

Abstract

This paper discusses the development approaches of building BurnHelp application for IOS and Android. We define the overall scope of the project, architecture and process to attain Functional & Non Functional Requirements, Business Rules, functional definition of the proposed system and the solution provided to the client.

Introduction

Our clients wanted to create life saving mobile application as a communication channel to help emergency room physicians to contact burn experts of main hospital to assess the burn wounds and determine the course of treatment.

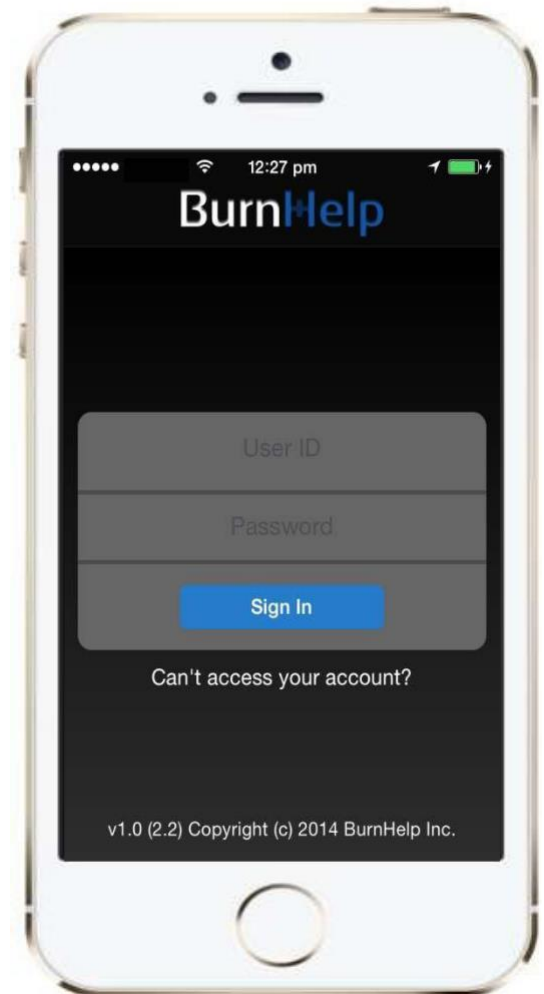
System Objectives and Background information

The challenge was to create a communication channel to help emergency room physicians to contact burn experts and streamline burn care even before a burn patient arrives at the ER.

In the U.S not every hospital has a burn expert in house, and most burn experts provide services to multiple hospitals. Their services are requested by physicians on an as needed basis. Since burn treatment requires immediate treatment and each burn requires different type of treatment from the get go, the burn experts need to be involved even before the patient arrives at the ER.

A physician usually calls in the main hospitals to get some assistance from burn experts to determine the course of treatments. By using this app, the physicians take pictures of the burns and passes on this info to a pool of burn surgeons/experts. Any of the burn expert in the pool can take on the patient and can start coordinating with the physician in the course of treatment. All physicians and Burn expert communication can be accomplished via the iOS app or via a web application.

Both the applications are HIPAA compliant and thus allow a free and secure communication pathway and workflow between a physician and a burn expert.



In response of following requirements, we created a web application to store data in database and manage system stakeholders and a BurnHelp Mobile App as a communication channel among following users.

- Physician
- Burn Expert

The app consists of three parts:

1. Sending side
2. Receiving side
3. Cloud repository

The general flow of the App is as follows:

Sending of patient information via mobile application

- Patient presents with burn wounds to referring hospitals.
- Physician or other practitioner at a referring hospital treats the patients when he/she want to seek advice from burn experts.
- Physician or other practitioner then login into application, take some photos of the patients along with its demographics and submit it to a web server.
- System (web server) receives the patient information and sends the notifications to all burn experts of a specific burn center.

Receiving of patient information via mobile application

- Burn experts after receiving the application login into application.
- Burn experts view his/her newly notified patient case.
- After view the patient photos and information Burn expert makes call to give his/her expert advice to referring physician.
- After having a conference call with physician burn expert open the application again and mark the status of the patient's case in order to notify other experts that whether the case has been resolved or it needs further attention.

Application Flow - Sending Side

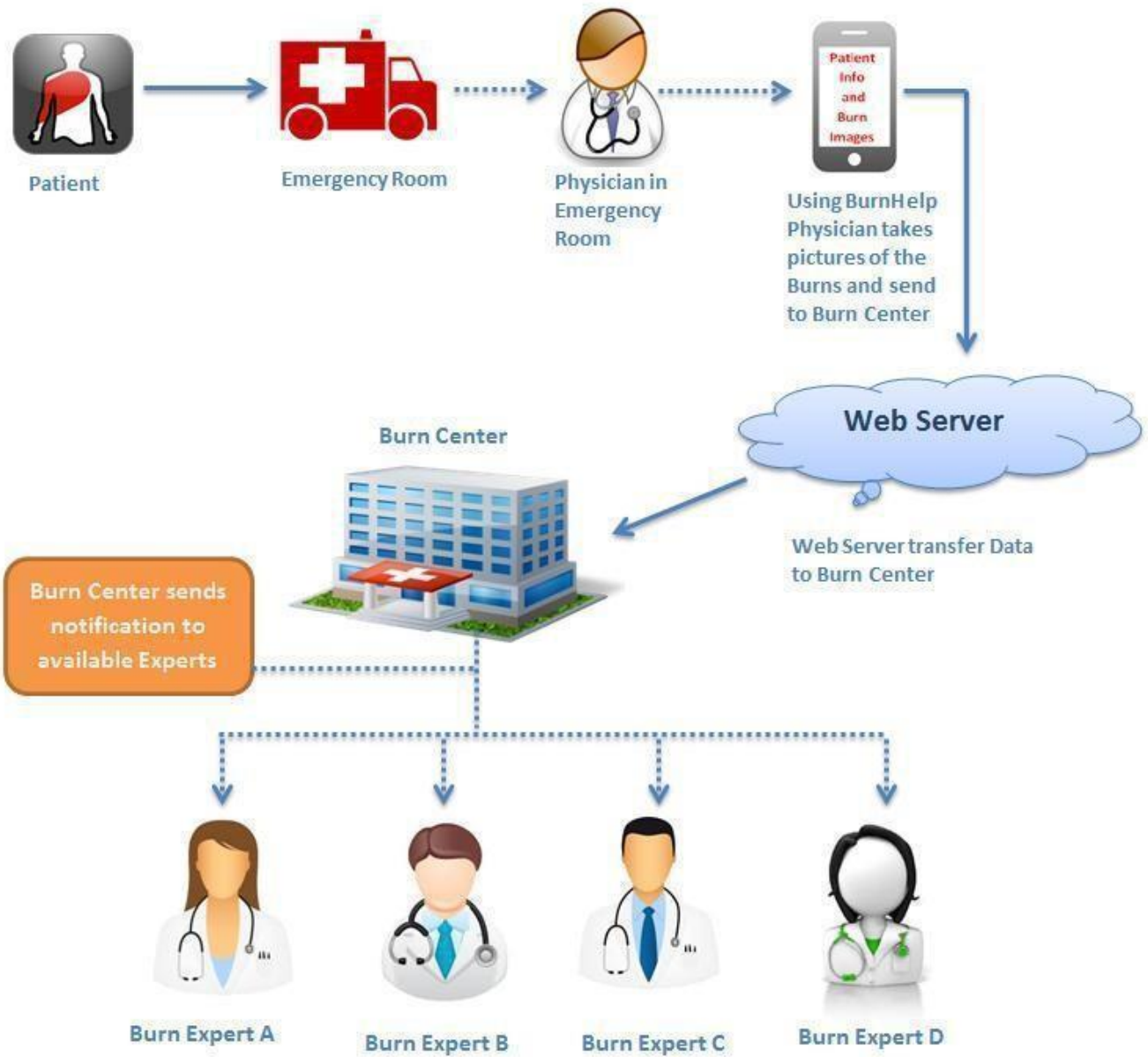


Fig-1: Schematic representation of Sending Side Implementations

Application Flow – Receiving Side

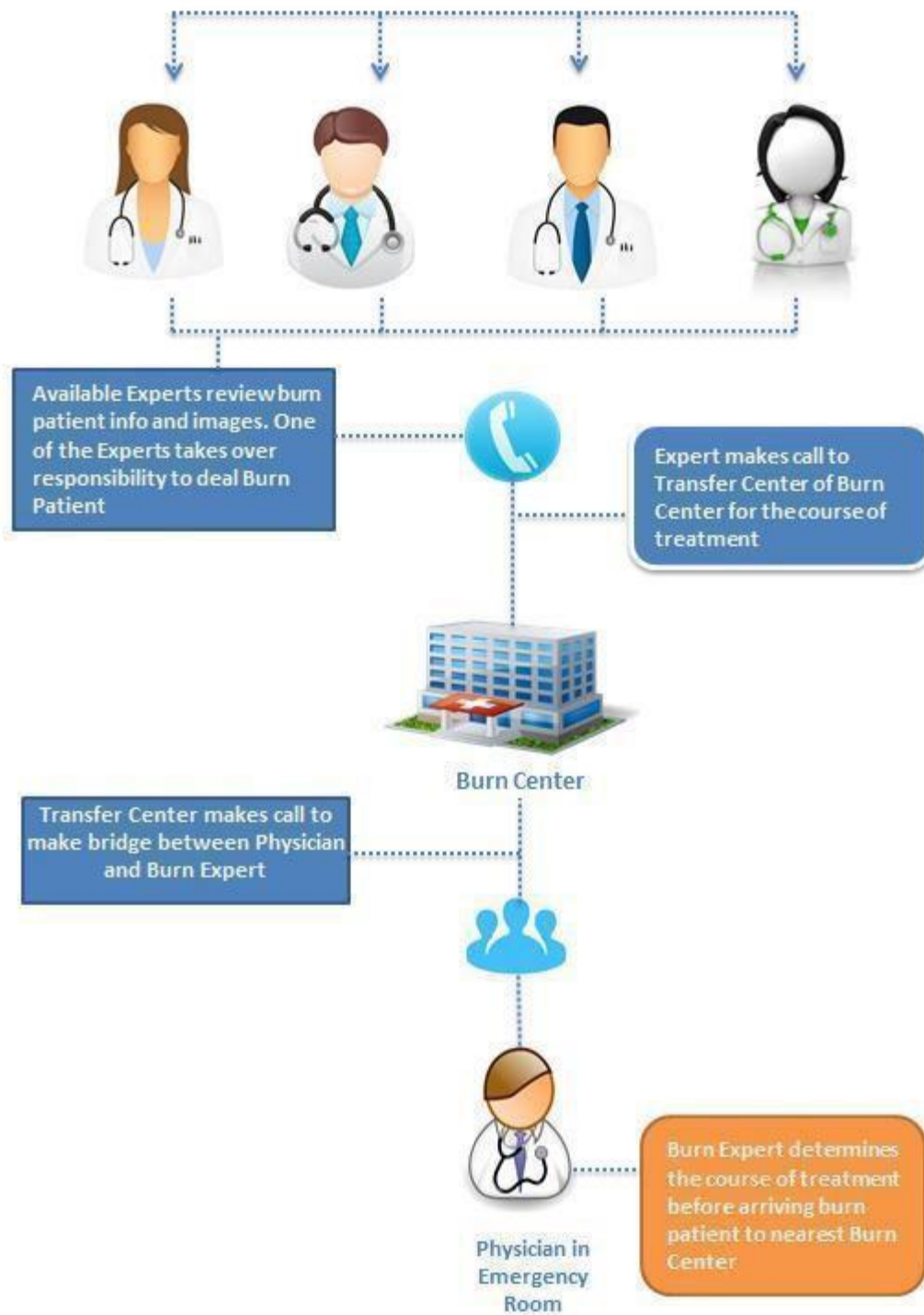


Fig-2: Schematic representation of Receiving Side Implementations

Application Platforms

BurnHelp application is designed for iPhone mobile devices only. Minimum supported OS for iPhone devices: iOS 6.0 or later.

System Constraints

Application does not work if devices are not connected to internet via 3G or Wi-Fi network.

System Stakeholders

- Mobile App
- Burn Expert
- Physician
- Other Practitioners (Junior Physician, Trainee, Nurse Practitioner)
- Web App
- Administrators

Important Technical Achievements

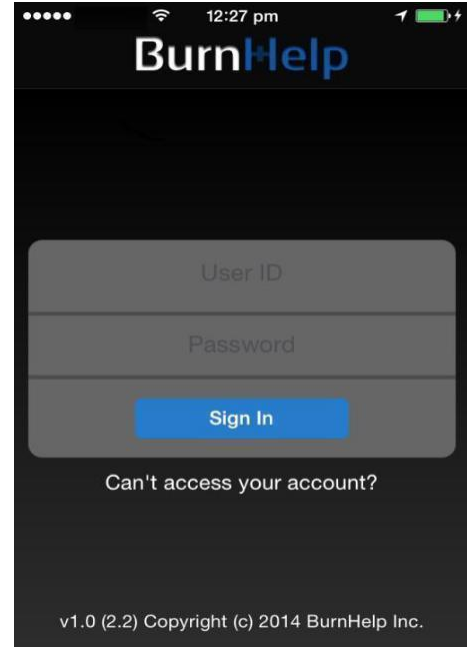
Following were some important technical achievements in this project:

- The full implementation was done in record time, enabling our client to successfully establish communication channel to help emergency room physicians to contact burn experts and streamline burn care before a burn patient arrives at the ER.
- Web application accessible over HTTPS instead of plain HTTP.
- Permissions page created for assigning rights to burn center & facility administrators as per client's requirement.
- Critical search criteria created based on permission assigned by master administrator
- Created a secure Database Encryption Logging. (*RSA 256 bit encryption*)
- Action logging was required to be performed to track all the activity of all the users. Based on requirements, all the logged activities of facility and master administrator can be logged and sent via email to Administrator by the end of the day.
- On completion iOS sends a request to service to update the case status to "Triage"
- Both Mobile & Web applications are HIPAA compliant and thus allow a free and secure communication pathway.

Key Screens for Mobile App

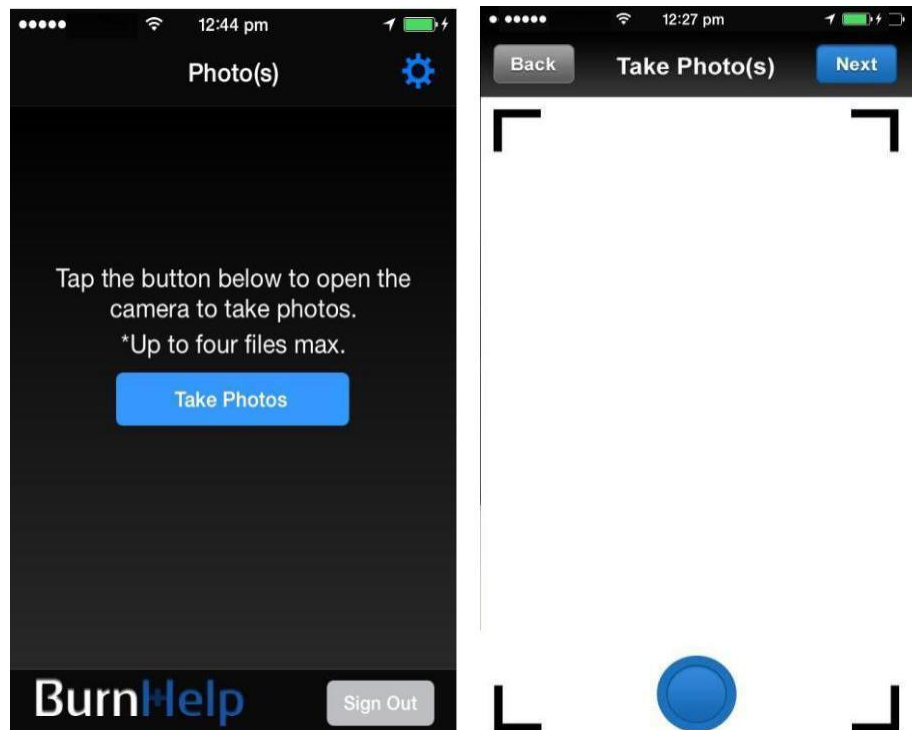
1. For Physician/Other Practitioners Login Screen

This is the login screen where existing physicians, other practitioners and burn experts log into the application.



Patient Photo(s)

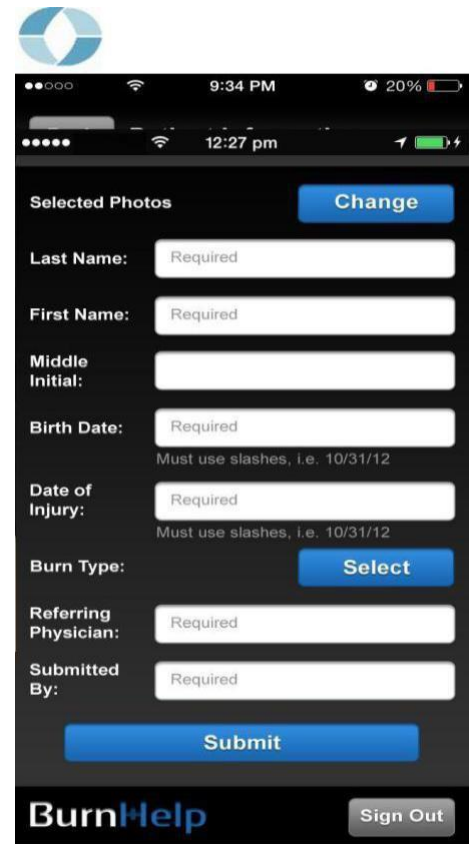
This takes patient photos screen. Once existing physician, other practitioners logged into application they will be redirected here. After taking photos of the patient they choose best three photos to be sent the web server.



Patient Demographics Fill up

When existing physicians or other practitioners take photos of patient and after selecting best three patient photos, then they need to fill up patient demographics/information required to move further with the submission of patient case.

Physician/other practitioner get notification after the successful submission of patient cases.

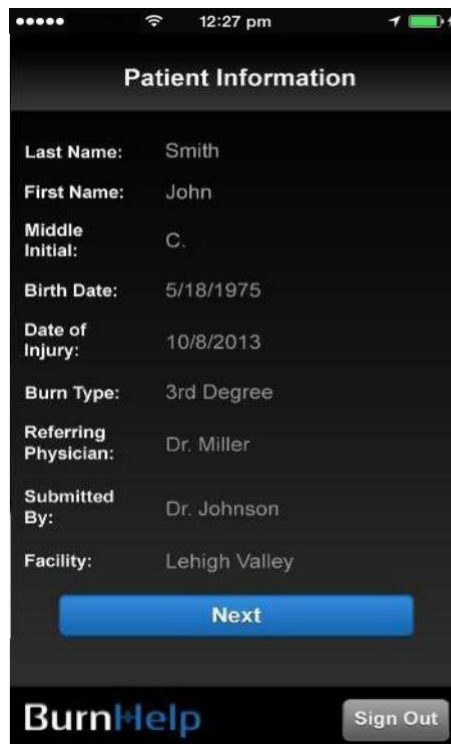


This screenshot shows the 'Patient Demographics' form in the BurnHelp mobile app. The form includes the following fields and options:

- Selected Photos:** A section with a 'Change' button.
- Last Name:** Required text input field.
- First Name:** Required text input field.
- Middle Initial:** Text input field.
- Birth Date:** Required text input field with a note: 'Must use slashes, i.e. 10/31/12'.
- Date of Injury:** Required text input field with a note: 'Must use slashes, i.e. 10/31/12'.
- Burn Type:** A 'Select' button.
- Referring Physician:** Required text input field.
- Submitted By:** Required text input field.
- Submit:** A large blue button at the bottom.
- Sign Out:** A button in the bottom right corner.

2. For Burn Experts Patient Case Information

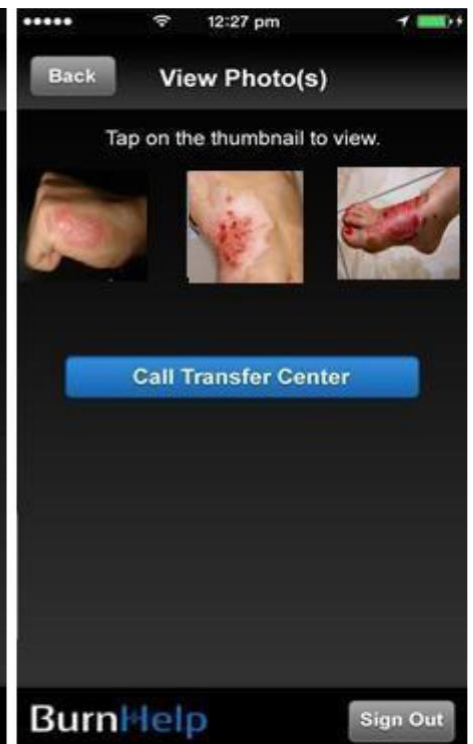
This is patient information screen where burn experts view patient information.



This screenshot shows the 'Patient Information' screen in the BurnHelp mobile app. The patient details are as follows:

Last Name:	Smith
First Name:	John
Middle Initial:	C.
Birth Date:	5/18/1975
Date of Injury:	10/8/2013
Burn Type:	3rd Degree
Referring Physician:	Dr. Miller
Submitted By:	Dr. Johnson
Facility:	Lehigh Valley

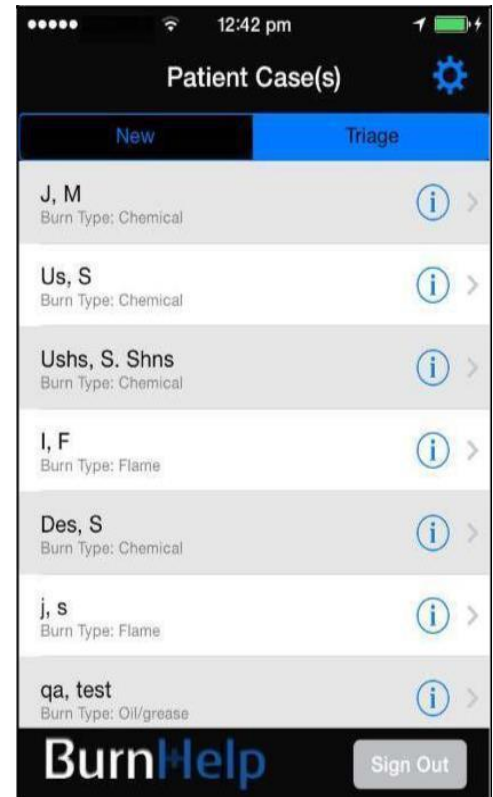
At the bottom of the screen, there is a blue 'Next' button and a 'Sign Out' button.



This screenshot shows the 'View Photo(s)' screen in the BurnHelp mobile app. It features a 'Back' button at the top left and a 'Call Transfer Center' button at the bottom. The main area displays three thumbnails of burn injuries with the instruction: 'Tap on the thumbnail to view.'

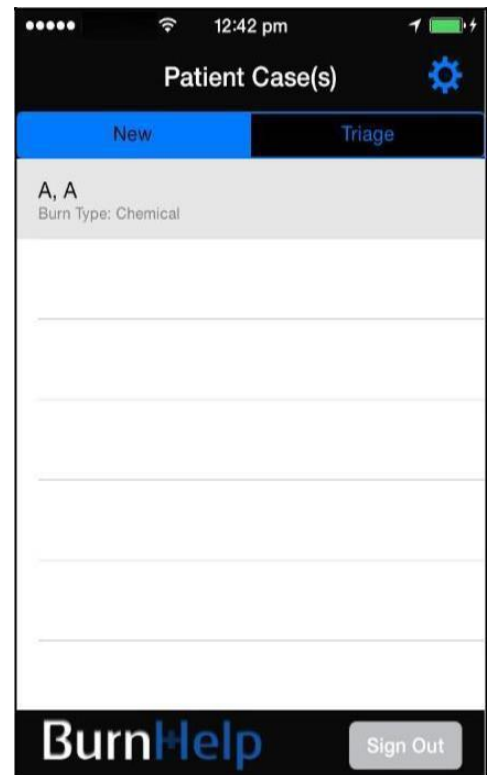
Triage Patient Case

This is Triage information screen where burn experts view patient triage information.



New Patient Case

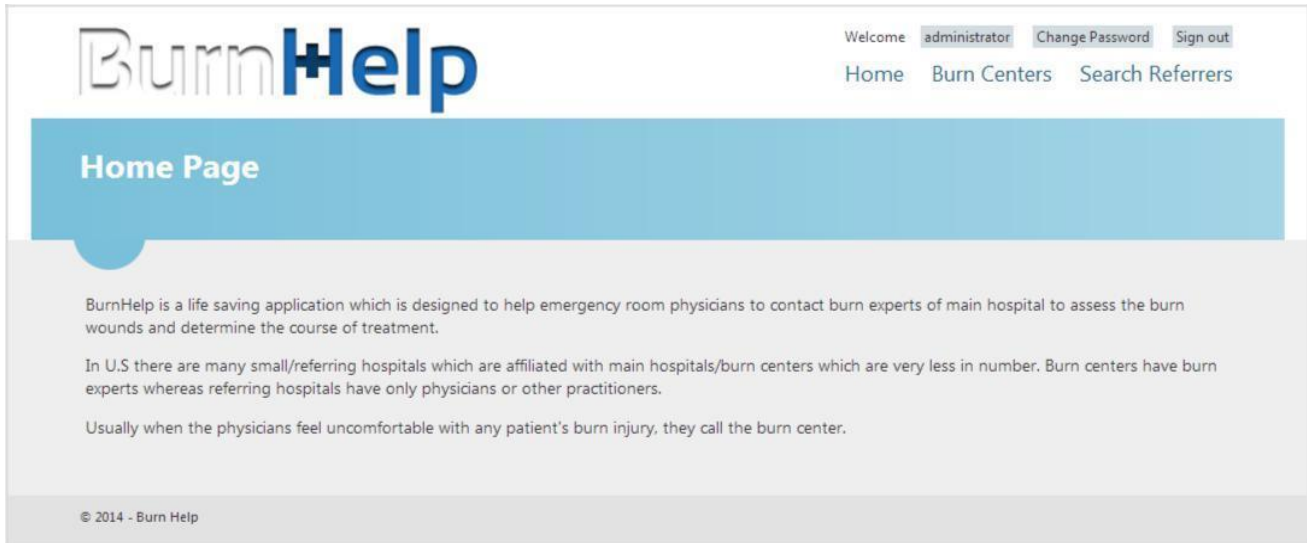
This is new patient case information screen where burn experts view new patient information.



Key Screens of Web Application

Main Screen

This is main screen. Once administrator is logged into the web application, they redirected here.

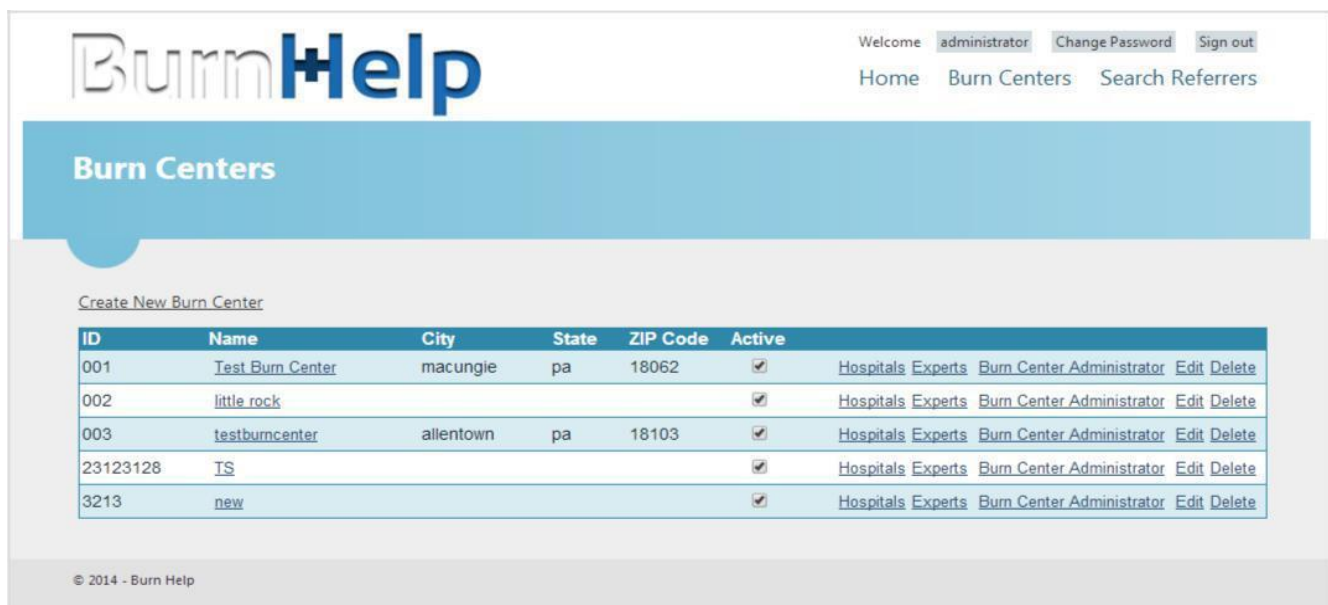


The screenshot shows the main interface of the BurnHelp application. At the top left is the 'BurnHelp' logo. On the top right, there is a user navigation area with 'Welcome administrator', 'Change Password', and 'Sign out' buttons. Below this is a primary navigation bar with 'Home', 'Burn Centers', and 'Search Referrers' links. A large blue banner below the navigation contains the text 'Home Page'. The main content area features a paragraph describing the application's purpose: 'BurnHelp is a life saving application which is designed to help emergency room physicians to contact burn experts of main hospital to assess the burn wounds and determine the course of treatment.' It also includes information about the network of hospitals and burn centers, and a note about when physicians call a burn center. The footer contains the copyright notice '© 2014 - Burn Help'.

Burn Center list screen

This screen displays when administrator clicks on 'Burn Centers' link button from top navigation bar.

- All burn centers are listed in this screen.
- Administrator can create new burn center by clicking 'Create New Burn Center' link button.



The screenshot shows the 'Burn Centers' list screen. It features the same top navigation and logo as the home page. A blue banner below the navigation contains the text 'Burn Centers'. Below the banner is a link to 'Create New Burn Center'. The main content area displays a table of burn centers with the following data:

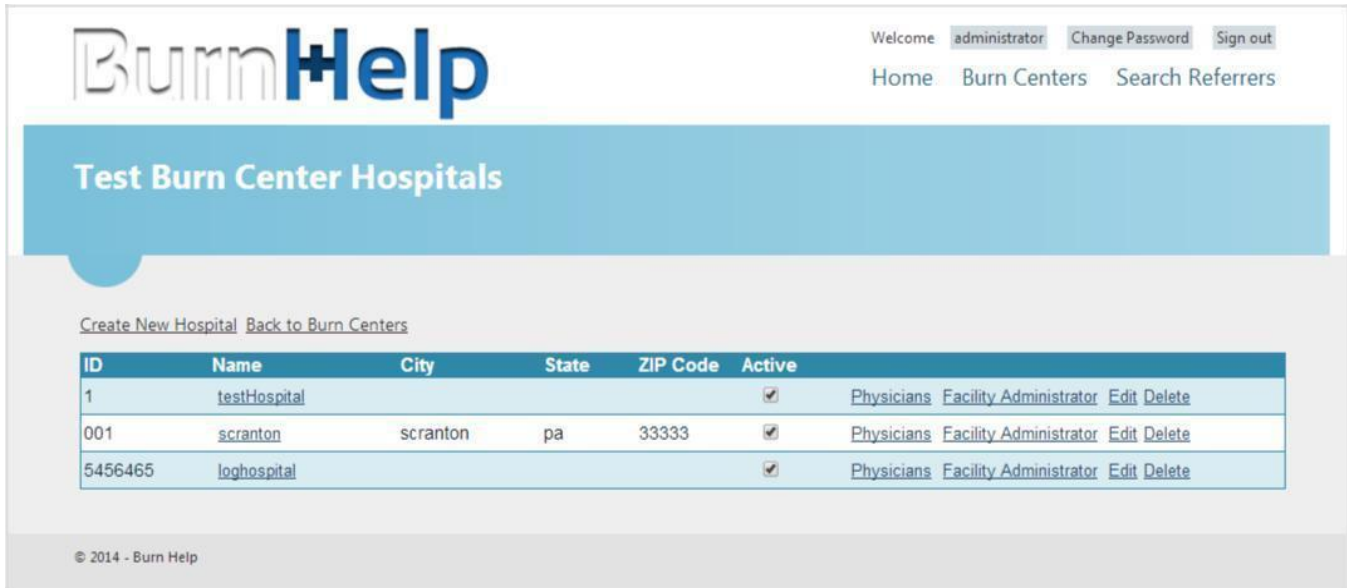
ID	Name	City	State	ZIP Code	Active	
001	Test Burn Center	macungie	pa	18062	<input checked="" type="checkbox"/>	Hospitals Experts Burn Center Administrator Edit Delete
002	little rock				<input checked="" type="checkbox"/>	Hospitals Experts Burn Center Administrator Edit Delete
003	testburncenter	allentown	pa	18103	<input checked="" type="checkbox"/>	Hospitals Experts Burn Center Administrator Edit Delete
23123128	TS				<input checked="" type="checkbox"/>	Hospitals Experts Burn Center Administrator Edit Delete
3213	new				<input checked="" type="checkbox"/>	Hospitals Experts Burn Center Administrator Edit Delete

The footer contains the copyright notice '© 2014 - Burn Help'.

Hospital list screen

This screen displays when administrator click on 'View Hospitals' link button against a burn center.

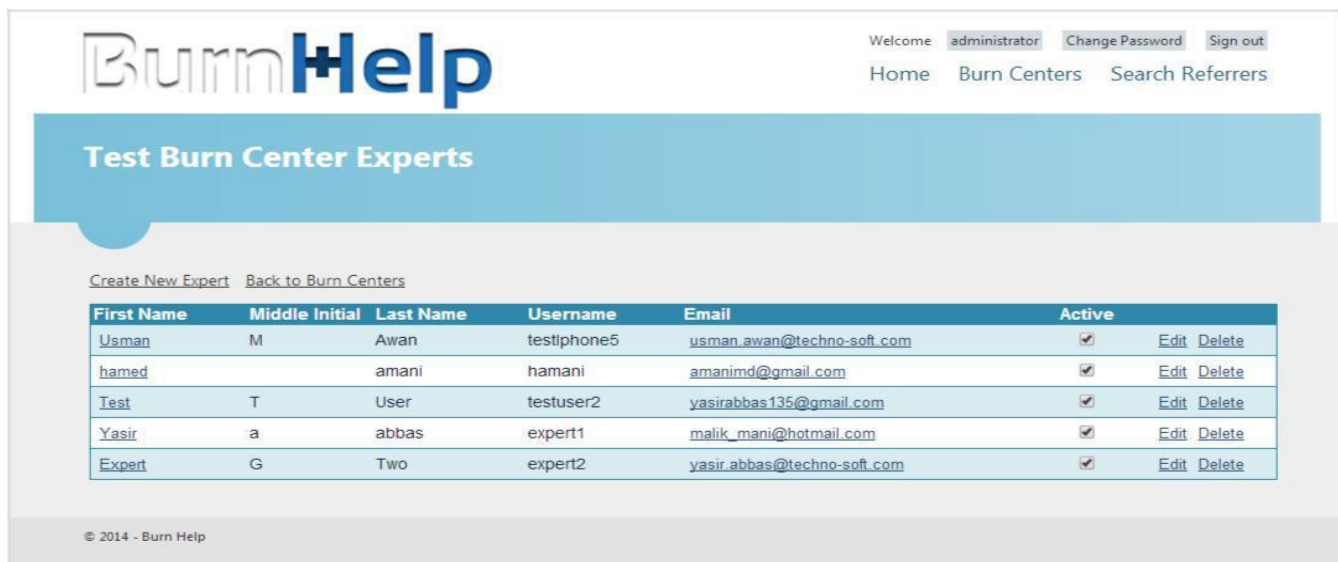
- All child hospitals of specified burn center will be listed in this screen.
- Administrator can create new hospital center by clicking 'Create New Hospital' link button.
- Administrator can go back to burn centers by clicking 'Back to Burn Centers' link button.



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Experts list screen

This screen displays when administrator clicks on 'View Experts' link button against a burn center.



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Customer Benefits

The app is now being used by Burn Experts, Physicians and other Practitioners (Junior Physician, Trainee, and Nurse Practitioner). The app proves successful immediate course of action and communication channel to help emergency room physicians to contact burn experts of main hospital to assess the burn wounds and determine the course of treatment before arriving burn patient at the ER.

Future Relationship

The full implementation was done in record time. The client was highly satisfied with the project and was pleased with Technosoft's working solution. He is in touch with maintenance work. Client has also referenced us new business leads and we are working on his referred prospects.

About Technosoft Solutions Inc.

Technosoft Solutions Inc. is leading outsourcing software and application development company dedicated in Healthcare Software Development and Integration Services. We are offering a full range of IT solution and support services to companies developing healthcare solution for the U.S market. For more than 10 years, our commitment to providing reliable healthcare system software solutions has remained constant and stable.

Many of our clients are well versed in software development and have healthcare solutions deployed at main hospitals. We augment their resources with our HL7 integration, HIPAA privacy & security services.

We are endowed with quality certifications and standards, including CMMI ML2, ISO 9001:2008, Sun, MySQL and as IBM Certified Partner.