



New Century Wellness Group  
P.O. Box 123  
Brae, California 12345  
1 (800) 246 - 7658

## **Business Profile**

### **Our Mission**

Ten years ago, internal medicine specialists Timothy Jones and Dolores Garcia decided to combine their individual practices to form New Century wellness Group. They wanted to create a clinic that would concentrate on preventative medicine and fitness, as well as traditional medical care. This dream lives on to this day.

### **Our Services**

New Century Wellness Group can provide a broad range of services. We have expanded to include four primary care physicians, a nurse practitioner, four physical therapists, a registered nutritionist, eight nurses and eight support staff as to provide the best care and service to our patients.

### **Our Patients**

Our patient base has expanded to include 8,000 patients from 325 different employers.

### **Competitors**

As a medical clinic we of course have competitors, but no other clinic offers the same range of services as we do here at the New Century Wellness Group.

### **Future Direction**

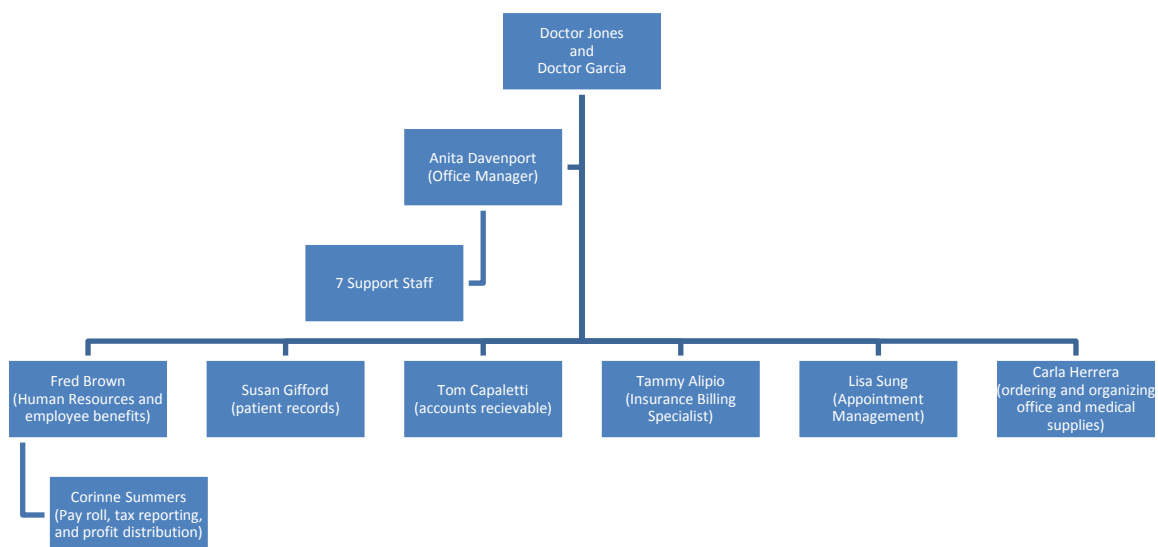
In future, we hope to keep expanding our clinic to accommodate more patients and doctors. We also hope to continue to expand our range of services as to be able to help the most people.

\*\*\*^^For patient viewing^^\*\*\*

## Constraints

With 8,000 patients, there may be some constraints when it comes to managing appointments between only a few medical staff.

## Staff Organizational Chart



## Business Processes

**Employee Benefits:** Fred Brown handles employee benefits. The data he needs for this is all the employee information including what benefits they are enrolled in. From that he can generate information pertaining to how many vacation days a person has used/has left, how many personal days, and how many sick days. This would also involve insurance benefits. The information generated by insurance benefits would help determine payroll information.

**Payroll/ Tax reporting:** Corrine Summers is in charge of payroll. The data she needs for this also includes employee information including direct deposit information and tax information for generating W-2's every year. She will also require information from punch cards (either digital or physical) to determine how many hours an employee has worked and information regarding the employee's salary or hourly rate. She will use

Fred's data on vacation, personal, and sick days to help in her calculations. She will also use the information about their insurance benefits to determine the amount of pay to be withdrawn for these benefits.

**Patient Records:** Susan Gifford is responsible for the maintenance of patient medical records. She will need a system that records all of a patient's data. The information produced by her position is crucial to properly caring for the patients. She will also make sure that each service issued at the visit is properly coded for billing purposes. She also is responsible for double checking to make sure insurance data is correct.

**Accounts Receivable:** Tom Capaletti handles accounts receivable. He will require properly coded reports on patient visits (which will come from Susan's data) to determine the total amount a patient owes. The information he generates will be ready to send to the insurance companies of the patients. Once the bills are submitted to insurance, he will receive the total the patient owes and mail out the bill.

**Insurance Billing Specialist:** Tammy Alipio is responsible for billing insurance companies. She will take the information generated by Tom and submit it to the insurance company of the patient. When she receives the data back from the insurance, she will re-submit the bill to Tom to send to the patient.

**Receptionist:** It is safe to assume that at least some of the support staff are responsible for receptionist duties. A receptionist is responsible for scheduling appointments, which is data that will be entered into a calendar to plan the doctor's day. They are also responsible for collecting correct billing addresses (to be used by Tom), insurance information (to be used by Tammy), and correct contact information for the doctors and nurses. They also determine the reason for the visit and must make the correct appointments with the correct people, and determine if the person needs to be seen by a doctor or if a nurses visit is more appropriate. They have access to basic patient information (maintained by Susan) and the information they produce is essential to a functional clinic.

I don't think you can really just use one of these systems for any business. A combination of a user productivity system and a transaction processing system would probably be best for them. The transaction processing system would help the monetary side of the company in managing the accounts receivable and insurance claims. The user productivity system would help with communication in the company and keeping appointment times accessible to nurses and doctors.

In planning the system I really just thought about what they would need, and after reviewing the development methods I guess I used the structured analysis, but were I actually going to

implement the system, I would use the agile/adaptive methods because it would be easier on the staff to implement the new features a little bit at a time so they wouldn't have to learn an entirely new system all at once.

## Chapter 2

**Electronic Medical Records (EMR)** are a digital version of a paper chart that contains all of a patient's medical history from one practice. An EMR is more beneficial than paper records because it allows providers to track data over time, identify patients who are due for preventative visits and screenings, monitor how patients measure up to certain parameters, such as vaccinations and blood pressure readings, improve overall quality of care in a practice. It also allows for easier records transfers between practitioners.

**Computerized physician order entry (CPOE)** is a process of electronic entry of medical practitioner instructions for the treatment of patients under his or her care. These orders are then communicated over a computer network to medical staff or to the departments responsible for fulfilling the order. It decreases delay in order completion, reduces errors related to handwriting or transcription, allows order entry at the point of care or off site, provides error-checking for duplicate or incorrect doses or tests, and simplifies inventory and posting of charges. It is a type of patient management software.

**Clinical decision support systems (CDSS)** is an interactive decision support system designed to assist physicians and other health professionals with decision making tasks, such as determining diagnosis of patient data. It links health observations with health knowledge to influence health choices by clinicians for improved healthcare.

I would start by analyzing organization charts to better understand the functions of each person in company and how they communicate with each other. I would also review the documentation of how their systems currently work, and then prepare questions I may have for the employees. I would combine observing operations and employee interviews where I would observe how the employees all interact with each other. I would then ask questions as needed, and ask questions I previously had after determining who might be able to answer them best. I would also conduct a survey about the current system to see what features the users would like to see so that I can balance them with what the employer wants. If the current user interface is something that most people like, it would lead me to develop a system for them with a similar interface to reduce training costs. After collecting all the data, I would move to the analysis step and determine where their biggest problems were, and come up with ideas to fix those problems.

**Operational Feasibility:** I would want to create a system that would combine the EMR, CPOE, and CDSS systems making necessary data more easily accessible.

**Technical Feasibility:** At most, they might need to upgrade their networking equipment to support the merging of the data and the influx of new data, but so long as the system is developed carefully,

hardware upgrades could likely be avoided. Minimal training would be required if the new system's front end is developed to work like the old system.

**Economic Feasibility:** It might be costly to develop, but a new system could jump productivity.

**Schedule Feasibility:** If the current system could be reworked to have the new features desired, costs could be kept lower and the development time could be reduced.

## Presentation

You have asked me to recommend a system to make your office more efficient and after some research I have come to the conclusion that what you need is a system that combines all the elements of your office's day to day functions. This would help prevent any transcription errors in moving information from one system to another and would help in office communications since everyone is using the same software. I would recommend purchasing EPIC which is a piece of software that fits the needs of this clinic perfectly (It is used by the Aurora system). The training process is rather short, and the software is easy to use. I feel like this will solve any issues with the current system.

## Chapter 4

In constructing a JAD team for the development of this system, I would include most of the people who are named in the organizational chart above. Doctor Jones and Garcia need to be there because they run the clinic and should have the final say about how something works, and because it would be beneficial for them to hear how things actually work currently. I can imagine that they might not always know the smaller details that go into how everything works because they are busy managing the bigger operations. I would have Anita in attendance because she manages the office staff who would be responsible for most of the communications with patients (scheduling appointments, scheduling labs, etc.). Susan, who manages patient records, should also be there so she could give her input on what information is needed by receptionists, nurses, and doctors at the time of appointment scheduling and visits. Tom, who manages accounts receivable, should attend to give more information on what he needs to manage accurate billing. Tammy manages insurance claims, and should be there to give more information on what she needs from Tom and Susan to complete an Insurance claim. Lisa, as the Appointment Manager, should be there to talk about the information she deals with and how it affects the rest of the clinic. Carla, who manages supplies, should be there so we can make sure the system gives her the stock information she needs when she needs it.

I didn't include Fred or Corinne because they would require a more specialized system that would be able to access some of the system being planned above. Both Fred and Corinne work more with Employees rather than Patients and I would meet with them separately.

### System Input

- Patient's personal information (at or before appointment time)

## Capstone Case: New Century Wellness Group

### Tegan Hatch

- Includes Name, address, phone number, employment, insurance
- Patient History
  - Includes current medications, medical history, lab results, etc.

### System Output

- Information for Billing/Insurance Claims
  - This would include the patients name, address, and insurance information as well as coded procedures for visits or labs.
- Patient History
  - Accessed by the doctor at the time of the appointment.
- Supplies
  - Sends a notice when supplies are used based off of what is done at each appointment

### Processes

- Procedure to Codes
  - Makes sure that each procedure is assigned the appropriate billing code
- Medication Cross Checking
  - Double checks to make sure that medications prescribed by a doctor do not conflict with other medications. Would produce a pop-up that shows the doctor the conflict and allows for over-ride if the doctor still feels it's the best option.

### Performance

- The system must be operational during clinic hours
- The system must provide information quickly and cleanly

### Control Examples

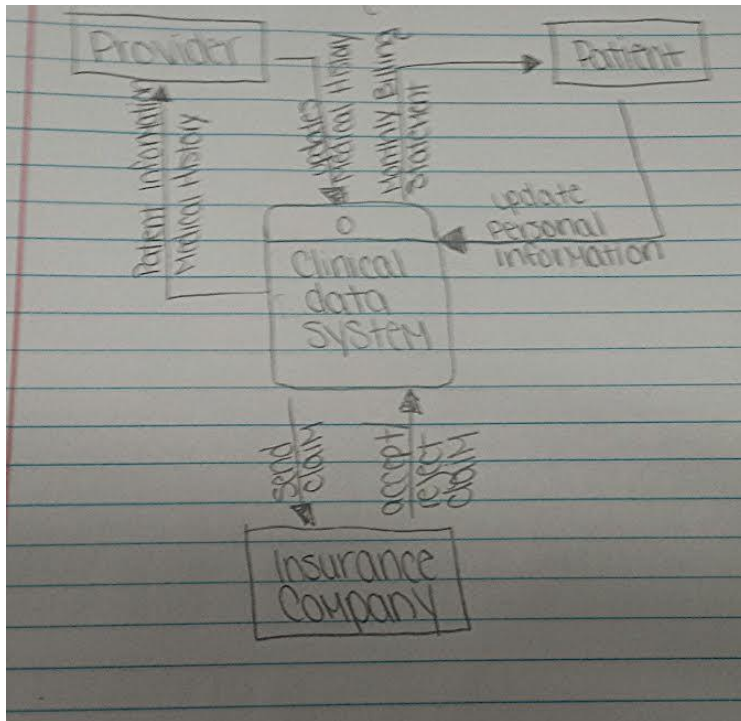
- The system must require a log-in to protect patient confidentiality. This also allows for tracking who makes what changes

### Questionnaire

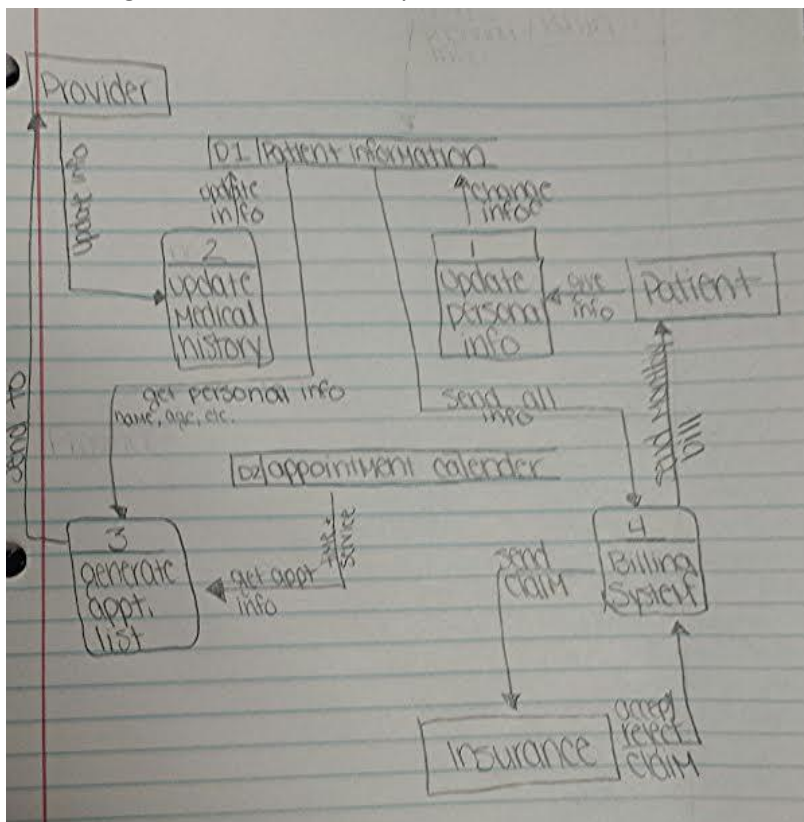
1. How complicated is it for you to provide the clinic with correct insurance information?  
(Scale of 1 – 10 with 1 being simple and 10 being difficult)
2. How difficult is it for you to make an appointment to see the doctor? Please do not base your answer on the availability of your doctor, but the interaction between you and the receptionist making your appointment.  
(Scale of 1-10 with 1 being simple and 10 being difficult)
3. Do you feel like your personal information and medical history are well protected?  
(Scale of 1-10 with 1 being you worry about your information and 10 being you feel completely safe with them having your information)

## Chapter 5

### Context Diagram for a Clinical Data System



### DFD 0 Diagram for Clinical Data System



Capstone Case: New Century Wellness Group  
Tegan Hatch

Data Flows

1. Update Info
2. Give Info
3. Change Info
4. Send all Info
5. Send Monthly Bill
6. Send Claim
7. Accept/Reject Claim
8. Get Personal Info
9. Get Apt Info time and service
10. Send to

Data Stores

D1. Patient Information

Includes patient name, telephone number, provider name, insurance information, employment information, head of household.

D2. Appointment Calendar

Includes Date, Time, Services, Billing codes for listed services.

## Chapter 6

Potential Use Cases/Actors

Patient Sets up an Appointment for Services

Provider Receives Information at Appointment

Services Sent to Billing

Bill Sent to Insurance

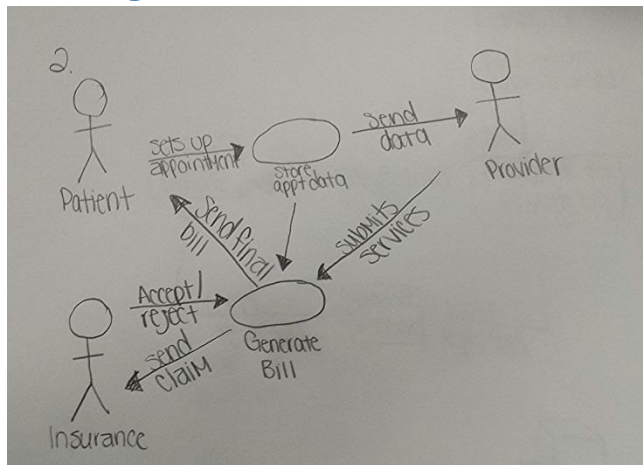
Insurance Accepts or Rejects Claim

Bill Sent to Patient.

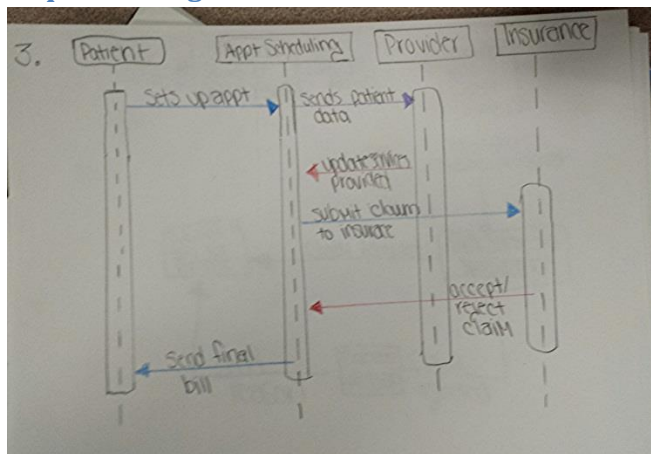


Capstone Case: New Century Wellness Group  
Tegan Hatch

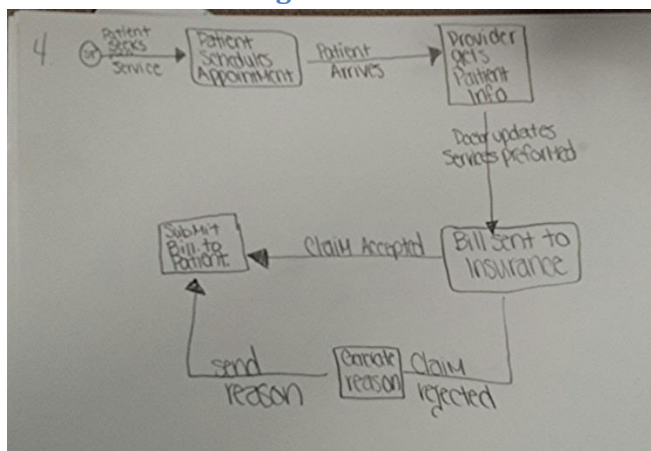
### Class Diagram



### Sequence Diagram



### State Transition Diagram



## Chapter 7

### Overview of the Proposed System

No matter which option is chosen for the system, the system will have to meet the client's needs. The system must have smoother operation, better efficiency and more user-friendly procedures for patients and New Century staff. Currently, the work load at New Century Wellness Group requires six hours of office staff overtime per week, and they will need to add another full-time clerical position in about six months. However, neither of these will be necessary if there is a new system.

Assuming that there is six hours of total overtime (not six hours per office employee), the company spends \$4,320 dollars per year on that overtime (also assuming that there is no time and a half for overtime AND fifteen dollars per hour is normal pay). With three errors per day, taking 20 minutes to fix, that is 5 hours per work week of wasted time totaling to \$3,600 dollars per year. In six months, they will have to hire a new employee at forty hours per week, 35 dollars per hour. In the first year, this totals \$4,200 and \$8,400 for each full year of employment after. It is painfully obvious that this is not an efficient way to continue the business.

With an in-house system, it will take twelve weeks to complete the system at 35 dollars per hour totaling \$1,400 per week and \$16,800 total labor costs. The company will also need to purchase a networked commercial package for \$2,500 which will bring the total to \$19,300. After the staff is trained, they will be able to do routine maintenance without the help of a systems analyst. The system will also be tailored to the clinics specific needs. However, there is a longer development time than the other options and the \$19,300 is (for all intents and purposes) due at once.

The alternative is to purchase a vertical software package. The initial cost is \$12,000 dollars for the software. However the vendor offers a lease-purchase package that has a down-payment of \$4,000 and annual installments of \$4,000 for two years following. It will take a systems analyst four weeks at 35 dollars per hour totaling \$5,600 for total labor costs. This system is cheaper up front (costing 9,600 dollars in the first year). The software also comes with technical support, however it is only free for the first year, and New Century Wellness Group will be required to sign a service contract that will cost \$600 per year afterwards. The other downfall, is that they do not have custom reports and it is difficult to modify the pre-designed reports.

Capstone Case: New Century Wellness Group  
Tegan Hatch

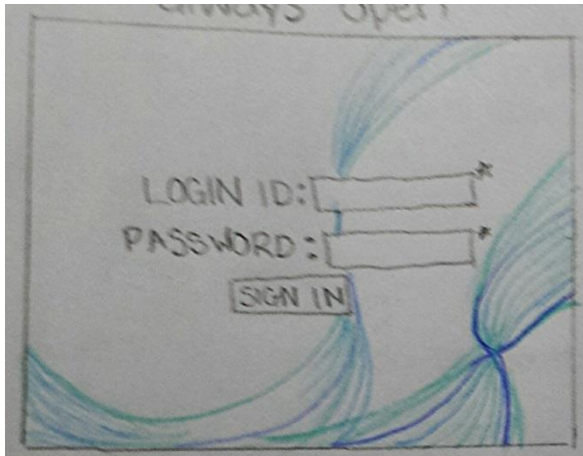
In the following table, I also took in to account the fact that I don't know if there is six hours of overtime total per week, or six hours per office worker so both situations are accounted for in the equations in the table.

|                  | No New System   | In-House Development | Vertical Software Purchase |
|------------------|---|----------------------|----------------------------|
| Year 1           | 6 overtime hours total<br>\$12,120<br>8 employees working overtime<br>\$44,520  | \$19,300             | \$9,600                    |
| Year 2           | 6 overtime hours total<br>\$16,320<br>9 employees working overtime<br>\$58,880  | \$0                  | \$4,600                    |
| Year 3           | 6 overtime hours total<br>\$16,320<br>9 employees working overtime<br>\$58,880  | \$0                  | \$4,600                    |
| Year 4           | 6 overtime hours total<br>\$16,320<br>9 employees working overtime<br>\$58,880  | \$0                  | \$600                      |
| Total            | 6 overtime hours total<br>\$61,080<br>9 employees working overtime<br>\$197,160 | \$19,300             | \$19,400                   |
| Saved in 4 Years |   | <b>\$41,760</b>      | <b>\$41,680</b>            |
|                  |   | <b>\$177,840</b>     | <b>\$177,760</b>           |

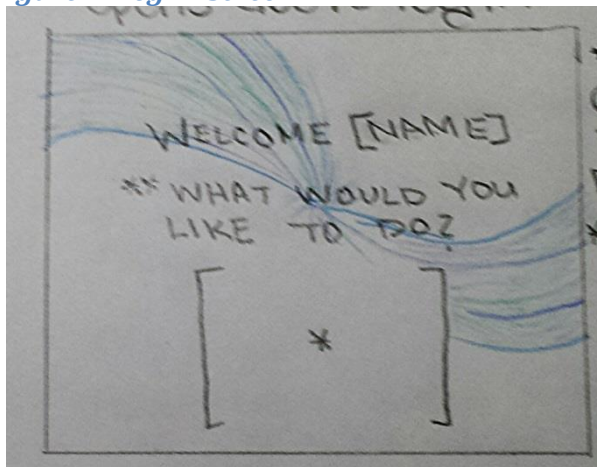
While the vertical purchase software is more expensive and has cost from year to year, it is important to note that, at the first estimate, it would take almost 70 years for 600 dollars per year to equal the amount that would be spent without a new system, and 296 years to equal the amount of the second estimate.

After explaining the alternatives, I would assume that development would continue, and I would honestly recommend the in-house development because while there isn't any guaranteed technical support, routine maintenance could be performed by existing staff, and the system could be tailored to their exact needs.

## Chapter 8



*Figure 1: Log-in Screen*



*Figure 2: Welcome/Home Screen*

I wanted the log in screen to be as simple as possible. It is also intentionally set up so that the computer cannot be used without first logging in for security reasons. It also gives the employer a way to track what employees are doing.

I wanted the home screen to feel a little more personal, and depending on whether you log in as a nurse, doctor, or receptionist; the options will be different (options are placed in the brackets with the star).

While the screen is loading, the text "What would you like to do" will be replaced by a loading icon or loading bar.

The different options are as follows:

Nurse:

- [Select Scheduled Appointment]
- [View Appointment Calendar]
- [View Patient Records]
- [View Emails]
- [View PayStubs]
- [View Work Schedule]
- [View/Change Personal Information]

Doctor:

- [Select Scheduled Appointment]
- [View Appointment Calendar]
- [View Patient Records]
- [View Emails]
- [View PayStubs]
- [View Work Schedule]
- [View/Change Personal Information]

Receptionist:

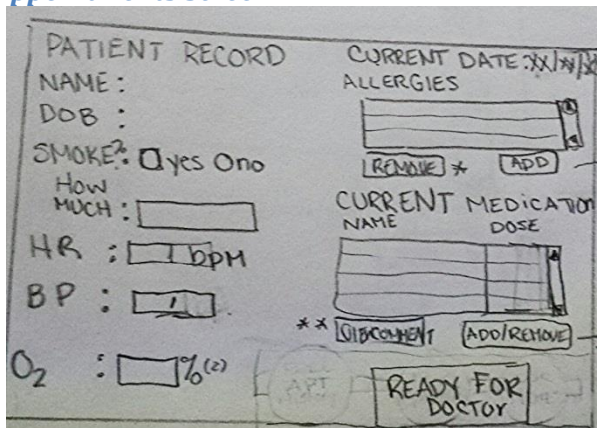
- [View/Change Scheduled Appointments]

(will display current day)  
[View Appointment Calender]  
[Access Patient Records]  
(basic information and relevant medical history)  
[View Emails]  
[View Patient Billing Statements]  
[View PayStubs]  
[View Work Schedule]  
[View/Change Personal Information]

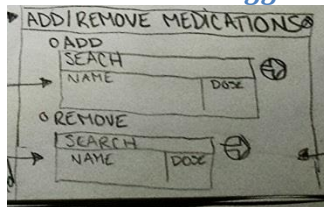
At this point the nurse or doctor will ask the patient his name and date of birth to select the correct appointment. Once an appointment is selected and the Continue button is pressed, the welcome screen will close and the patient records Screen will open.



**Figure 3:** Doctor and Nurse Current Scheduled Appointments Screen



**Figure 3-1:** The portion of the patient records that is unique to the appointment and can only be viewed while logged in as a Nurse or Doctor.



**Figure 3-1-1:** Medications Dialog Box

All fields will be required except for allergies and current medication. Since Validation is key to data integrity, there will be validation rules in place so that vital signs, such as heart rate, blood pressure, or blood oxygen levels cannot be entered at lethal values. The Name, DOB, Allergies, and Current Medications fields will be auto-filled from the patients record where data is available.

When Add/Remove is selected, a dialog box will appear with the content under Add (A searchable database of prescription medications) being shown by default. If the provider selects the Remove radio button, the Add content will hide and the Remove content (A list of current medications) will be displayed(See Figure 3-1-1). When a medication is selected on the list, a provider may also select the comments button (which will be greyed out if no medication is selected) to see Instructions or other comments about the prescription.

The Allergy section is also connected to a



PLEASE TAKE A MOMENT TO VERIFY  
THE PATIENT RECORD IS BEING  
UPDATED CORRECTLY.

NAME: \_\_\_\_\_  
DOB: \_\_\_\_\_  
SMOKE?: yes/no  
[HOW MUCH?: \_\_\_\_\_]  
HEART RATE XX BEATS PER MINUTE  
BLOOD PRESSURE: XX/XX  
BLOOD OXYGEN LVL: XX  
ALLERGIES: 1/1  
LI 2  
LI 3

MEDICATIONS:  
NAME DOSE  
COMMENT

MO DAY Year  
XX XX XX  
ELECTRIC SIG

**Figure 3-2: Verification Screen**

CAN BE SENT TO PHARMACY

| NAME | INSTRUCTIONS | DOSE | REFILLS |
|------|--------------|------|---------|
| "    | "            | "    | "       |

MUST BE SIGNED

| NAME | INSTRUCTIONS | DOSE | REFILLS |
|------|--------------|------|---------|
| "    | "            | "    | "       |

CONT. ▶

**Figure 3-2-1: Doctor Prescription Notice**

List of local pharmacies

| NAME | ADDRESS | DISTANCE |
|------|---------|----------|
| "    | "       | "        |

**Figure 3-2-1-1: Local Pharmacy List**

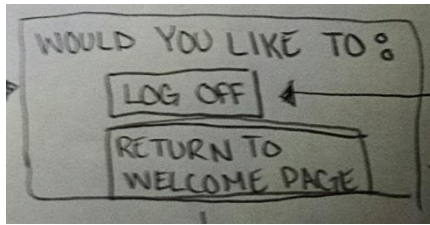
searchable database (to be discussed later). This screen requires the provider to double check the information that has been entered since validation is key. This is reached after clicking [Ready for Doctor] on the nurse screen or the (not pictured) [Conclude Appointment] button on the doctor screen. It also requires the provider to electronically sign and date the bottom which states that they have looked over the information and deem it to be accurate.

IF the doctor prescribes new medication or renews an old prescription, this screen will come up with a list of medications that can be electronically sent to the pharmacy, and a list of medications that must be printed and signed by the doctor and brought to the pharmacy by the patient.

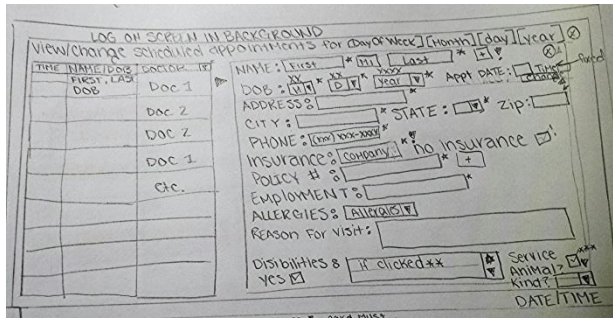
The doctor must click the prescriptions that can be sent and choose to either print them or help the patient choose from a list of local pharmacies.

The doctor must also click each prescription that must be signed and select to print them.

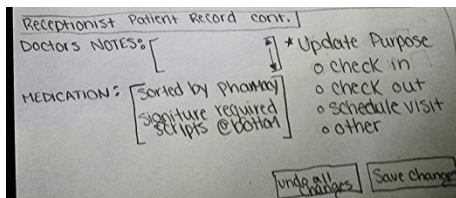
Each prescription must be handled before the doctor can click continue. After a prescription has been dealt with, the text will be greyed out. Modifications CAN be made, but I wanted to make it clear to the doctor that the prescription had been dealt with since the lists can get pretty



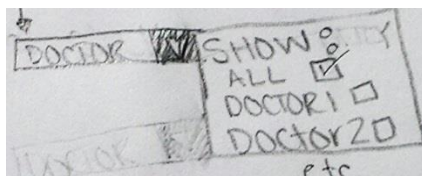
**Figure 3-3: Conclusion of Provider Services**



**Figure 4: View/Change Scheduled Appointments**



**Figure 4-1: Appointment Schedule cont.**



**Figure 4-2: Doctor Drop Down**

long.

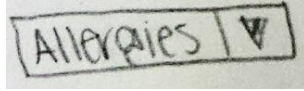
The nurse would encounter this screen after confirming that the patient is ready to see the doctor and a doctor would encounter this screen after all prescriptions have been handled. As an added safety measure. Any computer left unattended for more than 5 minutes will automatically log out while saving the progress of whatever someone was working on.

While this option is only part of the Receptionists list, doctors and nurses can also access this screen by clicking on [View Appointment Calendar], selecting the day, and clicking [View Details]. I wanted to implement the ability to schedule appointments into the Nurse and Doctor interfaces as well because my mother is a nurse and while a receptionist generally makes the appointments, if she is already on the phone with someone, why put the customer through being transferred, someone might not be able to answer, and then leaving a voice mail with the same information they just gave the nurse and wait for a call back. It's extremely inconvenient. I decided to leave the direct link out of the Nurse and Doctor options because they would use that functionality so rarely that it would be more clutter versus the receptionist who is on that screen many times a day.

Initially, patient records don't show on the screen. Along the left side, there is the schedule of appointments and with which doctor which can be set to show only appointments by one doctor or certain doctors, but by default it will show all appointments with all doctors. The drop-down box will also glow if anything but ALL is selected so a receptionist can't forget they implemented a filter.

With the patient record open in this view (logged in as a receptionist) there are several features that are crucial to a clinic functioning. First, there are little boxes with a plus in them (and in the final system there would be a camera with a + on it) and when the box is clicked it will display information that has been scanned.

Many clinics now require photo identification,



*Figure 4-3: Allergies Drop Down*

even to pick up prescriptions and so it wouldn't be uncommon for a clinic to scan a driver's license or state ID for photo identification.

There is also a [+] next to insurance. When you go to a doctor for the first time, and every time you get a new health insurance card, they photocopy the card so they have a copy on file. While I am unsure if they are also stored digitally in a real world environment, I worked under the thought process of if they do, great, if they don't it's a good move forward towards paperless healthcare.

If the records show that your id is expired or your insurance card has expired (or in the case of a new patient). An exclamation point will appear next to the data entry ([+]) indicating to the receptionist that a new scan is necessary. I didn't, however, plan to implement code that would prevent the appointment from continuing without the updated information. An insurance card isn't something you always carry on you so the appointment could be conducted with the knowledge that you have to come back in with the documentation so the bill can be submitted to the insurance company.

There is also a series of radio buttons seen in Figure 4-1 that will determine how the system takes the information. It is required to select at least one of the radio buttons before continuing on. For data integrity purposes, if the receptionist is viewing an appointment that is not scheduled for that day, the [Check In] and [Check Out] radio boxes will be greyed out and unselectable. A patient also cannot be checked out if they have not yet been checked in, and so even if the appointment date is correct, the [Check Out] radio button is greyed out if the patient has not yet checked in. I also have a [Schedule Visit] option that will be greyed out if an appointment is scheduled for that day or a future date UNLESS the [Appointment Date] at the top of the screen has been changed (the appointment has been rescheduled) and I would add an [Appointment Cancellation] for when appointments are canceled. I would also add a text box under



[Other] and a response would have to be typed before the system would accept the changes.

Another feature I wanted to implement keeps on record any patients that may have service animals and reference the Allergy database to make sure people with severe allergies to those animals do not have appointments when those animals will be in the building or immediately after(which is another reason for having allergies in a database rather than written as notes).

If a nurse, doctor or receptionist is scheduling an appointment and an Allergy conflict may occur (not just in the situation of animals but other allergies such as latex allergies), The drop down box for allergies (Figure 4-3) will have red text and clicking on the arrow will have the allergy conflicts highlighted in red and when clicked will bring up information about the conflicting appointment.

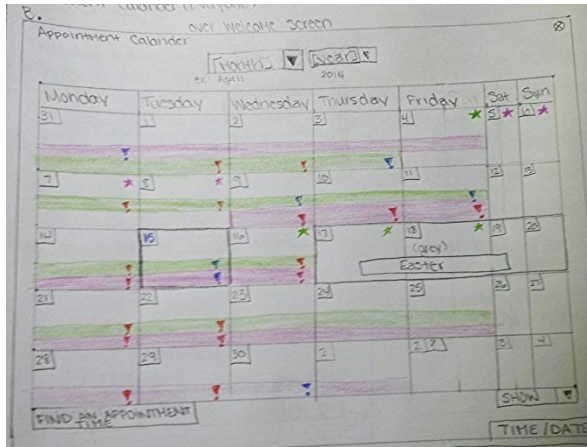
For allergies such as latex allergies, an email would be sent out to all staff the day before to clear the office of any latex products, and when scheduling these appointments, patients should be made aware that they should mention such allergies beforehand and schedule their appointments as the first appointment of the day.

A hand-drawn diagram of a dialog box titled "NAME OF DISABILITY". Below the title is a label "Severity : [1-10]". The main area of the dialog box contains two side-by-side dropdown menus. The left menu is labeled "SHORT DESCRIPTION" and the right menu is labeled "Potential Accommodation NEEDED". Both menus have upward and downward arrow icons on their right sides, indicating they are dropdown lists.

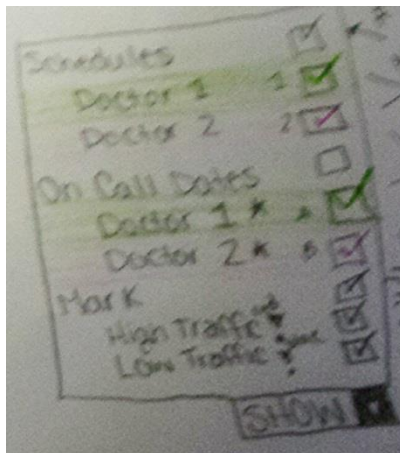
**Figure 4-4: Disability Accommodations**

There will also be an email sent out to all scheduled employees if a patient with a disability that may require accommodations so those accommodations can be prepared beforehand. The Dialog Box for Disabilities is also connected to a database that contains a short description of how it disables a person and what accommodations may be necessary. Also, each patient with a disability will have an individual "severity rating" for situations such as "Hearing Loss". Some people are completely deaf and can carry on a conversation just fine, while others are hard of hearing and cannot communicate effectively. I plan to also add a spot where doctors notes on that particular patients disability and how they could be accommodated.

Capstone Case: New Century Wellness Group  
Tegan Hatch



**Figure 5: Appointment Calendar**



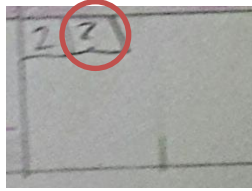
**Figure 5-1: Show Drop-Down**

When I was describing how nurses and doctors make appointments versus how a receptionist makes an appointment, this is what I was referring to. The appointment calendar is available to all employees (even if specific details wouldn't be available to the supplies manager or the human resources department) because it doesn't just show when patients have appointments, but when doctors and nurses will be busy with patients. I am also considering the possibility of having a patient appointment calendar and an employee appointment calendar. The patient calendar would be available to all healthcare employees, while the employee calendar would be available to all employees and would include the times of patient appointments (without names), what doctor has appointments, which nurses are assigned to those doctors and would also be busy during that time, as well as meetings and appointments that other employees (such as HR, payroll, or office supplies managers) may have as well. The calendar also has filters that can be applied to it.

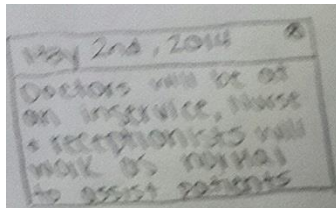
You could choose which doctors you want to show (Practical example: Doctors get sick to, or the doctor gets hurt and is suddenly out of the office for a few days, a week, or even a month (you never know) and you have to reschedule all of his patients).

You can also turn off the colored stars that are a doctor's [On Call Dates] (since doctors don't just work in clinics. Family doctors have babies to deliver or a clinic may be attached to a hospital and they may be shorthanded because of a vacation).

You may also choose to show [High Traffic] and [Low Traffic] days. I currently estimated at 30 minutes for an appointment in a seven and a half hour day, you would have about 15 appointments. The numbers could be changed but I currently have [Low Traffic] days (marked with a blue exclamation point) set at less than 5 appointments, and [High Traffic] days (marked with a red exclamation point) at more than 10.



**Figure 5-2: Important Notices**



**Figure 5-2-1: Notice Example**

The calendar is also highlighted to show which doctors are working what days, and the [Doctor] selections within [Schedule] are color coded to match the calendar.

Medical professionals never stop learning, and sometimes they may have an in-service or conference to attend. There could be any number of reasons for this icon to show up on the calendar, and that's why it's there. I felt that the calendar needed a sort of "catch-all" that covered unusual situations. It could also be used to mark appointments for patients with disabilities that require extreme accommodations, or appointments for patients with allergies that require preparation to accommodate.

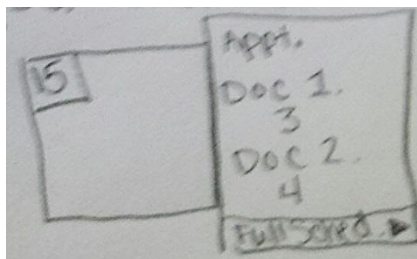
When an employee clicks on the box (which would show up on both employee and patient calendars) an alert box would pop up. This one in particular states:

May 2<sup>nd</sup>, 2014

Doctors will be at an in-service today. Nurses and receptionists will work as normal to assist patients.

There is a small X in the upper right hand corner to close the dialog once it has been read. The [?] box will show a red question mark until the notice has been read and a purple question mark after the notice has been read.

When you click on a date, a small box appears next to the date selected that displays how many appointments each doctor has. When you click full schedule you are directed to the View/Change Scheduled Appointments screen (Figure 4).



**Figure 5-3: Clicking a Date**



**Figure 5-4: Find An Appointment Time**

This is the most crucial part of the system as it allows for appointment scheduling. After clicking this button, the employee is directed to a new screen to begin searching for a convenient appointment time for the patient.

Capstone Case: New Century Wellness Group  
Tegan Hatch

A hand-drawn sketch of a patient scheduling form. It includes fields for Patient Name (First and Last), Date of Birth (Month, Day, Year), and a list of patients with columns for Name, DOB, Phone, and Address. There is an 'OR' section and a 'NEXT' button.

Figure 5-5: Scheduling the Appointment

A hand-drawn sketch of a 'New Patient Information Box'. It includes fields for Name (First, Last), DOB (Month, Day, Year), Phone, Address, City, State, and Zip. There are also checkboxes for Insurance, Allergies, Disability, Service Animal, and Previous Doctors. A 'Last Appointment' section includes a text box for 'Reason, what doc, where, when?'. There are 'Cancel' and 'Submit' buttons.

Figure 5-5-1: New Patient Information

A hand-drawn sketch of a 'Patient Availability' form. It includes fields for Doctor (a dropdown menu), Time (earliest and latest), and Day (checkboxes for Monday, Tuesday, Wednesday, Thursday, Friday). There are 'Back' and 'Search' buttons.

Figure 5-5-2: Patient Availability (c1)

When the employee is on this screen, they must ask for the patient's [First Name], [Last Name] and [Date of Birth]. Once that information is entered, the database populates a list of patients (which should usually only be one) for the employee to select. If there are multiple records, the employee can verify phone number and address to make sure they schedule the correct patient. If there is no record, verify the information is correct and they have not visited the clinic before, then select [Add New Patient] and click [Next].

If [Add New Patient] is selected when the employee clicks next, they will be taken to the New Patient Information Panel, where Name and DOB will be auto-filled from the search and the employee can go ahead and get the rest of the information. If the patient has health insurance, at the first appointment they will be asked to give their insurance card and ID, and should be informed ahead of time that they will need to sign medical release forms to have their records from previous doctors sent over. They should be told to arrive early and expect the appointment to take longer than they normally will. After this information is filled out, the employee is taken back to the Appointment Scheduling Box to find the new patient an appointment.

If the patient already exists in the computer and you select their file before clicking [Next], this box will appear below the Appointment Scheduling Box. This is where the employee will select a doctor (or any if it is a new patient with no preferences), and can search for empty appointment slots based off of time of day, day of the week or both.

After selecting your options, click [Search] to bring up the appointment list.



Capstone Case: New Century Wellness Group  
Tegan Hatch

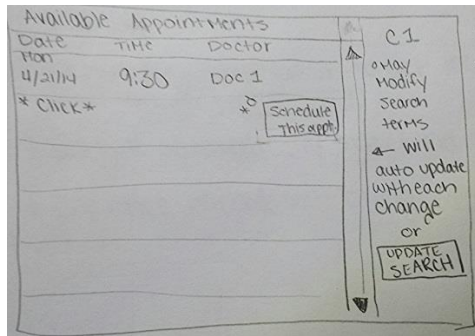


Figure 5-5-3: Available Appointments

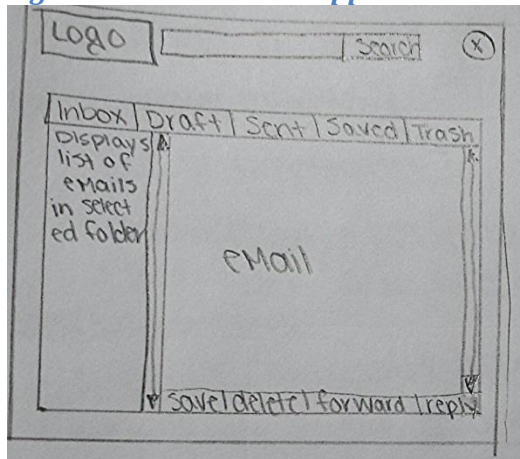


Figure 6: Company Email

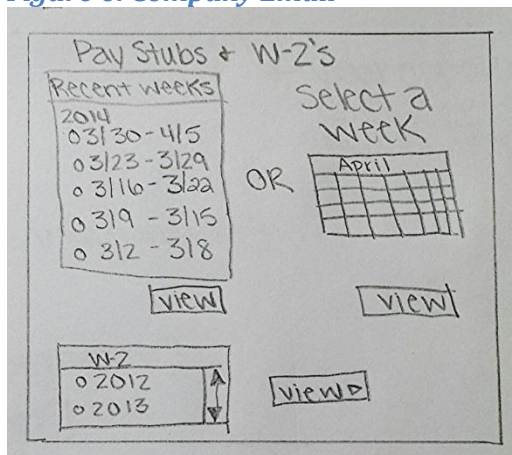


Figure 7: View Paystubs

After clicking search, Figure 5-4-2 (or C1) snaps to the right as a side bar that allows the employee to change search options and get live feedback from the list at the left side of the screen. When you click Schedule this appointment, it will bring you to the receptionist view of the patient records box, requiring the user to validate the information and enter the reason for visit.

The company email also allows outside communication, and a simple interface to make it easier to navigate.

While viewing paystubs or W-2's clicking the [View] button will open a printable pdf document of the data they selected.

Capstone Case: New Century Wellness Group  
Tegan Hatch

| Monday  | Tuesday | Wednesday    | Thursday        | Friday             | Saturday | Sunday |
|---|---------|--------------|-----------------|--------------------|----------|--------|
| 7:45 am - 11:00 am<br>Lunch break by [Employee]<br>12 pm - 4 pm |         | 12 pm - 4 pm | 7:45 am - 12 pm | 12:00 pm - 4:00 pm |          |        |
| 7.25  | 0       | 4            | 4.25            | 4                  | 0        | 0      |

Total Hours: 19.5

**Figure 8: View Work Schedule**

| TIME | FNAME |
|------|-------|
| 7    |       |
| 8    |       |
| 9    |       |
| 10   |       |
| 11   |       |
| 12   |       |
| 1    |       |
| 2    |       |
| 3    |       |
| 4    |       |

**Figure 8-1: Work Schedule Daily View**

When the user clicks the [View Work Schedule], it will open a screen that, by default, will have that individual's work week, with a selectable calendar allowing the user to select which schedule they would like to view. Future weeks that have no data will be unselectable.

There is also an option to view the daily schedule, allowing an employee to see who else is working on that day and at what time. There is also a weekly view that is similar to the daily view but displays a Monday through Sunday work week.

## Input Source Document/New Patient Form



### New Patient Registration Form

|                                 |   |  |                    |  |                              |                               |  |
|---------------------------------|---|--|--------------------|--|------------------------------|-------------------------------|--|
| Patient Information             | Last Name:  |  | First Name:        |  | M.I.:                        | Previous Name (if applicable) |  |
|                                 | Mailing Address:  |  |                    |  |                              | City/State/Zip:               |  |
|                                 | Apartment:  |  | Home Phone:        |  | Cell Phone:                  | Work Phone w/ ext:            |  |
|                                 | Date of Birth:  |  | Social Security #: |  | Sex (circle): Male or Female |                               |  |
|                                 | Marital Status:   |  | Employer Name:     |  | Employer Address:            |                               |  |
|                                 | Emergency Contact:  |  | Phone:             |  | Relationship to Patient:     |                               |  |
| Insurance & Payment Information | Person responsible for the bill (ONLY IF DIFFERENT THAN THE INSURED): Name:   |  |                    |  |                              |                               |  |
|                                 | Date of Birth:  |  | Social Security #: |  | Phone:                       |                               |  |
|                                 | Address of Person Responsible:  |  |                    |  | City/State/Zip:              |                               |  |
|                                 | Employer of Person Responsible:   |  |                    | Relationship to Patient:   |                              |                               |  |
|                                 | Primary Medical Insurance   |  |                    | Secondary Medical Insurance  |                              |                               |  |
|                                 | Ins. Co. Name:  |  |                    | Ins. Co. Name:   |                              |                               |  |
|                                 | Policy Holder Name:   |  |                    | Policy Holder Name:  |                              |                               |  |
|                                 | Policy Holder's Address if not same:  |  |                    | Policy Holder's Address if not same:   |                              |                               |  |
|                                 | Policy Holder's Date of Birth:  |  |                    | Policy Holder's Date of Birth:   |                              |                               |  |
|                                 | Policy Holder's Social Security #:  |  |                    | Policy Holder's Social Security #:   |                              |                               |  |
|                                 | Patient Relationship to Policy Holder:  |  |                    | Patient Relationship to Policy Holder:   |                              |                               |  |
|                                 | Employer Name:  |  |                    | Employer Name:   |                              |                               |  |
| Additional Information          | Physical Address (if different than mailing):   |  |                    |  | City/State/Zip:              |                               |  |
|                                 | Email Address:  |  |                    | Can we leave a message regarding your medical care & test results?<br>(Please Circle One) Yes No |                              |                               |  |
|                                 | Race (please select one):<br><input type="checkbox"/> American Indian or Alaska Native <input type="checkbox"/> Black or African American <input type="checkbox"/> Native Hawaiian or Pacific Islander <input type="checkbox"/> Other<br><input type="checkbox"/> Asian <input type="checkbox"/> Hispanic <input type="checkbox"/> White <input type="checkbox"/> Decline |  |                    |  |                              |                               |  |
|                                 | Ethnicity (Please select one): <input type="checkbox"/> Hispanic or Latino <input type="checkbox"/> Not Hispanic or Latino <input type="checkbox"/> Decline   |  |                    |  |                              |                               |  |
|                                 | Preferred Language (please select one): <input type="checkbox"/> English <input type="checkbox"/> Spanish <input type="checkbox"/> Indian (Including Hindi & Tamil)<br><input type="checkbox"/> Russian <input type="checkbox"/> Bosnian <input type="checkbox"/> Sign Language <input type="checkbox"/> Other  |  |                    |  |                              |                               |  |
|                                 | Preferred Pharmacy Name & Location:   |  |                    |  |                              |                               |  |
|                                 |   |  |                    |  |                              |                               |  |

I have read and agree to New Century Wellness Group's (NCWG) payment policy. I understand that payment is my responsibility regardless of insurance coverage. I hereby authorize NCWG to furnish insured's insurance company all information (including HIV, sexually transmitted diseases, drug/alcohol abuse, mental illness, or psychiatric treatment) which may be requested concerning my illness or injury. I also authorize the release of information regarding work related injuries to my employer. I hereby assign NCWG all money to which I am entitled for medical expenses related to the services performed from time to time by NCWG, but not to exceed my indebtedness to NCWG. Any money recieved from such insurance company over and above such indebtedness will be refunded to me when my bill is paid in full. I understand that failure to pay outstanding balances within 90 days of notification of the amount due will result in submission to an outside billing service. If my account is sent to an outside billing service there will be a setup fee of up to \$20.00 and finance charge(s) (1% per month/APR 12%). Note: Medicare patients will not be charged the set up fee or finance charge(s).

MEDICARE BENEFICIARIES: As a Medicare patient, I understand that interest will not be imposed on any outstanding balance. I request that payment of authorized Medicare benefits be made to NCWG. I authorize any holder of medical information about me to release HCFA and its agents any information needed to determine these benefits or the benefits payable for related services.

This office has been chosen to participate in the California Health Data Exchange (CHDE). If you do not wish to share your healthcare information with other medical providers you can contact the CHDE at (999)333-8475 or [www.californiahde.org](http://www.californiahde.org)

Signature of Responsible Party:

X

Date:

I have reviewed a copy of Primary Health Medical Group's Privacy Notice.

Signature :

X

Date:

## Capstone Case: New Century Wellness Group

Tegan Hatch

Control Features to guide data entry:

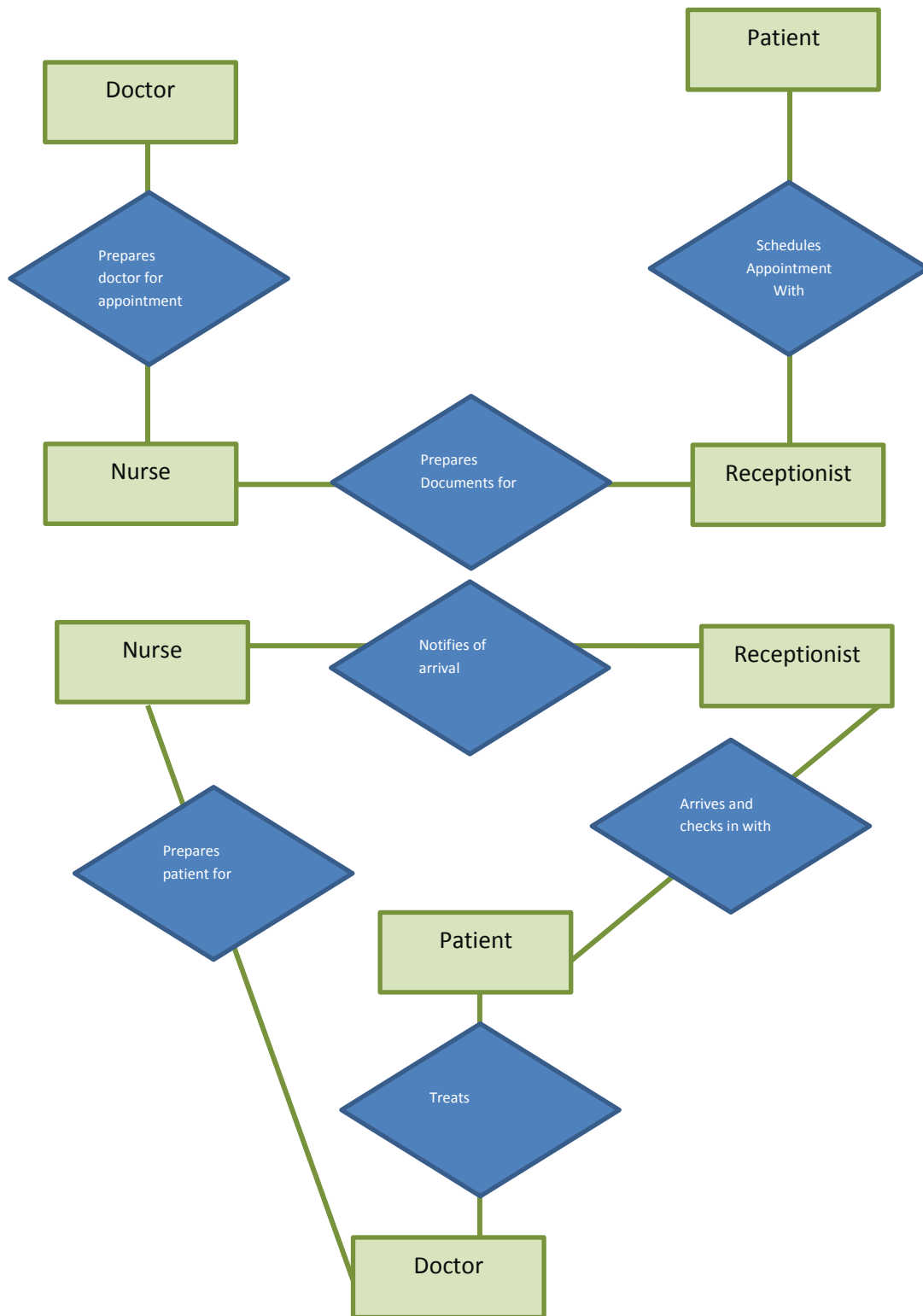
1. Give the patient the option of filling out the paper online.
  - a. Offers instant validation
  - b. Time saved at the office
  - c. Convenient for both the patient and the receptionist
2. Proper input masks and validation
  - a. Easier to interpret data format
  - b. Integrity of data
3. Consistent Page Numbering
  - a. N of n
  - b. Makes sure everything printed properly
4. Output Security
  - a. Protects privacy rights
  - b. Protects from theft and unauthorized access
  - c. Limit printed copies
  - d. Shred unnecessary documents

Output technologies other than printed reports:

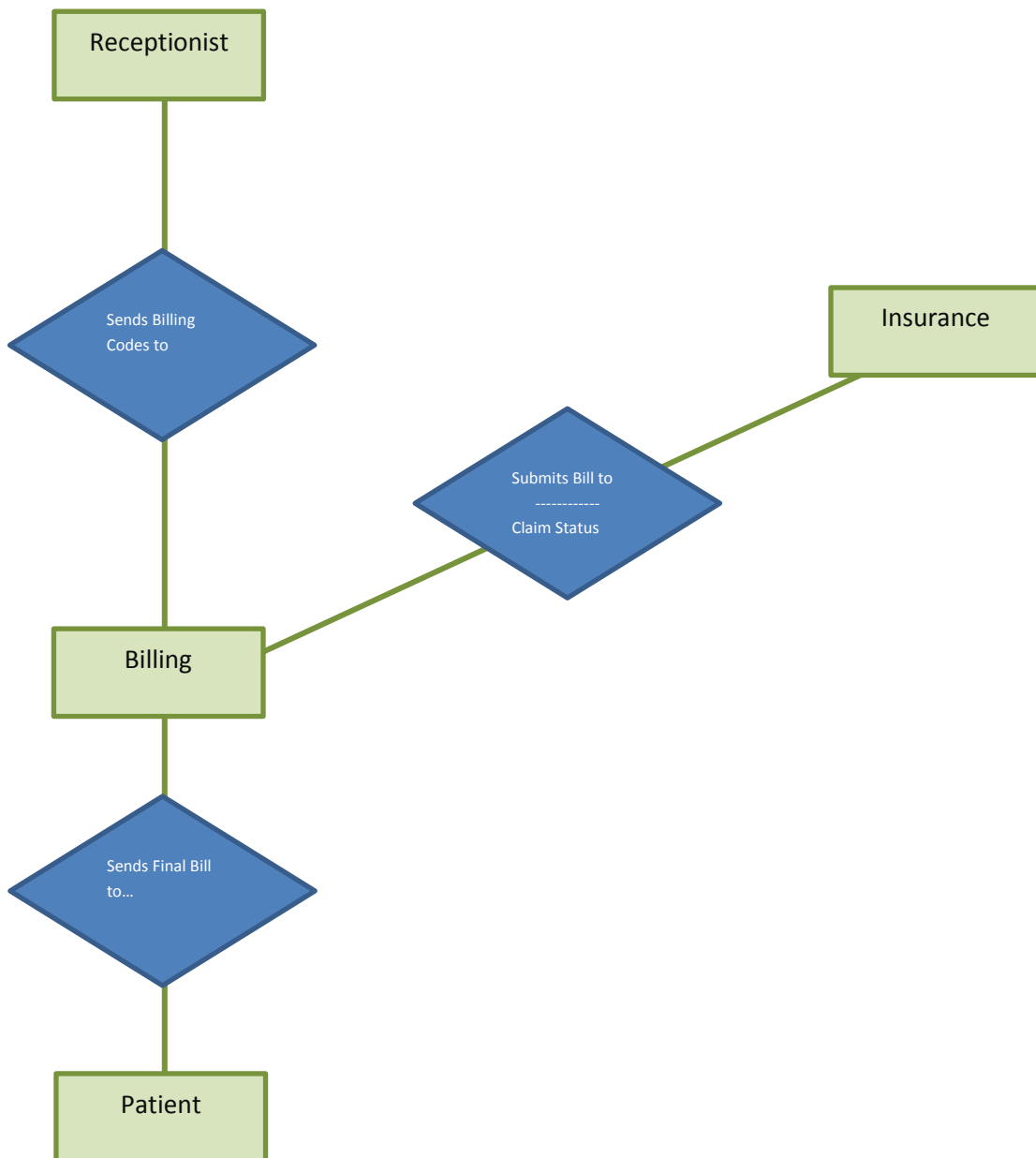
1. Internet-Based Information delivery
  - a. Allow patients to access an online system to schedule appointments, request refills, update information, etc.
  - b. Give patients a list of things they need to bring to their next appointment.
2. Texts
  - a. Appointment reminders
  - b. List of needed documents for the appointment
3. Mobile App
  - a. Track Meds
  - b. Manage Appointments
  - c. Update Contact Information.



## Chapter 9



Capstone Case: New Century Wellness Group  
Tegan Hatch



Capstone Case: New Century Wellness Group  
Tegan Hatch

Patient → Schedules Appointment With → Receptionist – M:1

Receptionist → Prepares Documents for → Nurse – 1:1

Nurse → Prepares for Appointment → Doctor – 1:1

Patient → Arrives and Checks in With → Receptionist – M:1

Receptionist → Informs of arrival → Nurse – 1:1

Nurse → Prepares patient for → Doctor – 1:M

Doctor → Treats → Patient – 1:M

Receptionist → sends appointment info to → Billing 1:1

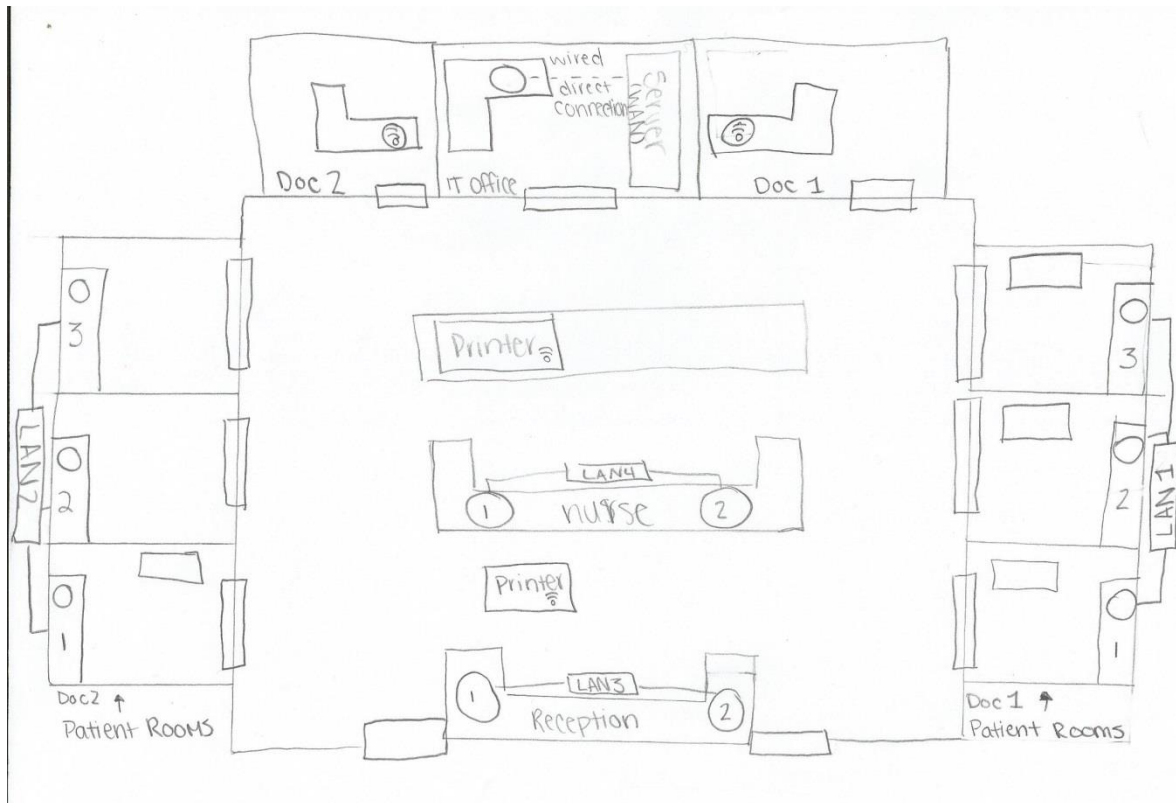
Billing → Submits to → Insurance – M:1

Insurance → Accept/Reject Claims → Billing – M:1

Billing → Sends Final Bill to → Patient – M:M

| Patient ID     | Doctor   | Insurance |  | Patient ID     | Appointment Date |
|----------------|----------|-----------|--|----------------|------------------|
| Smith012598-00 | Striker  | Yes       |  | Smith012598-00 | 5/4/2014         |
| Heise061670-00 | Stirling | Yes       |  | Heise061610-00 | 1/9/2013         |

## Chapter 10



All the circles in the diagram are used to represent computers. The IT office in the back doubles as a server room because New Century Wellness Group may not need a full time IT professional, but having an office set up gives an IT Professional space to work when more than routine maintenance is required. I also used (poorly drawn) wireless symbols to show computers that do not require a network cable to be connected to the network. The computer hardware could likely be easily upgraded where no cables are required outside the server room. This set up integrates both LAN and WAN technology, not because there needs to be data transmitted over vast spaces, but to avoid extra renovation costs to put cords under carpets. Minimal renovation will need to be done to link patient rooms to a LAN. Keeping most of the cords out of walls and out from under floors will also make for easier cable replacement should the need arise. With the way this system is set up, it will require four 4-port switches, and there are a total of 15 devices connecting into the network including printers and the IT office computer.

Using a divided Physical Topology, an IT professional will be able to better troubleshoot which part of the network is down by systematically testing each section.

The Logical Topology of the system involves several switches wirelessly communicating with a main server in a hierarchical network pattern. The nurse, reception, and patient room computers all communicate with different LANs which in turn, communicate with the main server which then sends relevant data back to other LANs.

## Capstone Case: New Century Wellness Group

### Tegan Hatch

The benefit of the hierarchical network topology is that each server can do its own level of processing before sending data to the main server, which reduces the amount of work the main server has to do. However, the more processing levels you add, the more complex and expensive the system gets. Given the way a clinic works, each unit like the diagram above won't get more complicated. The more units you add, the more benefits a hierarchical system has. If New Century Wellness were to open up more clinic sites, they would then probably have to implement a corporate office anyway, and could convert the current server into another departmental server that connected to the main one. On a national level (if they were to continue adding clinics to their company), that server would remain the primary server of the home corporate office which would communicate with servers of other corporate offices.

Wireless networks are magic. Your server itself will always have cords, and you will have different computers wired together, but wireless allows you to have fewer cords to be accidentally unplugged (can you hear the rejoicing tech support department in the distance?). However, wireless networks pose major security concerns because wireless transmissions are much more susceptible to interception and intrusion than wired networks. However, I think there is a level of paranoia that is caused by people not really understanding how difficult it can be to actually crack into a wireless network. No matter what security measures you have, there will always be someone capable of cracking into a data system. It happens all the time. The problem is, keeping everything on wires is impractical the larger the system becomes.

Another drawback is data speed. With developing wireless technology, the bridge between wired and wireless data speed is decreasing, but special wireless cards and routers are needed to make the gap smaller. As ideal as it would be to be able to hard-wire every device to a network for data speed alone, it just isn't practical.

## System Design Specification

When you approached me asking me to analyze your current system and present you with options for improvement, we took a lot of steps to decide what the best system was for you. We spent time investigating, in depth, exactly what you needed using many methods of basic systems analysis. After analyzing this data, you decided to go with in-house development, which will cost you \$19,300. The new system eliminates the six hours per week of overtime, and the employment of a new person. This system also helps enforce data integrity and is more convenient for everyone involved. The development phase is almost complete as everything has gone according to the initial twelve week schedule I proposed to you. Implementation will be ready to go, as scheduled, and will require 10 hours of initial training for employees on how to use the new system, including my support for the first three months of the new system's operation. There may be complications depending on the employee's prior computer knowledge and so extra training and attention may be needed for individual employees to guarantee maximum efficiency of the system.

Attached are all documents pertaining to this system. If there are any questions about these documents, feel free to ask me detailed questions as I have given basic explanations as part of the documentation.

Capstone Case: New Century Wellness Group  
Tegan Hatch

There will definitely need to be new hardware installed in the office, which I would be willing to do on a weekend to try to keep your clinic running weekdays with minimal interruption. All users will have an id and initial password assigned to them, which they will have to change upon their first login (which I will guide them through during the training). There will be data storage constraints that may become a problem if you expand. Once the system is running, we may run into some unforeseen issues that I will be there to deal with. Any major issues you encounter will be during the first three months of the system implementation and we will be able to deal with them together.

Unless it was included in the twelve week development process, there will be a transition time where patient records will be entered into the new system (or uploaded from a previous system if such a system exists), and I will require some time in the office to set up new hardware and software including employee computers, cables, switches, and the main server room. You may have to close the clinic during setup and training, but I promise to keep closure time as short as possible.

Since development is on schedule, it won't be long before we begin implementing the new system. I would like to run the training on two separate days, and would like to rent a conference room where I can set up the computers to be connected to the network temporarily so I can train the employees on the system they will be using while they are using it. This will also allow me to help them through the initial user profile setup steps all at once to avoid time lost by repetition. With everything on schedule, the cost analysis we discussed is the same, adding in the conference room rental and potential contractor work needed to install the wiring for the system. Until I spend some time in the clinic without the employees (minus management) and patients, I can't properly gauge the scope of the installation. Because of the wireless connectivity between sets of computers, we won't have to do anything as drastic as running cords under carpet or floorboards, but we may have to drill into walls under desks.

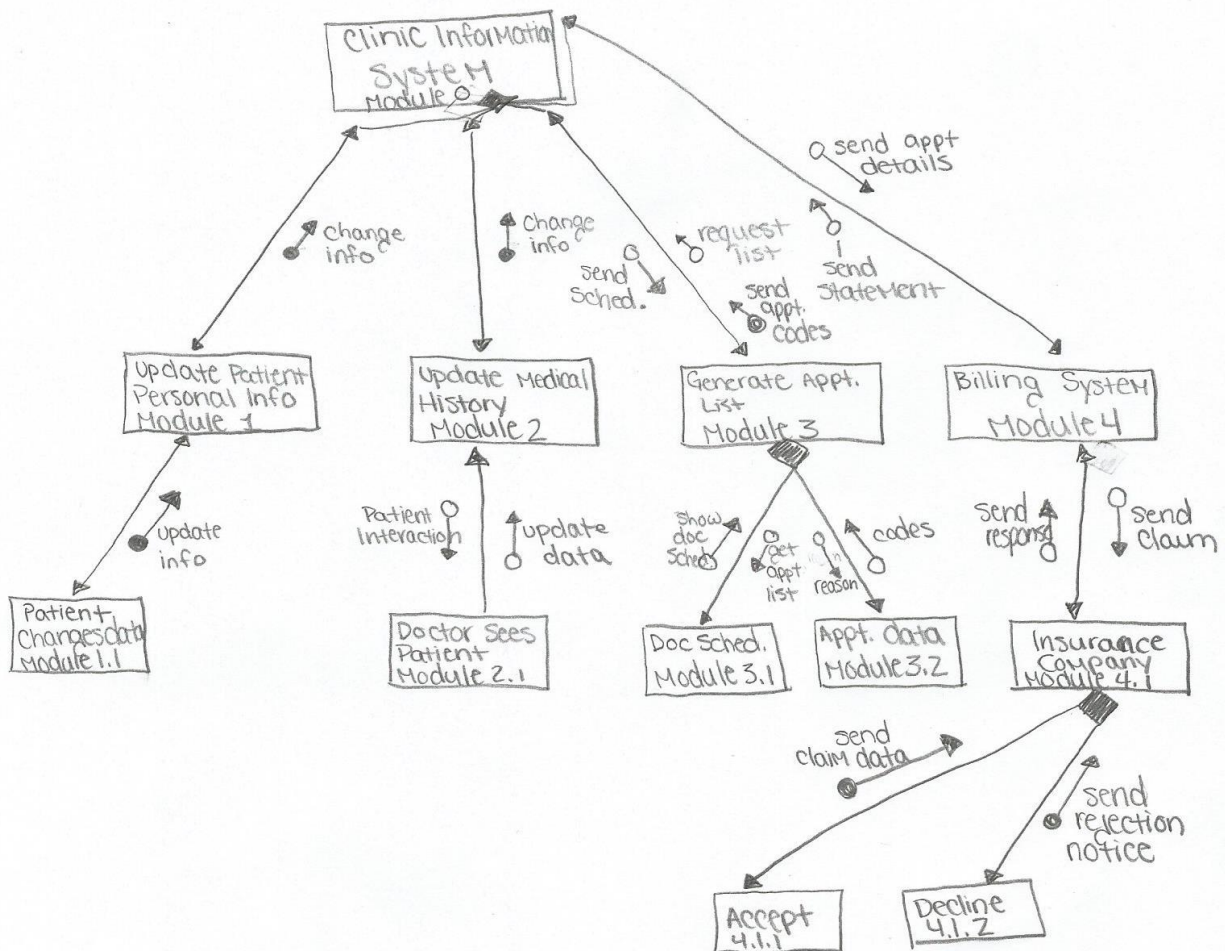
Thank you for the opportunity to work with your clinic. It was a pleasure to work with you and your employees to find you the best solution for your needs. After our time together, should you ever need my services for anything again, please feel free to call me any time and we will arrange a time to discuss your needs again.

## Chapter 11

I would probably choose structured development at this point because the system is very straight forward, but I would adopt a more agile approach for the interface design so that users have a more direct say in how they will interact with the system.

I would use several tools for finishing the business support system for different reasons. I would start with making an entity-relationship diagram to have a graphical representation of data interaction. I would then create flow charts for logic organization, and then modify the flow charts to include pseudo code to represent the logic. I would then create decision trees and tables based off of the flow charts and pseudo code to double check the logic, and if the logic was flawed, I would fix the decision tree/table, and then modify the flow charts and pseudo code with the corrected logic.

### Structure Chart



Capstone Case: New Century Wellness Group  
Tegan Hatch

I would start with unit testing to make sure that each of the parts of the overall software worked since the clinical system is all one piece of software. Then I would test the software that the billing department uses before testing them together with integration testing. I would then test how they work together with live data before using a parallel changeover method to switch the system over. In the following chart I have prepared some test data with some typo errors to test the data entry system.

The first entry is accurate and fits within data parameters.

The second entry has an error in the DOB field.

The third entry has an error in the Heart Rate field.

The fourth entry has an error in the Name field.

The fifth entry has an error in the How Much (per day) field.

The sixth entry has an error in the Blood Pressure field.

The seventh entry has an error in the Oxygen Saturation % field.

| Name          | DOB        | Smoke? | How Much (per day) | Heart Rate | Blood Pressure | Oxygen Saturation % | Allergies                | Medications  |
|---------------|------------|--------|--------------------|------------|----------------|---------------------|--------------------------|--|
| John Smith    | 6/15/1970  | Y      | 15                 | 80         | 120/80         | 97                  | Latex<br>Dogs<br>Peanuts | epipen<br>for peanut allergy   |
| Jackie Jones  | 13/15/1980 | N      | NA                 | 70         | 120/80         | 95                  | Penicillin               | Adderall 20mgXR<br>Once per day for ADHD<br>Cyclobenziprene 10mg<br>As Needed for Muscle<br>spasms<br>Citalapram 20mg<br>once a day For depression<br>Xanax 2mg<br>As Needed For anxiety |
| Anita Jacobs  | 10/20/1994 | Y      | 20                 | 250        | 120/80         | 98                  | None                     | None   |
| James Kross3  | 9/25/1990  | N      | NA                 | 95         | 120/80         | 96                  | None                     | Adderall 20mgXR<br>Once a Day For ADHD<br>Xyrem 5mg<br>One at Night For Narcolepsy   |
| Emiline Kai   | 11/14/1989 | Y      | twenty             | 95         | 120/80         | 95                  | None                     | None   |
| Seipher Jones | 12/25/1975 | N      | NA                 | 96         | 1220/80        | 97                  | None                     | None   |
| Janell High   | 6/30/1930  | N      | NA                 | 80         | 110/70         | 995                 | Cats                     | chlorthalidone 75mg<br>Once per day for Blood<br>Pressure<br>Prozac 25mg<br>Once in the morning for<br>Sleeplessness   |

Receptionist will receive training for:

- Appointment Scheduling
- Updating Patient Personal Data
- View Appointment Calendar
- Check-in/out patient
- Work Schedule
- View Paystubs
- View email



Capstone Case: New Century Wellness Group  
Tegan Hatch

Nurse receives training for:

- Appointment Scheduling
- Updating Patient Personal Data
- View Appointment Calendar
- Update Patient Medical History
- Work Schedule
- View Paystub
- View Email

Doctor receives training for:

- Appointment Scheduling
- Updating Patient Personal Data
- View Appointment Calendar
- Update Patient Medical History
- Prescribe Medication
- Send Scripts to Pharmacy
- View Work Schedule
- View Paystub
- View Email

Billing Department

- View Appointment Calendar
- Handle Claims
- Manage Patient Personal Data
- Manage Billing and Insurance Information
- Send Claims to Insurance
- View Insurance Claims Responses
- Submit Final Bill to Patient

All of their training would be similar since most of the options are available to everyone. I would prefer to teach them all hands on with access to online tutorials after training.

## Chapter 12

### Slow Response Time Memo

TO: New Century Wellness Group Staff Members

FROM: Tegan Hatch, Systems Analyst

DATE: May 5, 2014

SUBJECT: Slow Response Times

Thank you for contacting me with your concerns. I would like to put your mind at ease by explaining why you are having this issue. There are several things that contribute to the issue you are having:

- Response Time: the overall time between a request for the system activities and deliver of the response.
- Bandwidth: the amount of data that the system can transfer at any given time.
- Throughput: the actual system performance under specific circumstances.

To make this more understandable to you, imagine sitting down to with all the people in your office to watch a movie with a small bowl of popcorn, with the popcorn representing the data you are trying to access. The bowl represents your bandwidth; the size of the bowl is going to limit how many people can effectively grab a piece of popcorn at once. The less people grabbing for a piece of popcorn, the faster and easier it is to grab a piece of popcorn. Each time someone reaches for popcorn, it is a different set of circumstances, similar to throughput. The speed at which you can grab the popcorn and pull your hand back to eat it represents your response time. Now imagine everyone reaching for popcorn from the small bowl all at once. The bowl just isn't big enough to accommodate that many hands. The more people who are trying to grab at popcorn in the bowl, the longer it's going to take because the size of the bowl bottlenecks the transfer of the popcorn from the bowl, into your mouth.

## Ongoing Maintenance Memo

TO: Whomever it may Concern, New Century Wellness Group Partners

FROM: Tegan Hatch, Systems Analyst

DATE: May 5, 2014

SUBJECT: Ongoing Maintenance Memo

Thank you for contacting me about continuing maintenance for New Century Wellness Group. However, I wanted to send some clarification as to what you may mean by maintenance. There are several different types of maintenance and I need to know exactly what you are asking me to do.

1. Corrective Maintenance is the process of diagnosing and correcting errors in an operational system. I have received communication from New Century Wellness stating that they are experiencing slow response times at different times of the day, which I have deduced is due to high server volume. Although this may not seem critical, it has been stated that this low response time is causing employees to have difficulty keeping up with their workload.

If the server continues to be overloaded, the heat caused from hardworking electronics could damage some of the hardware components of the system, causing permanent damage.

Many errors that require corrective maintenance are the result of programming errors that need to be addressed quickly for daily business functions to continue effectively. As amazing as it would be to have a perfect product on the first install, software code can be very complex, and so even diligent testing may not reveal errors before the system changeover occurs.

Corrective maintenance is generally given priority level 1, as it has a significant impact on IT operations, security, or business activity that requires immediate action, and patches for these problems are implemented as soon as possible.

2. Adaptive maintenance adds enhancements to an operational system. As the business grows, they may require new user interface options to keep up with the increase in business. Another option New Century Wellness could consider that falls under this category of adaptive maintenance is Web integration so customers can view their medical records, recent appointments, schedule appointments, or update their personal information

Most adaptive maintenance is priority level 2 because it has some impact on IT operations, security, or business activity, and it requires prompt attention, but business operations can continue while a systems analyst finds a solution. These changes will be patched as necessary, and implementation will begin before the next version update.

3. Perfective maintenance involves changing an operational system to make it more efficient, reliable, or maintainable. New Century Wellness has contacted me with service requests for changes in certain reports and forms which fall under perfective maintenance. Another perfective maintenance change that I would suggest is an improved help system. The employees at New Century Wellness call me almost daily to request assistance or suggest changes.

Maintenance tasks such as these are generally under priority level 3 because they have little or no impact on the current IT operations, security, or business activity. Updates such as these will generally be “squirrelled away” until there are several updates that can be packaged into a single software update.

4. Preventive maintenance requires the analysis of areas where trouble is likely to occur. Most of the time, the IT department initiates preventive maintenance. These updates generally increase user satisfaction, decrease downtime, and reduce TCO. In this situation, preventive maintenance should be done to prevent a hardware failure caused by the volumes of data that are being transmitted on a daily basis. This would also solve the response time problems experienced by New Century Wellness Employees.

I have also had increasing concerns about the system’s security. Preventive maintenance is a viable solution to solve my concerns about any security issues. A recent article in my local paper described an incident where a disgruntled former employee was planning to break into a computer system at his prior place of employment and destroy or alter data. Digital security is already well set since the employees *must* log in with their ID and password before they are given any access to data, but I’m sure there are more ways to increase the security of the system that should be addressed.

Preventive maintenance requests are also generally initiated by the IT department, and security issues are always given priority level 1 because they have a significant impact on the system. Unfortunately, preventive maintenance competes for IT resources along with other projects and may not receive the high priority it deserves unless it is an issue that may border on corrective maintenance.

### System Maintenance Methodology

Maintenance release methodology is generally a good idea for priority level 3 requests. Given the time and cost of implementing updates into a new system, it makes sense for New Century Wellness to save several level 3 requests for a slightly larger patch. The major downfall to larger patches is the size of the code. The more code you have, the more chances you have to break something in the system.

However, version control fixes the risks of implementing large files. Because of version control, if a patch is applied to the system that breaks something within the system, the previous version of the software is saved so the business can still function on the old system while the IT team works on the problems with the patch.

### Security Issues Memo

TO: To Whom it may Concern, New Century Wellness Group

FROM: Tegan Hatch, Systems Analyst

DATE: May 5, 2014

SUBJECT: Security Issues Memo

I wanted to contact you because I had some concerns about your security. After reading an article in my local newspaper about an incident where a disgruntled former employee was planning to break into the computer system of their prior place of employment and destroy or alter data, I wanted to send you some security tips to make sure your system is safe from any unauthorized access.

I would like to start with discussing the wireless parts of your network in the clinic. While a wired connection is safer than a wireless connection, it would have been impractical for me to run wires under all of the carpet in your clinic. Wireless was the most space and cost efficient option for wiring your clinical network. Because wireless networks broadcast using radio waves, they are susceptible to eavesdropping and so network security was a must. Today, there are three different options for securing a network.

- WEP (or Wired Equivalent Privacy) was the initial standard for the first generation of wireless networking devices. It provides security by encrypting data over the radio waves so it is protected from one point to another. The biggest downfall of WEP security is static encryption. With static encryption, eavesdroppers get more material to work with, if the attacker breaks the key they can decrypt multiple messages, and it gives the attacker the possibility of arranging a known plaintext attack. You can kind of work around this by regularly changing the key (Wi-Fi password), but then you need to re-log in to the network on every computer with the new key.
- WPA (or Wi-Fi Protected Access) improved on WEP by adding data encryption through the temporal key integrity protocol (TKIP). TKIP scrambles the key using a hashing algorithm and, by adding integrity-checking features, ensures that the keys haven't been tampered with. The WPA "changes" the password for you essentially. You don't need to change the key consistently

because it uses the Wi-Fi password that you provide as a key to allow you into the encrypted data. WPA also includes authentication through EAP (extensible authentication protocol). The major downside that WPA had when it first came out, and can still have the problem with old hardware, occurs because all units on the network must be configured for WPA. If the device is not configured for WPA, it will default to WEP.

- After WPA, WPA2 (the newer version of WPA) was released. Since 2006, WPA and WPA2 have been available on all certified Wi-Fi devices. Given its age, I would definitely say that it is a reliable security option. WPA2 does not allow the use of the TKIP algorithm because of known security protocols. Some tech savvy people may still choose to use WPA depending on what they are using their network for. WPA2 requires Wi-Fi hardware to work harder when running more advanced options which, theoretically, can slow down network processes.

I decided to secure the office with WPA2 security because I felt that patient data records, which have more than just medical records but also include social security numbers, driver's licenses, and insurance cards, was more important than a theoretical sacrifice of server processing time. For extra protection of the Wi-Fi network, most employees should not know the network key to log in to the network. To give the employees Wi-Fi, create a guest network for employee and patient private devices. Only the head manager and the IT manager should know the password.

A firewall is another important part of network security and there are several options available for firewall protection. After analyzing the options, I decided a stateful multilayer gateway was the best option because it offers the best features of the three other firewall types. It filters packets at the network layer, determines packet legitimacy, and evaluates packet contents at the application layer. It also provides a direct connection between the host and client which allows transparency at the user level, unlike application-layer gateways. It does cost more, but it will protect the data most effectively.

Passwords are another crucial part of system security. Employee passwords should be changed every one to three months, but no longer than three. The password should be different from there last few passwords, and the password shouldn't contain any information that pertains to their identity because it is significantly less secure. Despite what most signups would have you believe, your password doesn't have to contain a bunch of numbers and symbols to be a strong password. For example, a password comprised of a non-gibberish base word, with capital letters, numbers, and symbols, such as Tr0ub4dor&3, is nearly impossible for a person to remember, but would only take a computer 3 days to guess at 1000 guesses per second. A phrase, such as correcthorsebatterystaple, is incredibly easy to remember, but will take a computer 550 years at 1000 guesses per second to figure out. Now, capital letters will help in the strength of a password, but length is a more reliable way to strengthen your password than adding numbers, capitals, and symbols.

As a final security note, I would like to remind the office that the server room is to be locked any time it is unoccupied. Also make sure that all computer cases are locked securely before leaving the office each day.