IPRO 340

Design of a Green Community Health Center of the Future

Sponsor Report

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Introduction

The quality of health care is progressing and, as technology advances, new cures and medical practices are emerging, reshaping the role of health care centers for their communities. Our project team (IPRO 340) sought to address the issue of implementing the physical implications of these innovative practices into community health care center design. Our objective was to utilize research of process maps and state of the art technology as well as information gathered from site visit observations and previous audits to design a green community health care center for the future.

Executive Summary

Our work during this semester was divided into two phases: the first phase was to research and understand the flow and needs of a community health care center and explore innovative state of the art technologies that can improve the efficiency of the facilities; the second was to design a community health care center based on our research.

The following five different processes of a community health care center were researched and mapped using swim lane diagrams: registration, examination, laboratory work, referral, and discharge. Our research consisted of site visit observations, interviews with Access staff members, and study of Lean (waste reducing) principles. The objective of the process maps was to develop and understanding of patient and data flow and how they affect facility design.

Our research of state of the art technology covered four different categories: infection control, information technology, medical technology, and sustainable technology. The research consisted of interviews with professionals with knowledge of the current trends in medical technology, visiting websites of companies developing new technologies, and studying journal articles related to emerging technology. The objective of the state of the art research was to determine the direction of technology in five to ten years and to understand how the incorporation of the advances in technology can benefit community health care centers.

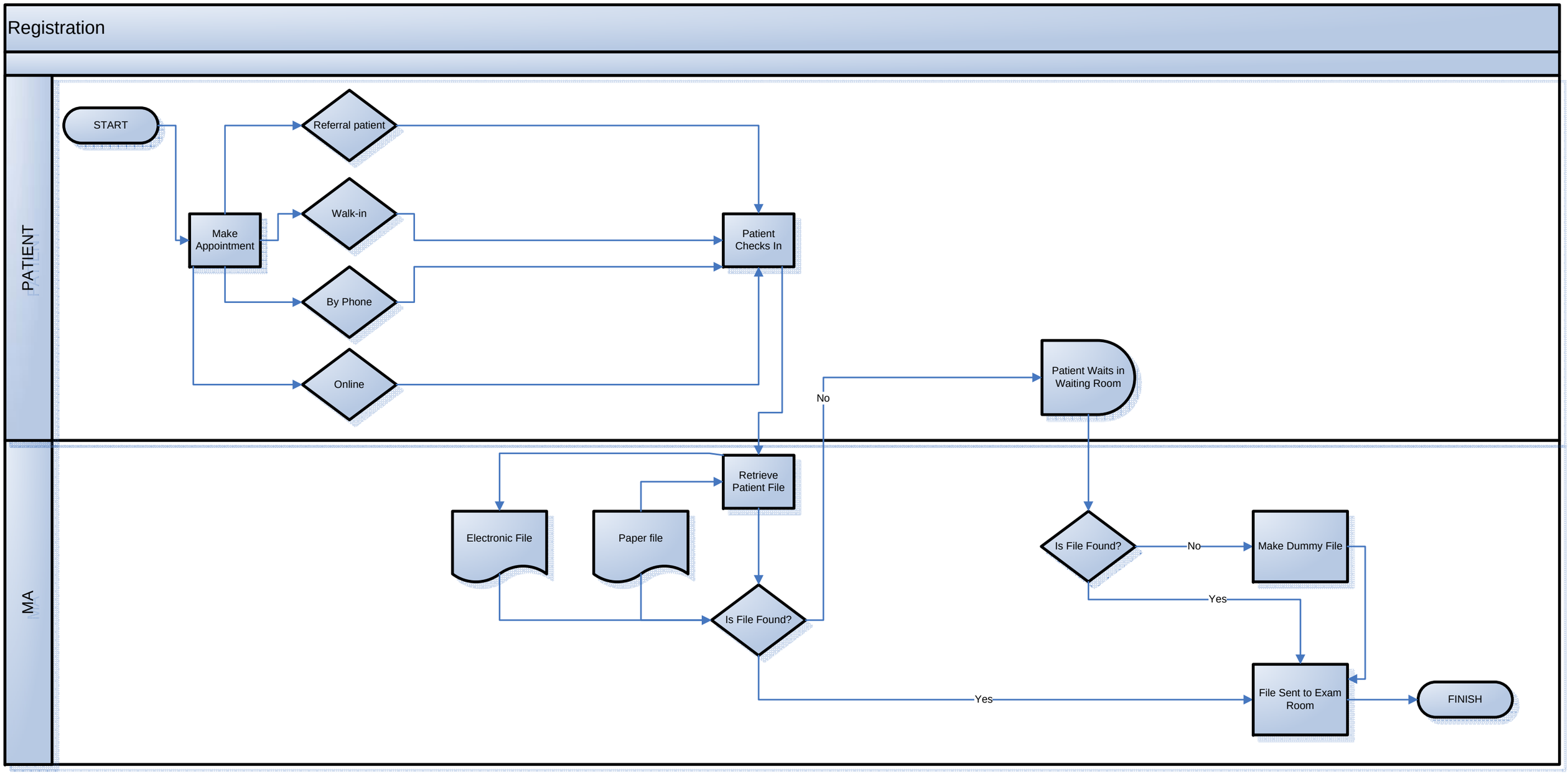
Following the development of process maps and the research of state of the art technology, our team sought to use these things to develop building designs for a community health care center. The final products are two building designs, one that is long and narrow and another that is nearly square. The designs incorporate new technologies, Lean principles, and adjacency diagrams based on our ideal process maps, and are expandable and contractible, allowing them to be implemented with varying capacities. Both designs were built around the following objectives: open communication, healing environment, incorporation of new technologies, pediatric/geriatric specific care, scalability of design, sustainability, privacy, Lean principles, and security.

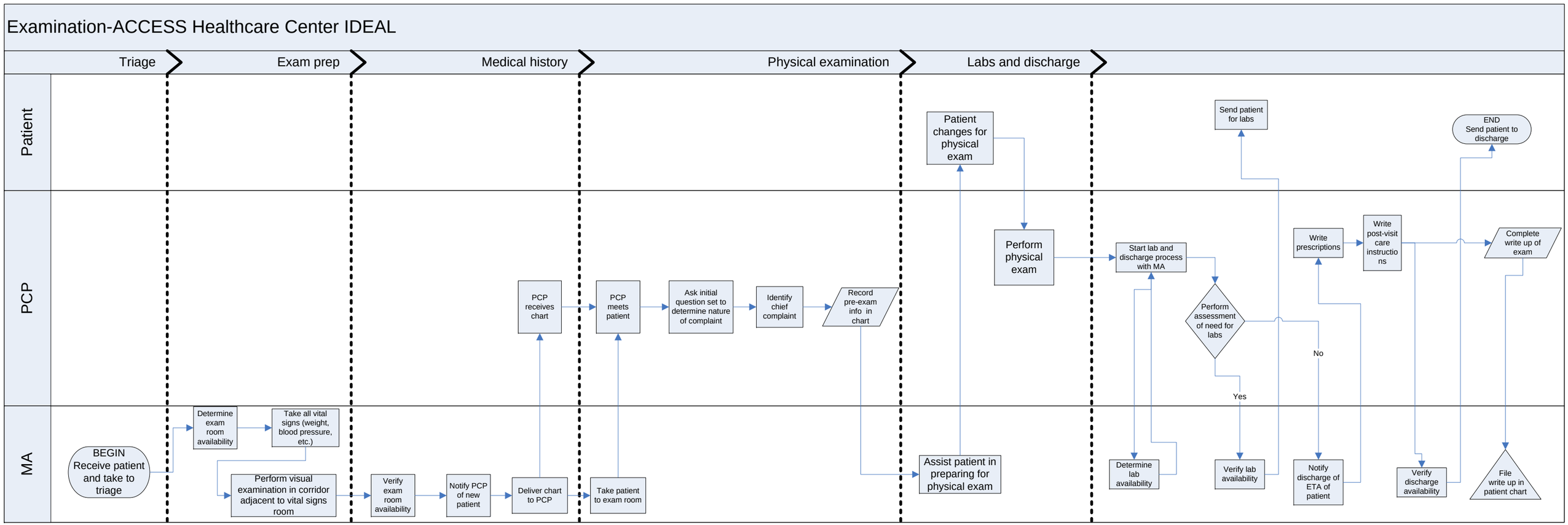
Site Visits

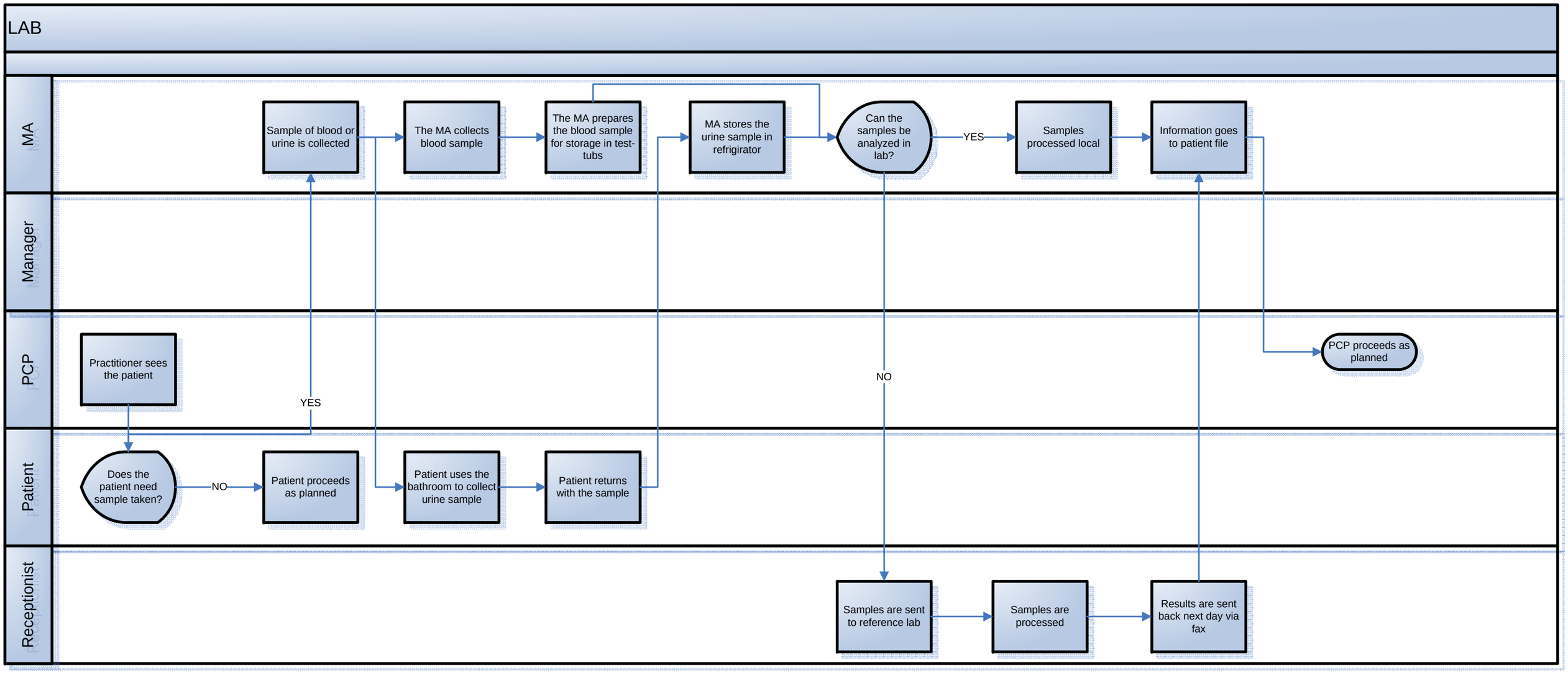
Site visits to the three Access community health care centers provided the preliminary research for the process mapping team and for understanding the needs of a health care center. The four sites selected were the Booker, Brandon, Hawthorne, and Genesis. These sites provided different perspectives on the needs and functions of health care centers. From the site visits, the team developed a better understanding of how a community health care center operates the different processes that exist in health care facilities. When the team visited the Genesis Center for Health and Empowerment, we were able to observe how current facilities implement innovative technology and other characteristics to maximize efficiency and effectiveness of the services provided.

Process Maps

Our objective in process mapping was to analyze existing processes at healthcare facilities and to develop an ideal process map for the processes. The five different processes the team focused on were registration, examination, discharge, laboratory work, and referrals. The team utilized research gathered from site visit observations, interviews with Access staff, and Lean principles to develop the ideal process maps. The team consulted Access' Performance Improvement and System Redesign director, Bessie Harris, to better understand the many different ways the processes can be improved, their efficiency maximized, waste minimized, and how the processes flowed. The process maps illustrate the flow and duties of patients and staff, and how their interactions affect each other. The process maps were used as a reference in the facility design phase, when the team focused on how to orient different areas and how to best implement the Lean principles into the design.


Registration
PATIENT
START
Referral patient
Make Appointment
Walk-in
By Phone
Online
Patient Checks In
No
Patient Waits in Waiting Room
MA
Retrieve Patient File
Electronic File
Paper file
Is File Found?
Is File Found?
No
Make Dummy File
Yes
Yes
File Sent to Exam Room
FINISH


Examination-ACCESS Healthcare Center IDEAL
Triage
Exam prep
Medical history
Physical examination
Labs and discharge
Patient
PCP
MA
BEGIN Receive patient and take to triage
Determine exam room availability
Take all vital signs (weight, blood pressure, etc.)
Perform visual examination in corridor adjacent to vital signs room
Verify exam room availability
Notify PCP of new patient
Deliver chart to PCP
PCP receives chart
PCP meets patient
Take patient to exam room
Ask initial question set to determine nature of complaint
Identify chief complaint
Record pre-exam info in chart
Patient changes for physical exam
Assist patient in preparing for physical exam
Perform physical exam
Start lab and discharge process with MA
Determine lab availability
Perform assessment of need for labs
Yes
Verify lab availability
Send patient for labs
No
Write prescriptions
Notify discharge of ETA of patient
Write post-visit care instructions
Verify discharge availability
END Send patient to discharge
Complete write up of exam
File write up in patient chart


LAB
MA
Manager
PCP
Patient
Receptionist
Sample of blood or urine is collected
The MA collects blood sample
The MA prepares the blood sample for storage in test-tubs
MA stores the urine sample in refrigirator
Can the samples be analyzed in lab?
YES
Samples processed local
Information goes to patient file
PCP proceeds as planned
Practitioner sees the patient
YES
NO
Does the patient need sample taken?
NO
Patient proceeds as planned
Patient uses the bathroom to collect urine sample
Patient returns with the sample
Samples are sent to reference lab
Samples are processed
Results are sent back next day via fax

Ideal Referral Process

Provider

Order Patient Referral- Fill out **Standard Referral Form** **I**ndicate Type of Referral Needed

Indicate Patient is waiting and Give Chart and Referral form to M.A.

Patients

Give Time Available for Referral and Follow-up Visits

Make Follow-Up Appt. upon Checking out

Waiting for Referral

Patient Check-Out

Receives Referral Appointment Information

Medical Assistants

Finish **Standard Referral Form** with Patients Chart, add available times, place into Referral Log Binder

Fill-Out **Referral Log Sheet**, add follow-up appointment, and referral information

Check if Referral is available with Access, with Access Partners, or outside Access and schedule appointment using the clinic lists

Add Referral Appointment to **Referral Log Sheet**

Is Referral Approval Needed?

Yes

NO

Allow Patient to Leave-Will Call with Appointment

Fax Standard Referral Form to Access Managed Care and wait for Approval

Mark Referral as Pending Approval

Receive Authorizations

Send all Referral Appointment Information to Patient and Mark on Referral Log Sheet information was sent

Give Patient Reminder Call 2-5 Days before Referral Appointment

Schedule Appointment with Central Scheduling

Complete **Referral Log Sheet**

Fax **Standard Referral form** to Referral Clinic

Give Patient Copy of Referral and Letters of Appt. Confirmation

Referral LOG- Log Referral by Patient Last Name

File a Copy of Referral in Chart – Place a Copy in Red Out-guide for Chart

Central Scheduling

Send Letter of Appointment Confirmation

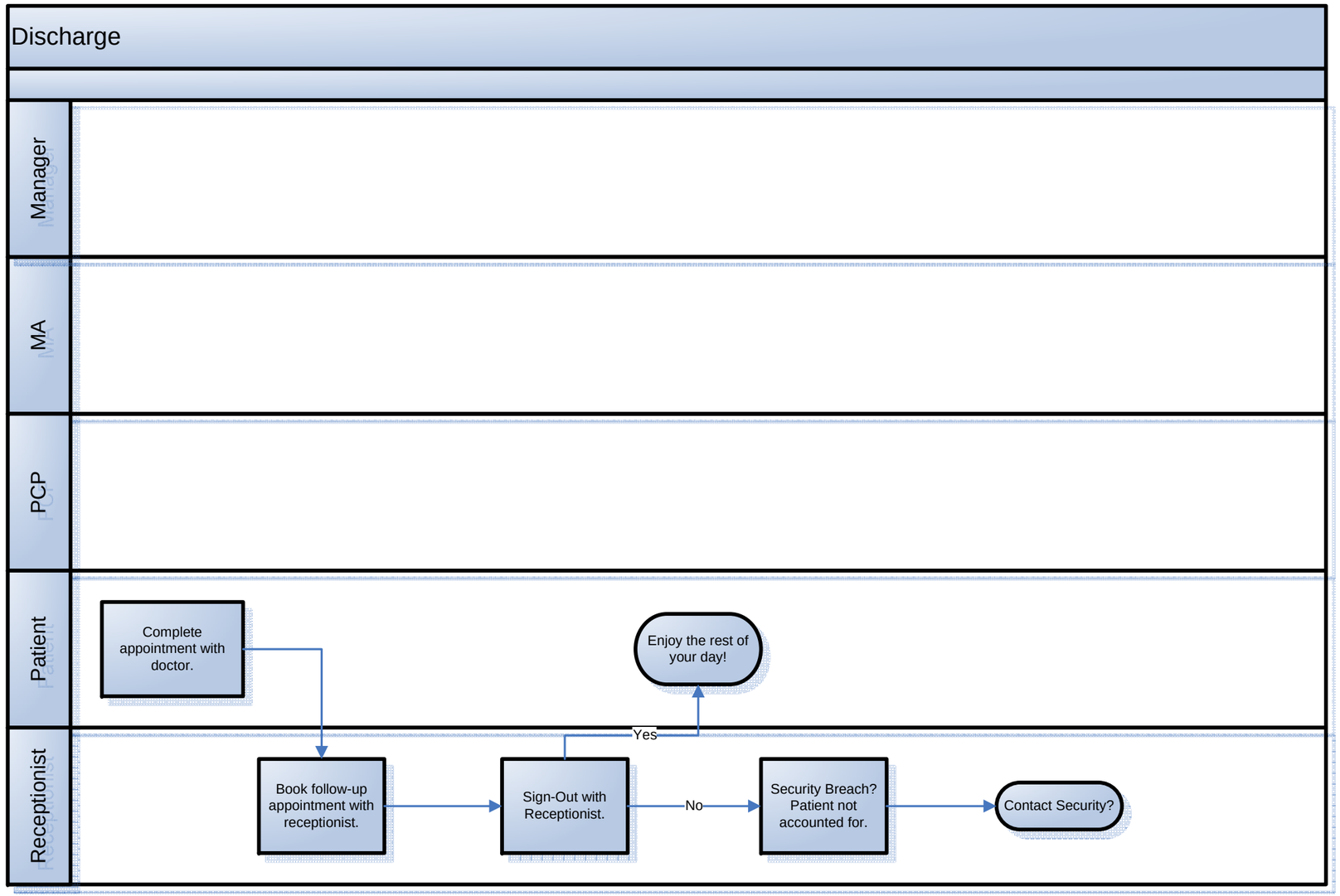
Chart Manager

File Patient's Chart

Referral Verifier

Process Referral- Send Authorization (3-7 days)

Send Authorization


Discharge
Manager
MA
PCP
Patient
Receptionist
Complete appointment with doctor.
Enjoy the rest of your day!
Yes
Book follow-up appointment with receptionist.
Sign-Out with Receptionist.
No
Security Breach? Patient not accounted for.
Contact Security?

State of the Art Technology

To aid the design of an efficient and effective health center, we researched emerging technology and technology trends and the way that they can be incorporated into the design of a future community health center. There were four areas of research the team focused on: infection control, information technology, medical technology, and sustainable technology. The team researched current technologies available at state of the art health care facilities and also interviewed professionals who have knowledge of the current trends in medical technology. The team developed a final report that focused on the top technologies to be included into the final design of the facility.

Infection Control

Touch-free Technology

Touch-free technology in a rest room is essentially a motion sensor that turns on and off water fixtures. It has one distinct advantage of not allowing a person to touch the surfaces that other people had previously touched, reducing the risk of spreading diseases from one person to the next. Bacteria and viruses lives in an infected body and risk spreading those bacteria and viruses whenever this infected body secretes bodily fluid (blood, saliva, urine, pus, feces). So the rest room of a healthcare center has a high risk of spreading diseases. Sadly, not everybody washes their hand after using the bathroom, and those that do, may not wash their hands correctly. Using soap is quite an important part of clean hands. While working in a high risk environment like a healthcare center, people are not aware of the risk of spreading bacteria and viruses, so unless one is trained, the risk of contamination is still present.

Touch-free technology is usually battery operated, and the electrical system can be redesigned so it can accommodate the technology without the need of periodical maintenance. Touch free technology on faucets, whether it is on a timer on not, can save up to 70% of water related costs. There are distinct advantages to touch-free technology; It can be applied to more than the faucet; it can also be applied to the toilet flush; soap and towel dispenser; and also to doors. Though we have to keep in mind that if we are to install automatic sliding door that the toilet stall should not be visible from the hallway.

The disadvantages of touch free technology primarily involve the replacement cost of hardware associated to the, such as the mixing valve (for the adequate water temperature), and the battery pack. Though if the battery pack were to be replaced by AC current there would be less maintenance as you would not have to replace periodically the battery.

Schroades, Renee L., Restroom Revolution: Touchfree, Low-flow, Infrared and Waterless. Facilities .com

Room Sterilizer

There are many types of room sterilizers, but hydrogen peroxide is one the most environmentally safe on the market and still effective enough disinfect an entire room using only it's vapor. It is much safer than irritant chemical sterilizers, such as glutaraldehyde or ortho-phthalaldehyde (OPA), which are also known to harm the environment.

One of the most advanced kind of machine room sterilizer's, is the VaproSure room sterilizer manufactured by Steris. It is portable enough to, at the very least, be carted into the room that is to be disinfected. There are four phases of the Steris's system: dehumidification, conditioning, sterilization, and aeration. In the dehumidification phase, the machine reduces the humidity in the room to ensure a dry safe environment; it cannot be operated with a person in the room, as the conditioning phase only works when the room is in a vacuum. In the

conditioning phase, the machine begins to vaporize the room with dry-vapor. In the sterilization, the machine continues to vaporizing until sterilant works effectively at eradicating viruses and bacteria. During aeration, the vaporization stop and breaks down into oxygen and water vapor.

One would want to make the system an integrated part in the design of a health care center by making them a permanent fixture in the system. But you would have to consider if you want to tackle the maintenance cost related to it. If the system is connected to the HVAC system and it breaks down. The whole facility would have to shut down, as it might be dangerous for patients and staff. But if a portable machine breaks down, another portable machine could easily replace it while the first one is being repaired.

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Information Technology

RFID

Radio Frequency Identification (RFID) is a technology that allows a tag or chip to be scanned and identified from a distance. Sensors send a signal to the RFID tag/chip and receive its unique digital signature. A tag or chip can therefore be identified by its unique digital signatures and located simply by knowing which sensor was able to read it[2]. If an RFID chip is embedded in equipment that monitors its own status by using a computer, that status can be transmitted through the chip to a sensor.

There are many applications for this technology in a community health center. RFID tags can be embedded into ID badges for both staff and patients, allowing patients to be accurately identified in the exam room and restricting sensitive areas of the building to qualified personnel. Expensive or sensitive equipment can be embedded with RFID chips not only to monitor their operational statuses, but also to trigger alarms if they are leaving the building.

Though more expensive[1] than alternatives, such as barcode scanning, magnetic ID badges, and WiFi tracking, RFID centralizes these things and is therefore more versatile in its applications. For example, patients can be tracked and identified by an RFID tag, whereas they can only be identified with other technologies, such as barcodes and magnetic IDs. RFID tags are passive, which means that they don't rely on internal power sources to operate. Because of this and the fact that they can be scanned from a distance; RFID ID badges can be longer lasting than magnetic strip ID badges, which wear down when they are swiped. One new RFID technology utilizes existing wireless infrastructures to track an RFID chip up to twelve miles away and through walls and other environmental obstacles[3].

The effects RFID will have on facility design depend on how far it is employed in identifying and tracking people and equipment. Sensors can be connected to the computer system for identifying and locating RFID transmitters. If RFID is used to restrict facility access, scanners will have to exist at every door. For patient identification, doctors will have to be able to scan a patient's ID tag, and the computer system will have to respond with the patient's medical records. For loss prevention, the computer system will have to be able to recognize when an RFID transmitter has been scanned in a restricted area (for example, if special medical equipment is scanned by the front door, the computer system must recognize that) and provide notification to the appropriate personnel. Finally, there will have to be some area of the clinic where programmable RFID tags are stored, and there will have to be a system

by which a newly registered patient can be assigned an ID tag.

Tablet PC's

Another technology that promises to be very useful in the medical field is the Tablet PC. Similar to the clipboard in the way that data is entered on it, it can be a natural transition for doctors from traditional paper data entry. New software can transform handwritten notes into typed text on the fly, allowing doctors to correct errors as they enter data. Wireless capabilities in the tablet allow doctors to access information, including digital health records as well as video and photographic data, during an examination[4]. The tablet is light and unobtrusive, and can be planted in a docking station to mimic a desktop computer environment.

An example of a Tablet PC that is designed for medical applications is the Motion C5 by Motion Computing. Its features include a RFID scanner, a barcode scanner, and a digital camera. Its splash-proof screen lends itself to easy disinfection. For security, doctors can log on using fingerprint or RFID identification. If a unit is lost or stolen, Motion Computing's data center can locate it and can even delete data remotely[5].

The impact this will have on health care center design is minimal if the center already employs a wireless network and digital health records. Without these things, there is little if any advantage in using the Tablet PC. If docking stations with keyboard and mice are put in every doctor's office, the clutter of the large, obtrusive desktop PC would be reduced. Finally, if an interoffice communication system is installed on the computers, doctors and staff could communicate with each other quickly and easily with their Tablet PC's.

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5. 22 Feb. 2008 <http://motioncomputing.com/products/tablet_pc_c5.asp>

Medical Technology

Hewlett Packard micro needle Patch

Hewlett Packard using the technology found in their inkjet printers has developed a drug delivery platform that enables painless, controlled release of one or more drugs in a single patch applied to the skin. The HP skin patch uses micro needles that barely penetrate the skin; this radically reduces discomfort compared to traditional hypodermic needles and enables the technique to be used with a much wider variety of drugs and biopharmaceuticals. The micro needles allow medication to quickly enter the bloodstream, resulting in the potential delivery of lower and more precise dosages.

The patch itself contains up to 90,000 micro needles per square inch, a microprocessors and a thermal unit. Medications contained in the patch is heated and then injected through the needles. Depending on how it is programmed, processors can monitor drug delivery, deliver

doses over extended periods of time or deliver drugs in response to a patient's vital signs such as blood pressure or heart rate.

The technology and equipment used to make the array of needles was adopted from HP's inkjet manufacturing. The heating element is also the same one used inside inkjet heads. The skin patch could be used to inject medicines painlessly through the skin from a patch on the arm. .

The device pushes drugs through tiny needles, which do not go far enough under the skin to trigger pain receptors. Conventional needles pass far beyond this into a layer called the dermis, which contains nerves which send a pain message when disturbed. These receptors are found approximately three-quarters of a millimeter under the skin surface, but the micro needles should only reach approximately half a millimeter at most, passing the stratum corneum without hitting the dermis. Since it is almost painless it reduces discomfort compared to traditional hypodermic needles. The feeling that you get when the medication is injected is the feeling you get when you are licked by a cat.

Another advantage of the HP patch is that multiple drugs can be on the same patch. It can deliver two different drugs at different times. For example: patch can deliver both insulin and glucagon in diabetics. Glucagon which counteracts the effects of insulin would be of great benefit to diabetics, as one of the greatest risks they face is an overdose of insulin.

This technology has the possibility to replace hypodermic needles or pills for delivering vaccine and medication. It could potentially deliver many drugs currently injected or taken daily dose and even the time of day a drug was injected could be controlled using a microchip. The chip enables precise control of dosage timing, as well as access to dosage history, patient activation mechanisms and inherent safety protocols for preventing adverse drug interactions

Patients will no longer need to remember to take medication at certain times of the day and be worried about the unwanted effects of missing a dosage. The chip can be programmed to send information to the doctor or pharmacy when the drug is about to run our so the patient will not need to see the doctor in the need of a new shot. The doctors will also be able to control the dosage of a drug that the patient takes remotely. This is very useful when administering vaccinations which require a period of time between shots. Patients will no longer have to visit the medical center 3 or more time to finish their vaccination. Patch will know when to inject the vaccination.

The patch will change the medical center by decreasing the amount of patients in the facility. Patients that are now there for shots only will no longer be required to come in for a visit which will also allow doctors to get through more patients and help ones with the serious need. Since the Patch produces no biohazard materials that need to be stored and disposed of properly. Nurses will no longer have to worry about possibility of receiving diseases from the blood of a patient as well as patient reaction to the pain of needle injection; this will make it safer and more comfortable for both the patient and a nurses. It is also easier for the kids since it causes no pain. This will make medical center a more comfortable environment all around.

Chip will allow the communication with a pharmacy when it will run out of medication, this way patient can directly go get more medication instead of seeing the doctor. Since it can deliver drugs in a response to a patient's vital signs it will prevent emergency visits, so doctors can focus on patients with different issues.

Aerosol Vaccine

Roughly a third of all vaccine injections done in developing nations are unsafe because of needles being reused or active ingredients becoming warm. Each year, 250,000 incidents of HIV infection occur because of needle reuse. Aerovax, the Cambridge, Mass.-based company, has designed a system that can deliver a vaccine through an inhaled, aerosol spray. One person

can carry the Aerovax system and provide inoculations for seven days in the field before reloading. Aerosol vaccines have been hailed for their potential in the developing world, where lack of trained personnel, problems with hygienic supplies and social acceptance issues are barriers to conventional, injected vaccines.

Aerosol method could be particularly useful in vaccinating against diseases that enter the body through mucous membranes, such as genital herpes, human papilloma virus, hepatitis B and HIV.

Vaccine administer in this way is safe and absorbed mainly into the respiratory tract and lungs, rather than the brain or eyes where they could cause damage. They also elicited a "robust and long lasting" immune response. Benefit of aerosol vaccines is that they provide immunity both in the mucosal tissue that pathogens invade and the rest of the body unlike most injected vaccines.

One of the advantages of using the Aerosol Vaccine is that it does not require electrical power to work. There is no need to plug it into any power source and so it can be taken everywhere. It also does not create biohazard which would need a proper storage and the small size means that big room in not required for storage.

Simple inhaler provides an ease of delivery to patients, especially small kids and elderly because it is completely painless. It will ease the patients discomfort because it is completely noninvasive, since there is no hypothermic needle used to administer the medication. In addition optimal way of introducing an aerosol vaccine is though nasal breathing, which is more suitable for geriatric and pediatric populations. This will be a great help with kids who are afraid of needles because of the pain, it will allow for more cooperation and faster time to get through the patients.

The device is very portables because of its small size. It is also very quick to use, requiring seconds to apply. Aerosol Vaccine is also very simple to use, only minimal training required and no additional time spend preparing the medication which allows getting though patients faster. Doctors can keep it with them and administer medication faster.

Since Aerosol Vaccination can be stored at a room temperature medical clinic will save money by not needing extra cooling equipment which takes up space and wastes energy. There is also no need for biohazard room since there is not dangerous waste created by the device.

Breath Analyzer

A new upcoming technology which had great application in the medical centers is a breath analyzer that would detect the presence of specific compounds associated with various diseases, including cancer. The system works by analyzing all the component chemicals and compounds that make up a patient's breath. The GCMS-TD *(*Gas Chromatography, Mass Spectrometry and Thermal Desorption*)* creates a breath profile, which allows identifying VOCs (volatile organic compounds) that may signify the presence of a disease.

High concentrations of certain VOCs in breath can correlate with disease. The odor of 'pear drops' esters and acetone in relation to diabetes, ammonia in relation to hepatitis, and dimethyl sulphide to cirrhosis. There are also certain compounds that seem to mark out particular types of cancer.

If unique markers for specific diseases can be recognized earlier than traditional techniques, then there is immense potential to revolutionize early disease diagnosis before any symptoms have developed, and without the need for invasive procedures. Volatile marker-based diagnostics offers new potential in the rapid diagnosis and monitoring of illnesses.

Breath test will provide a more convenient and rapid method for diagnosing serious diseases than blood or urine analysis, and will require minimal medical intervention. Breath samples are much easier to collect than blood and urine, for the patient as much as for the

person collecting the sample. They can be collected anywhere by people with no medical training, and there are no associated biohazard risks.

In the future this will lead to the development of simple diagnostic tools such as test strips that give positive results for specific illness markers, thereby reducing the cost and level of expertise for diagnosis.

Breath Analyzer provides fast results on the spot. Tests are done in house, so there is no need to wait for "third party" test results. Fast results would mean that there would be no need for the follow up visits to discuss the results.

Samples are easy to collect which would allow patient to be diagnosed before they see the doctor. A registration kiosk can be set up in which a patient can get registered and have his breath analyzed. Analyzer also provides early disease recognition for specific disease before any symptoms can develop, without the need for invasive procedures. This means that the treatment can start right away, before disease takes over the body, this would result in early successful treatment and no need for further visits and wasting other patient time. Since specific drugs can be administered for specific diseases there will be less potential for developing antibiotic resistant bacteria. This means that there will be no side effects like in general use drugs. No more patients will come with unwanted side effects that may need additional treatment.

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Sustainable Technology

Daylighting - http://en.wikipedia.org/wiki/Daylighting

Using natural light in a building offers simple integration into the design of the facility. It reduces the dependence on artificial light and thus conserves electrical energy and the cost of replacing light bulbs. Natural lighting also provides a dramatic effect on the perception of the

people in the building, patients and employees. It can make a normally drab room, such as an exam room, more cheerful and inviting. For interior rooms, skylights or light tubes can be used to light the space.

Active Lighting - http://en.wikipedia.org/wiki/Cfl_lamp - http://en.wikipedia.org/wiki/LED_lamp
A simple measure to save electrical energy is to replace old-fashioned incandescent lamps with CFLs (Compact Fluorescent Lamps) or LED (Light Emitting Diode) lamps. CFLs are extremely cost-effective across commercial building types and applications. On average, they offer an undiscounted net savings of about $22 per fixture per year per replacement of a 75W incandescent fixture. With an incremental initial capital investment of about $2 per fixture and a payback period of about one month. Savings are greater and payback periods shorter in regions with higher than average electric rates and, to a lesser extent, higher than average cooling requirements.
Higher efficiency lighting also reduces the resources required for sub-standard lighting. Use of certain lighting can change the appearance of rooms from cold and sterile to a more inviting atmosphere.

Geothermal - http://en.wikipedia.org/wiki/Geothermal_heat_pump
A geothermal heat pump system is a heating and/or an air conditioning system that uses the Earth's ability to store heat. These systems operate with the assumption of stability in the Earth’s underground temperatures; the ground a few feet below surface has a very stable temperature throughout the year, typically somewhere in range of 50-85 °F.
Using geothermal piping for heating and cooling can conserve both natural gas and electrical energy. Initial cost may be higher but savings in energy costs will be seen over time and Decision must be made early on to implement this technology due to it’s placement on the site.
Temperatures are usually much more stable than conventional heating and cooling solutions providing a much more comfortable environment
Will reduce maintenance costs for the facility due to its simplicity and it’s ability to switch between heating and cooling without laborious preparation
The initial cost of installing a Geothermal Heat Pump system can be two to three times that of a conventional heating system in most residential applications. In retrofitting, the cost of installation is affected by the size of the area, insulation characteristics, the geology of the area, and location of the property. For new construction, proper duct system design and mechanical air exchange should be considered in initial system cost. These systems can save 400-1400 US$/year for a typical home sized property, reducing the average heating/cooling costs by 35-70%.

Community Health Care Center Facility Design

For the second half of the semester, the team focused on developing prototype designs of a community health care center. Research gathered on both the process mapping, state of the art technology, and Lean principles (waste-reduction principles) were incorporated into the building designs. We developed nine main design objectives: open communication, healing environment, scalability of design, pediatric/geriatric specific care, state of the art technology implementation, sustainability, privacy, security, and waste reduction (Lean principles). The team developed two different designs, affectionately called the "Hotdog" and "Hamburger" designs, named so due to their shapes.

Program

This is the architectural program for our designs. It is simply a numerical representation of the space requirements for each area of the health center.

Spaces	**sf**	**quantity**			**total square footage**			**rough dimensions**
		SM	**MED**	**LG**	**SM**	**MED**	**LG**	
Reception/Discharge								
seating area	558 sf	1	1	1	558 sf	558 sf	558 sf	17' x 19'
pediatric seating area	220 sf	1	1	1	220 sf	220 sf	220 sf	22' x 10'
registration booths	11 sf	1	2	4	11 sf	22 sf	44 sf	3' x 3'-6"
info kiosk	13 sf	1	1	1	13 sf	13 sf	13 sf	4'-6" x 3'
security	35 sf	1	1	1	35 sf	35 sf	35 sf	7' x 5'
discharge station	30 sf	1	1	1	30 sf	30 sf	30 sf	5' x 4'-6"
registration	40 sf	1	2	4	40 sf	80 sf	120 sf	3'-6" x 5'
toilets	125 sf	1	2	3	125 sf	250 sf	375 sf	12'-2" x 10'
technology room	120 sf	1	1	1	120 sf	120 sf	120 sf	10' x 12'
education room	200 sf	1	1	1	200 sf	200 sf	200 sf	20' x 10'
total					***1352 sf***	**1528 sf**	***1737 sf***	
Exam								
exam rooms	150 sf	6	12	24	900 sf	1800 sf	3000 sf	10' x 15'
open office		1	1	1				
triage room	150 sf	1	2	2	150 sf	300 sf	300 sf	10' x 15'
moveable MA stations	4 sf	4	8	10	16 sf	32	40 sf	2' x 2'
storage	135 sf	1	1	1	135 sf	135 sf	135 sf	9' x 15'
sterile storage	135 sf	1	1	1	135 sf	135 sf	135 sf	9' x 15'
patient toilet	63 sf	2	2	2	126 sf	126 sf	126 sf	9' x 7'
janitor	63 sf	1	1	1	63 sf	63 sf	63 sf	9' x 7'
vaccination room	120 sf	1	1	1	120 sf	120 sf	120 sf	9' x 10'
medicinal storage	30 sf	1	1	1	30 sf	30 sf	30 sf	5' x 6'
biohazard room	80 sf	1	1	1	80 sf	80 sf	80 sf	8' x 10'
biomedical room	100 sf	1	1	1	100 sf	100 sf	100 sf	10' x 10'
total					***1855 sf***	***2921 sf***	***4129 sf***	

Laboratory								
lab	167 sf	1	1	1	167 sf	167 sf	167 sf	14'-6" x 11'-6"
lab toilet	63 sf	1	1	1	63 sf	63 sf	63 sf	9' x 7'
waiting area	63 sf	1	1	1	63 sf	63 sf	63 sf	9' x 7'
sample pick-up		1	1	1				
total					***293 sf***	***293 sf***	***293 sf***	
Referral/Offices								
team leader	120 sf	0	1	2	0	120 sf	240 sf	10' x 12'
site manager	120 sf	1	2	2	120 sf	420 sf	120 sf	10' x 12'
full-time doctors	120 sf	1	4	8	120 sf	840 sf	960 sf	10' x 12'
part-time doctors	120 sf	1	1	1	120 sf	120 sf	120 sf	10' x 12'
special providers	120 sf	0	1	2	0	120 sf	420 sf	
special providers PT	120 sf	1	1	1	120 sf	120 sf	120 sf	
referral	100 sf	1	2	4	100 sf	200 sf	400 sf	
phone/appts.	100 sf	1	2	4	100 sf	200 sf	400 sf	
MA stations	90 sf	4	8	16	360 sf	720 sf	1440 sf	9' x 10'
conference room	500 sf	1	1	1	500 sf	500 sf	800 sf	40' x 20'
staff storage/kitchen	300 sf	1	1	1	300 sf	300 sf	300 sf	30' x 10'
library	100 sf	1	1	1	100 sf	100 sf	100 sf	10' x 10'
social workers office	100 sf	1	2	2	100 sf	200 sf	200 sf	10' x 10'
total					***2040 sf***	***3960 sf***	***5620 sf***	
Support Spaces								
electrical room	120 sf	1	1	1	120 sf	120 sf	120 sf	12' x 10'
mechanical room	250 sf	1	1	1	120 sf	120 sf	120 sf	25' x 10'
staff toilets	63 sf	2	2	2	126 sf	126 sf	126 sf	9' x 7'
total					***496 sf***	***496 sf***	***496 sf***	
TOTAL					6036 sf	9198 sf	12275 sf	

The “Hamburger”

Based on size and capacity requirements, the “Hamburger” design can be compressed or expanded as shown in Fig. 1.

Fig. 1: “Hamburger” compression and expansion

Fig. 2: Patient flow diagram

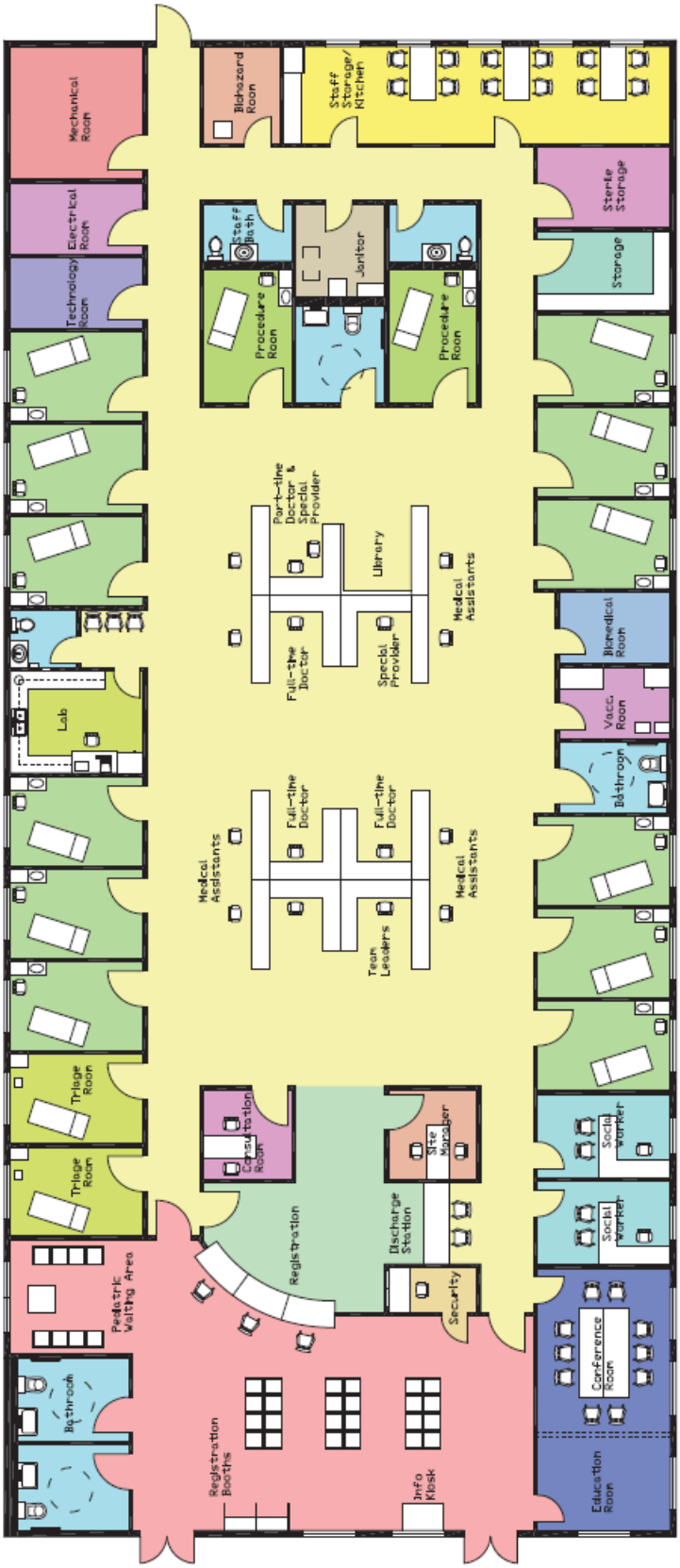
“Hamburger” Design Assumptions

- File rooms will not be necessary because of the implementation of a digital data infrastructure.
- The design will need to expand and contract.
- The “open office” design will produce a comfortable yet productive atmosphere, allowing fast and effective verbal and visual communication.
- The use of separate triage room will increase patient capacity and flow.
- New areas of the facility, such as the technology and biomedical rooms, will be required to facilitate the use of new technology.

“Hamburger” Design Objectives

- Employ day lighting in the design of each area of the clinic.
- Fully utilize an electronic file system, eliminating nearly all dependency on paper documents.
- Provide a consistent wireless network to clinical staff.
- Increase teamwork and productivity using the open-office layout.
- Eliminate unnecessary footwork by staff (both in vicinity of rooms as well as communication).
- Eliminate unnecessary wait time for patients and staff (due to information retrieval and patient flow).
- Protect patient privacy.
- Create a comfortable, relaxing environment for staff and patients.
- Create a productive work environment for staff.
- Keep public (patient-accessible) and private (staff-only) areas of the clinic separate.

The “Hotdog”


Mechanical Room
Electrical Room
Technology Room
Biohazard Room
Staff Storage/ Kitchen
Sterile Storage
Storage
Staff Bath
Janitor
Procedure Room
Procedure Room
Part-time Doctor & Special Provider
Library
Medical Assistants
Full-time Doctor
Special Provider
Lab
Biomedical Room
Vacc. Room
Bathroom
Medical Assistants
Full-time Doctor
Full-time Doctor
Medical Assistants
Team Leaders
Triage Room
Triage Room
Consultation Room
Site Manager
Social Worker
Social Worker
Registration
Discharge Station
Security
Pediatric Waiting Area
Conference Room
Bathroom
Registration Booths
Info Kiosk
Education Room

Based on size and capacity requirements, the “Hotdog” design can be compressed and expanded as shown in Fig. 3

Fig. 3: “Hotdog” compression and expansion

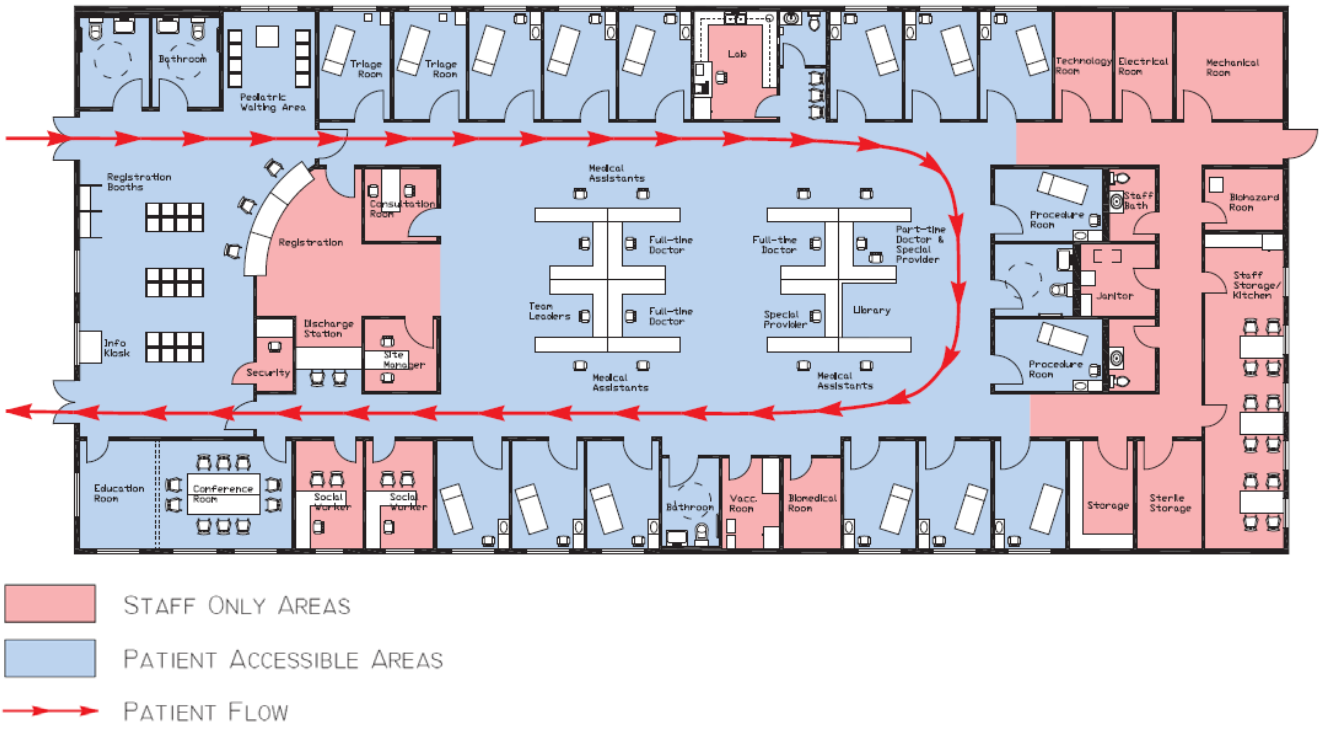


Fig. 4: Patient flow diagram

“Hotdog” Design Assumptions

- Compact middle size facility (3-4 doctors)
- File rooms no longer necessary since health center of the future will use electronic medical record.
- Future procedure rooms will not have to be bigger than exam rooms since medical equipment gets smaller with time.
- Meeting room will not be used all the time so the space can be used for different activity.
- Use of natural light to create more comfortable atmosphere and reduce energy usage.
- Small kids create a lot of noise so they need a separate area from the adults to not disrupt them.
- New spaces in the facility will be needed for future technology such as: technology room for electronically equipment, biomedical room for medical technology and registration kiosks.
- Future Health Center should promote open communication between its staff.
- There still will be public and private spaces in the health center.
- Elderly don't like to stand on their feet, they need chairs for registration
- Appointment will be shortened because of utilization of self-diagnostic equipment used in triage rooms

“Hotdog” Design Objectives

- Design a flexible floor plan that can expand as well as compress depending on the need of the facility.
- A health center with ability to change the sizes of certain rooms and create new spaces if required.
- Create a space with minimum amount of walking distance for the staff during their daily routines.
- Design and open environment in which staff can communicate efficiently and easily as well to be aware of their surroundings.
- Create two flow areas, one for the patients the other for the staff.
- Create a clear separation between public/private spaces, to provide staff with privacy
- Minimize traffic in the hallways and congestion
- Arrange working area so that providers and MAs know which area is theirs and can clearly see the signs on the doors