ER Fast Check-In

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Abstract **−** *COVID-19 has change everyone's daily lifestyle and this includes hospitals. The number of patients at Emergency Rooms (ER) have increased in every hospital around USA, including Puerto Rico. Employees are at risk by being in contact with possible virus carriers. ER Fast Check-In is an electronic self-register system consisting of a Windows PC with the ER Checking software integrated that business owners will be able to install on computers with touchscreens placed on the emergency room entrance. ER Fast Check-In purpose is to help reduce physical contact between some personnel and patients, increase their servicing speed and improve efficiency, while decreasing man-hours. Additionally, will help segregate possible COVID-19 virus carriers from the other ER patients. Another gain from adopting this technology is to capture records electronically and collecting data for future processes and statistical analysis.*

Key Terms − Emergency Room, ER Check-In, ID, and Symptoms.

INTRODUCTION

Just like computers, the first touchscreen was invented decades ago. The first touch-controlled screen was created by E.A. Johnson in 1965 at the Royal Radar Establishment in Malvern, UK [1]. Touchscreens' commercial availability came in the early 1980s [1]. But it was not until the 2000s that touchscreens really started to take off as developers explored ways of integrating the technology into daily life [2].

Implementing a touchscreen for this ER Fast Check-In will facilitate patients or companions to add the basic information and symptoms into the system. Some hospital currently has manual process to register patients in emergency rooms. During the last couple of years, companies have automated majority of their processes. Hospital demands require to start changing their working process to a more dynamic and automated type of workflow.

Figure 1 describes the current workflow process that many hospitals in Puerto Rico utilize. Patients wait a lot to be called initially only to register before even a nurse can take vitals. As a minimum, this process has from 5 to 7 steps before the doctor sees the patient.

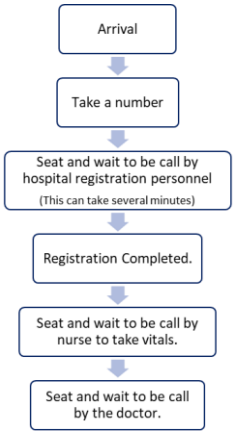

Figure 1

Actual Workflow

Figure 2 displays the emergency room workflow from a patient's perspective. It can easily demonstrate that it contains less steps than the actual hospital processes.

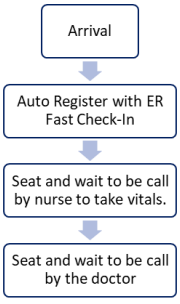

Figure 2

ER Fast Check-In integrated to workflow

The value of this tool is to provide a better service to patients, improving emergency rooms workflow processes, reducing personnel, or reorganizing personnel functions, reducing unnecessary exposure of personnel with COVID-19 patients.

PROBLEM STATEMENT

Most healthcare providers have taken advantage from touchscreen technology since it has many applications in the medical field. From a lost patient finding the way to the doctor's office for an appointment, to a mother who just gave birth digitally signing discharge papers. Touchscreen devices efficiently modernize processes, save money by minimizing human error, increasing patient satisfaction [3].

Touchscreen stations can be very efficient for patients to sign in at urgency/emergency clinics. They can enter their personal details, symptoms, insurance information, and probably make payments. Touchscreens simplify check-in, allow patients to choose their language, gathers data automatically, can provide information or tips to patients, and enhances protected health information (PHI) privacy.

A common issue is when the ER is saving on personnel hours by using the same employees for admission and check-out. This creates a bottleneck effect for the patients arriving and the ones paying and leaving. ER check-ins exist years ago, but they still have room for improvement. More specific, the Puerto Rico ER check-ins that the researcher have visited do not provide a way of pulling information previously given to the hospital. You could visit the ER three consecutive days, and still must fill every contact detail before providing your PHI.

SYSTEM DESCRIPTION

Development started with the Windows Forms objects [4], utilizing MS Visual Studio and C#. The initial screen of the system does not contain a complex functionality, other than welcoming the patient and letting know they are about to begin the check-in process (Figure 3).

Figure 3

Start Screen

Once the check-in process has started, the patient will have the ability to choose between scanning an ID (ex. the barcode of the driver's license card or a state ID card) or do a manual registration process (Figure 4). If patient scans an ID, the next screen will prefill some fields. If the patient has done previous visits, it will have a patient record.

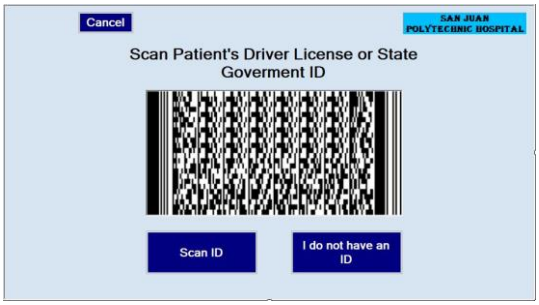

Figure 4

ID Check Screen

Next up will be the ID Info Screen. As aforementioned, most fields on this screen will be pre-filled if the patient scanned an ID on the previous screen. Most of the fields will be required. Middle name initial, second address line, last four digits of the zip codes, and tutor-related information, will not be required (Figure 5). Leaving required fields in blank will not allow the patient to press the "Confirm and Continue" button. The tutor fields will be invisible while the tutor checkbox is not marked and will show if the patient's birth determines it to be under 18-years—old. If the patient had previous visits, it means it

has a patient record. If the patient visited in the past with a tutor, the tutor information will be prefilled from the record, not from the information coming from the ID's barcode. The "Back" button would take the patient to the previous screen, while the "Cancel" button would erase all filed fields and return to the start screen.

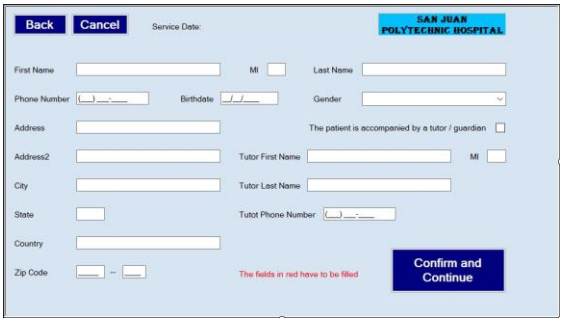

Figure 5

ID Info Screen

Once the very basic identification information has been saved, and until further notice, the COVID-19 screen is a must (Figure 6). In here, at the same time, will be the first of four screens the patient will have to file all the current symptoms [5] the patient is experiencing. The patient will have the ability to choose multiple symptoms.

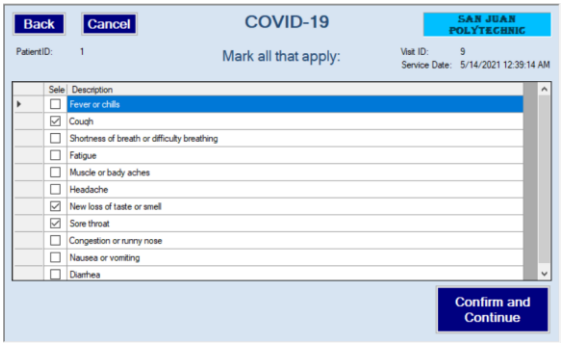

Figure 6

COVID-19 Symptoms Screen

In a world without COVID-19, the next screen would be the first symptoms-related (Figure 7). The group to be found here are pain symptoms [6]. Just like the previous screen, multiple selection is allowed. Just like previous screens, the "Back" button would take the patient to the previous screen (COVID-19 symptoms in this case) and the "Cancel" button would reset the system and return to the start screen.

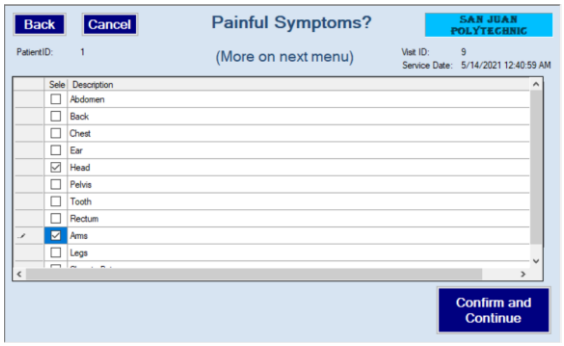

Figure 7

Pain Symptoms Screen

The next screen, third for symptoms, groups the feeling symptoms [6]. This one also permits multiple selection. Patients should always be able to express all their symptoms (Figure 8).

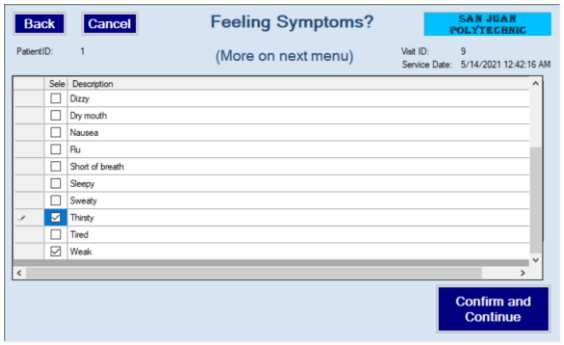

Figure 8

Feel Symptoms Screen

The fourth, and last, symptoms screen, is simply called "Other". This category captures all those additional symptoms [6] affecting your five senses or a functionality in your body (Figure 9).

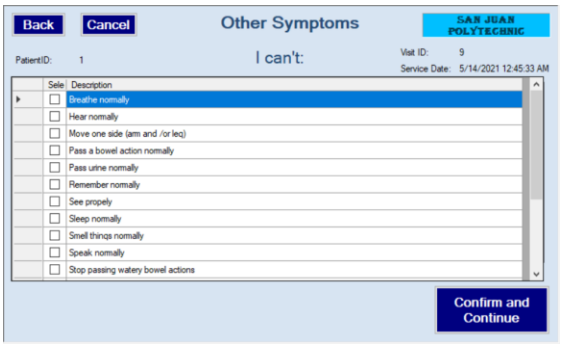

Figure 9

Other Symptoms Screen

All the symptoms' screens are capable to increase or decrease the numbers of symptoms list displayed based on these three categories: feeling, painful, and others.

Number of symptoms per screen should be considered since an excessively long symptoms' list could be a burden for any person not feeling well.

After the symptoms, we have all the necessary information for the hospital personnel to take further steps with the patient, which is usually to take the patient's vitals (temperature, pressure, etc.). Because of this, the next screen would be the last, letting the patient know that its check-in process has been completed (Figure 10). After this, the screen returns to the start for the next check-in.

Figure 10

Check-In Completed Screen

Database

For the database, the researcher chose MS SSMS 18. Both for the Windows Forms and the database, Stack Overflow [7] was referenced multiple times. Since this system provides very little output to the patient, and is intended to be fast and simple, there is not much data apart from the one being entered by the patient. The current database consists of two master tables, four record tables, and nine stored procedures:

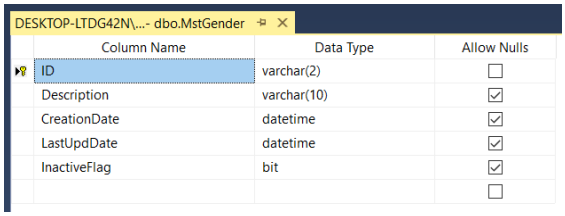

Figure 11

Master Table for Gender

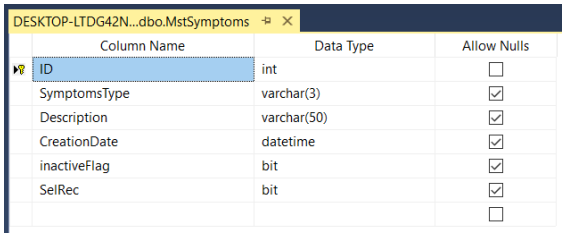

Figure 12

Master Table for Symptoms

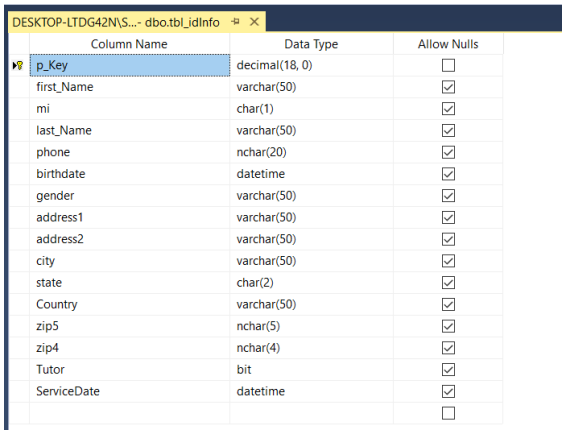

Figure 13

Record Table for ID Info

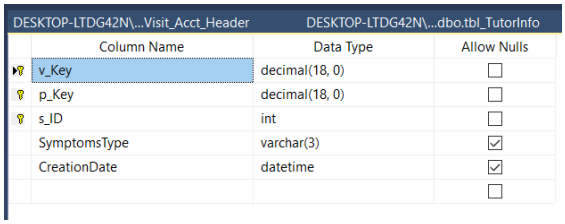

Figure 14

Record Table for Patient Symptoms per visit

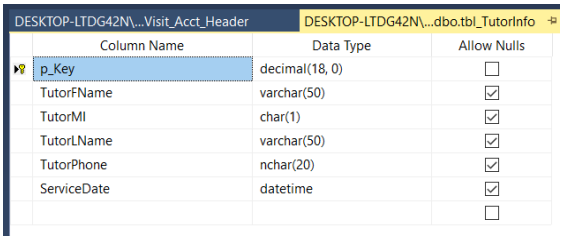

Figure 15

Record Table for Tutor Info

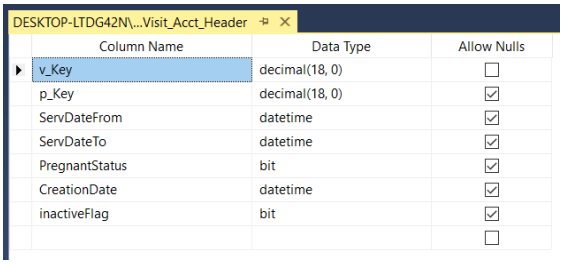

Figure 16

Record Table for Visits

CONCLUSION

Patients do not feel comfortable with many long steps when it comes to being attended for health issues. The system created fulfils its purpose, its fast, simple, and short. It does not take more time and energies from the patient than necessary. Controls are done in moderately big sizes, so patients can see them easily and press them on a touchscreen without much finger aiming skills required. By implementing this tool, hospitals will be able to minimize personnel and patient contact. Additionally, there is the possibility to minimize man-hours or reorganizing employees tasking. Overall, the final product is very close to the initial idea and purpose.

Future Improvements

There is always room for improvement. Controls could be more stylish without taking the clear and simple feel from them. More symptoms could be added to the symptoms list, although this could potentially make the check-in process much longer. An alternative is the ability to display symptoms based on age and gender. This will help decrease the number of symptoms per screen.

Now, there is one feature that would increase functionality, and that is voice commands. If the patient cannot control the touchscreen, or prefers not because of hygienic reasons, voice commands is something investigator have not seen in any ER, nor was the researcher able to find it via Google. Hopefully, this project will be nothing but the beginning for this system.

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