BioDesign Immersion Experience Comprehensive Need Statements							
Client	**Site**	**Observation**	**Problem**	**Primary Need**	***latent need**	**Secondary Need**	**Rank**
Brandon Young, Program Manager							
Brandon Young	Center for Independent Living on July 8th, 2016	Social security disability benefits discourage employment.	Social security disability benefits discourage employment.	Government benefits encourage employment.			4.80
		Good government healthcare disability benefits discourage employment.	Good government healthcare disability benefits discourage employment.				
Brandon Young	Center for Independent Living on July 8th, 2016	Paratransit is inefficient and overbooked.	Paratransit is inefficient and overbooked.	Paratransit is efficient.			3.60
Brandon Young	Center for Independent Living on July 8th, 2016	The process of signing up for paratransit is long and tedious.	The process of signing up for paratransit is long and tedious.	Signing up for paratransit is easy and efficient.			3.40
Brandon Young	Center for Independent Living on July 8th, 2016	People with mental disabilities are the largest group within the disabled population, but are generally the most neglected demographic.	People with mental disabilities are the largest group within the disabled population, but are generally the most neglected.	People with mental disabilities obtain proper assistance.			4.60
Brandon Young	Center for Independent Living on July 8th, 2016	Guide dogs get distracted occasionally.	Guide dogs are not always reliable.	Guides for disabled people are reliable.			3.00
Brandon Young	Center for Independent Living on July 8th, 2016	Private insurance does not cover most advanced devices.	Private insurance does not cover most advanced devices.	Insurance covers advanced devices.			2.80
Brandon Young	Center for Independent Living on July 8th, 2016	Most assistive technologies are paid for out of pocket.	Most assistive technologies are paid for out of pocket.	Assistive technologies are affordable.			4.60
Brandon Young	Center for Independent Living on July 8th, 2016	Retrofitting cars is expensive and cumbersome.	Retrofitting cars is expensive and cumbersome.	Retrofitting cars is inexpensive and convenient.			1.80
Brandon Young	Center for Independent Living on July 8th, 2016	There are few cars that are accessible to disabled drivers.	There are few cars that are accessible to disabled drivers.	Cars are accessible to disabled drivers.			2.60
Brandon Young	Center for Independent Living on July 8th, 2016	Technology and apps are not intuitive for older people.	Technology and apps are not intuitive for older people.	Modern technology and applications are intuitive for people of all age groups.			2.60
Brandon Young	Center for Independent Living on July 8th, 2016	People with speech impediments may not be able to make phone calls by themselves.	People with speech impediments may have difficulty communicating in real time remotely.	The device allows people with speech impediments to easily communicate remotely in real time.			1.60
Brandon Young	Center for Independent Living on July 8th, 2016	It is difficult to find staff trained in American Sign Language (ASL).	It is difficult to find staff trained in ASL.	It is easy to communicate with deaf people.			2.60
Brandon Young	Center for Independent Living on July 8th, 2016	People with cerebral palsy may have dexterity problems when doing daily chores, from laundry to cooking.	Daily tasks can be cumbersome for people with disabilities.	Daily tasks are easy for people with disabilities.		Daily tasks are easy for people with dexterity problems.	4.80
		Daily tasks can be cumbersome for people with disabilities. Feeding yourself with a tremor is difficult.					4.80
Brandon Young	Center for Independent Living on July 8th, 2016	Visually impaired people are not allowed to drive.	Visually impaired people are not allowed to drive.	Visually impaired people have convenient, affordable, and fast transportation options.			3.60
Tyler Heckendorn, AT Coordinator							
Tyler Heckendorn	Center for Independent Living on July 8th, 2016	Wheelchairs must be braked by hand which is painful and inconvenient.	Wheelchairs must be braked by hand which is painful and inconvenient.	Braking a wheelchair is convenient and painless.			3.80
Tyler Heckendorn	Center for Independent Living on July 8th, 2016	The Firefly is difficult to fit and back into elevators.	The Firefly is difficult to maneuver in small spaces such as elevators.	The Firefly is easy to use.		The Firefly is maneuverable is small spaces.	3.60
		Tyler can't see behind him, so he doesn't like reversing.	People cannot see behind themselves when using the firefly.			The Firefly allows users to reverse safely.	
		The Firefly cannot turn on a dime the way wheelchairs can.	The Firefly cannot turn in all directions.			The Firefly turns in all directions.	
		The Firefly cannot fit under most desks.	The Firefly cannot fit under most desks.			The Firefly fits under desks.	
		The Firefly is somewhat heavy.	The Firefly is somewhat heavy.			The Firefly is light.	
		The three wheeled design of the Firefly makes it unstable at high speeds.	The Firefly is unstable at high speeds.			The Firefly is stable at high speeds.	
		The Firefly is not collapsible.	The Firefly is not collapsible.			The Firefly is collapsible.	
		The Firefly is squeaky.	The Firefly is squeaky.				
		The Firefly takes 4 to 6 hours to charge.	The Firefly takes 4 to 6 hours to charge.			The Firefly charges fast.	
		The Firefly has a reflective light, but no headlights.	The Firefly has a reflective light, but no headlights.			The Firefly has headlights.	
Tyler Heckendorn	Center for Independent Living on July 8th, 2016	Manual wheelchairs do not have great locking systems. Tyler complained about them while trying to use Bart.	Manual wheelchairs do not have great locking systems.	Manual wheelchair locking systems are reliable.			3.40
Tyler Heckendorn	Center for Independent Living on July 8th, 2016	Uber doesn't provide disability training for drivers.	Uber doesn't provide disability training for drivers.	All ride-share services provide disability training.			2.80
Tyler Heckendorn	Center for Independent Living on July 8th, 2016	Powered wheelchairs are bulky.	Powered wheelchairs are bulky.	Powered wheelchairs are compact.			3.60
Tyler Heckendorn	Center for Independent Living on July 8th, 2016	Powered wheelchairs are heavy.	Powered wheelchairs are heavy.	Powered wheelchairs are light.			3.20
Tyler Heckendorn	Center for Independent Living on July 8th, 2016	Electronic wheelchair users can't use ride-share services such as Uber and Lyft.	Electronic wheelchair users can't use ride-share services such as Uber and Lyft.	Ride-share services accommodate electronic wheelchair users.			3.00
Tyler Heckendorn	Center for Independent Living on July 8th, 2016	Wheelchairs are very bumpy when going over small obstacles or cracks. There is little or no shock absorber or suspension, which is particularly bad for frailer wheelchair users, such as patients with muscular dystrophy.	Wheelchairs are not compatible with small obstacles or cracks in the road.	Wheelchairs remain comfortable (absorb shock) while going over small obstacles or cracks in the road.		The wheelchair casters help make navigating bumps easy.	5.00
Tyler Heckendorn	Center for Independent Living on July 8th, 2016	The small front casters of Tyler's wheelchair made going over bumps very difficult.	Small casters make navigating bumps difficult.	The wheelchair casters help make navigating bumps easy.			4.00
Tyler Heckendorn	Center for Independent Living on July 8th, 2016	The SmartDrive offers cruise control for wheelchairs, but it does not lift the wheelchair's front wheels up so it cannot adjust for small obstacles, which causes the wheelchair user to fall out.	The SmartDrive does not adjust its speed when the wheelchair encounters small obstacles.	Use of the SmartDrive is safe during encounters with small obstacles.			4.20
Tyler Heckendorn	Center for Independent Living on July 8th, 2016	Wheelchairs don't have gears, so users can't control the speed and ease of control.	Wheelchairs do not have gears.	Wheelchairs have gear options.			4.60
Tyler Heckendorn	Center for Independent Living on July 8th, 2016	Rowheels invert hand rails so that the user pushes pack to propel forward, which is better ergonomically and utilizes core muscles. However, it is set at a low gear so it's not easy to control, and does not move quickly.	Current Rowheel wheelchair designs only operates at a low gear.	Rowheel wheelchair designs operate in a variety of gears.			2.80
Tyler Heckendorn	Center for Independent Living on July 8th, 2016	Most wheelchairs require the user to throw their arms forward, which is an unnatural motion.	Wheelchairs are not ergonomically easy to move.	Wheelchairs are ergonomically easy to move.			3.60
Tyler Heckendorn	Center for Independent Living on July 8th, 2016	Most wheelchairs require the user to throw their arms forward, which is an unnatural motion.	The conventional movement to propel a wheelchair is unhealthy.	The movement required to propel a wheelchair is healthy.			5.00
Q and A with Brandon							
Brandon Young	Center for Independent Living on July 8th, 2016	Visually impaired people cannot read street signs or other location cues.	Visually impaired people have difficulty reading street signs and other location clues.	Visually impaired people fully understand their location.			4.40
Brandon Young	Center for Independent Living on July 8th, 2016	A monocular device has a small field of view.	Monocular devices have small viewing fields.	Monocular devices have viewing fields that are comparable to normal vision.*			2.80
Brandon Young	Center for Independent Living on July 8th, 2016	Blindsquare does not guide its users directly to doors in buildings.	Blindsquare does not guide its users directly to doors in buildings.	Direction navigational devices guide users directly to doors in buildings.			4.40
Brandon Young	Center for Independent Living on July 8th, 2016	Esight has stability issues when looking at far away objects.	Esight has stability issues when looking at far away objects.	View magnifying devices have auto-stability.			3.40
Tour of Building							
Brandon Young	Center for Independent Living on July 8th, 2016	The building is designed to minimize hand use for disabled people (automatic doors, elevator buttons near the floor), but one problem is that phone headsets still require hand dialing.	Phone headsets in CIL require hand dialing.	The CIL supports hands-free dialing.			2.00
Brandon Young	Center for Independent Living on July 8th, 2016	Disabled communities want assistive devices that don't look like clunky medical technology. Universal design can be aesthetically pleasing.	Assistive devices are unattractive to the average consumer.	Assistive devices are aesthetically pleasing.			2.60
Brandon Young	Center for Independent Living on July 8th, 2016	Esight is a company produces electronic googles yet they are hard to use. They are ugly.	Esight's electronic googles are ugly.			Esight's electronic googles are aesthetically pleasing.	2.60
Brandon Young	Center for Independent Living on July 8th, 2016	Most wheelchair ramps do not allow for two wheelchairs at a time either to pass each other or to allow for conversation.	Wheelchair ramps are not wide enough for two wheelchairs to pass side-by-side.	Device design reduces stigma of being disabled.			4.40
Brandon Young	Center for Independent Living on July 8th, 2016	Accessible design is not common in all buildings.	Accessible design is not common in all buildings.	Accessible design is prevalent.			3.60
Brandon Young	Center for Independent Living on July 8th, 2016	Sounds can act as landmarks for the visually impaired. Different colored and textured ground helps the visually impaired find their way. These features are rare however.	Features that act as audio, visual, or tactile landmarks are rare.	Building designs commonly feature audio, visual, or tactile landmarks.			3.60
Brandon Young	Center for Independent Living on July 8th, 2016	Modular designs for housing would be beneficial in allowing for ramps and elevators to be incorporated.	Lack of easily customizable housing places burdens on disables.	Houses are easily customizable for disabled people.			3.40
Brandon Young	Center for Independent Living on July 8th, 2016	Straight white canes used to help the blind can be difficult to fit into cars.	Long canes are difficult to fit into cars.	The assistive device for the blind is easily portable.			2.20
Brandon Young	Center for Independent Living on July 8th, 2016	The cane blind people use may have tips that wear down after prolonged use.	Long cane tips wear down over time.	The assistive device for the blind is durable.			2.20
Brandon Young	Center for Independent Living on July 8th, 2016	Blind people can loose their cane.	Long canes are difficult to find once lost.	The assistive device for the blind is easily located.			5.00
Brandon Young	Center for Independent Living on July 8th, 2016	It is difficult for blind people to differentiate between different money paper notes.	It is difficult for blind people to differentiate between different money paper notes.	Money is non-visually identifiable.			4.80
Brandon Young	Center for Independent Living on July 8th, 2016	Different AC Transit buses have different designs for locking down wheelchairs.	Different AC Transit buses have different designs for locking down wheelchairs.	Wheelchair locking mechanisms are standardized across all public transit agencies.			2.20
Brandon Young	Center for Independent Living on July 8th, 2016	Some wheelchair armrests are not ergonomic and can cut off blood circulation.	Some wheelchair armrests cut off blood circulations.	Wheelchairs promote proper blood circulation.			3.60
Brandon Young	Center for Independent Living on July 8th, 2016	People who use wheelchairs are at risk of developing sores from sitting in the same chair every day.	People who use wheelchairs are at risk of developing sores.	Wheelchairs prevent the development of sores.			4.40
Brandon Young	Center for Independent Living on July 8th, 2016	Wheelchairs are uncomfortable/painful for people when they traverse over bumps and cracks.	Wheelchairs are uncomfortable/painful for people when they traverse over bumps and cracks.	Wheelchairs are comfortable while the user traverses over bumps and cracks.			4.60
Brandon Young	Center for Independent Living on July 8th, 2016	Technological shift to touch screens causes difficulty for the visually impaired.	The visually impaired cannot use touchscreens.	The visually impaired can use touchscreens.			3.80
Brandon Young	Center for Independent Living on July 8th, 2016	Puff paint is used to make buttons tactile. Someone must assist a blind person and put the paint on the flush buttons.	Blind people cannot use flush buttons.	Buttons are distinguishable to visually impaired people.			3.40
Brandon Young	Center for Independent Living on July 8th, 2016	Fluorescent lighting is a trigger for some people with disabilities.	Fluorescent lighting is a trigger for some people with disabilities.	Lighting is safe for people with disabilities.			1.80
Brandon Young	Center for Independent Living on July 8th, 2016	There is a lack of accessible resources on where ADA ramps and elevators are located.	ADA ramps and elevators are difficult to find.	Ramps and elevators are easily located.			2.20
Brandon Young	Center for Independent Living on July 8th, 2016	There is a lack of general education about disabilities.	There is a lack of general education about disabilities.	People are aware and educated about disabilities.		People are aware of differences between intellectual disabilities and autism.	4.40

BioDesign Immersion Experience

Client	Site	Observations	Problem	Primary Need	Secondary Need	Rank (5 most important)
Marcela Weyhmiller, PhD	Children's Hospital Oakland Research Institute (CHORI), June 20, 2016	Serum ferritin tests are the least expensive iron tests.	The least expensive iron test method is not the most accurate method.	Accurate and inexpensive diagnostic tools for iron overload are accessible for all patients.		5.00
Marcela Weyhmiller, PhD	CHORI, June 20, 2016	There are only three Superconducting Quantum Interference Devices (SQUIDs) in the world--two in Europe, and only one in the US.	The number of SQUIDs globally limits access.		SQUIDS are easy to access for patients.	
Ellen Fung, PhD	CHORI, June 20, 2016	Dealing with hemoglobinopathies is a lifetime commitment, as there are no permanent cures now.	There is no permanent cure for hemoglobinopathies.	Hemoglobinopathies are cured.		5.00
Ellen Fung, PhD	CHORI, June 20, 2016	Patient non-compliance with thalassemia medication and procedures is a huge issue.	Patient non-compliance with thalassemia medication and procedures is a huge issue.	The device ensures patient compliance.		4.75
Ellen Fung, PhD	CHORI, June 20, 2016	Forteo is the only FDA-approved drug for increasing bone mass, but it cannot be used on children or people with open growth plates due to a risk of cancer.	There are no bone-density gaining supplements for children.	There is a effective bone-density gaining supplement for children.		4.75
Marcela Weyhmiller, PhD	CHORI, June 20, 2016	Iron overloads frequently occur in patients who get regular blood transfusions.	Iron overloads frequently occur in patients who get regular blood transfusions.	Patients are safe from risk of iron overload when undergoing regular transfusions.	Transfusion blood has a safe amount of iron.	4.50
Ellen Fung, PhD	CHORI, June 20, 2016	Iron in the pituitary gland can affect hormone production.	Iron in the pituitary gland can lead to stunted growth.	The negative effects of iron overload are easily managed.	Patients with iron in the pituitary gland grow and develop normally.	4.50
Ellen Fung, PhD	CHORI, June 20, 2016	Iron in the heart can lead to death.	Iron in the heart can lead to death.		Patients with iron in the heart remain healthy.	
Ellen Fung, PhD	CHORI, June 20, 2016	Iron in the pancreas can cause diabetes.	Iron in the pancreas can cause diabetes.		Patients with iron in the pancreas remain healthy.	
Ellen Fung, PhD	CHORI, June 20, 2016	Iron poisons osteoblasts in bone marrow	Iron poisons osteoblasts in bone marrow		Patients with iron in osteoblasts remain healthy.	
Ellen Fung, PhD	CHORI, June 20, 2016	Transfusions are lifelong commitments because once a patient requires transfusions, it's very hard to stop, and the transfusion process occurs regularly.	Patients can become reliant on transfusions.	Patients are independent from transfusions.		4.50
Ellen Fung, PhD	CHORI, June 20, 2016	Once pediatric patients turn 18, unless they are thalassemia /sickle-cell patients, they often change doctors and no longer go to CHORI, so there is no long-term data on how their bone density changes as they age.	This is a lack of long term bone health data for non-thalassemia/sickle-call patients.	Patients' medical records are easily available.		4.50
Ellen Fung, PhD	CHORI, June 20, 2016	Hemochromatosis is usually not diagnosed until age 60	Hemochromatosis is diagnosed late in life.	Hemochromatosis is diagnosed early.		4.25
Marcela Weyhmiller, PhD	CHORI, June 20, 2016	The average cost of care for a thalassemia patient is $75,000 per year.	The average cost of care for a thalassemia patient is $75,000 per year.	The cost of care is inexpensive for thalassemia patients.		4.25
Marcela Weyhmiller, PhD	CHORI, June 20, 2016	Free iron in the body causes serious damage in tissues not meant to absorb high concentrations of iron, such as the heart.	Free iron in the body causes serious damage in certain tissues, like the heart or thyroid.	Transfusion blood has a safe amount of iron.		4.25
Marcela Weyhmiller, PhD	CHORI, June 20, 2016	Over chelation is dangerous.	Over chelation is dangerous.	Chelation is safe for thalassemia patients.	Thalassemia patients are safe from risks of over-chelation.	4.25
Marcela Weyhmiller, PhD	CHORI, June 20, 2016	Patients without assistance from parents/caretakers may be less responsible about taking chelating medications.	Some patients are not consistent with chelation medication, leading to iron overload.		Thalassemia patients are safe from risks of inconsistency with chelation.	4.25
Marcela Weyhmiller, PhD	CHORI, June 20, 2016	Many things can lead to a poor signal to noise ratio, including: high BMI, low iron, small liver, large skin to liver distance, large breasts, cars moving outside, stents, dental implants, bobby pins.	The SQUID is very sensitive to a large number of factors that can lead to a poor signal to noise ratio.	The SQUID effectively differentiates signal from noise.		4.25
Marcela Weyhmiller, PhD	CHORI, June 20, 2016	Patients must undergo daily self care at home.	Patients must undergo daily self care at home.	At home treatment is convenient.	At home treatment aligns with the patient's schedule.	4.25
Marcela Weyhmiller, PhD	CHORI, June 20, 2016	Patients using the Demerol pump for chelation must use it overnight 5-7 nights per week.	Patients under chelation therapy need to use the Demerol pump very often, about 5-7 nights per week.		At home treatment is fast.	4.25
Marcela Weyhmiller, PhD	CHORI, June 20, 2016	Marrow transplant patients have to continually get phlebotomy to remove excess iron.	Marrow transplant patients have to continually get phlebotomy to remove excess iron.	Marrow transplant patients are safe from complications.		4.00
Ellen Fung, PhD	CHORI, June 20, 2016	Gene therapy is only effective for thalassemia patients who still produce little hemoglobin. Currently, it's ineffective for patients who don't produce any hemoglobin.	There are no gene therapy treatments available for patients with beta-O thalassemia.	Gene therapy treatments are available for patients with beta-O thalassemia.		4.00
Ellen Fung, PhD	CHORI, June 20, 2016	Quantitative ultrasounds are fast and commonplace, and they only require a finger or the heel of a long bone, but they are not very precise and only give an approximate idea of what the bone looks like.	Quantitative ultrasounds are imprecise imaging tools.	Quantitative ultrasounds are precise imaging tools.		4.00
Marcela Weyhmiller, PhD	CHORI, June 20, 2016	The pituitary gland has a high fat content, making it the tissue difficult to analyze using an MRI.	The pituitary gland is difficult to analyze with an MRI.	MRIs are effective and accurate.	MRIs effectively analyze the pituitary gland.	3.75
Marcela Weyhmiller, PhD	CHORI, June 20, 2016	There is a maximum iron content for measuring with an MRI, because high iron levels make the surrounding tissues dark.	The MRI cannot accurately measure extremely elevated iron levels.		MRIs accurately measure extremely elevated iron levels.	3.75
Ellen Fung, PhD	CHORI, June 20, 2016	The dual-energy x-ray absorptiometry (DXA) provides a 2D image unlike the peripheral quantitative computed tomography (PQCT) which can provide a 3D image.	The DXA cannot provide a 3D image, only 2D.	An imaging method provides a 3D density image and has sufficient reference data.	The DXA produces 3D images.	3.75
Ellen Fung, PhD	CHORI, June 20, 2016	The PQCT can provide a 3D image, but does not have enough reference data.	The PQCT does not have enough reference data.		The PQC has an appropriate amount of reference data.	3.75
Ellen Fung, PhD	CHORI, June 20, 2016	On average patients are at the clinic 35 days per year.	Patients must go to the clinic often, about 35 times per year.	The device makes frequent visits unnecessary		3.75
Ellen Fung, PhD; Marcela Weyhmiller, PhD	CHORI, June 20, 2016	There is a lack of data concerning the efficacy of new chelators.	There is a lack of data concerning the efficacy of new chelators.	Data concerning the efficacy of new chelators is available and robust.		3.50
Ellen Fung, PhD; Marcela Weyhmiller, PhD	CHORI, June 20, 2016	Phlebotomies are safe and effective but take a long time, resulting in many patients opting not to undergo the procedure.	Phlebotomies are time-consuming and result in patients opting out of the procedure.	Phlebotomies are quick.		3.50
Ellen Fung, PhD	CHORI, June 20, 2016	Chelators not only take out iron but other trace elements like zinc, which is important for bone density.	Chelators remove important nutrients from the body.	The device selectively removes excess iron from the body.		3.50
Ellen Fung, PhD; Marcela Weyhmiller, PhD	CHORI, June 20, 2016	Insurance companies will not cover a test if it is not considered the standard of care.	Insurance companies will not cover a test if it is not considered the standard of care.	Effective experimental diagnostic tools are covered by insurance agencies.		3.50
Ellen Fung, PhD	CHORI, June 20, 2016	The DXA measures tissue density and cannot differentiate dense tissue, contrast, or other confounding areas from bone.	The DXA measures tissue density and cannot differentiate dense tissue, contrast, or other confounding areas from bone.	The DXA works on patients with contrast in their system.		1.75
				The DXA differentiates dense tissue from bone.		3.50
				The DXA works on patients with dense implants		3.25
Marcela Weyhmiller, PhD	CHORI, June 20, 2016	Patients with dental work, stents, and other metal have some restrictions in using the SQUID.	Metal implants interfere with the SQUID results.	The SQUID is unaffected by metal implants in the body.		3.25
Ellen Fung, PhD; Marcela Weyhmiller, PhD	CHORI, June 20, 2016	The SQUID requires a specialized housing facility to limit the environmental noise.	The SQUID requires a specialized housing facility to limit the environmental noise.	The SQUID is unaffected by environmental noise.	The SQUID is unaffected by movements of metal outside of the housing facility.	3.25
Marcela Weyhmiller, PhD	CHORI, June 20, 2016	Movements of metals (like cars in traffic) in a close enough proximity to the machine can limit the use of the SQUID.	Movements of metal outside the building can interfere with the SQUID.			
Marcela Weyhmiller, PhD	CHORI, June 20, 2016	Ultrasound and SQUID machines are separate from one another. However, SQUID requires ultrasound measurements to measure liver iron content effectively.	Ultrasound and SQUID machines are separate from one another. However, SQUID requires ultrasound measurements to measure liver iron content effectively.	The iron overload measurement methods are incorporated into one machine.		3.25
Ellen Fung, PhD	CHORI, June 20, 2016	Central QCT requires a high dosage of radiation.	Central QCT requires a high dosage of radiation.	QCT uses only low dosage of radiation.		3.25
Ellen Fung, PhD	CHORI, June 20, 2016	Iron overloaded patients have more dense livers and spleen, which when viewed on DXA, confounds the bone mineral density (BMD) values for bones that overlap with the organs.	Iron overloaded patients have more dense livers and spleen, which when viewed on DXA, confounds the BMD values for bones that overlap with the organs.	The device properly differentiates dense organ systems from bone.		3.25
Ellen Fung, PhD; Marcela Weyhmiller, PhD	CHORI, June 20, 2016	High GI absorption can lead to iron overload and is difficult to catch.	It can be difficult to catch high GI tract absorption as a cause of iron overload.	High GI tract absorption related iron overload is easy to diagnose.		3.00
Ellen Fung, PhD; Marcela Weyhmiller, PhD	CHORI, June 20, 2016	There is a lack of research on how fast phlebotomy removes iron from the body.	There is a lack of research on how fast phlebotomy removes iron from the body.	Research on how fast phlebotomy removes iron from the body is available and robust.		3.00
Ellen Fung, PhD	CHORI, June 20, 2016	The background software of the DXA machine is in German.	The background software of the DXA machine is in German.	The DXA software is easy to understand and use.	The DXA background software is available in multiple languages.	3.00
Ellen Fung, PhD; Marcela Weyhmiller, PhD	CHORI, June 20, 2016	The SQUID requires specialized housing.	The SQUID requires specialized housing.	The SQUID is suitable for placement at any location.	The SQUID is unaffected by ferrous materials in the surrounding environment.	3.00
Ellen Fung, PhD	CHORI, June 20, 2016	Because the SQUID is so sensitive to surrounding electromagnetic interference, the building contains no ferrous materials.	Because the SQUID is so sensitive to surrounding electromagnetic interference, the building cannot contain any ferrous materials.			
Ellen Fung, PhD	CHORI, June 20, 2016	Brass and aluminum are the only metals permitted for use in the facility due to the sensitivity of the instrument.	Brass and aluminum are the only metals permitted for use in the facility due to the sensitivity of the instrument.			
Ellen Fung, PhD; Marcela Weyhmiller, PhD	CHORI, June 20, 2016	The ceiling of the SQUID is 20 feet high to allow for the liquid helium addition.	The SQUID requires high ceilings to allow for liquid helium addition.		The SQUID's cooling agent is added from any part of the device.	
Ellen Fung, PhD	CHORI, June 20, 2016	DXA is not used clinically because the reference data is "not fantastic"; however, it is FDA-approved and used for research.	DXA reference data cannot be used for clinical diagnoses.	DXA reference data is robust and reliable.		3.00
Ellen Fung, PhD; Marcela Weyhmiller, PhD	CHORI, June 20, 2016	Patients may have high serum ferritin levels, but low iron levels.	Serum ferritin levels may misrepresent the patient's iron levels.		Serum ferritin levels accurately represent patient iron levels.	2.75

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Ellen Fung, PhD; Marcela Weyhmiller, PhD	CHORI, June 20, 2016	Serum ferritin tests do not give quantitative results on irons levels.	Serum ferritin tests do not give quantitative results on irons levels.	Serum ferritin tests are accurate and inexpensive.	Serum ferritin tests give quantitative results.	2.75
Ellen Fung, PhD; Marcela Weyhmiller, PhD	CHORI, June 20, 2016	Serum ferritin tests tend to overestimate iron levels for patients with SCD or inflammation.	Serum ferritin tests tend to overestimate iron levels for patients with SCD or inflammation.		Serum ferritin tests accurately determine iron levels for patients with SCD or inflammation.	2.75
Ellen Fung, PhD; Marcela Weyhmiller, PhD	CHORI, June 20, 2016	The SQUID device does not have FDA approval.	Some insurance companies may not cover SQUID diagnosis because it is not FDA approved.	Insurance companies cover SQUID diagnoses.		2.75
Marcela Weyhmiller, PhD	CHORI, June 20, 2016	Liquid helium is needed to cool the SQUID and is expensive and difficult to store.	Liquid helium is expensive and difficult to store.	The SQUID operates without liquid helium.	Storage for liquid helium is easy.	2.75
					The storage method for liquid helium is inexpensive.	2.75
			The SQUID does not operate at room temperature.	The SQUID operates at room temperature.		3.25
Marcela Weyhmiller, PhD	CHORI, June 20, 2016	Body fat can interfere with iron readings.	Body fat can interfere with iron readings.	SQUID iron readings account for the impact of body fat		2.75
Marcela Weyhmiller, PhD	CHORI, June 20, 2016	Patients with a high BMI and low iron levels are difficult to diagnose with the SQUID since the approximation is not as effective with the confounding variables of high body fat and low iron.	Patients with high body fat and low iron are difficult to diagnose using the SQUID.	The SQUID easily diagnoses patients with low iron and high body fat		2.75
Marcela Weyhmiller, PhD	CHORI, June 20, 2016	Patients with a pacemaker cannot use the SQUID.	Patients with a pacemaker cannot use the SQUID.	Iron overload imaging methods work for patients with pacemakers	Patients with pacemakers are eligible to use the SQUID.	2.50
Ellen Fung, PhD	CHORI, June 20, 2016	The DXA bed has a height limitation for 6' 4". A basketball team study was tried once but none of the players except for one could fit on the bed.	DXA beds can only fit patients up to a certain height.	DXA beds accommodate people of all sizes.		2.50
Ellen Fung, PhD; Marcela Weyhmiller, PhD	CHORI, June 20, 2016	Research on how long iron must be present in tissue before leading to permanent consequences is limited.	There is not enough research on the threshold for how long iron must be present in the tissue before causing damage.	Research is available for how long iron must be present in tissues before causing damage.		2.25
Ellen Fung, PhD	CHORI, June 20, 2016	New generation of MRIs are more powerful (3T vs 1.5T) but they make it harder to detect iron in organs.	The new 3 Tesla MRIs are unable to accurately detect iron levels in the body.	All MRI models are able to accurately detect iron levels in the body.		2.25
Marcela Weyhmiller, PhD	CHORI, June 20, 2016	Extreme QCT is only used on adults because it requires no movement from the patient, which is hard for children.	Extreme QCT requires patients to remain still.	Extreme QCT imaging allows for slight movement.		2.25
Ellen Fung, PhD	CHORI, June 20, 2016	The upper vertebrae can't be properly scanned with DXA because the ribs overlap and confound the image.	The upper vertebrae can't be properly scanned with DXA because the ribs overlap and confound the image.	The device properly scans the upper vertebrae.		2.25
Marcela Weyhmiller, PhD	CHORI, June 20, 2016	Liquid helium cooling for the SQUID costs $1000 per week.	Cooling the SQUID with liquid helium is expensive.	Cooling the SQUID is inexpensive.		2.00
Ellen Fung, PhD; Marcela Weyhmiller, PhD	CHORI, June 20, 2016	Clinic patients need frequent visits for transfusion- generally once every 2-4 weeks.	Patients need frequent visits for transfusion, generally once every two to four weeks.	The device treats patients outside the clinic.		2.00
Ellen Fung, PhD; Marcela Weyhmiller, PhD	CHORI, June 20, 2016	Young children may need to be sedated for MRIs.	It is difficult to give MRIs to children.	MRIs are suitable for children.		1.75
Ellen Fung, PhD	CHORI, June 20, 2016	Contrast material from other MRIs, etc., can still be viewed in DXA a week after injection; the clinic requires patients to schedule DXA at least 2 weeks after any test with use of contrast material.	Contrast material from other MRIs, etc., can still be viewed in DXA a week after injection	Accurate imaging is performed regardless of contrast interference.	Contrast materials leave the body quickly post-study.	1.75
Ellen Fung, PhD	CHORI, June 20, 2016	When laying flat on the DXA bed, it was a bit disorienting to see the scanner or the bed moving, like light motion sickness.	DXA beds can invoke light motion sickness.	DXA beds are comfortable.		1.75
Marcela Weyhmiller, PhD	CHORI, June 20, 2016	The water bag used with SQUID is uncomfortable.	The water bag used with SQUID is uncomfortable.	The water bag used with SQUID is comfortable.		1.50
Marcela Weyhmiller, PhD	CHORI, June 20, 2016	The BMI does not completely adjust for thorax interference in SQUID measurements.	The BMI does not completely adjust for thorax interference in SQUID measurements.	SQUID measurements are adjusted for thorax interference.		1.50
Ellen Fung, PhD	CHORI, June 20, 2016	Positioning blocks are needed to position the patient for DXA scans.	DXA tests require patients to carefully position themselves to get a proper image.	The device tests are accurate regardless of patient position.		1.50
Marcela Weyhmiller, PhD	CHORI, June 20, 2016	The patient must lie still during the SQUID which can be difficult for very young pediatric patients, however sedation is not required.	The patient must lie still during the SQUID which is especially difficult for the center's young patient population.	The SQUID provides accurate results for restless children.		1.25
Jessica Hsueh	CHORI, June 20, 2016	When on the DXA, I wanted to be able to see the scan on the computer (this may be a very situational thing, I wonder if children would want to see that too)	DXA scans are not as engaging as they could be.	The device actively engages the patient.		1.25
Ellen Fung, PhD	CHORI, June 20, 2016	The ceiling is decorated with Winnie the Pooh stickers and colorful stickers, but some of the younger children don't know Winnie the Pooh.	Cartoon images were not kept up to date.	Physicians are well aware of current trends in youth entertainment.		1.25
Ellen Fung, PhD	CHORI, June 20, 2016	In the SQUID room, the non-metallic curtain rods (currently Plexiglas) are sagging under the curtains' weight.	In the SQUAD room, the non-metallic curtain rods (currently Plexiglas) are sagging under the curtains' weight.	The non-metal curtain rods are strong enough to support the weight of the curtains.		1.00

BioDesign Immersion Experience Needs Statements						
Client	**Site**	**Observation**	**Problem**	**Primary Need** *latent need	**Secondary Need**	**Rank (5 most important)**
Chris Grazzini	Mobile Dental Clinic on July 11, 2016	The clinic does not perform any procedures that require sedation (wisdom teeth removal).	The clinic does not perform any procedures that require sedation (wisdom teeth removal).	The mobile clinic provides the same range of services found at a regular dentistry clinic.		4.60
		Operations cease when dentists go on vacation.	The care given is very dependent on what staff members can come in, the staff is very small.			
Chris Grazzini	Mobile Dental Clinic on July 11, 2016	Undocumented children have difficulty signing up for insurance because of parental fears of deportation.	The threat of deportation prevents undocumented children from getting health insurance.	Health insurance for undocumented children ensures privacy of family immigration status.		4.60
Maynor Guerra	Mobile Dental Clinic on July 11, 2016	The film processor stopped working and the clinic did not have access to a machine that could read digital x-rays.	The clinic could not read digital x-rays.	The clinic accepts digital x-rays.		4.40
Chris Grazzini	Mobile Dental Clinic on July 11, 2016	Patient files were all on paper. Medical records are not standardized. One clinic uses paper, the other electronic.	Patient files were all on paper. Medical records are not standardized. One clinic uses paper, the other electronic.	Patient files are on a standardized electronic medical record system.	Medical records are standardized.	4.40
Chris Grazzini	Mobile Dental Clinic on July 11, 2016	All equipment must be locked down with bungee cords.	Equipment can be damaged if not secured during transport.	Equipment remains undamaged after transport.		4.40
Maynor Guerra	Mobile Dental Clinic on July 11, 2016	The mouth vacuum system suffers from backflow on hot days.	The mouth vacuum system suffers from backflow on hot days.	The mouth vacuum system is unaffected by temperature.		4.40
Valerie Lam, DDS	Mobile Dental Clinic on July 11, 2016	Clinic needs to transition to digital film. The clinic's system is currently incompatible with digital x-rays.	The clinic could not accept digital x-rays from other clinics.	The mobile clinic easily shares medical files between health care providers.		4.40
Valerie Lam, DDS	Mobile Dental Clinic on July 11, 2016	The clinic does not perform root canals.	Root canals are very time-consuming.	Root canals are fast.		4.20
Maynor Guerra	Mobile Dental Clinic on July 11, 2016	The 10k diesel power generator has had to be replaced multiple times.	The 10k diesel power generator has had to be replaced multiple times.	The power generator is reliable.		4.20
Chris Grazzini	Mobile Dental Clinic on July 11, 2016	There is limited Wi-Fi connectivity.	There is limited Wi-Fi connectivity.	Wi-Fi connectivity is available in the mobile dental clinic.		4.00
Maynor Guerra	Mobile Dental Clinic on July 11, 2016	The x-ray cassette got off alignment.	The x-ray cassette malfunctioned.	The x-ray film development system is reliable.		3.80
Chris Grazzini	Mobile Dental Clinic on July 11, 2016	Operations cost organization ~270K per year.	The mobile dentist clinic's operating costs are expensive.	The mobile dentist clinic's operating costs are reasonable.		3.80
Chris Grazzini	Mobile Dental Clinic on July 11, 2016	The truck has very limited storage, and inventory needs to be checked every day in case they need to refill supplies.	The truck has very limited storage, and inventory needs to be checked every day in case they need to refill supplies.	The truck has ample storage.		3.80
Chris Grazzini	Mobile Dental Clinic on July 11, 2016	There is a locking system on drawers, but it isn't perfect, and things sometimes fall out when the van is in motion.	Items fall out of cabinets when the van is moving.	Cabinets are secured while the van is moving.		3.60
Valerie Lam, DDS	Mobile Dental Clinic on July 11, 2016	The mobile clinic cannot sedate its patients.	The mobile clinic's environment is not optimal for patient sedation.	Mobile clinic's environment is conducive for patient sedation.		3.40
Chris Grazzini	Mobile Dental Clinic on July 11, 2016	Slides for cabinets have been phased out since they are thirteen years old making it difficult to find replacement parts.	It is hard to find replacement parts for the van since it is 13 years old.	New equipment parts are compatible with older models.		3.40
Chris Grazzini	Mobile Dental Clinic on July 11, 2016	The clinic only provides services to people under 20.	People over 20 do not have access to this clinic.	Patients of all ages have access to the clinic.		3.40
Maynor Guerra	Mobile Dental Clinic on July 11, 2016	It takes four to five hours to switch generators.	It takes four to five hours to switch generators.	Generators are long lasting.		3.20
Chris Grazzini	Mobile Dental Clinic on July 11, 2016	The driver needed to be screened for very carefully because they do the bulk of the maintenance.	The need for frequent maintenance makes it difficult to find a driver who is able to repair the vehicle.	Someone on site is capable of fixing vehicular problems.		3.00
Chris Grazzini	Mobile Dental Clinic on July 11, 2016	Everything is tied down with bungee cords before transport.	Tying down equipment before transport is time consuming.	Prep time before transport is minimized.		2.80
Chris Grazzini	Mobile Dental Clinic on July 11, 2016	The diesel fuel costs about $400-$500 a month.	Diesel fuel is expensive.	The energy expenses for the clinic are low.		2.80
Alejandra Franco, RDA	Mobile Dental Clinic on July 11, 2016	There are not enough resources on board to handle emergencies.	The clinic is not equipped to handle emergencies.	The clinic is equipped to handle emergencies.		2.80
Maynor Guerra	Mobile Dental Clinic on July 11, 2016	It takes four to five hours to switch generators.	It takes four to five hours to switch generators.	Switching generators is fast.		2.60
Chris Grazzini	Mobile Dental Clinic on July 11, 2016	The majority of equipment is over 10 yrs old, leading to frequent breakdowns.	The majority of equipment is over 10 yrs old, leading to frequent breakdowns.	Equipment is long-lasting.		2.60
Chris Grazzini	Mobile Dental Clinic on July 11, 2016	New vacuum systems do not fit in the clinic space.	New vacuum systems do not fit in the clinic space.	Vacuum systems are compact.		2.60
Valerie Lam, DDS	Mobile Dental Clinic on July 11, 2016	The clinic does not provide orthodontic care, but provides referrals.	The clinic does not provide orthodontic care.	The clinic provides orthodontic care.		2.40
Chris Grazzini	Mobile Dental Clinic on July 11, 2016	There was a pile of broken glass outside the truck.	The environment surrounding the truck is not always safe for children.	The environment surrounding the truck is safe for children.*		2.20
Chris Grazzini	Mobile Dental Clinic on July 11, 2016	Kids cannot be left unattended.	The dental equipment is not childproof.	The dental equipment is childproof.		2.20
Chris Grazzini	Mobile Dental Clinic on July 11, 2016	You can see into the windows of the van which could cause concern for patient privacy.	You can see into the windows of the van which could cause concern for patient privacy.	Patient privacy is maintained in the van.*		2.20
Chris Grazzini	Mobile Dental Clinic on July 11, 2016	X-ray arm units tend to break due to jostling during transportation.	X-ray arm units can break during transportation.	X-ray arm units are functional after transportation.		2.00
Chris Grazzini	Mobile Dental Clinic on July 11, 2016	Patients were forced to wait in the hot sun.	Patients were forced to wait in the hot sun.	There is a comfortable waiting area for patients.*		1.60
Chris Grazzini	Mobile Dental Clinic on July 11, 2016	Stairs to the clinic were very tall.	Stairs to the clinic were very tall.	The clinic entrance is accessible to people with disabilities and small children.*		1.40
Chris Grazzini	Mobile Dental Clinic on July 11, 2016	Stairs to the mobile van are not very stable.	Stairs to the mobile van are not very stable.	Stairs to the mobile van are stable.*		1.20
Chris Grazzini	Mobile Dental Clinic on July 11, 2016	Lead films from x-rays are kept in a sharps container.	Lead film containers are inaccurately labeled.	Lead film containers are accurately labeled.*		1.00

BioDesign Immersion Experience						
Client	**Site**	**Observation**	**Problem**	**Primary Need**	**Secondary Need**	**Rank (5 most important)**
History and Overview of HIV						
Dr. Susa Coffey	SFGH HIV Grand Rounds, June 24, 2016	Nearly 50,000 new HIV infections occur per year in the U.S. The incidence rate is plateaued and is not declining.	The incidence rate of HIV infections is not declining.	The incidence rate of HIV infections is zero.		4.80
Dr. Susa Coffey	SFGH HIV Grand Rounds, June 24, 2016	There is a "massive failure of prevention" as the incidence rate stabilizes.	There is a lack of emphasis on prevention.	Prevention of HIV is emphasized and successful.		5.00
Dr. Susa Coffey	SFGH HIV Grand Rounds, June 24, 2016	With current preventative measures the lifetime risk of HIV infection for men who have sex with men (MSM) is 1 in 6 and African-American MSM is 1 in 2.	Underprivileged minorities have higher HIV infection rates.	Underprivileged minorities are able to protect themselves against HIV as effectively as the rest of the population.		4.20
Dr. Susa Coffey	SFGH HIV Grand Rounds, June 24, 2016	Women are less empowered than males which put them in unsafe situations sexually and with injectable drugs.	Women have reduced ability to control their own health care.	Women are able to control their own health care as effectively as men.		4.20
Dr. Susa Coffey	SFGH HIV Grand Rounds, June 24, 2016	In the US, 86% HIV positive people are diagnosed and 14% are undiagnosed.	86% HIV positive people are diagnosed/ 14% are undiagnosed. (14% are unaware of their status)	HIV positive patients are aware of their condition.		4.60
Dr. Susa Coffey	SFGH HIV Grand Rounds, June 24, 2016	Only 40% of diagnosed HIV positive patients are engaged in patient care.	Only 40% of diagnosed HIV positive patients are engaged in patient care.	People diagnosed with HIV stay engaged in patient care.		4.40
Dr. Susa Coffey	SFGH HIV Grand Rounds, June 24, 2016	Patients might not have time or the access to insurance necessary to stay engaged in HIV care.	Patients might not have time or the access to insurance necessary to stay engaged in HIV care.			
Dr. Susa Coffey	SFGH HIV Grand Rounds, June 24, 2016	Mental health, substance abuse, and homelessness are all barriers to adherence seen in SFGH patients.	SFGH patients suffer from a wide category of medical / socioeconomic problems that impact their compliance.	Patients are treated for all medical and socioeconomic problems.		4.00
Dr. Susa Coffey	SFGH HIV Grand Rounds, June 24, 2016	Many patients seen at SFGH have comorbidities including poverty, mental illness, addiction, marginal housing, and other barriers to care.				
Dr. Susa Coffey	SFGH HIV Grand Rounds, June 24, 2016	The single pill regimen for antiretroviral treatment is expensive.	The single pill regimen for antiretroviral treatment is expensive.	Single pill combination drugs are accessible to all patient populations.	Single pill combination drugs are low cost.	2.80
Dr. Susa Coffey	SFGH HIV Grand Rounds, June 24, 2016	Single pill combination drugs are not available internationally (because of cost).	Single pill combination drugs are not available internationally (because of cost).			
Dr. Susa Coffey	SFGH HIV Grand Rounds, June 24, 2016	The single pill regimen for antiretroviral treatment may not work for all patients.	The single pill regimen for antiretroviral treatment may not work for all patients.		The single pill regimen is successful for all patients.	
Dr. Susa Coffey	SFGH HIV Grand Rounds, June 24, 2016	Single pills have been known to cause GI upsets, reducing patient compliance.	Single pills have been known to cause GI upsets, reducing patient compliance.	Single pills are free from side-effects.		2.60
Dr. Susa Coffey	SFGH HIV Grand Rounds, June 24, 2016	Most deaths from HIV positive patients at SFGH occur due to drug overdose, cancer, pneumonia, heart disease, or violence.	Comorbidities greatly impact HIV patients.	HIV patients receive effective treatment for all diseases.		4.40
Dr. Susa Coffey	SFGH HIV Grand Rounds, June 24, 2016	Tuberculosis and malaria are major killers of HIV patients around the world.		HIV patients are protected from contracting other diseases.		4.40
Dr. Susa Coffey	SFGH HIV Grand Rounds, June 24, 2016	40% of patients also suffer from Hepatitis C.				
Dr. Susa Coffey	SFGH HIV Grand Rounds, June 24, 2016	Point-of-care (POC) diagnostics for HIV testing are expensive and slow.	POC diagnostics for HIV testing are expensive and slow.	POC diagnostics for HIV testing are inexpensive.		3.60
Dr. Susa Coffey	SFGH HIV Grand Rounds, June 24, 2016			POC diagnostics for HIV testing are fast.		4.00
Dr. Susa Coffey	SFGH HIV Grand Rounds, June 24, 2016	Highest viral load for patients are associated with the time window where tests are inconclusive.	Current test methods are not effective when the patients are newly infected and have their highest viral load.	Diagnostic methods are effective shortly after transmission.		4.60
Dr. Susa Coffey	SFGH HIV Grand Rounds, June 24, 2016	POC tests do not detect drug levels of Pre-exposure prophylaxis (PrEP) or ART which would help clinicians decide treatment plan.	POC tests do not detect drug levels of PrEP or ART which would help clinicians decide treatment plan.	POC tests quantitatively detect drug levels.		2.40
Dr. Susa Coffey	SFGH HIV Grand Rounds, June 24, 2016	Oral testing is inconclusive until 3 months post HIV infection.	Oral testing is inconclusive until 3 months post infection.	Oral diagnostics detect HIV infection quickly post-infection.		3.00
HIV Prevention and PrEP						
Dr. Hyman Scott	SFGH HIV Grand Rounds, June 24, 2016	There is a decline in condom use in the US and SF.	Condom use in the US is declining.	Condoms are used properly during appropriate at risk situations.		3.80
Dr. Hyman Scott	SFGH HIV Grand Rounds, June 24, 2016	If a person is taking PrEP and unknowingly becomes HIV positive, the virus can develop PrEP resistance in a week and patients have to take other medication generally not in the form of a single pill.	The HIV virus can develop resistance to PrEP, causing patients to have to take other medications.	Medications prevent development of viral resistance.		4.60
				Patients adhere to a single medication regimen throughout treatment.		2.80
Dr. Hyman Scott	SFGH HIV Grand Rounds, June 24, 2016	More at risk people are beginning to perform regular HIV tests on themselves, but are still reluctant to seek care, which is a crucial next step.	More at risk people are beginning to perform regular HIV tests on themselves, but are still reluctant to seek care, which is a crucial next step.	HIV positive patients are willing to seek treatment.		4.20
Dr. Hyman Scott	SFGH HIV Grand Rounds, June 24, 2016	Cabotegravir (injectable PrEP) stays in the body after injection for up to a year. This is a problem if you don't need it and experience side effects and can lead to viral resistance. The client discussed the need of an implantable device.	Some HIV drugs have long half lives in the body. This causes them to linger below effective dose for long time periods, potentially leading to viral resistance.	The HIV prevention method clears the body as soon as treatment is stopped.		4.40
Dr. Hyman Scott	SFGH HIV Grand Rounds, June 24, 2016	Cabotegravir injections must be taken once every two months.	Prevention methods need frequent dosing.	HIV prophylactic treatment is convenient for patients.		3.40
Dr. Hyman Scott	SFGH HIV Grand Rounds, June 24, 2016	The current HIV vaccine in development has only 30% efficacy.	The current HIV vaccine in development has only 30% efficacy.	A HIV vaccine with high efficacy is available.		4.80
Dr. Hyman Scott	SFGH HIV Grand Rounds, June 24, 2016	Anal sex is the easiest way to get HIV through sexual activity.	Anal sex presents unique conditions for high likelihood of HIV transmission.	The device makes anal sex safe for HIV (+) patients.		4.00
Overview of the SEARCH Study						
Dr. Gabe Chamie	SFGH HIV Grand Rounds, June 24, 2016	Many people, especially those in Africa, are unaware that they are infected.	Many people are unaware that they are HIV infected.	Every person is aware of their HIV status.		4.80
Dr. Gabe Chamie	SFGH HIV Grand Rounds, June 24, 2016	The earlier HIV/TB is discovered, the greater the individual benefits.	Late HIV/TB discovery negatively impacts patient health outcomes	HIV/TB is detected early.		4.40
Dr. Gabe Chamie	SFGH HIV Grand Rounds, June 24, 2016	Patients don't feel like they need to take a preventative pill if they feel well.	Patients who feel well do not take preventative medication.	Patients who feel well still take preventative medication.		3.40
Dr. Gabe Chamie	SFGH HIV Grand Rounds, June 24, 2016	Most care facilities in Africa focus on acute care (malaria, diarrhea, etc.) and not on chronic care.	Care facilities in Africa only focus on acute care.	Care facilities in Africa have the resources to provide acute and chronic care.		4.60

BioDesign Immersion Experience						
Client	**Site**	**Observation**	**Problem**	**Primary Need**	**Secondary Need**	**Rank (5 most important)**
Dr. Gabe Chamie	SFGH HIV Grand Rounds, June 24, 2016	Competing priorities can make it hard for the patient to receive proper healthcare.	Competing priorities can make it hard for the patient to receive proper healthcare.	Healthcare is flexible around patient's priorities.		4.00
Dr. Gabe Chamie	SFGH HIV Grand Rounds, June 24, 2016	There is not a good POC diagnostic for HIV.	There is not a good POC diagnostic for HIV.	POC diagnostics for HIV are specific.		4.00
Dr. Gabe Chamie	SFGH HIV Grand Rounds, June 24, 2016	POC diagnostics do not detect viral loads (HIV RNA levels), CD4 count, or HIV base type. These tests take up to weeks to get the results.	POC diagnostics do not detect viral loads (HIV RNA levels), CD4 count, or HIV base type. These tests take up to weeks to get the results.	POC diagnostics for HIV are sensitive.	POC diagnostics detect viral loads, CD4 counts, and HIV base types.	4.20
Dr. Gabe Chamie	SFGH HIV Grand Rounds, June 24, 2016	So far, all POC testing for HIV uses blood.	So far, all POC testing for HIV uses blood.	Saliva or urine based POC testing is available.		3.20
Malaria Chemoprevention						
Dr. Pras Jagannathan	SFGH HIV Grand Rounds, June 24, 2016	Although malaria is treatable, there is no cure that prevents malaria.	Malaria is treatable, but not curable.	Malaria is permanently curable.		4.60
Dr. Pras Jagannathan	SFGH HIV Grand Rounds, June 24, 2016	Patients have multiple infections of malaria over a short time period.	Patients have multiple infections of malaria over a short time period.	Malaria is preventable.		4.80
Dr. Pras Jagannathan	SFGH HIV Grand Rounds, June 24, 2016	After repeated malarial infections, patients do not show symptoms and are not treated.	After repeated malarial infections, patients do not show symptoms and are not treated.	Malaria is detectable even when asymptomatic.		4.00
Dr. Pras Jagannathan	SFGH HIV Grand Rounds, June 24, 2016	Southeast Asian mosquitos have built up a resistance to artemisinin based drugs.	Current malaria treatments create treatment-resistant malaria strains.	Malaria treatments prevent treatment-resistant strains from developing.		4.20
Dr. Pras Jagannathan	SFGH HIV Grand Rounds, June 24, 2016	Chemoprevention is not widely deployed due to dispute about whether or not it delays the development of immunity.	Research on whether chemoprevention delays the development of immunity is not conclusive.	Research on whether chemoprevention delays the development of immunity is conclusive.		3.80
Dr. Pras Jagannathan	SFGH HIV Grand Rounds, June 24, 2016	Artemisinin needs to be given as part of a two part drug.	Artemisinin needs to be given as part of a two part drug.	Antimalarial treatment delivery is convenient.	Antimalarial treatment is given in a single drug.	2.20
Dr. Pras Jagannathan	SFGH HIV Grand Rounds, June 24, 2016	Malaria can cause severe anemia.	Malaria can cause severe anemia.	Malaria side-effects are quickly and easily managed.		3.40
Dr. Pras Jagannathan	SFGH HIV Grand Rounds, June 24, 2016	Compliance is a major hurdle for treatment. (patients don't take chemoprevention medication).	Compliance is a major hurdle for treatment. (patients don't take chemoprevention medication).	Treatments facilitate patient compliance.		4.40
Tour of Ward 86						
Guy Vandenberg, RN	SFGH HIV Ward 86 Tour, June 24, 2016	Antiviral malaria medication can give bad dreams.	Antiviral malaria medications may cause nightmares.	Antiviral malaria medication is free from side effects.		3.60
Guy Vandenberg, RN	SFGH HIV Ward 86 Tour, June 24, 2016	PrEP has a lot of negative side effects, such as irritation of the GI tract.	PrEP has a lot of negative side effects, such as irritation of the GI tract.	PrEP is free of unpleasant side effects.		3.20
Guy Vandenberg, RN	SFGH HIV Ward 86 Tour, June 24, 2016	Unstable patients at ward 86 may need to wait up to 20 minutes to be moved to the emergency department because an ambulance needs to transport the patients to another building.	Unstable patients at ward 86 may need to wait up to 20 minutes to be moved to the emergency department because an ambulance needs to transport the patients to another building.	Moving patients to the emergency department is fast.	The hospital itself offers emergency transport between buildings.	2.40
Guy Vandenberg, RN	SFGH HIV Ward 86 Tour, June 24, 2016	Patient beds do not offer much privacy.	Patient beds do not offer much privacy.	The hospital offers privacy to patients.	Patient beds offer privacy.	3.20
Guy Vandenberg, RN	SFGH HIV Ward 86 Tour, June 24, 2016	Counseling rooms do not offer much privacy.	Counseling rooms do not offer much privacy.		Counseling rooms offer patient privacy.	
Guy Vandenberg, RN	SFGH HIV Ward 86 Tour, June 24, 2016	There is no noise screening in ward 86.	There is no noise screening in ward 86.		There is noise screening in ward 86.	
Guy Vandenberg, RN	SFGH HIV Ward 86 Tour, June 24, 2016	Many relevant vaccines need to be taken as a series, and it can be very difficult to get patients to get their shots on time.	Many relevant vaccines need to be taken as a series.	Traditional multistage vaccinations are administered in one shot.		3.40
Guy Vandenberg, RN	SFGH HIV Ward 86 Tour, June 24, 2016	It is difficult to contact patients, especially those who are homeless, after they have left the clinic to follow-up on care.	Contacting patients for follow-ups is difficult.	Contacting patients for follow-ups is easy.		4.40
Guy Vandenberg, RN	SFGH HIV Ward 86 Tour, June 24, 2016	Patients taking AndroGel as a shot need to come in every 2 weeks for their hormones.	Patients taking AndroGel as a shot need to come in every 2 weeks for their hormones.	AndroGel treatment is convenient.		3.40
Guy Vandenberg, RN	SFGH HIV Ward 86 Tour, June 24, 2016	The cream testosterone supplement is messy.	The cream testosterone supplement is messy.	The testosterone treatment is localized to the prescribed patient.		2.20
Guy Vandenberg, RN	SFGH HIV Ward 86 Tour, June 24, 2016	The cream testosterone supplement can rub off onto a patient's partner accidentally.	The testosterone cream is easily transferred to a patient's partner.		The testosterone cream only stays on the prescribed patient.	
Guy Vandenberg, RN	SFGH HIV Ward 86 Tour, June 24, 2016	The testosterone patch often moves around the skin.	The testosterone patch often moves around the skin.	The testosterone patch remains firmly in place.		2.20
Guy Vandenberg, RN	SFGH HIV Ward 86 Tour, June 24, 2016	There is no oral testosterone replacement therapy.	There is no oral testosterone replacement therapy.	Oral testosterone replacement therapy is available.		3.60
Guy Vandenberg, RN	SFGH HIV Ward 86 Tour, June 24, 2016	Glass containers for medication broke shards into the container when the top was snapped off, so the medication needed to be filtered 3 times.	Glass may fall into a container of medicine.	The medication container prevents physical contamination.		2.00
Guy Vandenberg, RN	SFGH HIV Ward 86 Tour, June 24, 2016	The clinic does not accept private insurance.	The clinic does not accept private insurance.	The clinic accepts all types of insurance.		4.00
Guy Vandenberg, RN	SFGH HIV Ward 86 Tour, June 24, 2016	Coumadin and other blood thinners have multiple drug interactions.	Blood thinners (Coumadin) have multiple drug interactions.	Blood thinners are free from drug interactions.		3.20
Guy Vandenberg, RN	SFGH HIV Ward 86 Tour, June 24, 2016	Communities at risk have a historical distrust of the medical profession.	Communities at risk have a historical distrust of the medical profession.	There is trust between communities at risk and medical professionals.		4.60

BioDesign Immersion Experience Comprehensive Need Statements						
Client	**Site**	**Observation**	**Problem**	**Primary Need Statement**	**Secondary Need Statement**	**Rank (5 most important)**
Toxicology Grand Rounds						
Dr. Alan Wu, SFGH Toxicology	SFGH Poison Control Center on June 7, 2016	With acute poisoning, the toxin won't be found in hair or bones.	Detecting acute poisoning cannot be done through hair and bones which are the primary methods for testing when the ingestion occurred a substantial time prior.	The device to determines a person's history of prior acute poisoning.		2.75
Dr. Alan Wu, SFGH Toxicology	SFGH Poison Control Center on June 7, 2016	Abdominal radiography is incomplete and inadequate for poisoning. However, the radiography is useful for iron poisoning. Overall, the radiopathy isn't consistent.	Abdominal radiopathy has inconsistent radiopaque; thus, it is incomplete and inadequate for toxicity tests.	Medical imaging detects the location of toxins in the body.	Different compounds such as iron, antihistamines, phenothiazines, etc. are seen during imaging.	3.75
Dr. Alan Wu, SFGH Toxicology	SFGH Poison Control Center on June 7, 2016	Several compounds are inconsistently radiopaque when imaged through abdominal radiology, even though that is the common standard. Some radiopaque compounds will look different with different manufacturers/processes.			The toxins are accurately identified consistently.	
Dr. Alan Wu, SFGH Toxicology	SFGH Poison Control Center on June 7, 2016	Identical compounds have different radiopacity due to manufacturing variations between different manufacturers.				
Dr. Alan Wu, SFGH Toxicology	SFGH Poison Control Center on June 7, 2016	Low-dose CT can be used to detect toxins with body packers and is the gold standard. Yet, there is confusion from the attendings about what is considered a low dose and how to order that test.	Low-dose CT does not have a well-known standard level of dose or ordering protocol at SFGH.	The procedure for low dose CT is clear and standardized for testing toxins in drug packers.		3.50
Dr. Alan Wu, SFGH Toxicology	SFGH Poison Control Center on June 7, 2016	X-ray was 96% specific in detecting toxins in body packers, but only 77% sensitive.	X-ray cannot detect body packer toxins with high sensitivity.	There is an accurate method to detect packets of drugs in the human body.		3.50
Dr. Alan Wu, SFGH Toxicology	SFGH Poison Control Center on June 7, 2016	Stuffers have a higher tendency than packers to suddenly medically deteriorate due to a ruptured package	Stuffers are at high risk of toxins rupturing in their system leading to medical problems.			
Dr. Alan Wu, SFGH Toxicology	SFGH Poison Control Center on June 7, 2016	Difficult to diagnose body stuffing/packing and locate pills within body.	Difficult to diagnose body stuffing/packing and locate pills within body.			
Dr. Alan Wu, SFGH Toxicology	SFGH Poison Control Center on June 7, 2016	Many studies looked into ultrasound as an imaging technique for poisoning yet the studies were inconclusive or unrealistic.	Ultrasound is not an effective imaging technique for poisoning.		There is a method to detect drug packets in the human body without radiation.	
Dr. Alan Wu, SFGH Toxicology	SFGH Poison Control Center on June 7, 2016	Toxicology doctors stated that there was no well validated imaging study for confirming the presence of pills in the stomach.	There is no well validated imaging study to confirm the presence of pills in the stomach.	The device determines when a toxin was ingested.		4.50
Dr. Alan Wu, SFGH Toxicology	SFGH Poison Control Center on June 7, 2016	Activated charcoal and bowel irrigation only are helpful soon after (~1 hour) ingestion but physicians don't know when the toxin was ingested.	Physicians cannot tell when the toxin was ingested which is necessary in deciding if activated charcoal or bowel irrigation would be effective.		The device determines if there are pills in a person's stomach.	
Dr. Alan Wu, SFGH Toxicology	SFGH Poison Control Center on June 7, 2016		Activated charcoal and bowel irrigation are only effective when the toxin is above the pylorus.	The treatment for toxin poisoning is effective regardless of time toxin was ingested.		4.50
Dr. Alan Wu, SFGH Toxicology	SFGH Poison Control Center on June 7, 2016	An incompletely filled cavity (e.g. air in the stomach) will cause noise during ultrasound.	An incompletely filled cavity (e.g. air in the stomach) will cause noise during ultrasound.	Ultrasound is effective in an incompletely filled cavity.		3.50
Poison Control Center Tour						
Dr. Alan Wu, SFGH Toxicology	SFGH Poison Control Center on June 7, 2016	The poison control call center only had 2 operators working. There was also only no previous filtering of non-emergency calls.	The poison control center can be understaffed.	The poison control center effectively answers every call.		3.50
Dr. Alan Wu, SFGH Toxicology	SFGH Poison Control Center on June 7, 2016	One poison center for all of Northern Ca. Many prank calls come through.	The poison control center did not filter for crank calls.			
Dr. Alan Wu, SFGH Toxicology	SFGH Poison Control Center on June 7, 2016	Center seemed to be limited to calls and had no text or facetime capabilities.	The poison control center seemed to be limited to calls and had no text or facetime capabilities.	The poison control center is accessible to the community.		3.25
General Hospital Tour						
Dr. Alan Wu, SFGH Toxicology	Zuckerberg SFGH on June 7, 2016	Only bedridden patients are in earthquake safe buildings at SFGH.	Only bedridden patients are in earthquake safe buildings at SFGH.	All patients at SFGH are safe in the event of an earthquake in San Francisco.		4.00
Dr. Alan Wu, SFGH Toxicology	Zuckerberg SFGH on June 7, 2016	SFGH is the only level 1 trauma center in SF.	SFGH trauma center can be overload and patients are dispatched to Davis and Stanford decreasing their access to care.	Emergency care is accessible and timely.		5.00
Dr. Alan Wu, SFGH Toxicology	Zuckerberg SFGH on June 7, 2016	Overflow patients may go to Stanford or Davis.				
Dr. Alan Wu, SFGH Toxicology	Zuckerberg SFGH on June 7, 2016	Most emergency room patients are uninsured.	Many emergency room patients are uninsured and use the emergency department for primary care.		Uninsured patients have access to primary care.	
Dr. Alan Wu, SFGH Toxicology	Zuckerberg SFGH on June 7, 2016	For uninsured patients, the emergency room is the primary form of healthcare.				
Dr. Alan Wu, SFGH Toxicology	Zuckerberg SFGH on June 7, 2016	Large amounts of uninsured patients come to the ER for primary care, clogging up the system.		The number of uninsured patients is reduced.	The number of uninsured patients in the emergency department is reduced.	3.75
Dr. Alan Wu, SFGH Toxicology	Zuckerberg SFGH on June 7, 2016	G-force can lyse cells in transit from the 6th and 7th floor through pneumatic tubes.	G-force can lyse cells in transit from the 6th and 7th floor through pneumatic tubes resulting in false positive results.	Samples reach different locations throughout the hospital quickly and without compromising the sample.		4.50
Dr. Alan Wu, SFGH Toxicology	Zuckerberg SFGH on June 7, 2016	Samples transported from the 6th & 7th floor to the ground floor of the hospital often created false positives (such as for K testing) due to hemolysis.				
Dr. Alan Wu, SFGH Toxicology	Zuckerberg SFGH on June 7, 2016	A nurse had never seen padding for blood vials in pneumatics tubes.			The pneumatic tube system safely transports samples.	
Dr. Alan Wu, SFGH Toxicology	Zuckerberg SFGH on June 7, 2016	Samples are simply stored in biohazard bags when transported in pneumatic tubes.				
Dr. Alan Wu, SFGH Toxicology	Zuckerberg SFGH on June 7, 2016	There is no padding when pneumatic tubes reach the target receptacle.				
Dr. Alan Wu, SFGH Toxicology	Zuckerberg SFGH on June 7, 2016	Overhead lights in the triage and OR were awkwardly placed. There was no real coordination and the lighting required manual movement. (Maquet)	Overhead lights in the triage and OR were awkwardly placed. There was no real coordination and the lighting required manual movement.	Lighting is unobtrusive.		2.00
Dr. Alan Wu, SFGH Toxicology	Zuckerberg SFGH on June 7, 2016	Drug users may require painful bone drilling to access blood for testing if veins are extensively collapsed.	Drilling the bone causes a lot of pain and patient discomfort.	The device accesses blood in drug users after vein collapse in a less invasive method.		3.25
Dr. Alan Wu, SFGH Toxicology	Zuckerberg SFGH on June 7, 2016	The typical bone drill patient is a 30-40 year old with history of drug use for 10-20 years.	This procedure cannot be used on elderly, very young, and individuals with compromised skeletal systems			
Dr. Alan Wu, SFGH Toxicology	Zuckerberg SFGH on June 7, 2016	Blood gas tests must be done within 15 minutes.	Blood gas test is temporally sensitive.	Blood gas samples are protected from diffusion from the surrounding environment.		2.50
Dr. Alan Wu, SFGH Toxicology	Zuckerberg SFGH on June 7, 2016	Blood gas tests cannot be exposed to air.	Blood gas test is sensitive to atmospheric gases.			
Dr. Alan Wu, SFGH Toxicology	Zuckerberg SFGH on June 7, 2016	Doctors do not always trust patient-reported blood types.	Patients are uneducated on their own blood type.	Physicians have efficient access to patient's blood type.		3.75
Dr. Alan Wu, SFGH Toxicology	Zuckerberg SFGH on June 7, 2016	Real estate in ICU rooms is limited.	Patient rooms can get easily crowded. Limits amount of medical equipment, medical personal and/or family members that can be in the room.	ICU rooms have enough room for all staff and visitors.		2.50
Dr. Alan Wu, SFGH Toxicology	Zuckerberg SFGH on June 7, 2016	There is limited space on the ICU poles for equipment. Priority is given to monitoring and respiratory devices.	ICU poles limit the amount of specialized			

BioDesign Immersion Experience Comprehensive Need Statements						
Client	**Site**	**Observation**	**Problem**	**Primary Need Statement**	**Secondary Need Statement**	**Rank (5 most important)**
Dr. Alan Wu, SFGH Toxicology	Zuckerberg SFGH on June 7, 2016	There are no POC devices on the ICU poles.	equipment available to the patient.	All devices in the ICU rooms are easily accessible.		4.00
Dr. Alan Wu, SFGH Toxicology	Zuckerberg SFGH on June 7, 2016	ICU poles can get rather heavy and crowded with many equipment and loose wires.	ICU poles take up valuable space and are difficult to easily move.			
Dr. Alan Wu, SFGH Toxicology	Zuckerberg SFGH on June 7, 2016	Many beds in the ED and ICU and OBGYN wing were empty.	Patient demand for these medical services is lower than SFGH anticipated.	The hospital uses space efficiently.		2.75
Dr. Alan Wu, SFGH Toxicology	Zuckerberg SFGH on June 7, 2016	The portable monitor and defibrillator look similar.	Potential for the portable monitor and defibrillator to be confused.	The portable monitor and defibrillator are clearly distinguishable.		1.25
Dr. Alan Wu, SFGH Toxicology	Zuckerberg SFGH on June 7, 2016	Bilirubin blood tests require 2-3 uL (question on units) of blood, which is a lot for babies.	Babies' size limit the amount of blood that can be taken at any one time.	The bilirubin test can be administered on all patients.	The bilirubin test is easy to use with babies.	2.75
Dr. Alan Wu, SFGH Toxicology	Zuckerberg SFGH on June 7, 2016	Pigmentation test for bilirubin is cheap and noninvasive, but has accuracy issues, especially with babies with darker skin tones/more melanin.	Current noninvasive tests for bilirubin have inconsistent results when dealing with different skin types		The bilirubin test is accurate and consistent during use with patients with a variety of skin tones.	
Dr. Alan Wu, SFGH Toxicology	Zuckerberg SFGH on June 7, 2016	The blood bank has a pneumatic tube receptacle, but instead use coolers to transport blood samples.	Blood bank supplies are sensitive to elevated temperatures	Samples in the blood blank are resistant to changes in temperature.		2.00
Dr. Alan Wu, SFGH Toxicology	Zuckerberg SFGH on June 7, 2016	Platelet samples, when stored at room temperature and shaken, last for 5 days.	Blood replacements have a limited shelf life	Blood replacement samples are available when needed, yet waste is limited.		2.50
Dr. Alan Wu, SFGH Toxicology	Zuckerberg SFGH on June 7, 2016	Blood samples stored in a fridge last for 3 days, but last longer when frozen.				
Dr. Alan Wu, SFGH Toxicology	Zuckerberg SFGH on June 7, 2016	It is difficult to predict how many samples should be stored/ are needed for transfusion at a time.	It is difficult to predict how many samples should be stored/ are needed for transfusion at a time.			
Downstairs Toxicology Lab Tour						
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	Opiate testing takes 3 hours on the LCMS, including 1 hour of incubation.	There is a limited ability to perform a rapid, accurate opioid test on LCMS.	LCMS gives a rapid and accurate reading for opioids.		3.25
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	GCMS offers better detection of certain substances, but the machine consistently malfunctions and gives false errors.	The GCMS machine consistently malfunctions and gives false errors.	The GCMS machine reports errors accurately.		2.50
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	GCMS could have air leaks or water leaks and nitrogen contamination.	GCMS is plagued with atmospheric contamination	The CMS device is resistant to atmospheric contamination.		2.75
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	LCMS could have some leaks as well.	LCMS is also sensitive to atmospheric contamination, though to a lesser degree than GCMS			
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	Technician that fixes mass spectrometers is not readily available when malfunctions occur.	GCMS is not easy to troubleshoot. Requires highly trained personal	The GCMS is easy to troubleshoot.		3.75
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	Daily calibrations are run for each machine and can take up to 1.5 hour and require human analysis to compare tests to appropriate standards.	The toxicology equipment must be calibrated every day in a time consuming calibration process which requires human interaction.	The toxicology device calibration is efficient and minimizes human effort.		3.50
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	MDA, MDMA, meth, and other amphetamines are difficult to differentiate through quick tests.	MDA, MDMA, meth, and other amphetamines are difficult to differentiate through quick tests.	The toxicology device differentiates between MDA, MDMA, and methamphetamine quickly.		2.75
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	Immunoassays only detect a class of drugs but not the drug itself.	Immunoassays only detect a class of drugs but not the drug itself.	Immunoassays detect specific drugs.		4.25
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	Testing for THC and DHP specifically are very difficult with mass spec.	THC and DHP are difficult to detect using traditional mass spec.	The CMS device detects THC and DHP accurately.		3.75
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	When using LCMS, the technician may need to change the bed/tray while the machine is running since only 100 samples can be placed in the tray at once.	Equipment has limited capacity to carry out tests.	The LCMS accommodates for a large volume of samples.		3.75
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	GCMS could not scale up with the demand but LCMS can.				
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	Helium was used for GCMS, but it is difficult to control contamination and disposal.	Helium use in the equipment raises environmental concerns over disposal and control.	GCMS controls for helium environmental contamination and helium disposal.		2.50
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	Carryover from the previous sample can contaminate the next test.	Cross contamination slowed/impeded ability to rapidly perform tests.	The CMS device prevents cross contamination between samples and tests.		3.75
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	Columns can be optimized depending on needs of test, such as detecting racemic products. Costs are a component in determining if a hospital can test more specifically using these optimizations.	Cost scales directly with sensitivity required. Often, it is a limiting factor when looking for compounds.	Optimization columns are cost-effective.		2.75
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	Overload of an unknown sample can occur and the technician must go through an iterative and time consuming process to produce readable results.	Equipment is not easy to troubleshoot when presented with a sample with a high concentration.	The GCMS device is easy to use with highly concentrated samples.		3.25
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	Different columns with different stationary phases look different in the LCMS but not for GCMS.	Columns for different stationary phases are difficult to distinguish.	Columns with different stationary phases are easily identifiable.		2.50
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	The mobile phases in LCMS may leak, but they are collectable for proper disposal.	The liquids used in LCMS leak when transferring from the storage container into the LCMS.	The LCMS gives accurate results.	The LCMS prevents leaks.	4.50
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	The back pressure of LCMS is inconsistent and can affect results.	The back pressure of the LCMS is inconsistent, depending on the reagents and materials used.		The LCMS back pressure is consistent.	
Upstairs Toxicology Lab Tour						
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	Toxicology lab instruments have a lifespan of 8 years. The validation of new instruments takes 3 months.	The validation process for new instruments takes too long.	The toxicology lab instruments are quickly set-up and validated.		3.50
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016		The lifespan of the machines is too short.			
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	A new lab instrument is ADVIA Chemistry XPT instead of SEIMENS which is their usual manufacturer, so there is a steep learning curve to understand differences and advances in the technology.	Learning to use a new machine, especially from a different manufacturer, is complicated and time-consuming.	New machines require minimal training.		2.50
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	Some machines are very dependent on water and electricity. There is no generator or backup water supply available. When water goes down, only two machines are operable. Without water access, "fire brigade" type of line is required to manually maintain water supply.	The machines depend on water and electricity. When there is no water or electricity, the machine shuts down and cannot operate.		The system still performs its vital functions in the event of a power outage.	
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	The instruments are also sensitive to humidity	The instruments are sensitive to humidity.			

BioDesign Immersion Experience Comprehensive Need Statements						
Client	**Site**	**Observation**	**Problem**	**Primary Need Statement**	**Secondary Need Statement**	**Rank (5 most important)**
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	An increase in temperature increases the number of computer errors.	The instruments' results are affected by increased temperatures.	The chemistry analyzer and immunoassay function accurately in all environments.	The system still performs its vital functions in the event of increased temperatures.	3.75
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	The instruments tend to overheat and will shut down at 39C. Ice packs and fans occupy limited floor space.	There is no easy method to cool instruments.			
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	Water leaks affect surrounding machines & electronics, shutting down the whole lab.	Uncontained water leaks can affect surrounding machines and electronics.		The system still performs its vital functions in the event of floods.	
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	Water must be filtered to prevent bacterial contamination; machine will stop functioning if water is not pure enough.	The current water supply is contaminated.		The system still performs its vital functions in the event of water bacterial contamination.	
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	Machines go down for scheduled maintenance once a year and goes down accidentally around 3-4 times a year.	Maintenance of instruments requires shut down.	During device repair, samples are tested efficiently.		3.25
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	The maintenance of instruments requires shut down.				
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	Manual sorting and uncapping process is not ergonomic and is time consuming and more prone to error.	Manual sorting and uncapping process is not ergonomic and is time consuming and more prone to error.	The device accurately un-caps and sort tubes.		2.00
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	The automatic capper has a safety mechanism in which 2 photos are taken, and if a cap is detected, the tube goes to a human to uncap.	The automatic capper has an error rate and requires human monitoring.			
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	Competitive and sandwich assays take 18, 36, or 52 min	Assays take at least 18 minutes to run, which is too long for some tests.	Assays are accurate and rapid.		5.00
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	It costs $.13 to run each sample with the toxicology machinery. Point of care devices used during shut-down/power outage cost $16 for 8 tests or $8 for a creatinine test to look for renal failure.	POC and backup devices are too costly.	POC devices are cost-effective.		3.25
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	There is not an auto validation process set up because regulatory laws are difficult to overcome and the lab wants the manufacturer (SEIMENS) to complete the software validation process.	There is no auto validation process for SIEMENS machines.	The chemistry analyzer and immunoassay auto validate results.	The machine manufacturer validates the automation process.	3.50
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	Other hospitals use 'Data Validation' as their manufacturer which does have auto validation.				
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	The machines' software is about 2 updates behind what they would like it to be, so they have not yet upgraded to the latest software system.	The software of the machines do not do everything the toxicology lab would like, such as auto validation.		The software updates are easily integrated.	
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	In most hospitals 60% of tests come back within normal limits and don't need review. SFGH estimates theirs would be 40%, and a committee is required to review the other 60%.	SFGH has a higher than average percentage of tests that need review.			
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016		The review process requires a lot of time and people.			
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	Reagents for many instruments (CENTAUR) are manufacturer specific.	The instruments are limited in function by what the manufacturer produces.	The toxicology devices work with a wider variety of suppliers.		1.75
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	Instrument stop buttons are easy to hit by accident. The power switch is currently covered by a plastic cup.	The instruments' stop buttons are too easily accessible.	The device is easy to control manually.		2.50
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	To prevent accidentally turning power off, a cup was taped on the power stich to keep it in the on position.	The instruments' power switch is too easily accessible.			
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	Tests are batched together to conserve reagents. Some tests like general drug screening or the Q-PCR for B57 only run once a week.	It is not efficient to run 1 or 2 samples for a PCR test.	PCR tests are cost-effective.		2.75
Point of Care (POC) Device Discussion						
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	For emergency situations, the toxicology lab might not meet the urgency necessary and have too long of a turnaround time for test results which affects patient care.	For emergency situations, the toxicology lab might not meet the urgency necessary and have too long of a turnaround time for results which affects patient care.	The point of care device accurately and quickly provides emergency staff with basic blood profile.		4.75
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	There is a common POC device tradeoff between sensitivity and turn-around-time.	POC devices with immunochromatographic assays have limited sensitivity.		Immunochromatography tests have high sensitivity.	
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	Immunochromatography is common in point of care devices but is not as sensitive as the toxicology lab and subsequently less accurate.			Point of care blood tests are sensitive enough for clinical use.	
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	Many tests require fasting.	Protein concentration tests require fasting.	The point of care device determines protein concentration without fasting.		3.75
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	Tests that use antibodies and look at protein concentrations require fasting, but the cholesterol test did not require fasting.				
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	HIV is difficult to detect during the early incubation phase.	HIV is difficult to detect during the early incubation phase and POC devices could give false negative.	The test detects HIV in its early stages accurately.		3.75
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	HIV at home diagnostics do not offer the counseling portion of initial treatment.	HIV at home diagnostics do not offer counseling portion of initial treatment.	POC or at home HIV tests provide counseling information.		2.75
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	There is a fine line between treating clots with blood thinners and causing bleeding.	Blood thinners are used to treat blood clots but can cause too much bleeding.	The device determines optimum blood thinner dosage.		2.25
				Bloods clots are prevented without risk of excessive bleeding.		4.25
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	Glucometers are invasive and do not show real-time trends in blood glucose levels.	Glucometers are invasive and do not show real-time trends in blood glucose levels.	The device non-invasively measures real-time glucose levels.		4.25
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	Testing for antibodies may be inconclusive/have low specificity if the patient was already exposed to the disease.	Testing for antibodies may be inconclusive/have low specificity if the patient was already exposed to the disease.	The point of care device differentiates between previous exposure and active infection.		3.50
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 7, 2016	Self-contained blood tests can be used to avoid contamination, such as with Abaxis tests used in preparation for Ebola.	The current self-contained POC blood tests are not specific enough for clinical use.	Certain point of care blood tests meet the standards for BSL-3 and BSL-4 agent testing.	POC blood tests are self contained.	3.75
					POC blood tests are highly sensitive.	

BioDesign Immersion Experience Comprehensive Need Statements						
Client	**Site**	**Observation**	**Problem**	**Primary Need Statement *latent need**	**Secondary Need Statement**	**Rank (5 most important)**
Grand Rounds - Poison Center						
Dr. Alan Wu, SFGH Toxicology	SFGH Poison Control Center on June 21, 2016	It is impossible to run controlled trials for substances analyzed by the toxicology lab, so data and diagnostics are generally done on an anecdotal basis.	Physicians do not have a depth of information on the effects of certain drugs on the human body.	Comprehensive information about the effects of drugs is available.		4.50
Dr. Alan Wu, SFGH Toxicology	SFGH Poison Control Center on June 21, 2016	It is difficult to streamline processing assays for "orphan drugs", i.e. drugs that are not commonly found or used.	It is difficult to streamline processing assays for "orphan drugs", i.e. drugs that are not commonly found or used.	Streamlining processing assays for "orphan drugs" is easy.		2.75
Dr. Alan Wu, SFGH Toxicology	SFGH Poison Control Center on June 21, 2016	Only 1 company (Abbott) makes methotrexate diagnostics.	There is only 1 methotrexate diagnostic tool on the market.	There are multiple methotrexate diagnostic tools available.		1.50
Dr. Alan Wu, SFGH Toxicology	SFGH Poison Control Center on June 21, 2016	Patients taking pill/day instead of pill/week - someone suggested sugar pills to help with patient compliance and prevent overdose.	Weekly pills make patient compliance more difficult.	Medication dosages facilitate patient compliance.		4.50
Dr. Alan Wu, SFGH Toxicology	SFGH Poison Control Center on June 21, 2016	An infant died from accidental ingestion of a fentanyl patch.	Fentanyl patches can be ingested by children.	Fentanyl patches are safeguarded against potential hazards.	Fentanyl patches prevent unintended exposure.	3.75
		There is a significant amount of fentanyl left in the patch to maintain patch gradient.	A used fentanyl patch still contains significant amounts of fentanyl.		Fentanyl patches completely dispense all medication during use.	
		Used fentanyl patches have enough fentanyl in them to cause issues if ingested.			Fentanyl patches properly secure medication without external access to contents.	
		It is relatively easy to extract fentanyl from a patch (cut patch, roll to draw out fentanyl, and heat in water).	It is easy to extract fentanyl from a patch.			
		Whole fentanyl patch ingestion is common.	Whole fentanyl patch ingestion is common.			
Dr. Alan Wu, SFGH Toxicology	SFGH Poison Control Center on June 21, 2016	MTHFR mutation is common but relatively understudied by some physicians.	MTHFR mutation is understudied despite being relatively common.	The MTHFR mutation is well-studied.*		1.50
Dr. Alan Wu, SFGH Toxicology	SFGH Poison Control Center on June 21, 2016	Physicians are unsure about the appropriate length of stay for asymptomatic methotrexate overdose patients.	Physicians do not know the appropriate length of stay for a asymptomatic methotrexate overdose patients.	Physicians know the appropriate length of stay for asymptomatic methotrexate overdose patients.		3.75
Chemistry & Toxicology Tour (Downstairs Laboratory)						
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	LCMS-QTOF is unable to be incorporated into clinical testing because it is hard to analyze results so results can vary between people.	LCMS-QTOF is unable to be incorporated into clinical testing because it is hard to analyze results so results can vary between people.	The system is easy to use.	LCMS-QTOF results are easy to analyze.	3.50
					LCMS-QTOF results are consistent between users.	
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	The TOF Mass spec analysis requires a high degree of training.	TOF mass spec analysis requires extensive training.	The system accurately determines the molecular composition of an unknown compound.		3.50
		The TOF Mass spec result analysis can be very user specific.	TOF mass spec analysis is inconsistent between different users.			
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	Helium carrier gas for gas chromatography is becoming increasingly harder and more expensive to obtain.	Helium carrier gas for gas chromatography is becoming increasingly harder and more expensive to obtain.	The carrier gas for gas chromatography is accessible and inexpensive.	Helium gas is accessible and inexpensive.	2.75
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	Shifting between mobile phases for the different samples in the LC MS/MS is a time consuming process.	Shifting between mobile phases for the different samples in the LC MS/MS is a time consuming process.	Shifting between mobile phases for the different samples in the LC MS/MS is quick.		1.25
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	Immunoassays, while quick to do, are generally nonspecific.	Immunoassays are not specific enough for direct diagnosis.	Immunoassays are specific enough for direct diagnosis.		4.25
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	Vitamin D analysis has to be done exclusively through the Mass Spec system.	Mass spec is the only diagnostic method for vitamin D analysis.	There are multiple diagnostic methods available for Vitaman D analysis.		2.75
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	For the LC MS, Opiates and Vitamin D require different mobile phases.	Opiates and Vitamin D require different mobile phases for use in LC/MS.	The system analyzes all compounds with the same settings.		2.25
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	Peaks can be messy sometimes for the LCMS.	Peaks can be sometimes messy for the LCMS.	The system yields clear, easily interpreted results.		4.50
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	Because of the risk for error, physicians must have positive results from two methods to officially claim the presence of a compound in the patients system.	The risk for error in one test is significant enough that physicians must have positive results from two methods to state that the compound is present.	The tests are definitive and have a low risk of error.		5.00
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	Because there are so many components, Mass specs take up a lot of room.	MS instruments take up a lot of room.	The instrument is compact.		2.50
Chemistry & Toxicology Tour (Upstairs Laboratory)						
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	Machine tube holders need to be replaced regularly to prevent tubes from breaking.	Machine tube holders need to be replaced regularly to prevent tubes from breaking.	The pucks that hold sample tubes are durable.		4.00
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	The track system for the sample sorter, if not maintained, can cause samples to fall and leak out.	The track system for the sample sorter, if not maintained, can cause samples to fall and leak out.	The track system is low-maintenance.	The track system is reliable.	4.00
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	When the sorter fails and is shut down for maintenance, the staff must sort samples manually, using up more time than usual.	When the sorter fails and is shut down for maintenance, the staff must sort samples manually, using up more time than usual.	The sorter system is reliable.		5.00
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	The gripper is not 100% reliable. It can drop tubes.	The gripper can drop tubes.	The gripper system is reliable.		3.75
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	It can get hot in the machine room.	It can get hot in the machine room.	The machine room has a consistent temperature.		3.00
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	The machines will only operate up to a room temperature of 38 degrees Celsius. Fans and cooling systems are placed to prevent overheating, but severe heatwaves can still cause failures.	Severe heatwaves can cause the room temperature to get high enough to crash instruments.	The instruments work in all weather conditions.		2.75
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	Sample prep may have a steep learning curve.	Sample prep may have a steep learning curve.	Sample preparation is simple.		4.25
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	Turnaround time can be faster.	Turnaround time can be faster.	Turnaround time is fast.		5.00
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	The Advia 1800 requires a lot of wash steps and is designed in a way where reagents are added one by one. This means a lot of waiting.	The Advia 1800 requires a lot of wash steps and is designed in a way where reagents are added one by one. This means a lot of waiting.	The machine operates efficiently.		3.50
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	The immunoassay tests from Siemens are "closed systems"; they cannot be modified and must be bought and used, as is.	The immunoassay tests from Siemens are "closed systems"; they cannot be modified and must be bought and used, as is.	The immunoassay machine performs non-Siemens tests.		2.25
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	Sample tubes are still capped the old-fashioned way: >1000 per day by hand and sometimes with a hammer.	Manually capping sample tubes takes more time and employee-resources.	The instrument caps samples automatically.		3.25
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	Precision and recovery for Vitamin D immunoassays are so bad, that they need to be tested downstairs.	Precision and recovery for Vitamin D immunoassays are so bad, that they need to be tested downstairs.	Precision and recovery for vitamin D immunoassays are sufficient.		1.50
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	The immunoassay machine generates a lot of waste: single-use caps, cuvettes, and tips.	The immunoassay machine generates a lot of waste: caps, cuvettes, and tips.	The immunoassay machine is economical.		4.25
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	The immunoassay machine generates a lot of waste: single-use caps, cuvettes, and tips.	Many components are single use, generating a lot of waste.	Laboratory practices are more environmentally-friendly.		4.00
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	It takes about a week to return test results for B57, a critical gene in HIV treatment. HIV PrEP is most effective within 72 hours of exposure.	It takes about a week to return test results for B57, a critical gene in HIV treatment. HIV PrEP is most effective within 72 hours of exposure.	B57 tests provide results quickly.		4.75
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	The cameras monitoring the samples on the track was duct taped on.	The cameras monitoring the samples on the track was duct taped on.	The camera systems are securely mounted.*		1.50
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	People knock into buttons, so they have to be covered.	The buttons are easy to knock into.	The buttons are out of the way.		1.50
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	New instrument validation takes three months.	New instrument validation takes a significant amount of time (3 months).	New instrument validation is done quickly.		3.50
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	Samples are left unrefrigerated for as many as 4 hours.	Samples can be left unrefrigerated for as many as 4 hours.	Samples are refrigerated quickly.		3.75
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	The chiller system creates condensation on the floor.	The chiller system creates condensation on the floor which could potentially cause a workplace hazard.	The solution prevents condensation buildup on the workplace floor.		1.25
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	The Advia 1800 requires 20 minutes to properly refill so people try to time the refills in the middle of sample runs.	The Advia 1800 takes a long time to properly refill.	The Advia 1800 takes less time to properly refill.		3.25
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	The refills of the Advia 1800 often cause people to crash $1800 probes frequently, which temporarily shuts down the machine.	While trying to speed up the refill process, people crash the $1800 probes of the Advia 1800, shutting down the machine.			
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	Test results are filed manually.	Test results are filed manually.	Test results are filed efficiently.*		4.25
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	There is a one week turnaround for PCR results.	PCR results take too long.	PCR results are fast.*		3.25
Point-of-Care (POC) Device Discussion						
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	There is a need for quantitative, sensitive tests for heart diagnostics.	There are no quantitative, sensitive tests available for heart diagnostics.	There is a need for quantitative, sensitive tests for heart diagnostics.		4.25
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	Device and drug companies lobby for exorbitant reimbursement rates for their products, resulting in higher costs for payers, providers, patients, and the overall healthcare system (overhead).	Device and drug lobbies result in higher costs.	Policy prevents device and drug lobbyists from unnecessarily driving up overhead and overall healthcare costs.		5.00
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	Total lipid tests cannot be run on a nonfasting specimen.	Total lipid panels cannot be run on a nonfasting specimen.	The device allows for total lipid panel testing of a non-fasting patient.		1.75
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	POC diagnostics usually cost 10x more than lab tests.	POC diagnostics usually cost 10x more than lab tests.	The cost of point-of-care diagnostics is comparable to central laboratory tests.		3.75
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	Bladder cancer needs a clinically sensitive test for early stage POC testing.	There is no clinically sensitive test for early stage POC testing of bladder cancer.	POC testing of bladder cancer is clinically sensitive in early stages.		3.00
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	The Strep POC test is often used even in clinical settings but has a high number of false positives, especially outside of the flu season.	The POC test for Strep results in many false positives.	The POC test for Strep is accurate.		3.50
Dr. Alan Wu, SFGH Toxicology	SFGH Toxicology Laboratory on June 21, 2016	If veins collapse, the only way to draw blood and add drugs is to use an intraosseous drill to drill into the bone marrow.	If veins collapse, the only way to draw blood and add drugs is to use an intraosseous drill to drill into the bone marrow.	The method for drawing blood and delivering drugs during vein collapse is safe.		4.50
				The method for drawing blood and delivering drugs during vein collapse is comfortable.		3.50
Interventional Radiology Tour						
Dr. Alan Wu, SFGH Toxicology	Interventional Radiology Suite on June 21, 2016	The observation room was relatively crowded.	The observation room was crowded.	The observation room is spacious.*		1.75
Miscellaneous						
Dr. Alan Wu, SFGH Toxicology	ZSFG on June 21, 2016	Sometimes samples are ruined from the rough ride in the vacuum tube.	Sometimes samples are ruined from the rough ride in the vacuum tube.	Sample integrity is protected in the vacuum tube.		4.50
Dr. Alan Wu, SFGH Toxicology	ZSFG on June 21, 2016	Vacuum tubes may not be sealed tight, resulting in sample leakage into the transport system. The system is then shut down for cleaning.	Vacuum tubes may be at risk of sample leakage and, therefore, system contamination.	The vacuum tubes are leak-proof.		4.50
Dr. Alan Wu, SFGH Toxicology	ZSFG on June 21, 2016	The doors did not open in a consistent direction.	The doors did not open in a consistent direction.	The doors open in a consistent fashion.*		2.00

BioDesign Immersion Experience Comprehensive Needs Statements

Client	Site	Observation	Problem	Primary Need	Secondary Need	Rank (5 most important)
General Background						
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	Drinking to much water can lead to seizures due to hyponatremia (low serum sodium concentration).	Water intoxication causes hyponatremia which can result in seizures.	Water consumed in large amounts maintains electrolyte balance.		1.75
			People don't understand the dangers of consumption of large water.	The dangers of large water consumption is well known.		2.50
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	Focal, or partial, seizures originate in one part of the brain. These seizures are acquired and normally are caused from injury to the brain.	Brain injury can result in focal seizures.	Neurological damage from brain injury is quickly and accurately diagnosed.		4.25
Dr. John Hixson		Strokes, parasites (neurocysticercosis), and infections can lead to seizures.				
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	Generalized seizures occur throughout the whole brain all at once. These seizures are genetic where every neuron is abnormal.	Neuronal abnormalities can result in systemic electrical disturbances, i.e. seizures.	Neuronal abnormalities are easily detected.		3.75
			There are limited treatments for generalized seizures.	Generalized seizures are effectively and easily treated.		3.00
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	Generalized seizures normally present in childhood or adolescence. However, some can have a late onset. Some people are discharged from service because their epilepsy presents after they are enrolled.	Predisposition to late onset generalized epilepsy is difficult to detect.	Late onset epilepsy is diagnosed early on.		4.00
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	In order to get the patient to understand their condition, Dr. Hixson uses an electricity metaphor, but it's hard to explain what causes epilepsy when there's so little known about it.	It is difficult to effectively communicate the epilepsy in relatable terms.	Epilepsy diagnosis is easily explain explained to patients.		3.75
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	Muscle contraction (EMG), skin conductance, pupil dilation, heart rate, respiratory rate, blink rate, and pH data would help diagnose or track seizures.	There is no aggregate collection of physiological symptoms to diagnose or track symptoms.	The device tracks and collects multiple physiological symptoms of seizures.		5.00
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	Patients tend to underreport the number of epilepsies they have.	Patients tend to underreport the number of epilepsies they have.		The device accurately records a patient's seizure count.	
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	Self-reporting seizure activity may interfere with clinical trial data.	Self-reporting seizure activity may interfere with clinical trial data.			
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	Wearable devices have limited size range and battery life.	Wearable devices have limited size range and battery life.		Wearable devices for seizure monitoring allow for continuous measurement.	
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	A week of monitoring a patient for a seizure can cost $50-60k.	Seizure monitoring is expensive for patients.	Epilepsy diagnosis is cost-effective.		4.50
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	Financial incentives to provide surgical treatments or long-term observation studies for patients suspected of epilepsy	Hospitals incentivize money-making epilepsy diagnosis and treatment procedures.			
	SFVA Epilepsy Center, June 21,			Epilepsy surgical treatment is cost-effective.		3.25
EEG						
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	Ambulatory care is necessary because signals can be missed during inpatient exams.	Few ambulatory care devices are available for measuring missed signals during inpatient exams are available.	EEG observations record ictal and abnormal interictal moments despite long periods of normal activity.		4.75
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	The Gold Standard is to bring patients into an inpatient setting to monitor them in a hospital with a constant EEG. This monitoring may take up to 2 weeks to see a seizure. A seizure may be missed completely.	Spans of interictal activity last longer than EEG observations, resulting in seizure misdiagnosis.			
Dr. John Hixson		EEG takes around 30 min. However, interictal activity may not occur in the timespan.				
Dr. John Hixson		abnormal activity occurs for 30-50 ms with a burst of uncontrolled electrical activity at a time during interictal activity.				
Dr. John Hixson		EEG shows abnormality 30-40% of time. Normally, 3 EEGs are conducted at different times to try to catch the abnormal electrical activity, which gives a 90% sensitivity.				
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	It is challengng to place the electrodes for the EEG and reduce noise. The best signals are received when the electrodes are directly on the cortex.	The EEG has a poor signal to noise ratio on the scalp.	The EEG device has a high signal to noise ratio on the scalp.	The EEG differentiates between noise from movement and brain activity.	4.50
Dr. John Hixson		Electrosensitive paste is required for the electrodes for the EEG.	The EEG requires adhesive pastes to place the electrodes.			
Dr. John Hixson		Patients must be in bed rest while in the hospital for monitoring so that the EEG noise is reduced and so the patient is on camera at all times.	The EEG procedure requires patients to remain still.			
Dr. John Hixson		Patients must lie still during the EEG to reduce noise.				
Dr. John Hixson		Extreme artifacts presented in the EEG while a patient was eating.	Artifacts in EEGs occur when the patient performs an activity such as eating.			
Dr. John Hixson		The heart is 10x more electrically active than the brain. Heart activity shows up on the EEG.	The heart is 10x more electrically active than the brain, so heart activity shows up on the EEG.		The EEG measurements are unaffected by heart activity.	
Dr. John Hixson		Eye blinks show up on, and disrupt, EEG measurements	Eye blinks show up on, and disrupt, EEG measurements		The EEG measurements are unaffected by eye blinking.	
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	The number of electrodes used in EEG is arbitrary, but the fewer electrodes used, the lower the spatial resolution will be for determining origin of the interictal activity.	When fewer electrodes are used for EEG measurements, the spatial resolution for determining the origin of intracranial activity decreases.	The EEG's spatial resolution remains high with any number of electrodes.		2.50
Other Diagnostics						
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	Ambulatory (outpatient) diagnostics are difficult to administer due to the large level of noise.	Ambulatory (outpatient) diagnostics are difficult to administer due to the large level of noise.	Epilepsy outpatient diagnostics is easy to administer and accurate.		4.25
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	Generalized seizures produce normal MRI scans.	MRIs are unable to detect generalized seizures.	MRIs are able to detect generalized seizures.		2.25
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	CT is not very helpful for diagnosing seizures. MRI can detect blood flow better than CT.	CTs are not sufficient for diagnosing seizures.	CTs accurately diagnose seizures.		1.75
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	Neurological exams are normal for most epilepsy patients.	Neurological exams cannot diagnose epilepsy in most patients.	Neurological exams accurately diagnose epilepsy.		2.50
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	EEG only detects cortex surface signals so deep seizures cannot be detected.	The EEG only detects cortex surface signals so deep seizures cannot be detected.	The EEG detects electrical activity from the deep brain.		3.75
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	Psychogenic seizures appear to be like a seizure but are not from abnormal electroactivity.	Only experts can visually distinguish between a psychogenic seizure and an electrical seizure.	Electrical seizures and psychogenic seizures are easily distinguishable.		3.50
Dr. John Hixson		Epilepsy experts can distinguish between electrical and psychogenic seizures with video.				
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	Veterans are at higher risk of experiencing psychogenic seizures than the general population.	Veterans are at higher risk of experiencing psychogenic seizures than the general population.	Veterans have resources available to reduce their risk of experiencing psychogenic seizures.		4.50
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	"Video is the most important piece" - Dr. Hixson	It is difficult to diagnose a seizure without video of the event or witnessing it in person.	Seizure diagnosis is accurate irrespective of seizure footage.		3.50
Dr. John Hixson		Neurologists need to see the seizure to accurately diagnose it. They can identify which region of the brain the epilepsy originates from, and if it is caused by an electrical stimulus.				
Treatment Options						
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	65-70% of patients are seizure free after trying 1 or 2 AEDs. Combinations are not necessary.	30% of epilepsy patients are not seizure free after trying 1 or 2 AEDs.	Antiepileptic drugs effectively treat all patients.		4.25
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	Refractory patients may require surgery since AEDs are not effective for them.				
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	It is difficult to distinguish if a patient should receive surgery or if they should continue to try other AEDs.	It is difficult to distinguish if a patient should receive surgery or if they should continue to try other AEDs.	The treatment options for epilepsy have well established selection criteria.	Brain surgery criteria for the treatment of epilepsy is well researched and established.	3.50
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	MRI is used to look for structural abnormalities. Only focal seizures that were the result of injury would show signs on an MRI.	Only focal seizures that were the result of injury show signs on an MRI.	The source of a focal seizure is located noninvasively.		4.75
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	Locating the source of focal seizure can involve invasive procedures, like drilling boreholes or removing the skull.	Locating the source of focal seizure can involve invasive procedures, like drilling boreholes or removing the skull.			
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	A lot of effort and tests are required to find the location of a seizure to figure out if a patient is a candidate for surgery.	A lot of effort and tests are required to find the location of a seizure to figure out if a patient is a candidate for surgery.			
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	For patients in which the focal epilepsy region is unknown, after noninvasive diagnostics, an intermediate surgery and a skull removal surgery may be needed in addition to the actual resection surgery.	It is difficult to determine the location of a focal epileptic seizure.			
			Skulls might need to be removed in order to obtain accurate and informative data from the EEG.	The EEG produces meaningful data noninvasively.		3.75
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	Treatment can be more aggressive with children because their brain can recover more than adults.	As a patient ages, the chances of brain cognition and function recovering well after brain surgery is reduced.	The epilepsy treatment for refractory patients improves quality of life for adults.		4.00
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	The reason why some epilepsy patients suddenly become seizure free is unknown.	The reason why some epilepsy patients suddenly become seizure free is unknown.	The pathophysiology of seizures is well characterized.		3.25
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	Populations used in clinical trials do not always predicts results for individuals.	Populations used in clinical trials do not always predicts results for individuals.	Clinical trials use populations that accurately represent the general population.		3.25
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	The ideal epilepsy surgery candidate is someone with refractory focal epilepsy with a known location of origin in a nonessential part of the brain.	In order to be a candidate for surgery, the exact location of the origin of seizures must be known and in a nonessential part of the brain.	The epilepsy treatment for refractory patients is effective for patients whose seizures originate in an essential part of the brain.		4.00

BioDesign Immersion Experience Comprehensive Needs Statements						
Client	**Site**	**Observation**	**Problem**	**Primary Need**	**Secondary Need**	**Rank (5 most important)**
	[illegible]			The epilepsy treatment for refractory patients is safe to use when the location of seizures is unknown.		4.25
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	Patients whose right temporal lobes are resected or removed tend to lose emotive capabilities, sometimes with a change in personality.	Patients whose right temporal lobes are resected or removed tend to lose emotive capabilities, sometimes with a change in personality.	The treatment for epilepsy in refractory patients increases quality of life for patients whose seizures originate in the right temporal lobe.		3.75
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	Some patients are getting surgery where the risks outweigh the benefits due to the low chance of reducing seizure rate and the high invasiveness of the procedures.	The risks of brain surgery can outweigh the benefits of the surgery when used to attempt to treat epilepsy.	The epilepsy treatment increases the patients' overall health.		4.50
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	Some patients believe their chance of improvement after surgery is higher than it is. At the beginning of the process, surgery has a success rate of 70% but patients whose origin of seizure is more difficult to locate can reduce the efficacy to 30-40% without the patient understanding the statistics well. (Occurs in 5-10% of overall epilepsy population.)	Patients are misinformed about the chances of eliminating or reducing seizures through surgery.	Realistic clinical outcomes of brain surgery are accurately communicated to epilepsy patients.		4.25
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	There are biases in healthcare (from hospital administrators) that make it difficult to move diagnoses into the outpatient sector.	Some hospital administrators are motivated by monetary incentives and not the best for patient care.	Hospital administrators prioritize patient health.		3.50
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	The vagus nerve stimulator is not responsive and does not collect data for clinicians.	The vagus nerve stimulator is not responsive and does not collect data for clinicians.	The vagus nerve stimulator is responsive and collects seizure count data.		3.50
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	VNS can cause bradycardia.	VNS can cause bradycardia.	The vagus nerve stimulator maintains a safe blood pressure for the patient.		2.25
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	Even though the Neuropace/responsive neurostimulator system is responsive and collects data, it is still only as successful as the vagus nerve stimulator (2% seizure-free and 50% responder rate). 2% of patients are seizure free with the VNS and 50% have their amount of seizures reduced by at least half.	The vagus nerve stimulator does not help most patients become seizure-free.	Epilepsy treatment for refractory patients has a seizure-free rate greater than 2%.		3.75
			The Neuropace does not help most patients become seizure-free.			
			The vagus nerve stimulator has a 50% chance of reducing seizures by at least half.	Epilepsy treatment for refractory patients reduces seizure rate by at least half more than 50% of the time.		3.75
			The Neuropace has a 50% chance of reducing seizures by at least half.			
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	DBS Is not responsive and dangerous to place. Also, it has limited success in resulting seizure free patients. No patients are seizure free after DNS but 30-40% have their seizure rate reduced by half.	The Deep Brain Stimulator has a low seizure-free rate and has a 30-40% chance of reducing seizure rate by half.			
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	The stimulus from Neuropace can cause transient symptoms.	The Neuropace stimulus can cause transient symptoms.	The Neuropace allows proper brain function regardless of placement.		2.50
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	DBS Is not responsive and dangerous to place. Also, it has limited success in resulting seizure free patients. No patients are seizure free after DNS but 30-40% have their seizure rate reduced by half.	The Deep Brain Stimulator is dangerously invasive to insert.	Epilepsy treatment for refractory patients is minimally invasive.		4.25
			The Deep Brain Stimulator is not responsive to abnormal brain activity such as epilepsy.	Epilepsy treatment for refractory patients reduces seizures in a reactionary manner.		4.00
Patient Monitoring Unit						
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	Each patient's file from video and EEG monitoring is on the order of 10 GB and usually requires compression to store.	Each patient's file is very large and it requires a lot of memory to store the files.	Patients' EEG and video files are easily stored.		2.50
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	Automatic EGG seizure detection algorithms still require human review.	Automated seizure detection is slow and unreliable, requiring human review.	Automated seizure detection is fast and reliable.		3.75
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	Automated seizure detection algorithm is not trusted. Manual human review is required for accuracy.				
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	Patients get bored during long hospital stays for EEG and video monitoring.	Patients are bored during long hospital stays for epilepsy monitoring.	Patients are engaged during long hospital stays.		2.75
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	Concussive head blasts may damage brain although no structural damage occurs.	Concussive head blast brain damage cannot be detected.	Brain damage from concussive head blasts is well characterized.	The relationship between concussive head blasts and epilepsy is well understood.	3.75
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	It is unclear if concussive head blasts can lead to epilepsy.	It is unclear if concussive head blasts can lead to epilepsy.			
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	The camera monitoring the patients has to be manually adjusted by the nurses if the patient leaves the bed.	The camera monitoring patients has to be manually adjusted whenever the patient leaves the camera view.	The camera automatically follows the patient's position.		3.25
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	Patients must be in bed rest while in the hospital for monitoring so that the EEG noise is reduced and so the patient is on camera at all times.				
Wearable devices						
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	The E4 wristband needs to be charged, yet seizures may occur while a patient is charging their device so it will go undetected. The battery problem is seen in most wearable devices.	Wearable devices have limited size range and battery life.	Wearable devices for seizure monitoring fit people of different sizes.		3.00
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	The E4 wristband is medical grade and costs $4k. The Embrace wristband (not medical grade) costs $199.	The medical grade wristband is thousands of dollars more expensive than the similar wristband due to its medical quality.	Medical grade wearable devices for seizure monitoring are affordable.		2.75
Dr. John Hixson	SFVA Epilepsy Center, June 21, 2016	There is a constant debate between price and quality for wearable devices.	Wearable devices have tradeoffs between cost and data quality.	Wearable devices have high data quality and affordable pricing.		3.50

BioDesign Immersion Experience Comprehensive Needs Statements						
Client	**Site**	**Observation**	**Problem**	**Primary Need**	**Secondary Need**	**Rank (5 most important)**
EEG						
Dr. John Hixson	SFVA Epilepsy Center, July 19, 2016	Standard time for an EEG measurement is 30 min. 30% of patients who have epilepsy do not get diagnosed during that time frame.	A standard EEG measurement cannot identify damaged areas of the brain in many patients.	A standard EEG measurement identifies damaged areas of the brain in all patients.	The device monitors epileptic patients who do not show symptoms in EEG or imaging tests at home.	4.33
		Patients who do not show symptoms in EEG or imaging tests need to be brought in to the hospital for long-term testing, costing time and resources.	Patients who do not show symptoms in EEG or imaging tests need to be brought in to the hospital for long-term testing, costing time and resources.			
Dr. John Hixson	SFVA Epilepsy Center, July 19, 2016	Many bodily functions (i.e. heartbeat, muscle movement) can interfere with a EEG measurement.	Many bodily functions can interfere with a EEG measurement.	EEG measurement is specific.		3.67
Dr. John Hixson	SFVA Epilepsy Center, July 19, 2016	Talking creates significant levels of "noise" in EEG monitoring data.	Talking, blinking, and chewing create significant levels of "noise" in EEG monitoring data.	The device eliminates "noise" caused by common movements in the EEG reading.		4.67
		Blinking creates significant levels of "noise" in EEG monitoring data.				
		Chewing creates significant levels of "noise" in EEG monitoring data.				
Dr. John Hixson	SFVA Epilepsy Center, July 19, 2016	Electrodes need to be in complete contact with the skin.	Electrodes need to be in complete contact with the skin.	The monitoring device measures brain electrical activity independently of physical contact.		1.67
Dr. John Hixson	SFVA Epilepsy Center, July 19, 2016	Electrodes are attached using a concrete glue.	Electrodes are attached using a concrete glue.	Electrodes are comfortable.		3.00
Dr. John Hixson	SFVA Epilepsy Center, July 19, 2016	Head wrappings were used to keep the electrodes in place.	Head wrappings are required to keep the electrodes in place.	Electrodes stay in place by themselves.		2.67
Dr. John Hixson	SFVA Epilepsy Center, July 19, 2016	It is difficult to place and remove electrodes.	It is difficult to place and remove electrodes.	Electrodes are easy to place and remove.		3.67
Dr. John Hixson	SFVA Epilepsy Center, July 19, 2016	Electrodes can only be kept on the skin for three to seven days before causing skin ulcers and sores.	Electrodes can only be kept on the skin for three to seven days before causing skin ulcers and sores.	Noninvasive electrodes are safe for long-term use.		4.67
		Subdermal electrodes are invasive but circumvent the issues with skin ulceration.	Subdermal electrodes are invasive but circumvent the issues with skin ulceration.			
Dr. John Hixson	SFVA Epilepsy Center, July 19, 2016	Patient brain measurements are limited by how long electrodes are able to stay on the patient.	Patient brain measurements are limited by how long electrodes are able to stay on the patient.	Brain measurements are electrode-free.		2.67
Dr. John Hixson	SFVA Epilepsy Center, July 19, 2016	Hospital monitoring is not an option for patients who have infrequent seizures.	Damaged areas of the brain are not identified for some patients who have infrequent seizures.	Damaged areas of the brain are identified for patients who have infrequent seizures.		4.00
Dr. John Hixson	SFVA Epilepsy Center, July 19, 2016	EEG measurements are data intensive and require a lot of storage space.	EEG measurements are data intensive and require a lot of storage space.	Only relevant EEG measurements are stored.		2.33
Dr. John Hixson	SFVA Epilepsy Center, July 19, 2016	Each night of hospital monitoring costs $7,000.	Each night of hospital monitoring costs $7,000.	Hospital monitoring is inexpensive.		3.67
Dr. John Hixson	SFVA Epilepsy Center, July 19, 2016	The EEG line is connected directly into the wall.	The EEG line does not transmit data wirelessly.	The EEG line transmits data wirelessly.		1.33
Dr. John Hixson	SFVA Epilepsy Center, July 19, 2016	EEG measurements record macro level patterns, summing the action of hundreds of thousands of neurons firing.	EEG measurements record macro level patterns, summing the action of hundreds of thousands of neurons firing.	EEG measurements record neural patterns with high precision and detail.		3.67
Dr. John Hixson	SFVA Epilepsy Center, July 19, 2016	Patient mobility is limited during EEG measurement.	Patient mobility is limited during EEG measurement.	Patients are free to move during EEG measurement.		3.67
Dr. John Hixson	SFVA Epilepsy Center, July 19, 2016	Subdural electrodes are invasive but give better signal to noise ratio.	Subdural electrodes are invasive but give better signal to noise ratio.	Noninvasive electrodes have good signal to noise ratio.		4.67
Dr. John Hixson	SFVA Epilepsy Center, July 19, 2016	There is a need for better outpatient ambulatory devices to monitor patient brain activity.	There is a need for better outpatient ambulatory devices to monitor patient brain activity.	There is a need for better outpatient ambulatory devices to monitor patient brain activity.		5.00
Imaging						
Dr. John Hixson	SFVA Epilepsy Center, July 19, 2016	MRI measurements are indirect.	MRI measurements are indirect.	MRI measurements are direct.		1.00
Dr. John Hixson	SFVA Epilepsy Center, July 19, 2016	Higher resolution imaging can identify small islands of abnormal tissue that would not otherwise be detected.	Higher resolution imaging can identify small islands of abnormal tissue that would not otherwise be detected.	MRI resolution is high.		2.00
Dr. John Hixson	SFVA Epilepsy Center, July 19, 2016	Old hospital 1.5~3 Tesla MRIs do not have the resolution to detect the source of some focal seizures.	Old hospital 1.5~3 Tesla MRIs do not have the resolution to detect the source of some focal seizures.	All hospitals have MRIs powerful enough to provide standard of care resolution.		1.00
Seizure						
Dr. John Hixson	SFVA Epilepsy Center, July 19, 2016	Febrile seizures as a child are associated with a higher seizure risk later in life.	-	-		-
Dr. John Hixson	SFVA Epilepsy Center, July 19, 2016	Brain infections are the most common cause of epilepsy.	-	-		-
Dr. John Hixson	SFVA Epilepsy Center, July 19, 2016	It is difficult to differentiate generalized seizures from focal seizures with secondary generalization.	It is difficult to differentiate generalized seizures from focal seizures with secondary generalization.	The device differentiates generalized seizures from focal seizures with secondary generalization.		2.67
Dr. John Hixson	SFVA Epilepsy Center, July 19, 2016	35% of patients with epilepsy do not respond to medication.	35% of patients with epilepsy do not respond to medication.	Medication is effective for all patients with epilepsy.		4.67
Dr. John Hixson	SFVA Epilepsy Center, July 19, 2016	Restorative brain surgery is only an option for focal seizures.	Restorative brain surgery is only an option for focal seizures.	A surgical cure for generalized seizures exists.		1.00
Dr. John Hixson	SFVA Epilepsy Center, July 19, 2016	As of yet, there is no compensation for physicians for outpatient monitoring of epilepsy.	As of yet, there is no compensation for physicians for outpatient monitoring of epilepsy.	Physicians are compensated for outpatient monitoring of epilepsy.		1.67
Dr. John Hixson	SFVA Epilepsy Center, July 19, 2016	There is no reliable automated alert system for hospitalized patients who are being monitored for seizures.	There is no reliable automated alert system for hospitalized patients who are being monitored for seizures.	The automated alert system for hospital patients being monitored for seizures is reliable.		1.00
Dr. John Hixson	SFVA Epilepsy Center, July 19, 2016	The neuropace and other such technologies take a long time (20 years) to develop.	The neuropace and other such technologies take a long time (20 years) to develop.	Medical monitoring technologies are developed quickly.		2.67
Dr. John Hixson	SFVA Epilepsy Center, July 19, 2016	There is no permanent cure for seizures caused by gene mutations.	There is no permanent cure for seizures caused by genetic mutations.	There is a permanent cure for seizures caused by genetic mutations.		4.67
Other monitoring methods						
Dr. John Hixson	SFVA Epilepsy Center, July 19, 2016	Wearable devices only detect myoclonic seizures.	Wearable devices only detect myoclonic seizures.	Wearable devices detect all types of seizures.		5.00
Dr. John Hixson	SFVA Epilepsy Center, July 19, 2016	If the area in the brain causing the seizures do not show up under standard diagnostic systems, the only way to identify the abnormal area of the brain is to monitor the patient's brain activity during a seizure.	If the area in the brain causing the seizures do not show up under standard diagnostic systems, the only way to identify the abnormal area of the brain is to monitor the patient's brain activity during a seizure.	Standard diagnostic systems identify even minute abnormalities.		4.67
Dr. John Hixson	SFVA Epilepsy Center, July 19, 2016	Current wearable devices cannot provide 24/7 monitoring.	Current wearable devices cannot provide 24/7 monitoring.	Wearable devices provide 24/7 monitoring.		4.33
Dr. John Hixson	SFVA Epilepsy Center, July 19, 2016	Current wearable devices have problems with data management and storage.	Current wearable devices have problems with data management and storage.	Wearable devices manage and store data efficiently.		2.67

BioDesign Immersion Experience High Priority Needs Statements						
Client	**Site**	**Observation**	**Problem**	**Primary Need** ***latent need**	**Secondary Need**	**Rank (5 most important)**
Emily Otto, RN	Stanford Life Flight on July 6, 2016	Poor weather conditions prevent the helicopter from flying.	The helicopter cannot be deployed in bad weather conditions.	The helicopter's flight is unaffected by weather.	Pilots land quickly and easily in all weather and geographic conditions.	5.00
Emily Otto, RN	Stanford Life Flight on July 6, 2016	Cords get so tangled that they sometimes need to be cut from the patients upon arrival.	Untangling medical equipment cords can delay patient transportation out of the helicopter.	The device eliminates cord entanglement.		4.80
Emily Otto, RN	Stanford Life Flight on July 6, 2016	The helicopter cannot operate while drones are flying nearby.	The helicopter has no mechanism to deter drones.	The helicopter has a mechanism to deter drones.		4.80
Emily Otto, RN	Stanford Life Flight on July 6, 2016	The size of the equipment determines what the helicopter is able to carry.	The helicopter has limited space for equipment and people.	The helicopter has space for all the equipment the flight nurses require.		4.80
Emily Otto, RN	Stanford Life Flight on July 6, 2016	A balloon pump changes while in altitude. Its volume and rate change in a cycle that the nurses need to prepare for. High altitudes can trip certain medical devices, making their sensors obsolete in air.	The unpressurized cabin can cause issues with medical equipment like the balloon pump. High altitudes can trip certain medical devices, making their sensors obsolete in air.	The medical equipment is unaffected by cabin pressure.	The balloon pump helium cycling is altitude independent. Medical sensors are unaffected by altitude.	4.80
Emily Otto, RN	Stanford Life Flight on July 6, 2016	During a crash, items needs to be in reach for the flight crew.	Emergency item required during a crash are often out of reach.	Emergency items required during a crash are in reach.		4.60
Emily Otto, RN	Stanford Life Flight on July 6, 2016	Some volunteer emergency responders are medically untrained.	Some volunteer emergency responders are medically untrained.	Volunteer emergency responders are well trained.		4.60
Emily Otto, RN	Stanford Life Flight on July 6, 2016	Pilots often require ground crew to scout and approve landing zones.	Pilots often require ground crew to scout and approve landing zones.	It is easy for pilots to land the helicopter safely without the assistance of ground crew.	The ground crew knows when the helicopter is overhead.	4.40
Emily Otto, RN	Stanford Life Flight on July 6, 2016	It is difficult for the crew to communicate during flight.	The helicopter's noise interferes with the crew's ability to communicate.	The crew is able to use effective communication during flight.		4.40
Emily Otto, RN	Stanford Life Flight on July 6, 2016	There is no backup for the balloon pump.	There is no backup for the balloon pump.	The device used to transport and treat heart attack patients is reliable.		4.40
Emily Otto, RN	Stanford Life Flight on July 6, 2016	When a patient is transported by ground, a member of the flight crew must stay with him until a the nurse transfers the patient to a higher authority. The helicopter must wait until the patient is transferred and pick up the nurse. The helicopter cannot be used for a transport during this process.	The helicopter must wait for patients to be transferred by ground and cannot be used as transport during this time.	The helicopter's wait time during ground transport is minimized.		4.2
Emily Otto, RN	Stanford Life Flight on July 6, 2016	Communication flow from the scene to the flight crew has gaps in it. Emily described it as a game of telephone. What she hears is the patient status may not be accurate. It is difficult to prepare for the patient ahead of time.	Communication between parties is poor resulting in delay of care.	Communication of patient information between emergency responders and the flight crew is efficient and accurate.		4
Emily Otto, RN	Stanford Life Flight on July 6, 2016	Availability of devices is limited by size and specialty. For ECMO patients a perfusion specialist must be on board.	Availability of devices is limited by size and specialty.	Devices fit inside the helicopter.		3.8
Emily Otto, RN	Stanford Life Flight on July 6, 2016	The helicopter can accommodate up to 2 patients.	The helicopter cannot accommodate more than 2 patients.	The helicopter accommodates several patients.		3.6
Emily Otto, RN	Stanford Life Flight on July 6, 2016	Traction splints can limit the height of the patient allowed in the helicopter.	Traction splints can limit the height of the patient allowed in the helicopter.	The lengths of traction splints are adjustable.		3.6
Emily Otto, RN	Stanford Life Flight on July 6, 2016	Recent increases in paperwork/check delay time to take off.	Recent increases in paperwork/check delay time to take off.	The paperwork/pre-flight check is fast.		3.6
Emily Otto, RN	Stanford Life Flight on July 6, 2016	Helicopter equipment is only rated to 300 lbs.	Helicopter equipment is only rated to 300 lbs.	Helicopter equipment accommodates individuals of all weights.		3.4
Emily Otto, RN	Stanford Life Flight on July 6, 2016	The cabin is not pressurized in the helicopter. This can cause issues for patients with cardiovascular and pulmonary problems.	The unpressurized cabin is problematic for patients with cardiovascular and pulmonary issues.	The device allows the cabin to be pressurized.		3.4
Emily Otto, RN	Stanford Life Flight on July 6, 2016	The crew and patient require ear protection to avoid hearing damage.	The helicopter's noise can cause hearing damage.	The device prevents hearing damage from the helicopter.		3.4
Emily Otto, RN	Stanford Life Flight on July 6, 2016	Bird strikes can damage the windshield.	Bird strikes can damage the windshield.	The helicopter has a mechanism to ward off bird strikes.		3.4
Emily Otto, RN	Stanford Life Flight on July 6, 2016	The maximum flight distance of the helicopter is very weight dependent.	The helicopter's range is dependent on its weight.	The helicopter's flight range is independent of weight.		3.4
Emily Otto, RN	Stanford Life Flight on July 6, 2016	It is difficult for the helicopter pilot to see wires while in the air.	Wires are not easily visible from the helicopter.	Wires are easily visible from the helicopter.		3.4
Emily Otto, RN	Stanford Life Flight on July 6, 2016	Patients who are high, scared, or combative pose a risk to the flight crew and must be transported by ground.	Patients who are high, scared, or combative pose a risk to the flight crew and must be transported by ground.	The helicopter transports combative patients safely.		3.2
Emily Otto, RN	Stanford Life Flight on July 6, 2016	Crew members died during a crash from fire or from hypothermia from cold fuel.	Crew members often survive the crash, but don't survive waiting for rescue crews.	Crew members have the materials necessary to survive the wait for rescue crews in case of a crash.		3
Emily Otto, RN	Stanford Life Flight on July 6, 2016	FAA determines what goes in the helicopter but a long paper chase is required for progress.	FAA regulations impede the adoption of medical technology into aircrafts.	The FAA process for adopting medical technology for aircrafts is streamlined.		3
Emily Otto, RN	Stanford Life Flight on July 6, 2016	Patients taller than 6'5" cannot ride in the helicopter.	Patients taller than 6'5" cannot ride in the helicopter.	The helicopter accommodates patients of all heights.		3
Emily Otto, RN	Stanford Life Flight on July 6, 2016	It can take up to an hour to load the patient from a hospital for a hospital transfer.	Loading patients for transfer is inefficient.	Loading patients for transfer is efficient.		2.8
Emily Otto, RN	Stanford Life Flight on July 6, 2016	The uniforms worn by flight nurses are uncomfortable because they are stiff, poorly ventilated, and chafe.	Flight nurse uniforms are uncomfortable because they are stiff, poorly ventilated, and chafe.	Flight nurse uniforms are comfortable.	Flight nurse uniforms are well ventilated. Flight nurse uniforms are soft.	2.2
Emily Otto, RN	Stanford Life Flight on July 6, 2016	OCC approval requirements may result in a delay in takeoff.	OCC approval requirements may result in a delay in takeoff.	OCC approval is fast.		2.2
Emily Otto, RN	Stanford Life Flight on July 6, 2016	The black box can accidentally be flipped on during a hard landing.	The black box can be triggered accidentally when there is no crash.	The black box is only triggered in a real crash.		1.8
Emily Otto, RN	Stanford Life Flight on July 6, 2016	The elevator from the roof to the emergency room is slow.	The elevator from the roof to the emergency room is slow.	The elevator from the roof to the emergency room is fast.*		1.6
Emily Otto, RN	Stanford Life Flight on July 6, 2016	The Stanford hospital is not equipped for burns. The nurses must redirect the pilot and tell him to go to a different hospital.	Since the Stanford hospital is not equipped for burns, the pilot must redirect to another hospital for burn patients.	The Stanford hospital is equipped to handle burns.		1.6
Emily Otto, RN	Stanford Life Flight on July 6, 2016	The hospital does not have sufficient parking to handle its helicopter traffic.	The hospital does not have sufficient parking to handle its helicopter traffic.	The hospital has sufficient parking to handle its helicopter traffic.		1.8
Emily Otto, RN	Stanford Life Flight on July 6, 2016	The exposed tail end of the helicopter poses risk for bystanders.	The exposed tail end of the helicopter poses risk for bystanders.	It is safe for bystanders to walk around helicopters.		1.4
Emily Otto, RN	Stanford Life Flight on July 6, 2016	The helipad has no railing, which is dangerous since if someone is too close to the edge, he or she could fall.	The helipad does not have safety guardrails.	The helipad is safe.		1.4
Emily Otto, RN	Stanford Life Flight on July 6, 2016	The patient's belongings must be tied down before takeoff.	The patient's belongings cannot be transported without being tied down.	The patient's belongings are easily transported aboard the helicopter.		1.4

BioDesign Immersion Experience Comprehensive Needs Statements

Client	Site	Observation	Problem	Primary Need **latent need*	Secondary Need	Ranking
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	Dying when dehydrated is very painful, so it's important to stress drinking water to patients.	Patients with ALS do not drink enough water.	ALS patients are properly hydrated.	The device increases hydration in a non-invasive manner.	4.50
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	Medical staff was concerned about patients who didn't come in because they didn't know whether the patients were being noncompliant or if something serious had happened.	The clinic cannot keep track of patients and their health outside of the clinic.	Clinic staff communicates with patients outside of the clinic easily.		4.50
Dr. Nanette Joyce, Dr. Williams	UCD ALS Clinic, July 1, 2016	It is expensive to have 24 hour care, yet many ALS patients will end up needing it.	24hr care for ALS patients is expensive.	24hr care for ALS patients is affordable.		3.25
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	ALS patients require more calories, but have difficulty eating by mouth.	ALS patients require more calories, but have difficulty eating by mouth.	ALS patients eat by mouth easily.		3.75
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	Patients with ALS require additional calories to maintain weight due to increased metabolism. Patients with ALS often fail to increase their nutrition requirements, resulting in weight loss.	ALS patients can lose weight dangerously fast.	ALS patients maintain a healthy weight.		5.00
Dr. Nanette Joyce, Dr. Williams	UCD ALS Clinic, July 1, 2016	Some patients have not discussed their care goals with their families before coming in. The patient wishes and the family wishes can be conflicting which puts the doctor in a difficult position.	Patient's end of life care is not clearly established before treatment begins.	A patient's end of life care is clearly established with healthcare professionals and family members.		5.00
Dr. Nanette Joyce, Dr. Williams	UCD ALS Clinic, July 1, 2016	Doctors are worried that ALS patients can become depressed.	ALS patients may become depressed.	ALS patients maintain their standards of living.	There is adequate mental health support for ALS patients.	3.75
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	Patient status board has to be rewritten every morning and manually updated throughout the day.	Patient status board has to be rewritten every morning and manually updated throughout the day.	The patient status board is automatically updated. *		2.00
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	Someone in the office room talked about having specialized tools for patients who can't hold things or press buttons.	ALS patients have difficulty holding things.	ALS patients retain their ability to grasp things.		3.75
Michaela Sarazen, registered respiratory therapist (RRT)	UCD ALS Clinic, July 1, 2016	Chronic mask use can cause nasal dilation and septum irritation.	Chronic mask use can cause nasal dilation and septum irritation.	The respirator mask prevents nasal dilation and septum irritation from chronic use.		3.50
Michaela Sarazen, RRT	UCD ALS Clinic, July 1, 2016	Differently shaped masks are interchanged with the Trilogy device to reduce irritation. The Trilogy mask puts pressure on cheekbones.	Masks used for noninvasive ventilation may cause irritation with consistent use. The Trilogy mask puts pressure on cheekbones.	Masks used for noninvasive ventilation are comfortable during constant use.	The Trilogy mask evenly distributes pressure across the patients face.	4.25
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	While wearing the Trilogy mask, it is difficult to articulate so it is hard to understand the user.	While wearing the Trilogy mask, it is difficult to articulate so it is hard to understand the user.	The mask used with the Trilogy ventilation device allows the patient to speak clearly.		3.25
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	When the Trilogy mask covers both the nose and the mouth, the mask can fog up.	When the Trilogy mask covers both the nose and the mouth, the mask can fog up.	The mask used with the Trilogy ventilation device has defogging features.		2.25
Michaela Sarazen, RRT	UCD ALS Clinic, July 1, 2016	The Trilogy masks are not customizable for differently sized patients. Congenital myotonic dystrophy occurs in kids. Children have bad adherence to using the mask for their respiratory assist device. The masks are difficult to fit their thin faces.	The Trilogy masks are not customizable for differently sized patients.	The Trilogy ventilation device mask size is customizable for all patients.	The masked used with the Trilogy ventilation device fits children.	3.75
Michaela Sarazen, RRT	UCD ALS Clinic, July 1, 2016	The RRT manually needs to analyze the data taken from the Trilogy machine.	The RRT manually needs to analyze the data taken from the Trilogy machine.	The respiratory data from the ventilation device is automatically analyzed.		3.75
Michaela Sarazen, RRT	UCD ALS Clinic, July 1, 2016	An iPad can be used to give better support for the Trilogy device, but the patient is not comfortable using technology.	Technology fluency limits medical integration of modern electronic devices.	Newer electronic devices are easily useable by people with limited technological fluency.	Costumer support is easily accessible.	2.50
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	Patient's daughter was forced to manually keep track of medical records.	The caregivers and family of ALS patient's may have to be responsible for keeping track of their medical records.	Caregivers and medical professionals have convenient access to patient's medical records.	Medical records are easy for patients and their caregivers to keep track of.	4.25
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	Patient's paperwork was lost when one hospital sent the records to another hospital. This resulted in delay of care.	Medical records are not easily transferrable between hospitals.	Medical records are easily transferred between hospitals.		4.25
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	The patient's primary care physician (PCP) did not understand ALS so she came to the ALS clinic. However, her insurance only covers her PCP so all prescriptions and equipment need to be transferred from the ALS clinic to the PCP which delays care.	Patient care was delayed due to insurance limitations on coverage.	Insurance expedites specialty care.		3.50
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	Patient need to rearrange pillows to prop herself up.	The patient was uncomfortable during her visit. She had difficulty sitting upright due to reduced muscle mass.	Patients with reduced muscle mass can sit upright comfortably. *		3.00
Michaela Sarazen, RRT	UCD ALS Clinic, July 1, 2016	Disease causes weakness of diaphragm muscles, leading to weakened respiratory functions.	ALS patients have weakened respiratory function.	ALS patients have normal respiratory function.		4.50
Michaela Sarazen, RRT	UCD ALS Clinic, July 1, 2016	Pulmonary tests required uncomfortable nose clamps.	Uncomfortable nose clamps are required for current PFTs.	Nose clamps for PFTs are comfortable.		1.50
Michaela Sarazen, RRT	UCD ALS Clinic, July 1, 2016	Nose clamps don't work on all patients, effectiveness depends on nose size.	Nose clamps don't work for all nose sizes.	Nose clamps for PFTs are effective for all nose sizes.		3.00
Michaela Sarazen, RRT	UCD ALS Clinic, July 1, 2016	The patient was uncomfortable during the pulmonary function tests (PFTs) and short of breath. The patient reported feeling lightheaded.	PFTs are uncomfortable and can result in shortness of breath.	PFTs allow the patient to breathe comfortably.		2.25
Michaela Sarazen, RRT	UCD ALS Clinic, July 1, 2016	The patient is required to do PFTs at every visit. The process takes 20 min, including breaks for the patient when she felt short of breath.	PFTs are time consuming.	PFTs are performed quickly.		2.50
Michaela Sarazen, RRT	UCD ALS Clinic, July 1, 2016	Pulmonary test that required sniffing may cause nose bleeds.	PFTs that require sniffing may cause nose bleeds.	PFTs are complication free.		3.25
Michaela Sarazen, RRT	UCD ALS Clinic, July 1, 2016	Patients with weakness in the orbicularis oris (muscles around the mouth) can't form a seal over the pulmonary testing device.	Patients with weakness in the orbicularis oris (muscles around the mouth) can't form a seal over the pulmonary testing device.	PFT devices are accurate for patients with weakness in the orbicularis oris.		3.50
Michaela Sarazen, RRT	UCD ALS Clinic, July 1, 2016	In order to qualify for a CPAP machine, patients must show a span of 5 min of less than 80% oxygen levels. Yet, some patients need the machine without presenting with this qualifying data so they must see specialists to become approved for insurance.	CPAP machines may not be available to all the patients who need them.	CPAP machines are easily obtainable.		3.25
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	Patient felt lightheaded and short of breath while doing daily activities such as showering, getting dressed, getting out of a car.	ALS patients have difficulty performing daily tasks independently.	ALS patients can perform daily tasks independently.		4.50
Michaela Sarazen, RRT	UCD ALS Clinic, July 1, 2016	The PFTs involved three separate tests with three separate devices.	PFTs are inefficient.	The device incorporates all PFTs.		3.75
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	During the PFTs the patient was asked to cough for the fourth test but instead forgot the directions and breathed in.	The patient could not remember all the different directions for the PFTs.	PFT procedures are easy to remember for ALS patients. *		1.75
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	Creatinine supplements leave a powder-like residue on the back of patient's throat.	Creatinine supplements leave a powder-like residue on the back of patient's throat.	Supplements are easily ingested and digested.		2.75
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	Plastic foot braces are abrasive to the shin. Plastic foot braces are heavy.	Plastic foot braces are abrasive to the shin. Plastic foot braces are heavy.	Assistive foot braces are comfortable.	Plastic foot braces are comfortable on the shin. Plastic foot braces are lightweight.	3.75
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	Plastic foot braces weren't easily compatible with most common footwear.	Braces are not compatible with most common footwear.	Assistive braces fit with all common footwear.		2.25
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	Dr. Joyce requested that a second strap be used on the braces, however, the patient could not put the strap and shoes on and off herself so she is not adding the second strap.	The patient did not follow Dr. Joyce's recommendation because it would have reduced her independence.	Assistive wear preserves the patient's independence.		4.25
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	Common blood pressure medication (statins) can induce muscle degradation.	Common blood pressure medication (statins) can induce muscle degradation.	Blood pressure medication is free from muscle degradation complications.		3.25
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	Patient was using a walker when she fell.	Using a walker did not prevent a fall.	Walkers prevent falls.		3.50
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	Patient's home required out-of-pocket renovations (i.e. bars and ramps) to maintain independent living standards.	Patient's home required out-of-pocket renovations (i. e. bars and ramps) to maintain independent living standards.	Home renovations to maintain independent lifestyle are inexpensive.		2.75
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	The speech device is only 80% covered by Medicare. It takes a while to become approved, processed, and shipped.	Patients may not have access to a speech device that is convenient and affordable.	The speech-assist device is easy to use and affordable.		3.75
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	Patient must do a swallow test (barium test) because she reports having difficulties swallowing thin liquids.	Patients with ALS have a difficult time swallowing thin liquids.	ALS patients easily swallow thin liquids.		3.25
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	At night, the patient reports having uncomfortable dry mouth.	Patients with ALS can develop dry mouth.	The treatment reduces dry mouth in ALS patients.		2.75
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	Insurance denied genetic testing for ALS although the patient wanted the testing.	Insurance does not cover genetic testing for ALS patients.	Insurance covers genetic testing.		3.75
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	The patient had a difficult time adjusting to the change in life style of ALS.	Adjusting to the change in life style of ALS is difficult for some patients.	ALS patients lead a normal lifestyle.		3.75
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	The patient lost her ability to move her toes which decreases her balance and causes her to stub her toes at times.	ALS patients have reduced balance after losing function of their toes.	ALS patients maintain their core strength.		4.50
Dr. Williams	UCD ALS Clinic, July 1, 2016	During a physical exam, the patient's leg cramped up.	During a physical exam, the patient's leg cramped up.	ALS examinations are complication free. *		2.50
Terri Hayward, OT	UCD ALS Clinic, July 1, 2016	The seat elevator in a motorized wheelchair is normally denied through insurance, yet it increases patient's accessibility and independence.	Insurance does not cover seat elevators in wheelchairs. Patient's have reduced accessibility and independence when using a wheelchair.	Wheelchair accommodations are affordable.		3.25
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	Some ALS patients get impatient with slow communication. It took the patient the patient about 15 seconds to type 2 words using the old Tobii Dynavox.	Some ALS patients get impatient with slow communication. Delays in conversations can occur when patients use speech-assist devices.	ALS patients communicate fluidly with others.		4.25
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	The patient claimed that he was abused at a previous care facility. Care facility staff do not always believe patients who report abuse.	Abuse occurs at care facilities. Care facility staff do not always believe patients who report abuse.	Care facilities treat patients with respect.	Care facilities respond quickly to patients reports of abuse.	4.50

BioDesign Immersion Experience Comprehensive Needs Statements						
Client	**Site**	**Observation**	**Problem**	**Primary Need** **latent need*	**Secondary Need**	**Ranking**
		The patient was hassled into removing some of his belonging from his care facility room.	Care facilities may not accommodate all of a patient's belongings.		Care facilities accommodate patient's belongings.	
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	A special lift is required to move the patient to his shower chair and normal wheelchair.	A special lift is required to move the patient to his shower chair and normal wheelchair.	Assistive devices allow for easy transitions.		2.75
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	The patient's hospice facility rent increased from $6,700 to $9,000.	Hospice facilities are expensive.	Hospice care is affordable.		3.75
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	Opiate pain medications cause constipation.	Opiate pain medications cause constipation.	Opiate medications have limited GI side effects.		3.75
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	Botox treatments for controlling siallorhea only last 3 months.	Botox treatments for controlling siallorhea only last 3 months.	Botox treatments are long lasting.		1.50
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	The frequency and timing of doses stated in EMR do not always match exactly how the patient is taking their medications.	The frequency and timing of doses stated in EMR do not always match exactly how the patient is taking their medications.	The device accurately records patients' medicinal intake.		4.00
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	Patients may not always remember the names of their medications because they have to take so many.	Patients may not always remember the names of their medications because they have to take so many.	Doctors have access to a list of current medications that a patient is using.		3.50
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	The patient had a washcloth wrapped around his left hand to catch excess salivation. He was also wearing a long bib.	ALS patients may drool onto their clothes.	The device/medication prevents ALS patients from excessive drooling.		3.50
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	Oxygen levels dropping during sleep greatly shortens a patient's lifespan due to CO2 toxicity.	Oxygen levels dropping during sleep greatly shortens a patient's lifespan due to CO2 toxicity.	The device allows for consistent oxygen levels while the patient is sleeping.		4.75
		Patient wakes up frequently with a headache.	Low levels of oxygen result in headaches.			
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	Patients need to have bowel movements every 2-3 days, but constipation occurs because patients can't walk to stimulate their gut/digestive system.	Patients can't walk to stimulate their gut, causing constipation.	The treatment prevents constipation in ALS patients.		4.25
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	It takes a while to order new devices through the VA.	It takes a while to order new devices through the VA.	New devices are readily available for ALS patients.		3.50
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	Old data from the previous model cannot be transferred to the newer model. A flash drive may be used, but not everything may be saved.	Old data from the old Dynavox cannot be transferred to the newer model.	The Dynavox speech-assist device models allow for data transfer.		3.50
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	The newest Dynavox model has smartphone capabilities, but can only pair with android phones.	The newest Dynavox model cannot pair with iPhones.	The Dynavox speech-assist device pairs with iPhones.		1.25
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	New Dynavox may not be compatible with current mount for old Dynavox.	The mount for the speech-assist device is not compatible with all speech-device models.	The speech-assist device mount is compatible with all Dynavox models.		2.25
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	The patient developed symptoms for ALS a full year before she was diagnosed. The process was time consuming and frustrating for the family.	ALS is difficult to diagnose.	ALS is easily diagnosed.	ALS diagnosis is efficient.	4.75
		It took doctors months to diagnose the patient with ALS, because ALS is a rule-out disease.	ALS diagnosis is generally done through an inefficient rule-out technique.			
		The patient had an unnecessary spinal stenosis surgery before being diagnosed with ALS.	People with ALS are frequently misdiagnosed.		ALS diagnosis is accurate.	
			People with ALS often have unnecessary surgeries.			
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	The cough assist can cause gastric distention.	The cough assist can cause gastric distention.	The cough-assist device is free from gastric distention side effects.		4.25
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	Caretakers or family are responsible for recording outpatient daily measurements.	ALS patients must rely on caretakers or family to record their outpatient daily measurements.	The device records outpatient daily measurements for ALS patients.		3.50
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	The breathing tube was covered with felt and ran from the top of the patient's head to the center of his upper body.	The breathing tube is not comfortable.	The non-invasive ventilation device's breathing tube is comfortable. *		3.50
			The breathing tube is not aesthetically pleasing.	The non-invasive ventilation device's breathing tube is aesthetically pleasing. *		1.50
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	The Trilogy ventilator was attached to the back of the wheelchair and was rather bulky.	The ventilator does not conveniently fit onto the wheelchair.	The Trilogy ventilator is easily attached to a wheelchair. *		1.75
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	The patient's fatigue level increases throughout the day and is difficult to treat.	ALS patients get easily fatigued.	The treatment reduces fatigue in ALS patients.		4.50
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	Wheelchair maintenance and repair sometimes requires a medical prescription. The patient's wheelchair's on/off switch was broken.	The wheelchair could not be repaired quickly.	Wheelchair repair is convenient and quick.		3.25
Dr. Nanette Joyce	UCD ALS Clinic, July 1, 2016	The patient wanted a smaller cough assist, but Medicare would not pay since he already had a compression vest.	Medicare will only pay for one coughing device at a time.	ALS patients have convenient access to cough-assist devices.		3.00

BioDesign Immersion Experience Comprehensive Needs Statements						
Client	**Site**	**Observation**	**Problem**	**Primary Need *latent need**	**Secondary Need**	**Ranking**
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	Back surgery relieves pain in the legs and helps with incontinence and bowel control, but does not really relieve back pain.	Back surgery relieves pain in the legs and helps with incontinence and bowel control, but does not really relieve back pain.	A permanent back pain relief treatment is available.		5.00
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	There are no effective gene therapy treatments for neuromuscular diseases; every solution offered right now is focused on address symptoms and prolonging life, not fixing the disease or gene mutation.	There are no effective gene therapy treatments for neuromuscular diseases; every solution offered right now is focused on address symptoms and prolonging life, not fixing the disease or gene mutation.	Effective gene therapy treatments for neuromuscular diseases are available.		5.00
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	The patient's progressively worsening balance made her fall backward several times since the walker did not protect her balance going backwards.	The patient's mobility device does not protect them from falling.	The patient's mobility device protects the patient from falling.		5.00
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	Weight of most AFO devices throws the patient off balance.	The AFO device affects the patient's balance.		AFO device promotes good balance.	
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	The patient's CT scan was not in the clinic's health records.	The patient's CT scan was not in the clinic's health records.	All patient results are entered into the patient's health records.		4.67
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	Medical providers (wheelchair manufacturers and providers) take too long to get back to patients, causing complications such as ill-fitting wheelchairs.	Medical providers (wheelchair manufacturers and providers) take too long to get back to patients, causing complications such as ill-fitting wheelchairs.	Wheelchair manufacturers and providers are prompt in providing services to patients.		4.67
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	Wheelchair repairs take too long to get parts.	Wheelchair repairs take too long to get parts.		Wheelchair repairs are fast.	
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	Patient lived alone at home with a caretaker for only three hours each day but also mentioned loneliness and depression as general mood.	Patient lived alone at home with a caretaker for only three hours each day but also mentioned loneliness and depression as general mood.	The patient's mental and social health and wellbeing are addressed and cared for.*		4.33
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	It is hard for patients to maintain circulation, especially in their lower extremities, leading to problems such as "dry foot".	It is hard for patients to maintain circulation, especially in their lower extremities, leading to problems such as "dry foot".	The device facilitates proper blood circulation.		4.33
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	Any device that a patient sits or lies down on requires good airflow.	Any device that a patient sits or lies down on requires good airflow.	The device facilitates proper airflow.		4.33
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	Two different physicians gave the patient two different follow-up timeframes, confusing the patient and caregivers.	Two different physicians gave the patient two different follow-up timeframes, confusing the patient and caregivers.	Communication between clinicians and caregivers is clear and easily facilitated.*		4.33
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	The patient would like a chair for her tripod walker, but that would make it too heavy to carry around and difficult to put in the car. (she fatigues easily)	Walkers with chairs are too heavy for easily fatigued patients.	Walkers are easy to use.		4.33
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	Tightening the sleep mask puts an uncomfortable amount of pressure on the patient's cheeks.	The mask straps make the patient uncomfortable.	The BIPAP mask is comfortable for the patient to wear.		4.00
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	Insurance companies don't want to pay for genetic testing (the ultimate diagnostic tool for Duchenne's and Becker's muscular dystrophy) without prior, often unnecessary, blood testing.	Insurance companies don't want to pay for genetic testing (the ultimate diagnostic tool for Duchenne's and Becker's muscular dystrophy) without prior, often unnecessary, blood testing.	Genetic testing is accessible and timely.		4.00
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	The rubber at the bottom of the patient's breathing mask did not stick to the bottom of her face well.	The rubber at the bottom of the patient's breathing mask did not stick to the bottom of her face well.	The BIPAP mask seals to the face well.		4.00
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	Patients are diagnosed with Duchenne's only when they become symptomatic.	Patients are diagnosed with Duchenne's only when they become symptomatic.	The device diagnoses patients with Duchenne's at an early stage.		3.67
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	Skin breakage from constant pressure in one position (i.e. bed sores) is a huge issue for patients who can't move.	Skin breakage from constant pressure in one position (i.e. bed sores) is a huge issue for patients who can't move.	The device protects patients from skin breakage.	The device notifies caregivers when to move patients to avoid bed sores.	3.67
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	Patients can get hot easily because they cannot regulate temperature as well as people with normal muscles.	Patients can get hot easily because they cannot regulate temperature as well as people with normal muscles.	The device regulates the patient's body temperature appropriately.		3.67
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	Patients and caregivers were confused about the patient's diagnosis and the differences between Duchenne's and Becker's muscular dystrophies.	Patients and caregivers were confused about the patient's diagnosis and the differences between Duchenne's and Becker's muscular dystrophies.	Thorough patient education is provided.*		3.67
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	The testing of relative muscular strength was done manually, so approximate scores were given.	Accurate quantitative measurements of muscular strength cannot be given.	The device allows for accurate, quantitative measurement of muscular strength.		3.67
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	The plastic braces sometime slip with socks.	The brace slips with socks	The AFO brace is secure		3.67
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	Typing patient info into the health records takes time.	Typing patient info into the health records takes time.	Entering patient information into the health records is fast.*		3.33
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	Painkillers have a lot of side effects.	Painkillers have a lot of side effects.	Painkillers are free of side effects.		3.33
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	Sleeping pills have a lot of side effects.	Sleeping pills have a lot of side effects.	Sleeping pills are free of side effects.		3.33
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	It is hard for patient go through doorways because their legs jut out from the wheelchair (weakness) and their arms are too weak to move legs into a more compact position.	It is hard for patient go through doorways because legs jut out from their wheelchair (weakness) and their arms are too weak to move legs into a more compact position.	The device helps patients with functional weakness enter compact spaces like doorways.		3.33
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	Patient may have to wear mask at all times to support breathing.	Patient may have to wear mask at all times to support breathing.	The device that provides support for breathing is convenient.		3.33
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	Electric wheelchairs are bulky and difficult to transport.	Electric wheelchairs are bulky and difficult to transport.	Electric wheelchairs are easy to transport.*		3.33
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	Patients need support to stand up from sitting position but don't always have something to hold on to.	Patients need support to stand up from sitting position but don't always have something to hold on to.	The device helps patients stand up from sitting position. *		3.33
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	General practitioners lack proper wound care knowledge for chronic wound patients.	General practitioners lack proper wound care knowledge for chronic wound patients.	General practitioners are aware of appropriate wound care for chronic wound patients.		3.33
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	The patient had to switch insurance companies to be able to get her leg braces.	Insurance issues make it difficult to get medical devices.	Insurance makes getting mobility devices straightforward.		3.33
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	Patients have a hard time maintaining proper posture because their muscles are too weak to support themselves.	Patients have a hard time maintaining proper posture because their muscles are too weak to support themselves.	The device facilitates proper posture.		3.00
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	The brace the patient wore for lordosis would need to be taken off for spine X-rays.	The patient's braces can interfere with the ability to take x rays.	The device facilitates imaging for patients with braces.		2.67

BioDesign Immersion Experience Comprehensive Needs Statements						
Client	**Site**	**Observation**	**Problem**	**Primary Need *latent need**	**Secondary Need**	**Ranking**
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	The gap between the patient's lips and the breathing test tube needed to be closed by hand.	Patients with muscle control difficulties or misshapen palates have difficult with spirometry.	Spirometry setup works for patients who have difficulty closing their mouths.		2.67
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	Balance issues made it difficult to put the walker in her car.	Mobility devices are difficult to move into vehicle for weak or easily fatigued patients.	Walkers can be easily moved into cars by weak patients.		2.67
			Moving mobility device into car difficult with balance issues.	Walkers can easily be put into cars by patients with balance concerns.		2.67
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	Patient's hips are weak so he gets on his toes to walk more easily.	Patient's hips are weak so he gets on his toes to walk more easily.	The device facilitates proper foot position while walking.		2.33
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	It is hard for patients to grab objects.	It is hard for patients to grab objects.	The device helps patients grab objects.		2.33
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	The patient does not know how to change the warmth of the air for the humidifier (there is a way to change this, but it is not clear to the patient).	The humidifier warmth settings are difficult to understand for the patient.	The humidifier settings are simple to adjust.		2.33
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	Wheelchair armrests can cause pain and cut off blood flow over time if patient rests their arm in a bent position.	Wheelchair armrests can cause pain for patients.	The wheelchair relieves patient pain.		2.00
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016		Wheelchair armrests can cut off blood flow in the arms.	The wheelchair promotes patient health.		2.00
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	The exam room did not have a great location for the motorized scooter the patient was in.	The exam room did not have a great location for the motorized scooter the patient was in.	The exam room is accessible for patients in motorized scooters and electric wheelchairs.		1.67
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	The patient's leg braces require closed shoes to work.	AFO braces don't work with all kinds of shoes.	AFO braces work with all shoe types.		1.67
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	The patient noted that the carbon fiber braces are much more comfortable than the previous plastic braces.	Cheaper braces are less comfortable.	Affordable leg braces are comfortable.		1.67
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	The AFO foot brace has a very flat unpadded foot plate so the insole needs to be placed over it.	The AFO foot plate is uncomfortable.	AFO foot plate is comfortable.		1.67
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	The space in the examination room was very limited.	The space in the examination room was very limited.	The examination room is spacious.		1.33
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	It was somewhat difficult to move the patient's limbs to the correct positions for reflex testing.	It was somewhat difficult to move the patient's limbs to the correct positions for reflex testing.	The device facilitates positioning of the patient for reflex testing.		1.33
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	Nose clips that were required for breathing test left indentations on the patient's face.	Nose clips for spirometry are uncomfortable.	Equipment used for spirometry is comfortable.		1.33
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	Carbon fiber AFOs can be sharp and cut up shoes.	The sharp edges of carbon fiber AFOs can damage patient shoes.	AFO device keeps shoes in good condition.		1.33
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	Patient has very limited options in regards to exercise; swimming in a specially modified pool (with a ramp to make getting out easier) seems to be one of the only physical activities that patients can do.	Patient has very limited options in regards to exercise; swimming in a specially modified pool (with a ramp to make getting out easier) seems to be one of the only physical activities that patients can do.	A variety of weight loss methods are accessible to patients suffering from muscular dystrophy.		1.00
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	It is difficult for the nurse to figure out the humidifier model based on description, making describing how to adjust settings difficult.	It is difficult to instruct the BIPAP user on how to address BIPAP issues unless in the presence of the BIPAP machine.	The BIPAP device is easy to troubleshoot remotely.	The BIPAP device is easy to identify.	1.00
Dr. Nanette Joyce	UCD Neuromuscular Disease Clinic, June 30, 2016	The patient feels suffocated by their sleeping mask, and therefore doesn't wear it.	BIPAP sleeping mask makes patient feel suffocated.	BIPAP mask stays secure around the chin.		1.00

BioDesign Immersion Experience

Client	Site	Observation	Problem	Primary Need **latent need*	Secondary Need	Rank *5 most important
Conni Noia, Veterinary Technician	UCD VMTH, June 19, 2016	Entropion surgeries (rolling out the eyelid) are often repeated since it is difficult to extract all the extra tissue during the first surgery. Surgeons are nervous of removing too much tissue and decreasing the protection of the eye.	If entropion surgery under corrects the eyelid, the animal will require additional surgery.	The first entropion surgery removes the correct amount of tissue.		5.00
Conni Noia	UCD VMTH, June 19, 2016	There are no skin grafts for animals with large injuries or necropathy, such as from spider/snake bites.	There are no skin grafts for animals with large injuries or necropathy, such as from spider/snake bites.	There are skin grafts available for animals.		4.80
Conni Noia	UCD VMTH, June 19, 2016	Foxtails can get inhaled by dogs, but are difficult to remove if they lodge too closely to the heart (in the aorta).	Foxtails are difficult to remove if they lodge too closely to the heart.	The device easily removes foxtails lodged near the heart.		4.80
Ingrid Balsa, Shannon Kerrigan	UCD VMTH, June 19, 2016	The patient's leg was wrapped in Coban gauze to be sterile, but the person who was holding the leg would sometimes hold underneath the wrapped part and onto the bare leg.	The patient's leg was wrapped in Coban gauze to be sterile, but the person who was holding the leg would sometimes hold underneath the wrapped part and onto the bare leg.	The sterile field is maintained throughout the operation. *		4.80
Conni Noia	UCD VMTH, June 19, 2016	The substance used to mark the borders of the amputated leg is permanent, so marking the tissue layers must be done very carefully.	The substance used to mark the borders of the amputated leg is permanent, so marking the tissue layers must be done very carefully.	Amputation boundaries are easily and accurately marked.		4.80
Conni Noia	UCD VMTH, June 19, 2016	Dogs (horses , cats...) have a 3rd eyelid that get in the way during ocular surgery, The only speculum available is for the other two eyelids.	Dogs (horses , cats...) have a 3rd eyelid that get in the way during ocular surgery, and the only speculum available is for the other two eyelids.	The device moves the third eyelid out of the way of the surgical site.		4.60
Sheri Pendergraft	UCD VMTH, June 19, 2016	Intraocular injections require puncturing the eye twice.	Intraocular injections require puncturing the eye twice.	Intraocular injections require a single puncture.		4.60
Conni Noia	UCD VMTH, June 19, 2016	The dog threw up due to the anesthesia.	The dog threw up due to the anesthesia.	Anesthesia is free of complications. *		4.60
Ingrid Balsa, Shannon Kerrigan	UCD VMTH, June 19, 2016	The anesthesiologist had to keep looking pretty far under the draping to visually check the condition of the cat.	It is difficult for the anesthesiologist to observe small animals during surgery	The device makes inspecting the status of small animals during surgery simple. *		4.60
Ingrid Balsa, Shannon Kerrigan	UCD VMTH, June 19, 2016	The cautery tool is used with another tube that is required to clear the carcinogenic smoke, but another person had to hold it and make sure they turned it on and off at the same time as the cautery tool. It is turned on and off manually to save battery and filter life.	The cautery tool is used with another tube that is required to clear the carcinogenic smoke, but another person had to hold it and make sure they turned it on and off at the same time as the cautery tool. It is turned on and off manually to save battery and filter life.	The smoke clearing device is simple to use.	The smoke clearing device has a long battery life. The smoke clearing device is integrated with the cautery tool.	4.60
Conni Noia	UCD VMTH, June 19, 2016	Surgeon complained that the bipolar was difficult to see under the table. When it got kicked out of place, she had to look away from the surgery to find the pedal. The surgeon wanted a wireless, non pedal use, bipolar.	The bipolar is difficult to see under the table.	The bipolar tool is wireless and functional without a pedal.		4.40
Conni Noia	UCD VMTH, June 19, 2016	There are no artificial intervertebral discs for dogs.	There are no artificial intervertebral discs for dogs.	There are artificial intervertebral disks for dogs. *		4.40
Ingrid Balsa, Shannon Kerrigan	UCD VMTH, June 19, 2016	The hat spoon was not used because it was too large; a blade was used instead to scrape tissue.	Appropriately sized tools are unavailable for surgery on small animals.	Surgical tools are appropriately sized for working with small animals.		4.40
Conni Noia	UCD VMTH, June 19, 2016	It is difficult to place sutures since the wound bleeds continuously. A second surgeon needs to soak up the blood with a clean gauze.	It is difficult to place sutures since the wound bleeds continuously. A second surgeon needs to soak up the blood with a clean gauze.	The device manages bleeding from open wounds to allow proper placement of sutures.		4.20
Conni Noia	UCD VMTH, June 19, 2016	Animals who lose their left eye tend to bump into things from their left side because they can't see that side.	Animals who have an eye removed have difficulty navigating their environments.	Animals with impaired vision are able to navigate their surroundings.		4.00
Conni Noia	UCD VMTH, June 19, 2016	The anesthesiologist had to manually record vitals over a time period.	The anesthesiologist had to manually record vitals over a time period.	The device automatically records the patient's vitals over a predetermined time period.		4.00
Conni Noia	UCD VMTH, June 19, 2016	It is often difficult to diagnose animals, with limited communication.	It is often difficult to diagnose animals, with limited communication.	The device allows vets to effectively communicate with animals.		4.00
Ingrid Balsa, Shannon Kerrigan	UCD VMTH, June 19, 2016	Movement in the patient's leg could risk nicking the femoral artery.	Movement in the patient's leg could risk nicking the femoral artery.	The device keeps the patient's leg stabilized during procedure to decrease the risk of nicking the femoral artery.		4.00
Ingrid Balsa, Shannon Kerrigan	UCD VMTH, June 19, 2016	The surgeon cart is ideally placed close to the anesthesiologist but this cannot be done in surgery with smaller animals as it prevents the anesthesiologist from checking in on the animal properly.	The surgeon cart is ideally placed close to the anesthesiologist but this cannot be done in surgery with smaller animals as it prevents the anesthesiologist from checking in on the animal properly.	The surgical cart is placed close to the anesthesiologist and allows access for monitoring in small animal surgery.		4.00
Conni Noia	UCD VMTH, June 19, 2016	No specialized tools are created for veterinary surgery, most surgical instruments come from pediatrics.	Tools used in veterinary surgeries were not customized for that species.	Veterinary surgical tools are customized for the patient's size.		4.00
Conni Noia	UCD VMTH, June 19, 2016	Suturing requires surgeons to manually grip and re-grip the needle driver multiple times when performing a simple suture.	Suturing requires significant degree of manual dexterity.	Suturing is easily performed. *		3.80
Conni Noia	UCD VMTH, June 19, 2016	A surgeon needed a pair of surgical magnifying glasses for the surgery. The glasses were battery operated and were about to die. The technician left the room to find replacement batteries and switch the batteries. This process occurred while the patient was already under anesthesia.	Surgical magnifying glasses need replacement batteries which are not easily accessible during surgery.	Surgical magnifying glasses stay charged throughout the duration of surgical procedures. *		3.80
Conni Noia	UCD VMTH, June 19, 2016	A surgeon complained that the drill pedal was difficult to see under the table. When it got kicked out of place, she had to look away from the surgery to find the pedal.	The drill pedal is difficult to see under the table.	The drill pedal is easy to see and use.		3.80
Ingrid Balsa, Shannon Kerrigan	UCD VMTH, June 19, 2016	Cats can get tumors from any under the skin injection, such as vaccines.	Injections cause significant cancer risk for cats.	Cat vaccinations are administered without injections.		3.80
Conni Noia	UCD VMTH, June 19, 2016	Fluid from the stomach came up from the esophagus as the patient laid on the table.	Fluid from the stomach came up from the esophagus as the patient laid on the table.	The position of the patient on the surgical table prevents vomiting.		3.60
Conni Noia	UCD VMTH, June 19, 2016	The technician needed to suction the stomach but she was not sure where the suction tube was located in the patient. There are numbers on the suction tube so that technicians could measure the distance from the patient's mouth to the stomach and then estimate. However, that process is time consuming and the technician preferred eyeballing it.	It is not easy to see the location of the suction tube in the patient.	It is easy to locate the position of the suction tube in the patient.		3.60
Conni Noia	UCD VMTH, June 19, 2016	Spinal decompression surgery costs approximately $7000.	Spinal decompression surgery is expensive.	Spinal decompression surgery is affordable.		3.60
Conni Noia	UCD VMTH, June 19, 2016	The surgical lights have built-in cameras, but they can't be used because the hardware/connections are obsolete.	Hardware/connections in built-in cameras on surgical lights are obsolete.	Hardware/connections in built-in cameras on surgical lights are up to date.		3.60
Conni Noia	UCD VMTH, June 19, 2016	The cautery tool burned through muscle better than fat.	It is difficult to burn through fat with the cautery tool making it harder to operate on overweight patients.	The device facilitates cauterizing tissue on overweight patients.		3.60
Conni Noia	UCD VMTH, June 19, 2016	Every amputation generates different muscle valleys, some of which can make reconstruction difficult.	The different muscle valleys created during amputations can make reconstruction difficult.	Reconstruction after amputation is easy.		3.60
Conni Noia	UCD VMTH, June 19, 2016	Blood-soaked fur is difficult to clean.	Blood-soaked fur is difficult to clean.	The device facilitates cleaning blood from fur.		3.40
Conni Noia	UCD VMTH, June 19, 2016	The table was moving slightly during surgery near the spinal cord. Weights were used to try to keep the table in place. The feet on the bottom wear off which leads to the table being easier to move accidentally.	The feet beneath the surgical table wear off, making the table move slightly.	The feet beneath the surgical table are durable, minimizing table movement. *		3.40
Conni Noia	UCD VMTH, June 19, 2016	There was a small isoflurane leak in the anesthesia tube from the endotracheal tube cuff.	The endotracheal tube cuff leaked isoflurane during surgery.	The endotracheal tube cuff seals well.		3.40
Conni Noia	UCD VMTH, June 19, 2016	The surgical cart did not fit through some doors in the operating suite.	The surgical cart did not fit through some doors in the operating suite.	The surgical cart fits through all doors in the operating suite. *		3.20
Ingrid Balsa, Shannon Kerrigan	UCD VMTH, June 19, 2016	The cautery grip does not seem very ergonomic, and was stained with blood at the end.	The cautery grip does not seem very ergonomic, and was stained with blood at the end.	The cautery grip is ergonomic. *		3.20
Conni Noia	UCD VMTH, June 19, 2016	Surgeon was continuously cleaning the cauterizer by scraping it off against a small rough sponge.	The cauterizer required continuous cleaning during surgery.	The cauterizer is self-cleaning.		3.20
Conni Noia	UCD VMTH, June 19, 2016	Patients were transported on steel rolling carts that must be padded for comfort. There are many layers of the surgical bed: a pad, inflatable pad, heating pad, a fluffy white pad, a grounded board, drapes and then the patient.	Each layer of the surgical bed have to be placed separately.	The components of a surgical bed are integrated into one device. *		2.80
Conni Noia	UCD VMTH, June 19, 2016	The dangers of clamping the optic nerve are not well understood.	The dangers of clamping the optic nerve are not well understood.	The dangers of clamping the optic nerve are well understood.		2.80
Conni Noia	UCD VMTH, June 19, 2016	It is hard to get bandages to stay on cats particularly around the butt.	It is hard to get bandages to stay on cats particularly around the butt.	Bandages securely attach to the patient.		2.80
Conni Noia	UCD VMTH, June 19, 2016	Because of the large number of different blood types, cat blood can be difficult to get.	The variety in blood types for cats makes it difficult to source blood.	A variety of cat blood types are available.		2.60
Conni Noia	UCD VMTH, June 19, 2016	The anesthesiologist capped the syringe after use.	The anesthesiologist manually capped the syringe after use.	Syringe needles are capped safely after use.		2.60
Conni Noia	UCD VMTH, June 19, 2016	Lack of space in the operating room (OR) makes it difficult for students to see cases and learn.	Lack of space in the OR makes it difficult for students to see cases and learn.	The OR design makes it easy for students to view surgical procedures.		2.60
Conni Noia	UCD VMTH, June 19, 2016	Sometimes the grounding doesn't work well for the cautery tool.	Sometimes the grounding doesn't work well for the cautery tool.	Cautery tools are well grounded.		2.60
Conni Noia	UCD VMTH, June 19, 2016	The nitrogen tube for the drill was malfunctioning. (Nitrogen is used as the energy source for the drill). The technician went to get a new tube to replace the current use. After replacement, the drill worked, however the surgeon was still skeptical as the sounds she was hearing from it did not seem similar.	There is no way to ensure that the replacement nitrogen tube for the drill is placed and functioning properly.	The device ensures that the replacement nitrogen tube for the drill is placed and functioning properly.		2.40
Conni Noia	UCD VMTH, June 19, 2016	Silk is used to tie off blood vessels, but its size makes it overkill for small animals.	Silk is used to tie off blood vessels, but its size makes it overkill for small animals.	Sutures are specifically tailored to each operation.		2.40

BioDesign Immersion Experience

Client	Site	Observation	Problem	Primary Need **latent need*	Secondary Need	Rank *5 most important
Ingrid Balsa, Shannon Kerrigan	UCD VMTH, June 19, 2016	The lighting had green sterile covers, but it was bulky and not easy to move into position.	The lighting had green sterile covers, but it was bulky and not easy to move into position.	The lighting is easy to move into the correct position. *		2.40
Conni Noia	UCD VMTH, June 19, 2016	Saline containers do not have specialized nozzles for dispensing. The vets sometimes used a straw to extract liquid.	Saline containers do not have specialized nozzles for dispensing.	Saline containers allow for easy dispensing. *		2.20
Conni Noia	UCD VMTH, June 19, 2016	The patient must be manually picked up and transferred from the OR table to a roll away cart while still hooked up to the anesthesia machine. Wires became entangled during the transfer and the roll away cart did not have much room. Chairs and power cords needed to be pushed aside. The cart could not make a tight turn.	The transfer from the OR table to a rollaway cart is difficult and time consuming.	Patient transfer from the OR table to rollaway cart is fast and easy. *	The roll away carts have good maneuverability.	2.20
					The wires remain untangled during patient transport.	2.20
Conni Noia	UCD VMTH, June 19, 2016	Surgeons noted that extra precaution was needed during the procedure since more people in the room increased the risk of infection.	Sterility is an issue with additional observers.	Sterility is maintained when additional observers enter the surgical room.		2.20
Ingrid Balsa, Shannon Kerrigan	UCD VMTH, June 19, 2016	Scrubbing of the hands in the scrubbing in and out process can create microabrasions that microbes can get into.	The hand scrubbing process creates microabrasions in the surgeon's skin.	Scrubbing leaves the surgeon's skin free from microabrasions.		2.20
Ingrid Balsa, Shannon Kerrigan	UCD VMTH, June 19, 2016	The patient's leg had to be held up manually the entire procedure.	The patient's leg had to be held up manually the entire procedure.	The patient is automatically positioned for procedure. *		2.20
Conni Noia	UCD VMTH, June 19, 2016	People are wary of vets wearing shoe covers outside of the OR.	People are uneducated on the cleanliness of shoe covers versus regular shoes.	Hygienic practices are well understood and followed.		2.00
Sheri Pendergraft	UCD VMTH, June 19, 2016	Injections use a very small volume so is difficult to find instruments that have a high accuracy.	Injections use a very small volume so is difficult to find instruments that have a high accuracy.	The device measures very small volumes accurately.		2.00
Conni Noia	UCD VMTH, June 19, 2016	It is sometimes difficult to hear or understand what people wearing masks are saying.	Surgical masks interfere with a person's ability to understand what the wearer is saying.	Surgical masks allow others to understand what the wearer is saying. *		1.80
Conni Noia	UCD VMTH, June 19, 2016	The hallway in the OR suites was crowded with equipment.	The hallway in the OR suites was crowded with equipment.	Hallways in the OR suites are kept uncluttered. *		1.80
Conni Noia	UCD VMTH, June 19, 2016	It was hard to observe the surgery from the viewing room because the surgeon was blocking the view of the surgery.	It was hard to observe the surgery from the viewing room because the surgeon was blocking the view of the surgery.	The surgical site is completely visible from the viewing room. *		1.80
Conni Noia	UCD VMTH, June 19, 2016	Trashcans with medical waste in OR do not have lids.	Trashcans in the OR do not properly contain medical waste.	OR trashcans properly contain medical waste. *		1.60
Conni Noia	UCD VMTH, June 19, 2016	Saline was aspirated by hand using a rubber suction bulb, which varied in amount of liquid aspirated at a time. The straw was leaky, and the vet had to reach over 4-5 times in order to refill and completely wash the surgical site.	Saliva had to be repeatedly be manually removed from the surgical field.	Saliva only has to be removed from the surgical field once.		1.60
Conni Noia	UCD VMTH, June 19, 2016	The surgical cart can only fit through one of two doors in the room so you cannot wheel out a patient as a second patient is being wheeled in.	The surgical cart is not easily portable.	The surgical cart is portable. *		1.60
Conni Noia	UCD VMTH, June 19, 2016	The surgical cart had a lot of wire and tubes hanging from it and connected to the ceiling.				
Conni Noia	UCD VMTH, June 19, 2016	Clear tubes are tied to a lot of the hanging wires and tubes in order to grip onto them if the wires and tubes are too high.	The wires are too high and difficult to grip without extra additions.	The hanging wires are easily reached and gripped.		1.60
Conni Noia	UCD VMTH, June 19, 2016	Few people in the OR knew where ice was located.	Ice is difficult to locate during the procedure.	Ice is easily located during a procedure. *		1.40
Conni Noia	UCD VMTH, June 19, 2016	It is difficult to pull the right number of surgical booties out.	It is difficult to pull the right number of surgical booties out	Pulling out the correct number of surgical booties is easy.		1.00
Conni Noia	UCD VMTH, June 19, 2016	Disposable surgical caps only fit on short hair.	Disposable surgical caps only fit on short hair.	Disposable surgical caps accommodate all hair lengths.		1.00

BioDesign Immersion Experience Comprehensive Need Statements						
Client	**Site**	**Observation**	**Problem**	**Primary Need Statement**	**Secondary Need Statement**	**Rank (5 most important)**
Colonoscopy						
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	Colonoscopy prep can be difficult to ingest.	Colonoscopy prep can be difficult to ingest.	Colonoscopy prep materials are easier to ingest.	Colonoscopy prep materials are palatable. Colonoscopy prep volume is reduced.	2.75
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	After time, physicians become fatigued and it becomes harder for them to spot polyps and other important observations.	After time, physicians become fatigued and it becomes harder for them to spot polyps and other important observations.	The device reduces the rate of physician fatigue from use during endoscopy or colonoscopy.		3.25
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	Colonoscopy can only reach the secum, and endoscopy through the GI tract can only reach the duodenum; the jejunum is inaccessible through endoscopic procedures.	Colonoscopy can only reach the secum, and endoscopy through the GI tract can only reach the duodenum; the jejunum is inaccessible through endoscopic procedures.	The device accesses and views the jejunum.		3.50
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	It can be difficult to properly guide and control the endoscopic scope.	It can be difficult to properly guide and control the endoscopic scope.	The endoscopic scope is easier to control.		3.50
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	Having to extend and retract the colonoscopy scope several times can be problematic.	Extension and retraction of the colonoscopy scope can create problems.			
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	If the scope punctures an organ, patient health is at risk.	If the scope punctures an organ, patient health is at risk.	The endoscopic scope prevents organ damage.		3.75
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	Polyps hidden in folds are difficult to spot during a colonoscopy.	Polyps hidden in folds are difficult to spot during a colonoscopy.	The endoscope detects polyps hidden in folds during colonoscopy.		4.50
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	The physician carrying out the colonoscopy needed to lean over the patient to read their chart.	Patient's chart was not easily accessible to the attending physician.	Patient charts are readily accessible to physicians during a colonoscopy.		1.25
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	Doctors needed to step over the line plugging the vitals monitor into the wall several times.	Power cords for monitors impeded full access to the room. Power cords for monitors were a tripping hazard	Monitor positioning is optimized.		1.00
Communication						
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	The phone triage specialist sometimes forgets which patient is on which line.	Managing multiple patients over the phone can be difficult.	The device clearly indicates which patient is on each given line of the triage line.		1.50
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	Physicians in outreach clinics are often not knowledgeable of what needs to be done for patients suffering from chronic liver disease.	Physicians in outreach clinics lack sufficient knowledge for treating patients with chronic liver disease.	Physicians in outreach clinics are knowledgeable about chronic liver disease and its treatments.		3.75
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	Physicians spend a lot of time providing patient care over the phone but receive no compensation for this care.	Physicians typically are not compensated for patient care given over the phone.	Physicians are compensated for patient care given over the phone.		2.00
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	Lab tests and biopsies that are ordered individually do not show up together on the electronic medical records system.	Lab tests and biopsies that are ordered individually do not show up together on the electronic medical records system.	The electronic medical system accesses multiple results together.		3.50
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	It is significantly more difficult to communicate with patients who do not sign up with the electronic medical record system.	It is significantly more difficult to communicate with patients who do not sign up with the electronic medical record system.	Patient communication is easy.	Patients are enrolled in the electronic medical system. It is easy to communicate with patient who are not on the electronic medical system.	3.50
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	It is hard to communicate with other hospitals that do not use an electronic medical record system or the same system.	It is hard to communicate with other hospitals that do not use an electronic medical record system or the same system.	Exchanging patient information with other hospitals is easy.	It is easy to exchange patient information with hospitals that do not use and electronic record system. It is easy to exchange patient information with hospitals that use a different electronic system.	4.25
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	The current EPIC/APEX phone app, Haiku, has limited functionality compared to the desktop version.	The current EPIC/APEX phone app, Haiku, has limited functionality compared to the desktop version.	The phone app, Haiku, has as much functionality as the desktop equivalent.		1.00
Procedural						
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	Liver dialysis is not an effective treatment for chronic liver disease because the liver has too many functionalities.	Liver dialysis is not an effective treatment for chronic liver disease because the liver has too many functionalities.	Chronic liver disease treatment is effective.		5.00
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	Left lobe transplants are used for live-donor procedures for survivability of donor, but right lobe transplants have greater recipient success.	Left lobe transplants offer better survivability of donor, but right lobe transplants have greater recipient success.	Liver transplants optimize the survivability of both the donor and the recipient.		4.50
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	Until a site performs 20 live donor partial liver transplants the success rates are lower than whole liver dead donor transplants.	A site must perform 20 live donor partial liver transplants to match success rates of whole liver dead donor transplants.	The number of live-donor transplants a facility undergoes before reaching the efficacy of deceased-donor transplants is reduced.		3.50
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	Very few live donor partial liver transplants are performed in the US because most heptologists are not trained to perform them.	Most heptologists are not trained to perform live donor partial liver transplants.	Transplant surgeons are trained to perform live donor partial liver transplants.		3.75
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	Living-donor recipients tend to require longer hospital stays than deceased-donor recipients.	Living-donor recipients tend to require longer hospital stays than deceased-donor recipients.	Living-donor recipients have reduced hospital stays.		4.00
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	Lying in bed post-operation puts patients at a higher risk for pneumonia because bacteria can enter the spaces the collapsed lung.	Lying in bed post-operation puts patients at a higher risk for pneumonia because bacteria can enter the spaces the collapsed lung.	Post-op procedures safeguard patient health.		4.50
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	Hepatitis C is more manageable with higher socioeconomic status.	Hepatitis C medication is expensive.	Hepatitis C medication is affordable.		4.25
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	There are no clinically available prophylactic treatments for pre- or post-exposure to HCV.	There are no clinically available prophylactic treatments for pre- or post-exposure to HCV.	HCV prophylactic treatment is available.		4.50
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	The patient needs to see many specialists for postoperative care.	Postoperative care of patients requires many specialists.	Postoperative care is streamlined.		2.75
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	Drugs for hepatic encephalopathy cause diarrhea.	Drugs for hepatic encephalopathy cause diarrhea.	Treatment options for hepatic encephalopathy have minimal side-effects.		1.75
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	Transplant is the only way to treat end stage liver disease.	Transplant is the only way to treat end stage liver disease.	End stage liver disease has multiple treatment options.		5.00
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	Some patients are ineligible for intermittent dialysis due to the large fluid volume changes and must receive continuous dialysis.	Some patients are ineligible for intermittent dialysis due to the large fluid volume changes and must receive continuous dialysis.	All patients are eligible for intermittent dialysis.	Intermittent dialysis keeps body fluid at constant levels.	3.75
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	Live donors cannot donate more than once even if their liver fully regrows.	Live donors cannot donate more than once even if their liver fully regrows.	Fully-recovered donors can donate again.		2.25
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	Stem cell technology is not advanced enough to repair livers.	Stem cell technology is not advanced enough to repair livers.	Repairing liver functionality with stem cell technology is viable.		4.00

BioDesign Immersion Experience Comprehensive Need Statements						
Client	**Site**	**Observation**	**Problem**	**Primary Need Statement**	**Secondary Need Statement**	**Rank (5 most important)**
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	Artificial organ technology is not advanced enough to produce viable livers yet.	Artificial organ technology is not advanced enough to produce viable livers yet.	Artificial livers are viable.		4.00
Selection						
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	3000 candidates die or are removed from the transplant waiting list every year.	Many candidates die or are removed from the transplant waiting list without treatment every year.	Every patient needing a liver transplant receives a liver transplant.		5.00
		Each year, the number of people who get transfers is severely outnumbered by the number of patients who get put on the waiting list and the number of patients that die due to liver disease.	The number of patients on the transplant waiting list far exceeds the number of transplants performed each year.			
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	It is more difficult to operate on obese patients because it is harder to keep the incision open with retractors.	It is more difficult to operate on obese patients because it is harder to keep the incision open with retractors.	Operations on obese patients are as easy as operations on other patients.		3.50
		Liver transplant is difficult with obese patients because it is more difficult to operate with a small incision.	Liver transplant is difficult with obese patients because it is more difficult to operate with a small incision.			
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	Transplant recipients must be sober from illicit drugs for at least one year.	Patients who have used illicit drugs in the previous year are not eligible for transplants	Patients on the waiting list remain eligible for liver transplant, despite complications.	Patients on the waiting list remain eligible for liver transplant despite having used illicit drugs in the previous year.	3.00
		Transplant recipients must be sober from alcohol for at least six months.	Patients who have imbibed alcohol in the previous six months are not eligible for transplants		Patients on the waiting list remain eligible for liver transplant despite having imbibed alcohol in the past six months.	
		Patients with uncontrolled medical illness are often deferred or removed from the waiting list.	Patients with uncontrolled medical illness are often deferred or removed from the waiting list.		Patients on the waiting list remain eligible for liver transplant despite suffering from uncontrolled medical illness.	
		Patients with no social support are often deferred or removed from the waiting list.	Patients with no social support are often deferred or removed from the waiting list.		Patients on the waiting list remain eligible for liver transplant even though they lack social support.	
		Patients with insurance issues are often deferred or removed from the waiting list.	Patients with insurance issues are often deferred or removed from the waiting list.		Patients on the waiting list remain eligible for liver transplant despite insurance issues.	
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	Patients can wait as long as 20 years for a transplant.	Patients can wait several years before receiving a transplant.	Patients receive liver transplants quickly.		4.75
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	The weight limit for donors makes finding donors more difficult.	The weight limit for donors reduces the pool of qualified donors.	The device extends the weight range for potential donors.		3.75
Miscellaneous						
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	Weight loss and body building supplements advertised on TV can cause acute liver disease.	Patients purchase and use weight loss and body building supplements as advertised on TV, causing acute liver disease.	Products promote healthy livers.		1.75
Dr. Danielle Brandman, UCSF Liver Disease Clinic	UCSF Parnassus Medical Center on June 14, 2016	There was a sign on the hallway wall that said that pregnant women should not be exposed to x-rays.	Pregnant women cannot safely undergo x-ray procedures.	High-resolution imaging procedures are safe for pregnant women.		2.25

BioDesign Immersion Experience Comprehensive Need Statements						
Client	**Site**	**Observations**	**Problem**	**Primary Need**	**Secondary Need**	**Rank**
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	Conscious sedation makes many patients chatty.	The patient is not fully immobilized while under conscious sedation.	The angiogram remains safe during patient movement.	The patient is fully immobilized while under conscious sedation.	4.00
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	The patient's face is draped even while conscious.	The patient is not in a comfortable environment.	The patient is comfortable during the angiogram.		2.80
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	It is difficult to move the large screen without bumping into items hanging on patient bed.	The large screen is difficult to move without bumping into items hanging on patient bed.	The imaging monitor is easily mobile through a clear path.		2.60
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	The weight limit on the "S" table is 551 lbs.	Some patients may be over the weight limit of 551 lbs. for the "S" table.	The "S" table accommodates patients of all weights.		1.40
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	The screen completely blocks one long side of the bed, while there are 2-5 people in the room at a time.	The large screen limits access to the patient.	The medical equipment allows for access to the patient on all sides.		1.80
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	It is difficult to hear patient during procedure. There is a speaker in the procedure room to help the patient hear, but no microphone near the patient.	It is difficult for the patients to communicate their concerns.	The equipment provides effective patient communication.		3.60
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	Patient was nervous at the beginning of the procedure and asked if everything was okay. The patient had to repeat what they said.				
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	Previous angiogram had to be rescheduled because patient was uncomfortable and needed general anesthesia.	The patient was not properly educated on what to expect during the procedure.	The doctor educates the patient on what to expect prior to the angiogram.		3.20
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	Radiation can enter observation room, where people are not wearing lead aprons.	Radiation from X-rays can enter observation room, where people are not wearing lead aprons.	The observation room is protected from radiation.		3.80
Dr. Steven Hetts				Imaging is safe for hospital staff and patients.		3.60
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	The doctors move in and out of procedure room to look closely at images.	Images cannot be clearly viewed on the monitors inside the procedure room.	The interventional radiology equipment is easily accessible during the procedure.	Images are clearly visible in the procedure room.	4.00
Dr. Steven Hetts			Movement in and out of the room can cause crowding.			
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	Stent placed in previous aneurysm coiling procedure migrated.	Stent placed in previous aneurysm coiling procedure migrated.	Stents resist dislodging.	Stents are easily secured at initial placement.	4.40
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	Stent movement obstructs catheter re-entry.	Stent movement obstructs catheter re-entry.		Dislodged stents enables catheter reentry.	
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	Sterility and cleanliness in observation room is not maintained since surgeons can track in blood on surgical garments.	The observation room is not sterile.	The observation room is sterile.	Surgical garments remain sterile throughout the procedure.	2.00
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	X-ray tables need to be manually moved and adjusted for multiple views (i.e. biplane, lateral).	X-ray tables are difficult to move.	X-ray tables are easily mobile.	X-ray table has multiple points of movement.	2.80
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	It took two people at a time to move the table. It was difficult to make fine adjustments to the position of the X-ray table. It seemed like there was only one point of movement for the X-ray table. All adjustments needed to be done manually.			X-ray table allows for fine adjustments in positioning.	
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	Nurses need to manually spin the patient bed to align with X-rays, which can be difficult after intubation and IV lines are placed. They had to be careful not to dislodge lines.				
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	The overlay roadmap does not align perfectly with actual vasculature, making it difficult for surgeons to ensure that the catheter is properly placed.	Roadmap is occasionally misaligned with real time view.	The catheter's position is easily determined.	The virtual roadmap is perfectly aligned with the physical vasculature.	3.60
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	Communication between monitors of procedure and observation room and between monitors of observation room sometimes glitch.	Communication between monitors of procedure and observation room and between monitors of observation room sometimes glitch.	All computers allow for perfect communication between other computers.		3.40
				The monitors in the procedure room are high resolution.		3.60
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	The catheter is difficult to navigate over arches and turns in vasculature.	The catheter is difficult to navigate through arches and turns in the vasculature.	The catheter is easily manipulated.		4.20
Meningioma Embolization						
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	The breathing tube usually leads to a sore throat and occasionally sore lips.	The breathing tube usually leads to a sore throat and occasionally sore lips.	The device maintains the airway without making the throat or lips sore.		3.00
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	Set up process (draping, breathing tube insertion, shaving, maneuvering monitors, iodine) not including IV insertion or talking to patient took 40 minutes.	The procedure's set up process is slow.	The set up process is quick.	The set up process is efficient.	2.40
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	Lead aprons are heavy.	The lead aprons are heavy.	The device blocks radiation while maximizing comfort.	The device is lightweight.	2.80
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	Lead aprons do not protect arms, legs, neck, and head from radiation.	Lead aprons do not provide full body protection.	The device provides full body protection from radiation.		3.60
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	Nurses were unaware that oxygen tube used in earlier procedure had a leak.	There is no way to identify leaks in oxygen tube until patient's oxygen level drops.	Oxygen tubes are leak proof.	Oxygen tubes alert medical staff in the event of a leak.	2.40
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	Areas that are exposed to radiation are not marked on the ground in every room.	Areas that are exposed to radiation are not marked.	Irradiated areas are clearly designated.		2.80
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	Doors to the procedure room are not locked.	Entry to the operating suite is not secure.	Operating suites are secure.		2.40
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	Signs on doors of procedure room saying whether the X-ray is in use were inaccurate.	Signs on doors of procedure room saying whether the X-ray is in use were inaccurate.	Procedure rooms accurately inform individuals of radiation exposure in real time.		2.60
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	Some patients are hypo metabolizers, making it hard to determine Plavix (blood thinner) dose.	Some patients are hypo metabolizers, making it hard to determine Plavix (blood thinner) dose.	Patient's specific drug metabolism rate is easily measured.		3.20
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	It is difficult to determine loss of cortical gray-white differentiation (sign of ischemic stroke) on a high contrast scan.	It is difficult to decide between getting a high contrast scan (more detail) or viewing loss of cortical gray-white differentiation.	Imaging allows for easy visualization of cortical grey-white differentiation loss.		2.40
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	Doctors from the same network use different measurement systems.	Doctors from the same network use different measurement systems.	Doctors have a standardized, easily understandable, measurement system.		2.00
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	Parents of children being treated are often at different hospitals.	Patients do not have access to quality care for specific specialties.	Patients with specialized needs receive quality care.	Patient receives the care close to his or her family.	3.40
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	Some patients are more scared of treatment for aneurysms that rupture.				
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	Stroke patients suffering speech impairments are unable to vocalize all symptoms.	Stroke patients suffering speech impairments are unable to vocalize all symptoms.	Patients with limited speech capabilities are able to clearly communicate their symptoms.		4.40
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	When overseas doctors request consults the specialists do not always have adequate patient health records or scans.	When consulting, doctors may not have access to all patient records.	Patient's medical records are readily available for medical professionals.		4.00
			Patient health records may be on paper or on electronic records systems that are not compatible with American electronic records system.	Patient health records are compatible with the American electronic records system.		2.80
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	High risk aneurysms are risky to agitate even with minimally invasive interventional radiology procedures, resulting in no treatment available.	High risk aneurysms are risky to agitate even with minimally invasive interventional radiology procedures, resulting in no treatment available.	Treatment for high risk aneurysms is safe.		4.40

BioDesign Immersion Experience Comprehensive Need Statements						
Client	**Site**	**Observations**	**Problem**	**Primary Need**	**Secondary Need**	**Rank**
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	Change in insurance plans delay treatment to time sensitive diseases.	Change in insurance plans delay treatment to time sensitive diseases.	Time sensitive diseases are treated quickly.	Insurance plans allow treatment while patient transitions between plans.	4.40
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	Multiple procedures involving contrast injections have to be spaced out.	Contrast medium is hard on the kidneys.	Contrast medium is safe for kidneys.	Contrast injections allow for multiple procedures within in a short time frame	4.00
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	It is difficult to determine if spinal blood vessels are draining up or down.	It is difficult to determine if spinal blood vessels are draining up or down.	The imaging device distinguishes blood vessel flow direction less invasively.		2.60
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	Embolism particles can cause ischemia at undesirable locations.	Embolism particles can cause ischemia at undesirable locations.	The embolization agent stays in targeted area.		4.60
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	Turning the guidewire to correct directions often takes multiple tries.	Turning the guidewire to correct directions often takes multiple tries.	The guidewire is easy to maneuver.	The guidewire turning is easy to control.	4.40
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	Contrast medium diffuses quickly. They have to keep injecting the medium every few seconds to observe vasculature.	Contrast medium diffuses quickly.	The contrast agent ensures that the vasculature remains visible for an extended period of time.	The contrast medium requires only one injection.	3.60
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	Many meningioma patients were first prescribed pain medications that did not work for their headaches before doctor ordered brain imaging that diagnosed the disease.	Meningioma misdiagnosis as headaches can lead to delay in treatment.	Meningioma diagnosis is quick and accurate.		3.00
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	Chemotherapy drugs cannot cross blood brain barrier.	Meningioma cannot be treated with chemotherapy.	Chemotherapy drugs treat meningioma.		3.80
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	Embolization agents can clog catheter tip if not ejected properly.	Embolization agents can clog the catheter tip.	The catheter facilitates proper ejection of embolization agents.		4.20
Dr. Steven Hetts			It requires skill to effectively use the embolization agents.	The embolization agents are easy to deploy.		3.40
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	It took the doctors a few minutes to exchange the catheter for a new size or softness.	Exchanging the catheter for a different size or softness is inefficient.	The catheter accommodates changes in blood vessel diameter.		3.20
Other						
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	Electronic medical records system interferes with daily work and physician's notes.	The electronic medical records system interferes with daily work and physician's notes because of issues with saving and editing information.	The electronic medical records system is easy to use.	The electronic medical system allows for efficient edits and updates.	4.40
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	Communication between physicians is impaired due to communication issues with pager system.	The communication system is not efficient.	The hospital communication system is efficient.		3.40
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	The neuroIR procedure room is shared with gastroenterology team at Mission Bay, causing scheduling conflicts.	The neuroIR procedure room is shared with gastroenterology team at Mission Bay, causing scheduling conflicts.	The neuroIR procedure room at Mission Bay is available for use when needed.		2.60
Dr. Steven Hetts	UCSF Neurointerventional Radiology on June 8, 2016	Lack of patient education about trauma to head and neck often results in stroke from common activities like chiropractic manipulation or hair washing at the salon.	Common activities like chiropractic manipulation or hair washing at the salon puts patients at risk for stroke.	Common activities prevent further risk of stroke.		2.80