Health Care System

DataBase project

2014

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06.06.2014

Business Case: Health Care System

Objectives of the project

Current Health Care situation in Quebec and the whole Canada requires some changes to allow numerous patients use this Health System more effectively. Every city in Quebec, especially big ones like Montreal, requires reducing the waiting time for patients and fastening the access to medical services. Thus, increasing the efficiency of supporting medical staff will lead to solve this issue. Moreover, it will lead to increasing the efficiency of the work of general staff in hospitals or other health care institutions. In most cases the waiting time depends on the time spent on filling up necessary forms, the time spent on gathering the necessary information about a patient, time spent on checking the availability of doctors or nurses at the time of a patient visit, time spent on making the primary anamnesis and etc. Almost most of that time can be reduced by implementing the proposed project.

Finally, this project allows medical staff and patients to receive and send all necessary information in on-line mode. It will allow patients to fill in on-line forms, to schedule and reschedule an appointment, medical staff and laboratories exchange the information in on-line mode and so on. Those actions are usually performed by the phone or at the patients’ presence in hospitals manually. Proposed system can be very useful in cases of planned visits, and when people don’t have any urgent cases. But even in such case, process of filling up electronic forms is much more easily for medical staff then filling up the paperback forms.

All information mentioned above, it’s only a tip of an iceberg. But even so, many hospitals and clinics are required to adopt the use the computer system which allows sharing information with other health care institutions, such as laboratories and independent specialists. It allows patients to retrieve medical information about their current state, to replace the paperback information with its digital copy.

So far current health care electronic systems are divided on three categories:

* an electronic health record (EHR);
* an electronic medical record (EMR);
* a personal health record (PHR)

An electronic health record (EHR) is built to share information with other health care institutions, such as laboratories and independent specialists. An EHR contains information about all clinicians involved in patient care. Moreover, authorized clinicians can access the information they need, to provide better treatment to a patient.

An electronic medical record (EMR) is a digital version of paper charts in a doctor’s office. An EMR contains notes and information collected by and available to clinicians in that office. A fully implemented EMR system allows electronic storage, retrieval, and modification of patient information. It is the chance for departments within the health organization to collaborate providing patients’ care. In hospitals and clinics, these federally backed EMR systems will replace hundreds of different applications used by physicians, radiology personnel, and even hospital administration.

A personal health record (PHR) contains the same types of information as a electronic health record—diagnoses, medications, immunizations, family medical history, and contact information for health care workers, but it is designed to be set up and accessed by patients themselves.

With impact of information technology, the proposed project will join all three variants of the current systems into a unified one. In the common case health records will be made available via large clinical systems in hospitals and health care institutions. And the goal of health record projects is to make personal health information accessible and transportable, which is beneficial to both consumers and health care workers. Hereafter, there is just an example, what kind of information can be gathered through this system:

*Data in an electronic medical record*

* patient demographics
* medical history, results of examinations and progress of reports of health state and diseases
* medication and allergy lists, and immunization status
* laboratory test results
* radiology images, x-rays, computer topographies’ or CTs, MRIs, etc
* photographs, from endoscopy or laparoscopy or clinical photographs
* medication information, including side-effects and interactions
* evidence-based recommendations for specific medical conditions
* records of appointments and other reminders
* billing records
* eligibility
* advanced directives, living wills, and health power of attorney

So now we can see some benefits of the proposed project:

1. Health Care System (HCS) reduces the possibility of medical errors
2. Features, such as integrated drug databases, symptom checks, and drug interaction verification, help physicians prescribe correct medications and right dosages.
3. HCS improves patient care and treatment, lower administrative costs, and improve billings and collections.
4. Increasing the number of patient visits per day is taken into account in order not to reduce the quality of care.
5. Duplicating of tests and clinical assessments is reduced
6. According to “The Health Level Seven International. Introduction to HL7 Standards” gathering of information is used according to the standards.
7. HCS increases physician efficiency, reduces costs and promotes standardization of treatment and patient care. Physicians find themselves with more time to focus on patient care as they eliminate paperwork, speed up medical charting, receive lab test results electronically, and make prescriptions electronically.
8. HCS provides the good level of privacy, which is executed according to the right of privacy for all Canadian citizens who interact with health professionals.
9. As physicians and support staff spend less time conducting and tracking paperwork, they are able to see more patients. HCS also allows physicians to complete and to document patient encounters more quickly, thus increasing their ability to provide more qualified care and take care of more patients.
10. One of the top benefits of electronic health records is serving more patients which naturally increases the flow of patients served as well as statistical information. Electronic patient records provide physicians with the necessary documentation to support claims sent to insurance companies, Medicare, and Medicaid.
11. HCS can also provide prompts to physicians based on inputs of patient major complaints and/or risky demographic factors.

Project alternatives

There are some current alternatives (EMR and EHR):

1. **Epic®.** Is presented in two variants of software: for hospitals and for laboratories. This system mostly belongs to the EHR – systems, because it communicates with different medical institutions within medical network.
2. **Cerner®.** Presents only one variant of software. This software mostly belongs to the EMR – systems, because this system was developed mostly for gathering information about patients within the same hospital, clinic or other medical institution.
3. **MEDITECH®.** This is complete EHR-system. The main point of this system is the workflow documentation between medical institutions.

All mentioned above systems are mainly concentrated on only one type of medical systems. As a matter of fact, our project is able to take the niche of medical software market, providing the combination of systems, and becoming the basis of further project’s development. According to the most recent research[[1]](#footnote-2) only 6% from 21,202 respondents said they plan to remain without an EHR. And adding some very useful features as working directly with patients, connecting all three systems in one and so on is very valuable competitive advantage for the whole system.

Implementation plan

We are planning to develop the system which combines all three systems simultaneously from the beginning. This project is going to be based on desktop-technology with further involvement Web-technology (i.e. one relational database, access to the information through Internet, involving SaaS-technology and cloud-technology in the future). We have chosen this approach because at the end, it is much more affordable for small clinics and hospitals, which face budget limits. Moreover, even it allows big clinics and hospitals use existing staff eliminating the need for the additional personal for dealing with hardware and server issues.

According to the recent research, mentioned above, "easy to learn" and "easy to implement" were among the most important factors that respondents consider the most important, because these factors are marked their introduction in both the EHR and EMR systems. Users appreciated EHRs that are based on more "intuitive" work because they allow them to figure out aspects of operation more easily when instructions and constant technical support are not available.

A key factor is appearance a useful end product. Both EHR and EMR systems ultimately need to present information in a way that is easy to understand, easy to work with, and is user-friendly. Interactivity with other office systems is also critical. When the EHR operates with other systems, these office functions can be made more efficient.

Taking all these into account we are trying to develop “easy to understand” interface, including help system and to divide the system on small parts, which are very simple to use and operate with.

Executive Summary

Goal:

* developing Health Care System which connects three categories of systems, already existing in the market;

Advantage:

* reducing the possibility of medical errors;
* improving patient care and treatment, lowering administrative costs;
* increasing staff work’s efficiency;
* increasing access to information from multiple venues of the health system;
* reducing communication time between medical institutions, within the institution between staff as well as between a medical institution and a patient;

Expenses:

* supplying the computer systems if needs;
* startup budget for implementing this system

SWOT Analysis

***Strengths:***

* User friendly interface with minimum time for training
* The data is stored and systemized
* Access to data is fast, easy and made in different paper, electronic forms
* It doesn’t need extra software
* The System satisfies demands of the doctors, medical assistants , nurses, laboratory  
   staff and patients
* Increases the productivity of all the participants in patient treatment
* Program is going to be developed for using through Web-access (Web – application)
* Reduces the waiting time for clients due to the decrease of the paperwork level

***Weaknesses:***

* Increases budget spending on developing and implementing this project
* Might need the modernization of equipment
* Needs improving some basic software components if the old ones are in use
* Might cause conflicts with current using software of the company and demands extra efforts to get over them
* Might cause patients issues if this program is going to be implemented in other software

***Opportunities:***

* Can be supported, updated or implemented in other projects
* All the data, including particular company cases, can be covered with this program
* In the next step, information can be accessed elsewhere, even in other countries and during the vacations abroad.

***Threats:***

* Changing the demands to the performance of future Web application in Web Browsers can invoke non-displaying pages and improper functioning of the system
* The program highly depends on the Internet connection
* Appearance of the competitive software could impact the distribution of the program
* In general, it can be widely used within the hospitals all over the country, but application has to be approved by government institutions.

Questionnaire: Health Care System

**People to be interviewed**

1. GPs
2. Nurses
3. Medical Assistants
4. Lab Staff
5. Patients

Questionnaire for a Nurse:

**Multiple choices.**

1. How do you determine your level of computer literacy?
2. Advance.
3. Intermediate.
4. Beginner.
5. Starter.
6. Which of the following programs do you use the most?
7. Word
8. Outlook
9. Excel
10. Access
11. Other specify \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
12. How long does it take you to learn something new?
13. 1-3 days
14. 3-5 days
15. a week
16. more than a week
17. How do you collect the patient’s information?
18. Personally by questioning her/him

(If chosen provide a sample, please)

1. Patient fills in a form (If chosen provide a sample, please)
2. Other specify \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. How do you track the patients’ tests?
2. Receive them with a courier in paper form

(If chosen provide a sample, please)

1. Receive electronically
2. Patients collect them and hand them in personally
3. Other ways Specify\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. How do you collect information about patient state during his/her visit?
5. Paper-based form (If chosen provide a sample, please)
6. Questionnaire (If chosen provide a sample, please)
7. Paper-based description in a free form
8. Any other Specify\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
9. How long does it take you to find out the patient case according to records in her/his file?
10. Just a glimpse
11. Less than 5 min
12. More than 10 min
13. Other specify
14. Are the patients’ files organized just as you like them to be?
15. Yes
16. No

**Open-ended questions.**

1. Haw many patients use your services daily\_\_\_\_\_\_\_\_\_\_\_?
2. Haw many patients use your services weekly\_\_\_\_\_\_\_\_\_\_\_?
3. How many appointments are scheduled for you a day?
4. How does the missed appointment influence on your day schedule?
5. How long does a patient’s visit last?
6. How long does it take to full fill the patient’s file after a visit?
7. How long does it take you to make notes about patient condition during her/his visit?
8. How do you determine what hospital or what special doctor the patient has to be sent to?
9. How do you track the patient’s schedule of treatment, tests and vaccination?
10. What medications do you have a right to prescribe to a patient? Provide a list, please.
11. Who provides you with the list of medications?
12. How would you like a patient’s file to be organized?

Describe in detail, if possible provide any forms.

Questionnaire for a GP:

**Multiple choices.**

1. How do you determine your level of computer literacy?
2. Advance.
3. Intermediate.
4. Beginner.
5. Starter.
6. Which of the following programs do you use the most?
7. Word
8. Outlook
9. Excel
10. Access
11. Other specify \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
12. How long does it take you to learn something new?
13. 1-3 days
14. 3-5 days
15. a week
16. more than a week
17. How do you collect information about patient state during his/her visit?
18. Paper-based form (If chosen provide a sample, please)
19. Questionnaire (If chosen provide a sample, please)
20. Paper-based description in free form
21. Any other Specify\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
22. How do you track the patients’ tests?
23. Receive them with a courier in paper form
24. Receive electronically
25. Patients collect them and hand them in personally
26. Other ways Specify\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
27. How long does it take you to find out the patient case according to records in her/his file?
28. Just a glimpse
29. Less than 5 min
30. More than 10 min
31. Other specify
32. Are the patients’ files organized just as you like them to be?
33. Yes
34. No

**Open-ended questions.**

1. Haw many patients use your services daily\_\_\_\_\_\_\_\_\_\_\_?
2. Haw many patients use your services weekly\_\_\_\_\_\_\_\_\_\_\_?
3. How many appointments are scheduled for you a day?
4. How does the missed appointment influence on your day schedule?
5. How long does a patient’s visit last?
6. How long does it take to full fill the patient’s file after a visit?
7. How do you determine what hospital or what special doctor the patient has to be sent to?
8. How would you like a patient’s file to be organized?

Describe in detail, if possible provide forms if any.

Questionnaire for a Medical Assistant:

**Multiple choices.**

1. How do you determine your level of computer literacy?
   1. Advance.
   2. Intermediate.
   3. Beginner.
   4. Starter.
2. Which of the following programs do you use the most?
3. Word
4. Outlook
5. Excel
6. Access
7. Other specify \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
8. How long does it take you to learn something new?
9. 1-3 days
10. 3-5 days
11. a week
12. more than a week
13. How do you collect the patient information?
14. Personally (If chosen provide a sample, please)
15. Patient fills in a form (If chosen provide a sample, please)
16. Other  
    Specify\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
     \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
17. How does a patient receive notifications about an appointment?
18. Phone call from an assistant
19. E-mail
20. Text-message
21. They don’t receive any notifications
22. How do you determine patients to a doctor or a nurse within your hospital/clinic?
23. Live line
24. According to their condition
25. Any doctor who is free takes the patient
26. Other   
    Specify\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
     \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
27. How do you collect general information about a patient during his/her visit?
28. Paper-based form (If chosen provide a sample, please)
29. Questionnaire (If chosen provide a sample, please)
30. Paper-based description in free form
31. Any other   
    Specify\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
     \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
32. Are the patients’ files organized just as you like them to be?
33. Yes
34. No

**Open-ended questions.**

1. How many patients use your services daily\_\_\_\_\_\_\_\_\_\_\_?
2. How many patients use your services weekly\_\_\_\_\_\_\_\_\_\_\_?
3. How many appointments do you have to schedule a day?
4. How long does it take you to schedule an appointment?
5. How many appointments do you have to reschedule a day?
6. How long does it take you to reschedule an appointment?
7. Do patient miss their appointments?
8. How often does it happen?
9. What is the main reason of missing?
10. How would you like a patient’s file to be organized?

Describe in detail, if possible provide forms if any.

1. What information does any patient file consist of? If it is possible provide a form of it.
2. How do you determine what hospital or what doctor the patient has to be sent to?

Questionnaire for a Lab Staff:

**Multiple choices.**

1. How do you determine your level of computer literacy?
   1. Advance.
   2. Intermediate.
   3. Beginner.
   4. Starter.
2. Which of the following programs do you use the most?
3. Word
4. Outlook
5. Excel
6. Access
7. Other   
   Specify\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
    \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
8. How long does it take you to learn something new?
9. 1-3 days
10. 3-5 days
11. a week
12. more than a week
13. How many tests do you generally deal with during the day?
14. Less than 1000
15. More than 1000
16. If possible provide with a precise number\_\_\_\_\_\_\_\_\_\_\_
17. How do you write down the results of the tests?
18. Fill in a form (if checked provide a form, please)
19. Write in a free form
20. Other specify\_\_\_\_\_\_\_\_\_\_\_\_

**Open-ended questions.**

1. How do you receive the tests prescribed and sent them back?
2. How much time do you usually need to write down the results of a test?

Questionnaire for a Patient:

**Multiple choices.**

1. How do you determine your level of computer literacy?
2. Advance.
3. Intermediate.
4. Beginner.
5. Starter.
6. Which of the following programs do you use the most?
7. Word
8. Outlook
9. Excel
10. Access
11. Other   
    Specify\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
     \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
12. How long does it take you to learn something new?
13. 1-3 days
14. 3-5 days
15. a week
16. more than a week
17. How would you like to receive notifications about your appointment?
18. Phone call from an assistant
19. E-mail
20. Text-message
21. Other   
    Specify\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
     \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
22. How do you determine patients to a doctor or a nurse within your hospital/clinic?
23. Live line
24. According to their condition
25. Any doctor who is free takes the patient
26. Other   
    Specify\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
     \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Open-ended questions.**

1. Have you ever missed an appointment?
2. If yes, how many times did it happen?
3. What was the main reason of missing?
4. How often do you visit a GP?
5. How long do you usually wait for the appointment?
6. Have you ever lost, asked for a copy of a prescription?
7. How long does it take you to find the prescribed medication?

Questionnaire [Answers]: Health Care System

Nurses’ Answers

|  |  |
| --- | --- |
| *Question 1:*  How many patients use your services daily? | *Answer:*  Over 15-30(250-500), it depends on the season  Observation: |
| *Question 2:*  Haw many patients use your services weekly | *Answer:*  Over 70-150 (1000-3000) people a day  Observation: |
| *Question 3:*  How many appointments are scheduled for you a day? | *Answer:*  One third is scheduled and the rest are urgent cases.  Observation: |
| *Question 4:*  How does the missed appointment influence on your day schedule? | *Answer:*  I prefer it doesn’t happen because even 5-10 minutes delay shift all day work and I have to continue to suppress all my work. It is a very stressful side of my work.  Observation: |
| *Question 5:*  How long does a patient’s visit last? | *Answer:*  From 15 up to 40 minutes. It depends on the case and a patient.  Observation: |
| *Question 6:*  How long does it take to full fill the patient’s file after a visit? | *Answer:*  Never less than 5-10 minutes. Sometimes more, again it depends on the case.  Observation: |
| *Question 7:*  How long does it take you to make notes about patient condition during her/his visit? | *Answer:*  Usually I don’t have enough time to finish them. During the visit just several notes or short comments, that don’t let me to forget the full picture of the case.  Observation: |
| *Question8:*  How do you determine what hospital or what special doctor the patient has to be sent to? | *Answer:*  Firstly, it is the condition and complains. Secondly, I track the doctor’s availability and check the alternatives and only after that the decision is taken.  Observation: |
| *Question 9:*  How do you track the patient’s schedule of treatment, tests and vaccination? | *Answer:*  Usually it is parents’ job to check if all the vaccines have been done. But as a matter of fact they don’t know the calendar of vaccination, so I check it during the visit and inform in advance what has to be done and approximately at what time.  Observation: |
| *Question 10:*  What medications do you have a right to prescribe to a patient? | *Answer:*  Generally, they are the medication which could be bought without prescription; any pharmacist can do the same.  Observation: |
| *Question 11:*  Who provides you with the list of medications? | *Answer:*  Any person can check this list it is available in the Internet, as well as any pharmacist knows it and can inform you. <https://www.canadadrugs.com/otc>  Observation: |
| *Question 12:*  How would you like a patient’s file to be organized? | *Answer:*  It would be perfect to see it just as the form I fill in every day in is organized.  Observation: |

Doctors’ Answers

|  |  |
| --- | --- |
| *Question 1:*  How many patients use your services daily? | *Answer:*  Over 16-25 people a week.  Observation: |
| *Question 2:*  How many patients use your services weekly? | *Answer:*  Over 80-125 people a week.  Observation: |
| *Question 3:*  How many appointments are scheduled for you a day? | *Answer:*  Over 16-20 appointments a day.  Observation: |
| *Question 4:*  How does the missed appointment influence on your day schedule? | *Answer:*  Most patients have little understanding of the intricacies of how a medicine practice operates. They have minimal knowledge of the challenge of balancing the office appointment schedule with a physician’s many other daily commitments and responsibilities. So any delay causes a disastrous influence on all day long schedule.  Observation: |
| *Question 5:*  How long does a patient’s visit last? | *Answer:*  Every appointment is scheduled from 15 to 30 minutes, but it is never less than 20. The time is determined according to the case and a patient’s reason for coming.  Observation: |
| *Question 6:*  How long does it take to full fill the patient’s file after a visit? | *Answer:*  I don’t really have time to write something in a file. Just a couple of notes to a nurse, she does the general work.  Observation: |
| *Question 7:*  How do you determine what hospital or what special doctor the patient has to be sent to? | *Answer:*  When a patient needs a consultation of a specialist, I already know the hospitals where they operate, if not I can easily find it out in a paper based guide.  Observation: |
| *Question 8:*  How would you like a patient’s file to be organized? | *Answer:*  Oh! It is an easy and the most difficult question. Firstly, it should be logically organised with the minimum time need to find the necessary information. Secondly, it shouldn’t be too complicated.    Observation: |

Medical Assistant Answers

|  |  |
| --- | --- |
| *Question 1:*  How many patients use your services daily? | *Answer:*  Over 250-500, it depends on the season  Observation: |
| *Question 2:*  How many patients use your services weekly? | *Answer:*  Over 70-150 (1000-3000) people a day  Observation: |
| *Question 3:*  How many appointments do you have to schedule a day? | *Answer:*  Over 1600-2000 appointments a day.  Observation: |
| *Question 4:*  How long does it take you to schedule an appointment? | *Answer:*  Generally it takes 3-5 minutes. In some cases when a patient has a time limit it can take more than 5 minutes.  Observation: |
| *Question 5:*  How many appointments do you have to reschedule a day? | *Answer:*  Generally 10-30 appointments a day. Sometimes less, it depends on the season. If it is a time of holidays or vacations it happens more often.  Observation: |
| *Question 6:*  How long does it take you to reschedule an appointment? | *Answer:*  Usually it is the same time as to schedule an appointment. 3-5 minutes.  Observation: |
| *Question 7:*  Do patient miss their appointments? | *Answer:*  Yes, of course.  Observation: |
| *Question 8:*  How often does it happen? | *Answer:*  Almost every day. You know, we don’t have a possibility to remind our patient about upcoming appointment. If it was taken long ago, patents tend to forget about their appointments.  Observation: |
| *Question 9:*  What is the main reason of missing? | *Answer:*  Usually they forget about it, or confuse the time.  Observation: |
| *Question 10:*  How would you like a patient’s file to be organized? | *Answer:*  Easy to find the information and to enter the new one.  Observation: |
| *Question 11:*  What information does any patient file consist of? | *Answer:*  General information about a patient such as: Full Name, address, medical insurance, and of course his health care information such as: diagnosis, anamnesis, prescription. As well as the doctor’s and nurse’s name. You can find it in the general form.  Observation: |
| *Question 12:*  How do you determine what hospital or what doctor the patient has to be sent to? | *Answer:*  We have a list of hospitals and specialist. And according to the needs of the patient we determine the hospital.  Observation: |

Questionnaire for a Lab Staff:

|  |  |
| --- | --- |
| *Question 1:*  How do you receive the tests prescribed and sent them back? | *Answer:*  We receive the tests with a currier and when the test is ready we send them back as well with a currier.  Observation: |
| *Question 2:*  How much time do you usually need to write down the results of a test? | *Answer:*  If it is a complex test it takes up to 5-7 minutes. Usually We have only to choose the options which are already defined and write some short comments which consist of just numbers. If it is a complex test we have to make complete description.  Observation: |

Questionnaire for a Patient:

|  |  |
| --- | --- |
| *Question1:*  Have you ever missed an appointment? | *Answer:*  Yes. You know, it is difficult to keep in mind long distant dates. Why don’t they notify us about upcoming appointment?  Observation: |
| *Question2:*  If yes, how many times did it happen? | *Answer:*  Twice of thrice. Not more.  Observation: |
| *Question3:*  What was the main reason of missing? | *Answer:*  I have just forgotten and once I confused the time and arrived an hour later. It would be nice to have a written notification two days before the appointment.  Observation: |
| *Question4:*  How often do you visit a GP? | *Answer:*  Twice or thrice a year.  Observation: |
| *Question5:*  How long do you usually wait for the appointment? | *Answer:*  If it a GP only a couple of days, sometimes a week. If it is a specialist than much longer. Once I waited for half a year.  Observation: |
| *Question6:*  Have you ever lost, asked for a copy of a prescription? | *Answer:*  Oh, Yes.  Observation: |
| *Question7:*  How long does it take you to find the prescribed medication? | *Answer:*  I usually go to the nearest drug store. Just another half an hour to do that.  Observation: |

Requirements Modeling: Health Care System

Project glossary

HCS – Health Care System

Medical staff – doctors, nurses, medical assistants

Laboratory staff – technicians, laboratory assistants

System – Health Care System

Medical institutions – hospitals, clinics and so forth

SSN – social security number

Patient – person, who needs medical treatment

Medical history – information about previous visits and previous diagnoses

Description the system

The main purpose of proposed project is to allow the medical staff, the laboratory staff and patients to be always connected through this system in the real-time mode. Achieving this goal allows all sides involved in using this project to reach the side back targets which are not considered to be minor at the same time. For example: to decrease waiting time in the medical institutions during the first and following visits; to reduce the possibilities of medical errors; to lower administrative costs, to reduce communication time within the medical institutions.

All mentioned above should be built by dividing the whole system on five subsystems. In spite of this division, all information circulating in the system should be stored in the same database. The first subsystem belongs to the medical assistance and allows entering primary information about patient. This subsystem should not let medical assistants enter the information which belongs to doctors, nurses and laboratory staff. The second subsystem belongs to nurses and allows entering primary medical information such as medical history, results of primary examinations, lists of medication and allergies, and immunization status. This subsystem should also allow nurses making prescriptions which they are authorized to do. The third subsystem belongs to doctors and allows entering all information about health status, health treatment, prescriptions, referrals to necessary tests and so forth. The fourth subsystem belongs to the laboratory staff and allows entering information about tests’ results. The fifth subsystem belongs to patients and allows entering information about desirable appointments and retrieving information about medical prescriptions, diagnoses and further appointments. Also system allows to patients makes initial evaluation prescribed medications.

Raw requirement

System must do following:

* Add and retrieve information about patients.
* Close patient data file for some reason (death, moving etc.)
* Retrieve information about estimated cost of drugs. And their availability in the drugstores.
* Look through medical history, tests’ results and so forth.
* Schedule and reschedule appointments.
* Provide communication between medical institutions and within the same medical institution.

System mustn’t do following:

* Delete information about patients.
* Allow to duplicate the appointment time of different patients to the same staff.
* Allow to duplicate the appointment time of the same patient to different staff.
* Allow to duplicate tests to different medical institutions simultaneously.

It would be nice for the system to do following:

* Connect to the drugstore system, in order to estimate the best cost of drugs and to calculate the cost of drugs for a chosen drugstore.
* Book prescribed drugs online.
* Allow to inform a patient about appointment via e-mail, phone message, call by robot
* Allow a patient to mode appointment’s date with desired doctors without confirmation in the real-time. In this case system shows patient all possible dates and time.
* Voice recognizing system for nurses and doctors for filling in patient files

Functional requirements

Input:

* General information about patients
  + First name
  + Second name
  + Date of birth
  + SSN
  + Insurance information
  + Contact information (address, phone, e-mail)
* Medical information about patients
  + Primary information (illnesses, allergies etc.)
  + Results of the initial examination
  + Anamnesis
  + Diagnosis
  + Prescriptions
  + Tests’ results
  + Referrals to necessary tests
* Related information
  + Date of appointment
  + Tests’ date arrival and departure

Output:

* Display general and medical information about patients (see below)
* Display name of drugstores where drugs can be purchased
* Display estimated cost of prescribed drugs
* Display patient’s medical history and tests’ history
* Display related information (appointment dates, test date)
* Display test results

Process:

* Find information about patients
* Find information about availability of prescribed drugs in drugstores
* Calculate estimated cost of drugs
* Store entered data in database
* Retrieve necessary information from database

Non-functional requirements

Performance:

* System must allow at least 500 users to work simultaneously.
* System is capable to update information in short time interval.
* Work on any computer architecture (Mac, PC)
* Provide the everyday back-up information
* System gets primary information according to some rules (name cannot contain numbers; SSN must have exactly 9 digits etc.)
* System must provide strict checking of entering information.
* Any run-time error during system’s execution is not allowed.

Security:

* Appearing of any subsystem types depends on user’s role in the system (login and password)
* All the queries to the database should be developed with prevention of the sql-injection
* Upper level staff can see information of lower level staff. Otherwise not allowed.
* System should avoid malicious behaviour

Requirement associations

* Upper level subsystems cannot be developed before lower level subsystems.
* Medical information about patients cannot be entered before general information
* Test referrals and test results cannot be entered before either general information or medical information
* Estimated cost of drugs cannot be calculate without prescription

Risk Management: Health Care System

Risk Management Plan:

Project can be issued with the following factors:

* Project scope
* Budget issues
* Business issues
* Scheduling
* Technical issues
* Human challenges
* Software issues

There are several organization units, which are responsible for the named factors:

* financial department
* HR department
* software Developer Company (in form of different departments)
* suppliers of software and hardware
* Principle client

All mentioned above challenges will be solved in the ways of:

* increasing financial support
* employing extra workers or evolving other departments to solve the problem
* Extra-hours working or external resources involved in project.

Identifications and analyzing of risks

Key-risks:

* Project’s scope risk.
* The change of demands to the application during the implementation and support-security phases, which might effect on the cost and the schedule deadlines of the project. It can be reasoned by the Principal client; the users of the application, as well as poorly realized preliminary-investigation phase of the project can impacted its realization. It leads to increasing the project‘s cost and deadlines scheduled for its completion.
* Technical risks.
* Development and implementation this application in a lot of Health Care Organization can get a problem in terms of old hardware and software, which conflicts with developed application and needs to be updated. It leads to increasing of the project’s cost.
* Access to the Internet has to be available and reliable for all devices, where current application will be installed, as the new releases of the current project can be provided through the Internet. In future as a Web-application, it can’t function without the Internet, otherwise the system won’t launch at all.

Medium-occur-risks:

* Software risk.
* During the developing of the project, the similar applications might be produced by other companies. Thus, the project might be cancelled or abandoned.

Low-occur-risks:

* Budget issues.
* Project can be under-estimated within the system planning phase. It might lead to decreasing of project’s functionality, cutting its possibilities, delaying some of the realization stages of the project or of the whole project.
* Human issues.
* Project might meet issues taking into account the needs of people in different levels. The end-user, the manager and other participants of the project won’t agree to collaborate with the developer team, or the developer team won’t survey, explain the project’s aims clearly or involve improperly people in development of the project. It leads to problems with extra modeling, prototyping and implementation, thus extra budgeting and scheduling are spent.

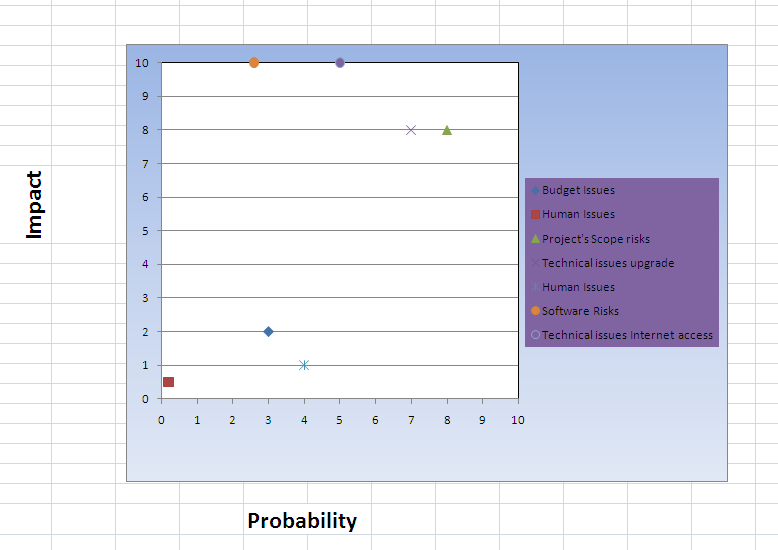
Risk response plan:

* Project’s scope risk. Responsible-preliminary investigation team of Software Developer Company. It has to use different approaches in their work, as well as different, simple and clear questionnaires, personal meetings and observing the procedures and tools that take place nowadays in medical institutions. If it occurs, the team has to organize fast and short extra investigations to correlate the project.
* Technical risks. Responsible - preliminary investigation team of Software Developer Company. It has to check all possible devices and software throughout the units, where Application will be installed with technical conclusion of the computers (quantity, price, and upgrade time). The team has to calculate this spending with reserved fund, if there is a need in modernization.
* Technical support team of Software Developer Company checks all the Internet connection within future Database Network and supplies preliminary investigation team with their conclusion. Support team also has to supply alternative possibilities.
* Software risk. Responsible- marketing department of Software Developer Company. It monitors the competitors, their projects, and the possibility of similar upcoming products. Marketing department has to find several available projects in realization in order to replace current ones in case of cancelation.
* Budget issues. Responsible-budget departments both of Software Developer Company and Principal Clients. They calculate, analyze, summarize spending, control financing of the whole project. They are responsible for sharing the reserved fund money to support different phases of the project in case of emergency situations (risk occasions).
* Human issues. Responsible- preliminary investigation team of Software Developer Company, HR Department of the client side. They organize meetings, interviews, surveys, in-person observations and training courses. If there is no possibility to consult the necessary people, they find and organize collaboration with other equivalent participants.

Monitor Risk:

During developing of the project, the regular meetings of all the departments will be organized. Within these meetings, the terms of realizations, (possible) issues, financing and development procedure will be discussed, negotiated and corrected. The new possible risk will be contoured and processed.

Risk Matrix:



Norm forms

1. **First Normal Form (1NF).**

**Functional dependency**

**Functional dependency**

**Functional dependency**

**Full dependency**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| positionid | positiondesc | qualifid | qualifdesc | testid | testresult | drugid | drugname | drugdosage | drug price | Availability | Patientid | PFname | PLname | PdateBirth | Pemail | Paddress | Zip | Pphone | Pmedcard | Pinssurance | Prescription | Anamnesis | Diagnosis | Staffid | StaffFname | StaffLname | StaffdateB | Staffemail | Staffaddress | Zip | Staffphone | DStoreid | DSname | DSaddress | DSphone | DSopenhour | Hospitalid | Hname | Haddress | Hphone | Labid | testarrivetime | testdeptime | Sheduleid | AppNextdate | AppLastdate | AppHistory |

**Partial dependency**

**Transitive dependency**

**Transitive dependency**

**Partial dependency**

**Partial dependency**

**Partial dependency**

**Transitive dependency**

**Transitive dependency**

**Transitive dependency**

**Transitive dependency**

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**nonkey columns**

**2: Tables in 2NF (No partial dependency)**

**Functional dependency**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Patientid** | PFname | PLname | PdateBirth | Pemail | Paddress | Zip | Pphone | Pmedcard | Pinssurance | Prescription | Anamnesis | Diagnosis | testid | testresult | Labid | testarrivetime | testdeptime | drugid | drugname | drugdosage | drug price | Availability | DStoreid | DSname | DSaddress | DSphone | DSopenhour |

**Transitive dependency**

**Transitive dependency**

**Transitive dependency**

**Transitive dependency**

**Transitive dependency**

**Functional dependency**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Staffid** | StaffFname | StaffLname | StaffdateB | Staffemail | Staffaddress | Zip | Staffphone | positionid | positiondesc | qualifid | qualifdesc |

**Transitive dependency**

**Transitive dependency**

|  |  |  |  |
| --- | --- | --- | --- |
| **Hospitalid** | Hname | Haddress | Hphone |

|  |  |  |  |
| --- | --- | --- | --- |
| **Sheduleid** | AppNextdate | AppLastdate | AppHistory |

**3: Tables in 3NF (No transitive dependency)**

Position

|  |  |
| --- | --- |
| **positionid** | positiondesc |

Qualification

|  |  |
| --- | --- |
| **qualifid** | qualifdesc |

Tests

|  |  |
| --- | --- |
| **testid** | testresult |

Drugs

|  |  |  |  |
| --- | --- | --- | --- |
| **drugid** | drugname | drugdosage | drug price |

Patient General Information

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Patientid** | PFname | PLname | PdateBirth | Pemail | Paddress | Zip | Pphone | Pmedcard | Pinssurance |

Staff Information

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Staffid** | StaffFname | StaffLname | StaffdateB | Staffemail | Staffaddress | Zip | Staffphone | **positionid** | **qualifid** |

Drug Stores Information

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **DStoreid** | DSname | DSaddress | DSphone | DSopenhour | **drugid** |

Hospital Information

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Hospitalid** | Hname | Haddress | Hphone | **Staffid** |

Laboratory

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Labid** | testarrivetime | testdeptime | **Hospitalid** | **Patientid** | **Staffid** | **testid** |

Schedule

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sheduleid** | AppNextdate | AppLastdate | AppHistory | **Patientid** | **Staffid** |

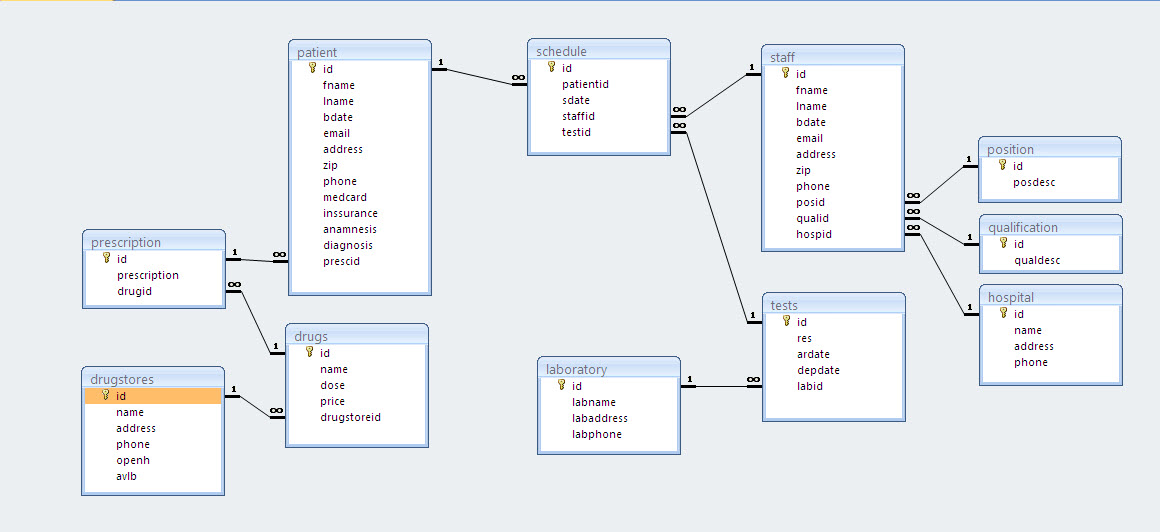
Patient Treatment

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Sheduleid** | **Patientid** | Prescription | Anamnesis | Diagnosis | **Hospitalid** | **Staffid** | **testid** |

Availability

|  |  |  |
| --- | --- | --- |
| **DStoreid** | **drugid** | availability |

Entity Relation Model: Health Care System



Data Dictionary: Health Care System

**Entity: Position.** This table contains information about the position of the staff and its description.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Field Name** | **Description** | **Type** | **Specification** | **Default** | **Required** | **Unique** | **Key(s)** |
| **id** | Number generated automatically | integer | 7 numeric characters |  | Yes | Yes | PK |
| **posdesc** | Description of the position(post) | character | 30 alpha-numeric characters |  | Yes | No |  |

**Entity: Qualification.**  This table contains information about the qualification of the staff and its description.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Field Name** | **Description** | **Type** | **Specification** | **Default** | **Required** | **Unique** | **Key(s)** |
| **id** | Number generated automatically | integer | 7 numeric characters |  | Yes | Yes | PK |
| **qualdesc** | Description of the qualification.(Qualification title) | character | 30 alpha-numeric characters |  | Yes | No |  |

**Entity: Laboratory.**  This table contains information about the tests processing at a laboratory.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Field Name** | **Description** | **Type** | **Specification** | **Default** | **Required** | **Unique** | **Key(s)** |
| **id** | Number generated automatically | integer | 5 numeric characters |  | Yes | Yes | PK |
| **labname** | The name of the laboratiry | character | 30 alpha-numeric characters |  | Yes | No |  |
| **labaddress** | The address of the laboratory | character | 30 alpha-numeric characters |  | Yes | No |  |
| **labphone** | The phone number of the laboratory | character | 17 alpha-numeric characters |  | Yes | Yes |  |

**Entity: Tests.**  This table contains information about the tests results.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Field Name** | **Description** | **Type** | **Specification** | **Default** | **Required** | **Unique** | **Key(s)** |
| **id** | Number generated automatically | integer | 20 numeric characters |  | Yes | Yes | PK |
| **res** | Description of the results of the test | character | 1000 alpha-numeric characters |  | Yes | No |  |
| **ardate** | The date, when the test was delivered | Date | “MM/DD/YYYY”  format |  | Yes | No |  |
| **depdate** | The date, when the test was sent back | Date | “MM/DD/YYYY”  format |  | Yes | No |  |
| **labtid** | Laboratory information (as an id from laboratory entity) | integer | 5 numeric characters |  | Yes | No | FK |

**Entity: Drugstores.**  This table contains information about the drugstores.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Field Name** | **Description** | **Type** | **Specification** | **Default** | **Required** | **Unique** | **Key(s)** |
| **id** | Number generated automatically | integer | 5 numeric characters |  | Yes | Yes | PK |
| **name** | Name of the drugstore | character | 30 alpha-numeric characters |  | Yes | No |  |
| **address** | Address of the drug store | character | 30 alpha-numeric characters |  | Yes | No |  |
| **phone** | Phone of the drug store | character | 17 alpha-numeric characters |  | Yes | Yes |  |
| **openh** | Open hours of the store | character | 10 alpha-numeric characters |  | Yes | No |  |
| **avlb** | A letter showing the availability of a drug | character | 1 character (‘N’/’Y’) format | ‘N’ | Yes | No |  |

**Entity: Drugs.**  This table contains information about the drugs name, dosage and the price.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Field Name** | **Description** | **Type** | **Specification** | **Default** | **Required** | **Unique** | **Key(s)** |
| **id** | Number generated automatically | integer | 5 numeric characters |  | Yes | Yes | Composite PK |
| **name** | Name of the drug | character | 30 alpha-numeric characters |  | Yes | No |  |
| **dose** | Dosage and format of the drug | character | 30 alpha-numeric characters |  | Yes | No |  |
| **price** | Number | double | (6.2) floating-point number with 6 whole parts and 2 fractional parts |  | Yes | No |  |
| **storeid** | Number | integer | 5 numeric characters |  | Yes | No | Composite PK |

**Entity: Prescription.**  This table contains information about the patients’ prescriptions.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Field Name** | **Description** | **Type** | **Specification** | **Default** | **Required** | **Unique** | **Key(s)** |
| **id** | Number generated automatically | integer | 10 numeric characters |  | Yes | Yes | PK |
| **prescription** | Information about prescriptions made for a patient | character | 1000 alpha-numeric characters |  | No | No |  |
| **drugid** | Number generated automatically | integer | 5 numeric characters |  | Yes | No | FK |

**Entity: Patient.**  This table contains general information about the patient.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Field Name** | **Description** | **Type** | **Specification** | **Default** | **Required** | **Unique** | **Key(s)** |
| **id** | Number generated automatically | integer | 11 numeric characters |  | Yes | Yes | PK |
| **fname** | Patient’s first name | character | 30 alpha-numeric characters |  | Yes | No |  |
| **lname** | Patient’s last name | character | 30 alpha-numeric characters |  | Yes | No |  |
| **bdate** | Patient’s date of birth | Date | “MM/DD/YYYY”  format |  | Yes | No |  |
| **email** | Patient’s e-mail | character | 30 alpha-numeric characters |  | No | Yes |  |
| **address** | Patient’s address | character | 30 alpha-numeric characters |  | Yes | No |  |
| **zip** | Patient’s ZIP code | character | 7 alpha-numeric characters |  | Yes | No |  |
| **phone** | Phone of the drug store | character | 17 alpha-numeric characters |  | Yes | Yes |  |
| **medcard** | Patient’s medical card number | character | 15 alpha-numeric characters |  | Yes | Yes |  |
| **inssurance** | Patient’s insurance number | character | 300 alpha-numeric characters |  | No | Yes |  |
| **anamnesis** | Description of patient’s anamnesis | character | 3000 alpha-numeric characters |  | Yes | No |  |
| **diagnosis** | Information about patien’s diagnosis | character | 100 alpha-numeric characters |  | No | No |  |
| **prescid** | Information about prescription(as an id from prescription entity) | integer | 10 numeric characters |  | Yes | No | FK |

**Entity: staff.**  This table contains information about the staff.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Field Name** | **Description** | **Type** | **Specification** | **Default** | **Required** | **Unique** | **Key(s)** |
| **id** | Number generated automatically | integer | 7 numeric characters |  | Yes | Yes | PK |
| **fname** | Employee’s first name | character | 30 alpha-numeric characters |  | Yes | No |  |
| **lname** | Employee’s last name | character | 30 alpha-numeric characters |  | Yes | No |  |
| **bdate** | Employee’s date of birth | Date | “MM/DD/YYYY”  format |  | Yes | No |  |
| **email** | Employee’s email address | character | 30 alpha-numeric characters |  | No | Yes |  |
| **address** | Employee’s address | character | 30 alpha-numeric characters |  | Yes | No |  |
| **zip** | Employee’s ZIP code | character | 7 alpha-numeric characters |  | Yes | No |  |
| **phone** | Employee’s phone | character | 17 alpha-numeric characters |  | Yes | Yes |  |
| **posid** | Employee’s position (as an id from the position entity) | character | 7 alpha-numeric characters |  | Yes | No | FK |
| **qualid** | Employee’s qualification (as an id from the qualification entity) | character | 7 alpha-numeric characters |  | Yes | Yes | FK |
| **hospid** | Information about hospital(as an id from hospital entity) | integer | 5 numeric characters |  | Yes | No | FK |

**Entity: hospital.**  This table contains information about the hospital.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Field Name** | **Description** | **Type** | **Specification** | **Default** | **Required** | **Unique** | **Key(s)** |
| **id** | Number generated automatically | integer | 5 numeric characters |  | Yes | Yes | PK |
| **name** | Name of the drugstore | character | 30 alpha-numeric characters |  | Yes | No |  |
| **address** | Address of the drug store | character | 30 alpha-numeric characters |  | Yes | No |  |
| **phone** | Phone of the drug store | character | 17 alpha-numeric characters |  | Yes | Yes |  |

**Entity: schedule.**  This table contains information about schedule of appointments of a certain patient to a certain medical staff.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Field Name** | **Description** | **Type** | **Specification** | **Default** | **Required** | **Unique** | **Key(s)** |
| **id** | Number generated automatically | integer | 7 numeric characters |  | Yes | Yes | Composite PK |
| **patientid** | Information about patient (as an id from patient entity) | integer | 11 numeric characters |  | Yes | No | Composite PK |
| **sdate** | The date, when the next appointment is scheduled | Date | “MM/DD/YYYY”  format |  | Yes | No |  |
| **staffid** | Staff information (as an id from staff entity) | integer | 7 numeric characters |  | Yes | No | FK |
| **testid** | test information (as an id from tests entity) | integer | 20 numeric characters |  | Yes | No | FK |

1. Medscape EHR Report 2012: Physicians Rank Top EHRs between 21,202 respondents across 25 specialties. [↑](#footnote-ref-2)