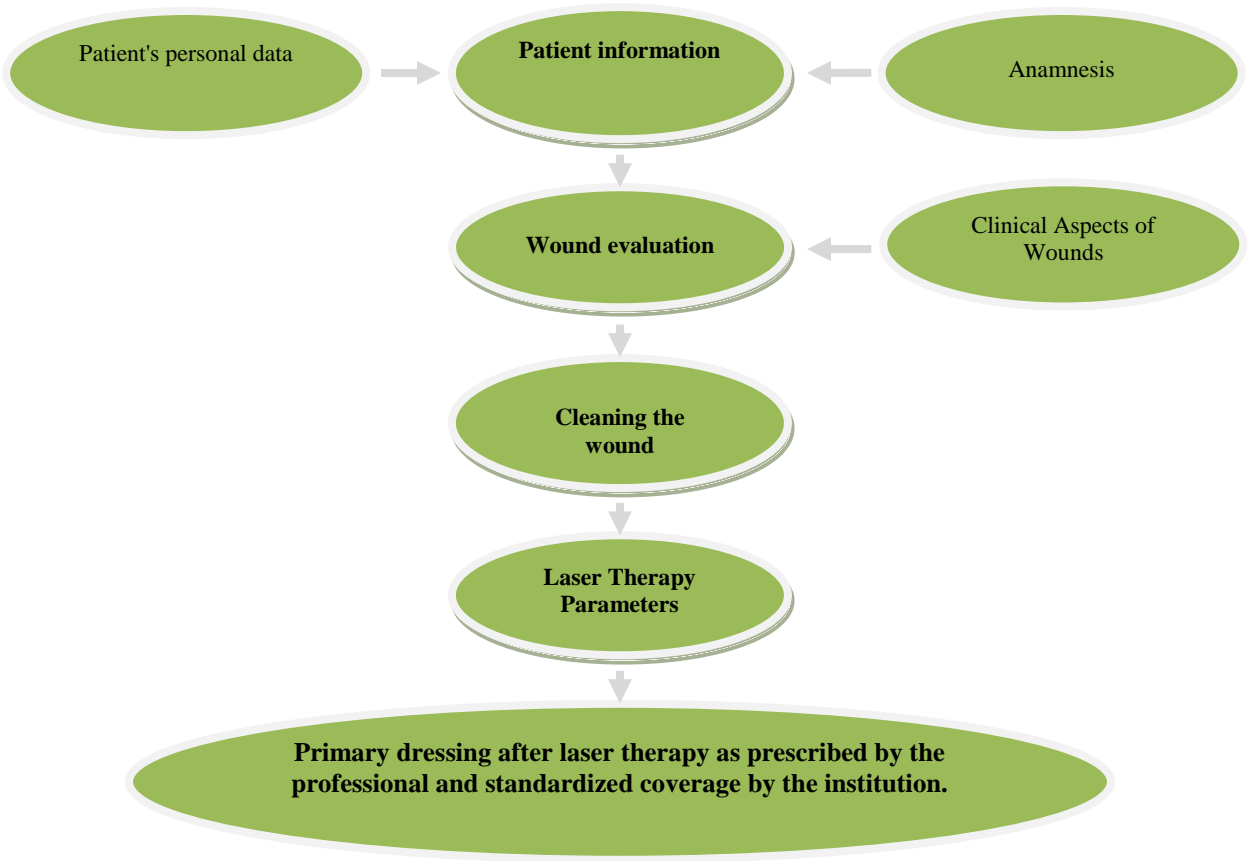


Figure 1. Schematic design of the application database. Pouso Alegre (MG), Brazil, 2017.

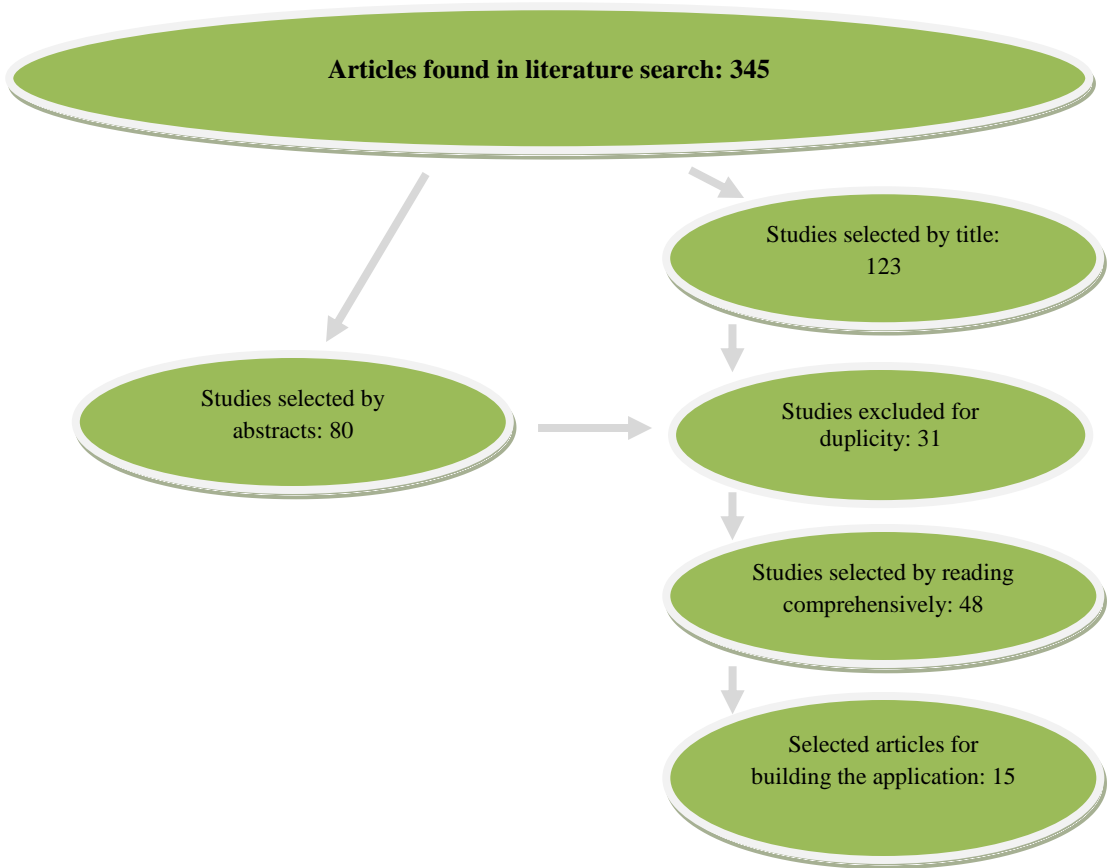


Figure 2. Flowchart of identification, selection, and inclusion of the studies found during the review of the literature for the construction of the application. Pouso Alegre (MG), Brazil, 2017.

The search in the databases and virtual libraries resulted in the selection of 15 articles, 2 books and 1 master's dissertation as a basis for the construction of the application (Figure 2). Figure 3A shows the screen for filling patient identification data. After completing this form, the professional will click “Next” to begin the evaluation of the wound.

Then, the professional should identify the characteristics of the margin of the wound (macerated, epithelial or hyperemic), choose the types of tissue in the wound bed and record the percentage of each type of tissue (Figure 3B), and measure the size of the wound (width, length, depth and presence or absence of detachment) (Figure 3C).



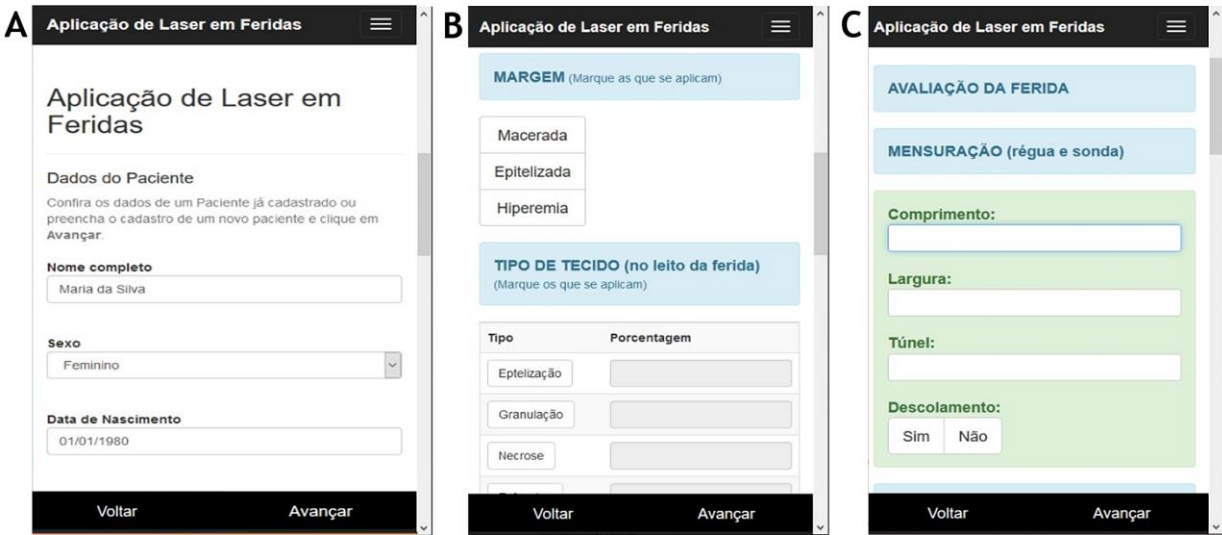


Figure 3. Examples of application screens showing forms of (A) patient identification, (B) tissue evaluation of wound margin and bed, and (C) wound size. Pouso Alegre (MG), Brazil, 2017.

The professional should also evaluate the type and amount of exudate (Figures 4A and 4B) if the wound has signs of infection and what are these signs (heat, flushing, edema, and pain) (Figure 4C).



Figure 4. Examples of application screens showing evaluation (A and B) of type and amount of exudate, and (C) signs of infection. Pouso Alegre (MG), Brazil, 2017.

After evaluation of the wound, the application shows proposals for cleaning according to each type of tissue identified (devitalized, granulated or epithelialized) (Figure 5A), indications of the parameters for the application of laser therapy (Figure 5B) and orientation for the dressing (Figure 5C).



Figure 5. Examples of application screens showing proposals for (A) wound cleaning, (B) laser therapy parameters, and (C) orientation for performing the primary dressing. Pouso Alegre (MG), Brazil, 2017.

The multimedia application on mobile platform for the treatment of wounds with laser therapy was registered at the National Institute of Industrial Property (Ministry of Development, Industry and Foreign Trade) under the number of protocol BR512016001168-8. and it is available for free on the Internet at [http://fnunes.azurewebsites.net/aplic\\_laser\\_feridas\\_1.asp](http://fnunes.azurewebsites.net/aplic_laser_feridas_1.asp)

## DISCUSSION

The treatment of patients with wounds is a complex and dynamic process, and it is considered a challenge for professionals who provide care to these individuals, since it involves multiple factors, such as socioeconomic and cultural aspects, clinical conditions related to systemic alterations presented by the patient, characteristics of the wound, emotional and behavioral factors, and the difficulty of access to new technologies by professionals.<sup>17-9</sup>

Health professionals need to follow the technological evolution and globalization that provoke ideological, cultural and social changes. The accelerated growth of knowledge and the volume of information require the professional to be able to learn and adapt quickly to the current context, developing skills and strategies to provide assistance based on scientific and technological evidence.<sup>20-1</sup>

This study has developed an application that will be a clinical tool to aid in decision making during the evaluation and treatment of wounds using laser. The application was developed based on scientific evidence in the literature.

The use of applications in the clinical environment contributes to the systematic recording of care, enabling continuity of treatment and improving quality of care.<sup>22</sup> Systematic wound care minimizes healing time and allows cost and benefit analysis of the treatment used.<sup>22-5</sup>

Mobile devices can have access to millions of applications. In 2012, more than 40 billion applications were downloaded on smartphones, with a forecast of around 300 billion in 2016.<sup>2</sup> Thus, developing mobile computing solutions represents an effective way to deliver tools and reach the target audience.<sup>26</sup>

One of the main features of the applications is the break in the mobility limitation since the user can use a smartphone 24 hours a day, wherever he is. Another relevant aspect is the personalities that the

equipment provides to its users, considering that the professional can use his personal device he is already accustomed to deal daily.<sup>27</sup>

The choice of the theme of this study was based on the difficulties found by health professionals in their care activities to find criteria for the application of laser in the treatment of wounds. Laser therapy is an adjuvant treatment of wounds that accelerates tissue proliferation, increases wound vascularization and formation of more organized granulation tissue, favoring a rapid healing of the lesion; however, it needs criteria for its application.<sup>10-12,14</sup>

Studies have shown that the availability of technological resources in virtual learning environments, such as Moodle, applications, social networks, and forums, facilitate the acquisition of information and skills to perform nursing procedures, increasing safety and improving the performance of professionals health.<sup>28-9</sup>

In a study describing the steps of creating a digital application aimed at teaching vital signs to nursing students,<sup>30</sup> the authors concluded the application provides a means of rapid consultation and easily transposed to the various practice scenarios in health facilities. The academic is capable of solving several doubts with more autonomy when accessing this type of platform, and feeling more confident in their professional performance, better interpreting the results of an evaluation in terms of the patient's clinical evolution.<sup>30</sup>

There is a difficulty in the clinical and academic environment in consulting procedures manuals, mainly because the content is usually very theoretical and the descriptions are very long. In this way, the proposal of this work is to facilitate the access of professionals to the information. Among the many advantages already discussed, it is important to note that the proposed adjuvant treatment tool will be available free of charge, facilitating the access of professionals working in the area of laser therapy in wounds.

The study has its large-scale use by professionals who use laser therapy in their daily practice for the treatment of wounds and the improvement of the application as its perspective so it can also be used in offline mode and can be accessed from anywhere. This research has as future perspective the validation of this application by doctors, nurses and dermatologists.

## CONCLUSION

The study enabled to describe the stages of planning and developing a mobile application for the treatment of wounds with laser therapy. The use of this application will be very useful in clinical practice for the professional involved in the prevention and treatment of injuries through laser therapy and in the teaching and training of health professionals.

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