

2

INSIGHTS

To gather insights, I went to observe and record data to different hospitals in Norway (Stavanger, Skien and Ullevål) and Safer, a simulation centre located at the facilities of Laerdal Medical. The difference among them, gave me a better understanding of the flexibility of simulation as a tool for learning.

I also interviewed users and stakeholders of simulation. Among them nurses, simulation instructors, physicians, IT experts, and designers and engineers at Laerdal Medical, who provided me with information about their own needs (See appendix). In this chapter of my report, I showcase the most important insights divided within the different phases of the learning process.

INSIGHTS

Knowledge Acquisition

“In some cases, the purpose of E-learning is to evaluate the students, for them to be able to be part of the simulation in teams”
- Emil Skejlbred

In some hospitals and most of the universities, E-learning, which is basically an online multiple choice service, has been commonly used to evaluate the students or the personnel. One of the insights I got from the hospital of Skien, is that in some cases, this type of evaluation assesses whether or not the student is eligible to the simulation in teams.

This tool is not very used yet, since it is very new. However, some of the people I interviewed, believe that nothing can be compared to the simulation in teams. Collaboration with your peer is something you can not get specifically from these type of softwares (see image 2.1), because they focus mainly on the sequence of procedures, but not in the interaction of the participants, which is equally important for the safety of the patient.

Usually, students of hospital staff practices skill with models, dead bodies or even with their own professor, if the procedure is superficial. With this step, the interviewed people also think that there is nothing comparable to a real body. Therefore, the real practice begins when you treat real patients.



Lectures

E-learning

Software simulation

Skill learning

HeartCode® is a self-paced instructional e-learning program that uses eSimulation technology to allow students to assess and treat patients in virtual healthcare settings. In this environment, students apply their knowledge to real-time decision making and skills development (“HeartCode® ACLS Part 1 | Overview,” n.d.). However, the simulation software focuses mainly in the practice of a chain of procedures, not in the team collaboration.



Image 2.1 Hearcode. Laerdal Medical product

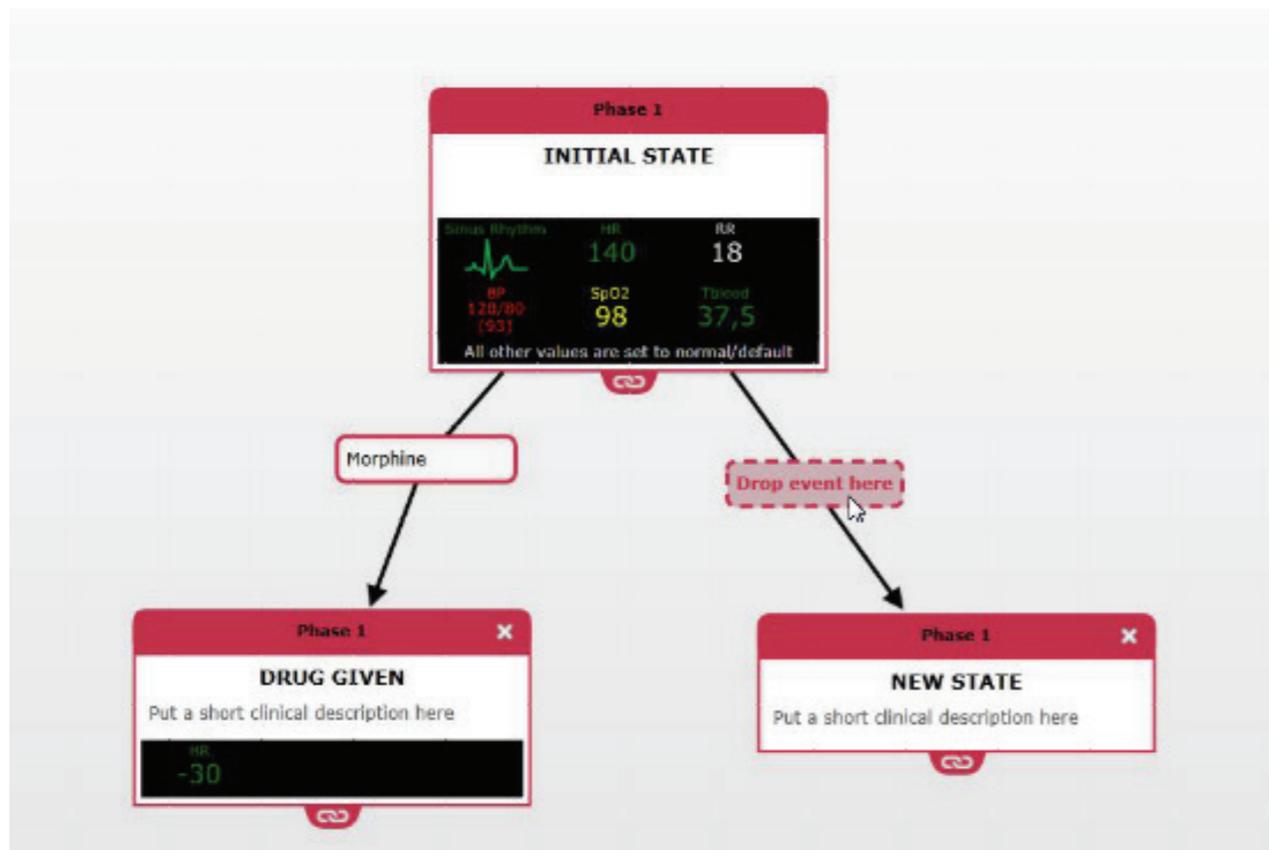


Image 2.2 SimDesigner flowchart

The simulation instructor plays a big role in all the phases of simulation. Without him/her learning would not be the same. For those reasons, Laerdal Medical, for example, has a software called the SimDesigner. This software consists in a flowchart (See image 2.2) that allows the simulation instructor to build up the different steps that the trainees could accomplish in order to save the patient. Using this flowchart improves the control of the mannequin and helps to set better learning goals beforehand. However, even when these types of tools exist, planning a scenario is still time consuming. So, many of the instructors prefer just to use old cases and not to create new ones. But it would be ideal to rehearse as much new and updated scenarios as possible.

“It is difficult to plan or design new scenarios, because of time. Therefore we just use old cases that maybe went wrong”.

Dr.Kjell Tjosevik (Leader at the emergency of Stavanger)

INSIGHT SUMMARY (Knowledge Acquisition)

From the research and insight gathering regarding the knowledge acquisition phase, e-learning is one of the most common tools to use in order to evaluate the competence of the student. However, one of the hospitals I visited, mentioned that if the student is not able to pass the e-learning test he/she is not allowed to be part of the team during simulation. Consequently not during the real emergency either. This information can be interpreted in many ways, depending on the reader, but I want you to know my own interpretations, which are:

- If the student passes the e-learning tests, then he/she is allowed to be part of the scenario simulation. In this way I see simulation more as a reward rather than a needed step of the learning process. The student can be good at memorizing, but that does not necessarily mean that he/she is good at working in a team.

The simulation instructor is a key actor for knowledge acquisition. Therefore, it is important that planning and introduction to new scenarios is well established as part of the system, so the trainees can have more opportunities of learning by being exposed to different settings.

INSIGHTS

Scenario Simulation

The insights regarding this phase were many, so I divided them in three clusters of needs which are:

1. COMMUNICATION:

The main reason to practice simulation in teams is to practice communication among the participants. It should be clear, direct, and use the right medical language and closed-loop communication (See CRM part) at determined moments. Some insights from different users and observations:

*“You can tell when people haven’t been rehearsing, they hesitate a lot during the real emergency or even during simulation, and they might **forget to communicate in double loop** sometimes”*

-Kjell Tjosevik

*How can we **practice ‘team work’** when not all the roles are available every time we simulate?*

-Irlin Troye and Cecilie Haraldseid (Stavanger university and Ullevål)

Some hospitals practice the real emergencies with **vests or tags**, which identify their roles, and make it easier for the others to follow and communicate.

-Hospital of Stavanger and Ullevål

*“**Communication is fundamental**, if the communication goes wrong the procedures go wrong”*

- Emil Skejlbred

Image 2.3 Emil Skejlbred & Stig Frydelund



Image 2.4 Vest tags / Stavanger hospital

2. NEED FOR UPDATED KNOWLEDGE

Simulation instructors usually are personnel that work at the hospital and that have knowledge regarding medicine on the field they teach with simulation. However, this means that these users are very occupied both with their own duty and the teaching. Therefore, most of the time simulation instructor will use old real medical cases and try to resemble it and rehearse it with the trainees. This might be due to many reasons, but the main one I found is because of lack of time to do the planning, the difficulty of using the existent tools to create new scenarios and the variety of scenarios that might exist, which makes it difficult to know the right one that should be rehearsed. Here are some of the insights:

*“We simulate 1 or 2 times per year...I wish we could do it more often, but **to set the scenario requires time, and economical and human resources, which we can't afford for so many students**”* - Cecilie Haraldseid (Teacher at the university of Stavanger)

*The methodology of **performance in the emergency room varies** from country to country, or even it might vary from hospital to hospital.*
-Laerdal & Skien



Image 2.5 Kjell Tjosevik

“It is difficult to plan or design a good scenario, because of time. We use just old cases that maybe went wrong”.

-Kjell Tjosevik



Image 2.6 Cecilie Haraldseid



Image 2.7 Irlin Troye

3. DATA GATHERING

There is a need for the different institutions to gather data from the simulations. This data might consist in the performance of the team they get from the videos they record during the simulation or the set of procedures that the mannequins are able to register. Today, the data they collect from the mannequins and videos is used to give feedback to the trainees, but also to understand what are the right ways to go about teamwork and communication skills during the real clinical experience, not just for the trainees, but in generalities for the institution. However, individual performance is difficult to capture which makes it complicated to have an overview of the team dynamics.

There is also a trend of using actors instead of mannequins. Actors reassemble more reality and it is easier to set in place for the training. However, this diminishes the data that they can get. The institutions rely just on the videos to provide feedback to the trainees, and sometimes not even that, because it takes a lot of time to go through it. The need of more detailed data is not just for the different institutions, but also for Laerdal Medical, they want to provide better tools for the different users and be able to support users depending on the different needs.



Image 2.8 Actors as patients

The trend is to use actors instead of mannequins, which diminishes the amount of data they track. But it is also cheaper for the hospitals and universities to carry the scenario out.

-Ullevål, Safer, the hospital and university of Stavanger

INSIGHTS SUMMARY (Scenario simulation)

It is evident that the scenario simulation practice purpose is to improve team dynamics, but the most important among them is 'Communication'.

Most of the users from different hospitals mentioned that when they have official simulations is when they finally gather all the staff members at the same time in the same place. However, this might happen just once or twice per year, definitely not enough to get to exercise the communication and coordination of the team.

The methodology of performance in critical scenarios varies from country to country or even from hospital to hospital. In my opinion, this fact can be seen as an advantage, that practitioners should use to learn from each other, adopt different and beneficial procedures from other sources, that will just increase competence and update knowledge.

Gathering data seem to be something very important both for the institutions to provide feedback and to get insights for improvement, and for Laerdal to provide the right teaching and learning tools that can meet the different needs of the users.

INSIGHTS

Debriefing

The debrief session can be considered as the most important part of the learning process of simulation, because here is where the actual learning happens (See image 2.9). Today, the only way to actually observe carefully and give concrete feedback to the students or personnel after simulation is by filming the simulation and watch it again to find the critical situations, and also for the individuals to notice the way they performed. From the observations and interviews, I can conclude that most hospitals and educational institutions find filming a good tool to provide feedback to the individuals. But they also find a bit 'time consuming' to watch the whole video to identify the actions that went right or wrong.

However, from the three hospitals I visited, just Ullevål is recording constantly the simulations to provide feedback, to have it as a study material and also for teaching purposes. In addition, they are the only hospital in Norway which is allowed to film the real emergencies, with the condition of recording it on VHS, to destroy the material straight after they have watched it. They have a practitioner in charge of getting the best bits of the videos of these real emergencies. He prepares the material to present it in a meeting with the personnel each Monday. There they will analyse it and set the points where they can improve.



Image 2.9 Debrief session with video



Image 2.10 Debrief Video Software

The fact that some institutions are not using video recording even when they have the infrastructure to do it, is not because they think it doesn't work as a tool for feedback, but because they do not have the time and the human resources to manage to use it properly. Yet, there is the need to provide constructive and individual feedback. Here are some of the quotes that confirm how the debriefing session is when the real learning happens:

This is a quote from Irlin Troye, nurse at the hospital of Ullevål, confirming how effective the video debriefing is:

"When you see yourself, is when the real learning happens. Like in theatre, you have to see yourself to perform better next time!"

"Learners are lacking solid feedback, everything is based in what you manage to take notes of or how the participants felt during simulation"

- Cecilie Haraldseid & Stig Frydelund

"We have the Laerdal video debrief, but we don't use it, because we have no time to watch the whole video to find the actions that went wrong or well, even though it would be ideal"

- Stig Frydelund

CONCLUSION

Scenario Simulation, has been a key element to improve patient safety, specially because until today it is the most reliable way to train team dynamics, which are equally relevant for the medical performance as the skills of the individuals. However, as explained before, to get the right feedback from the simulation is the most important phase of the learning process, because it allows learning and improvement at specific areas. Simulation wouldn't be fruitful without the debriefing session, but more concrete and individual feedback should be implemented urgently as part of this system.



3

NEEDS

In this chapter I make a summary of the most important findings, based on the theoretical research and insights I gathered from users and observations.

Giga Map

To find the needs within the system processes, actors and resources, I used the method of Giga-Mapping. I displayed every component in a time line, taking the learning phases into account as the main zones for the distribution of the insights, resources and actors. (See Giga-Map in the digital appendix).

From this distribution and the exploration of the context, which I showcase in the next chapter, I found 4 main needs, that I explain in the following pages.

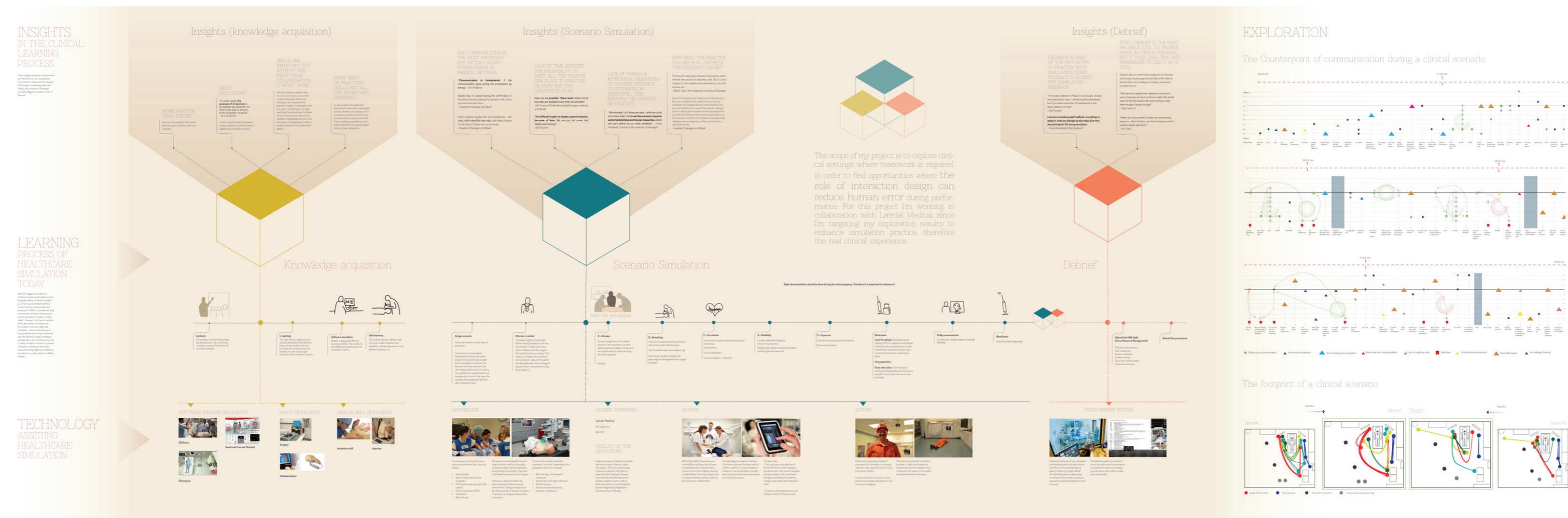
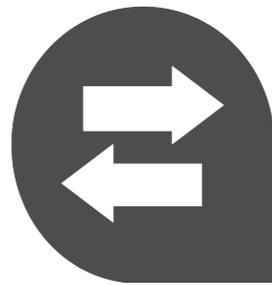


Image3.1 Giga-Map Medical Simulation

The needs

The main goal of the team within the clinical setting is to execute all the right procedures to save the patient. They need to avoid making mistakes that can have negative repercussions in the health of the patient. Therefore, medical institutions and professional seek constantly, through simulation, **to reduce human error in the clinical emergency**. However, I identified four needs of different actors and stakeholders which, if affected positively, will enrich simulation practice. Therefore, they will reduce human error in the critical setting. The four needs are:



The right feedback

The participants of the scenario lack concrete feedback related to their communication and their behaviour. The current debrief sessions provides them with a general feedback. They do not know exactly where to improve.



Updated Knowledge

The scenarios which they rehearse are mainly based in old cases that the simulation instructor provides them with. To create scenarios that they might face in the future is difficult, and there is not much updated material available that can help with it.



Save Time planning and debriefing

The simulation instructor is the KEY actor in this learning process, since his role is to create knowledge, convey it and evaluate it. However, simulation instructors normally are part of the daily duties at the hospital. Therefore, their time to plan the scenarios and to provide feedback to the trainees is limited.

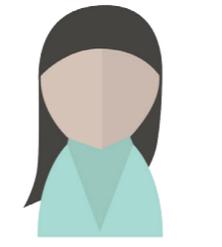


Get more data

Laerdal Medical, as the provider of the tools to facilitate simulation, is concern about the needs of the users. Thus, they are constantly seeking to get more data from the scenarios in order to find opportunities for improvement.

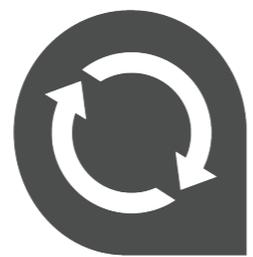
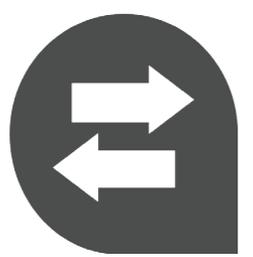
The actors

In order to meet the needs, it is important to identify the actors and users within the simulation setting, these should be addressed in order to have a higher impact. Consequently, I look into the main users or stakeholders within the needs, and I came to the understanding that even when the participants are the ones requiring the solid feedback and updated material for learning, the key actor to convey this knowledge is the Simulation Instructor. Thus, if the simulation instructor is provided by Laerdal with better tools to accomplish this, the impact would be broader. Below is a scheme of the different actors within the needs mentioned before.



= The Champion

Simulation Instructor



Medical team

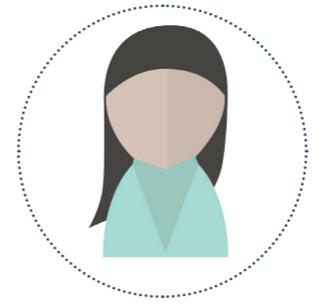
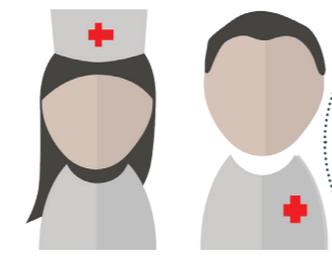
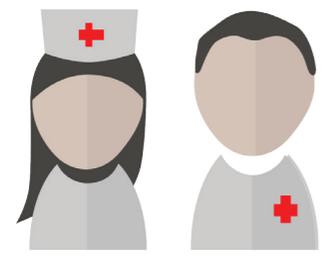
Simulation Instructor

Medical team

Simulation Instructor

Simulation Instructor

Laerdal Medical



THE EXPLORATION

I needed to understand the interaction of the participants within the simulation room. Therefore, I explored the scenarios in three different ways:

1. Interaction of the participants with the resources or equipment.
2. Communication among the participants
3. Movements of the participants within the simulation room.

In order to do this, I basically used video and observation.

I recorded the different scenarios with a SLR camera and a Go-Pro camera. This last one, I put it on the ceiling of the room to track the individual movement (motion tracking) and on a nurse to analyse the interaction of the participants, in first person with the resources.

I also analysed a 'code blue' emergency response scenario video in English from the Carmel West Hospital, Columbus, Ohio. Recorded in June 2013, with the purpose of understanding what are the important issues to care about communication. In this chapter, I display my exploration in more detail.

First person exploration

I did this exploration in order to analyse the interaction of the participants with the different resources. I looked into timing and how the distribution of the equipment in the room was, but mainly the distribution of the tasks within the team.

I was able to observe when participants were struggling with some instruments, equipment, or even when the person carrying the camera was going to different places with no purpose. This was a great way of understanding the different roles and the body language.

Even though these videos gave me a different understanding of what really happens in the clinical scenario, I did not get any data in correlation with the time and the individual until I compared this in a time line with the dialogue and actions of the participants.

Hygiene

Teamwork

The equipment

Procedures

The roles

The patient

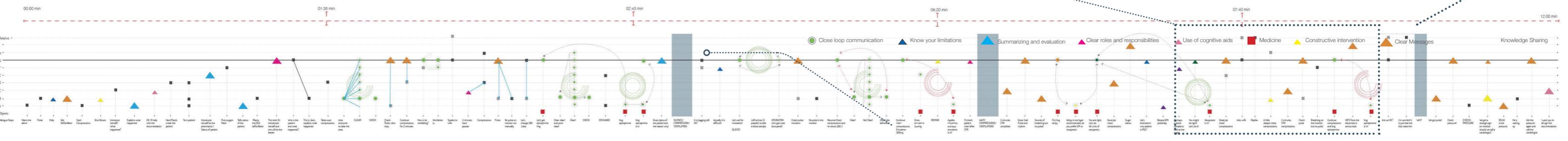
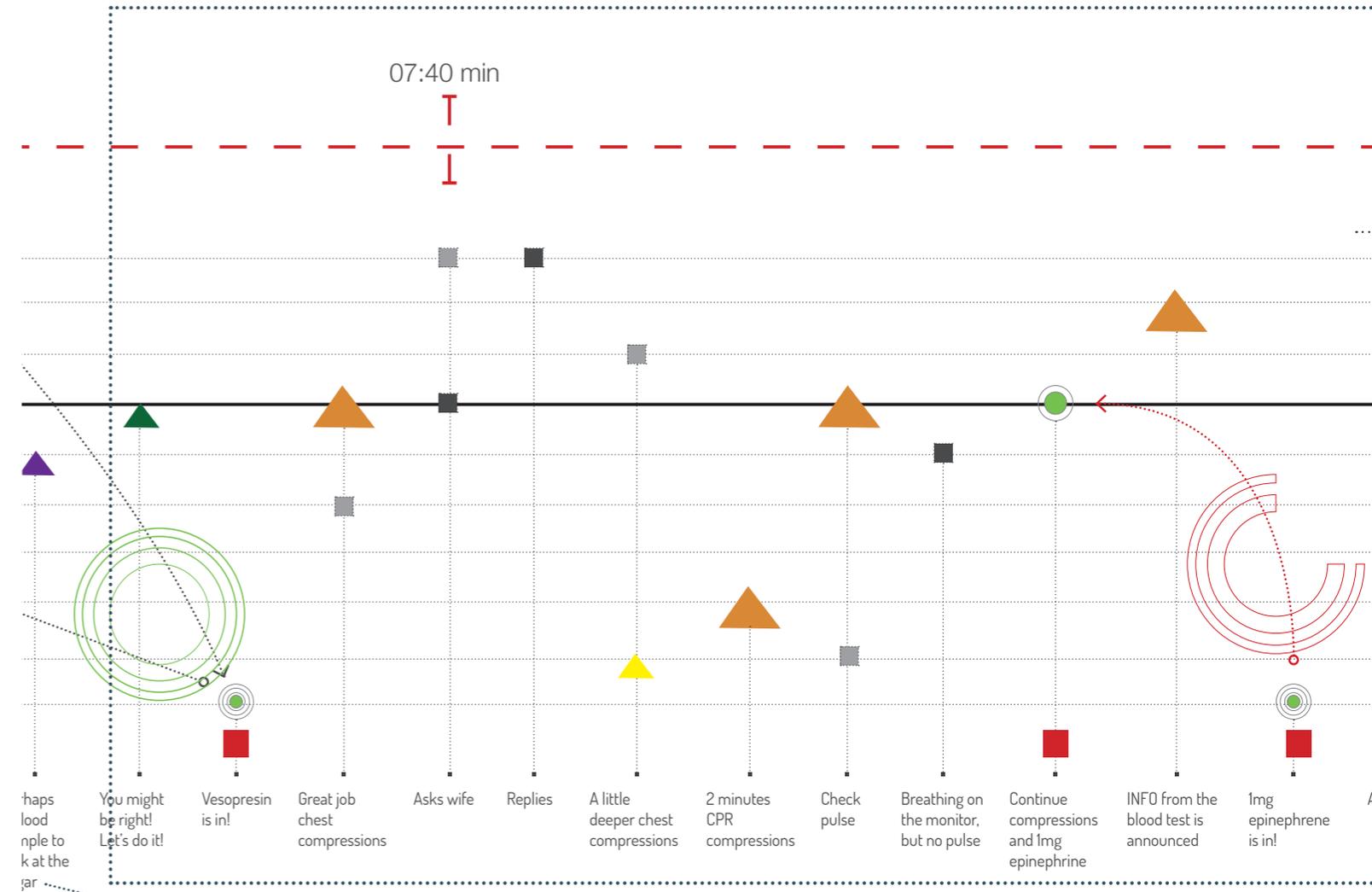


Image 4.1 First person exploration

The counterpoint of communication

I wanted to understand the role of communication within the medical scenario, so I analysed the dialogue of a 'code blue' (CPR, Cardiopulmonary Resuscitation scenario) emergency response scenario (Video in English from the Carmel West Hospital, Columbus, Ohio. Recorded in June 2013, see digital Appendix) and identified the CRM skills (closed-communication, use of cognitive aids, clear messages, etc. See page 6) that were represented by the words and actions of the participants. I started by abstracting the most important rules to follow within the scenario, and assigned a symbol to each (eg. on the right), this in order to study the dialogue in a more objective way. The exploration was extensive and at the end it almost looked like a counterpoint. On the next page, I explain the findings in more detail (To see the research process go to the digital Appendix, Giga-map)

-  Close loop communication
-  Use of cognitive aids
-  Know your limitations
-  Clear roles and responsibilities
-  Summarizing and evaluation
-  Constructive intervention
-  Clear Messages
-  Knowledge Sharing
-  Medicine



Communication Findings

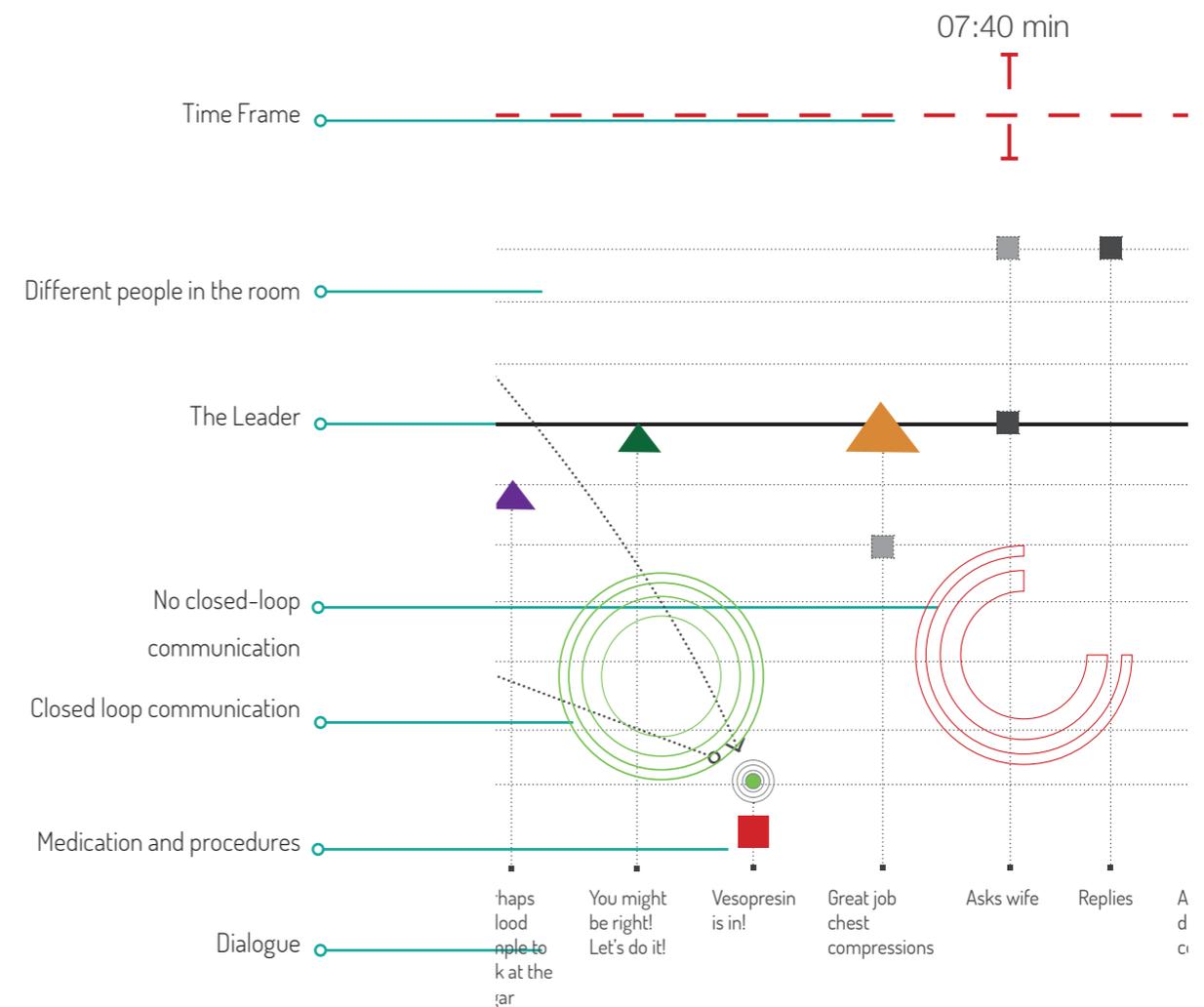
Here, I show the different parts of the counterpoint, each horizontal line represents a person in the room, the dark line is the leader of the scenario. The text below is the dialogue divided by the person speaking, so every time a line is said by one of the participants, I assigned a symbol that represents the rule, guide or procedure in the role-play. And finally, the big green and red circles represent the moments when closed-loop communication was achieved and when it failed (CLC briefly is about confirming what you heard by repeating what the person said, e.g. If the main Physician asks to put 1mg of morphine, the nurse should answer 1mg of morphine to make sure that what she heard was correct, before she applies the medication).

I showed this to two simulation instructors and other professional (Lasse Schmidt, Thom Belda and my main contact at Laerdal Medical). I wanted them to filtrate the information and to tell me what is important to know from the dialogue of the participants in order to improve the communication. They all agreed that knowing exactly where CLC was done or missing would give them a much better understanding of specific areas of improvement and provide more specific feedback to the students.

The reason for this is because, CLC is used specially in those cases when either the patient or the team is put in a danger-

ous situation. For example, when applying medication, the participants have to make sure is the right type of medication and dose, because this can kill the patient if not done properly. Therefore, the team is obligated to use closed-loop communication ALWAYS.

Recent studies from Umeå university concluded that *“despite focus on the importance of communication in terms CLC, the difficulty in achieving safe and reliable verbal communication within the interdisciplinary team remained. This finding indicates the need for validated training models”.* (Hårgestam, Lindkvist, Brulin, Jacobsson, & Hultin, 2013).



Motion Tracking

In this exploration, I wanted to look at the distribution of tasks among the participants and if the motion of the participants within the room could reflect the performance outcomes.

I tracked the movements of the participants of six different role-play scenarios. These scenarios were repetitions of two different cases. One of the scenarios at the hospital of Skien and one at the hospital of Ullevål.

I did the tracking of the movements manually, and filming it from a top view (See video in CD Appendix). On the right, it is possible to see some of the pictures from the role-play scenario at Ullevål.

Red tag, leader nurse

Calling for help

Physician

Bedside nurse

Swapping roles to complete compressions

In charge of medication

In charge of defibrillator

Ventilations

Taking the time

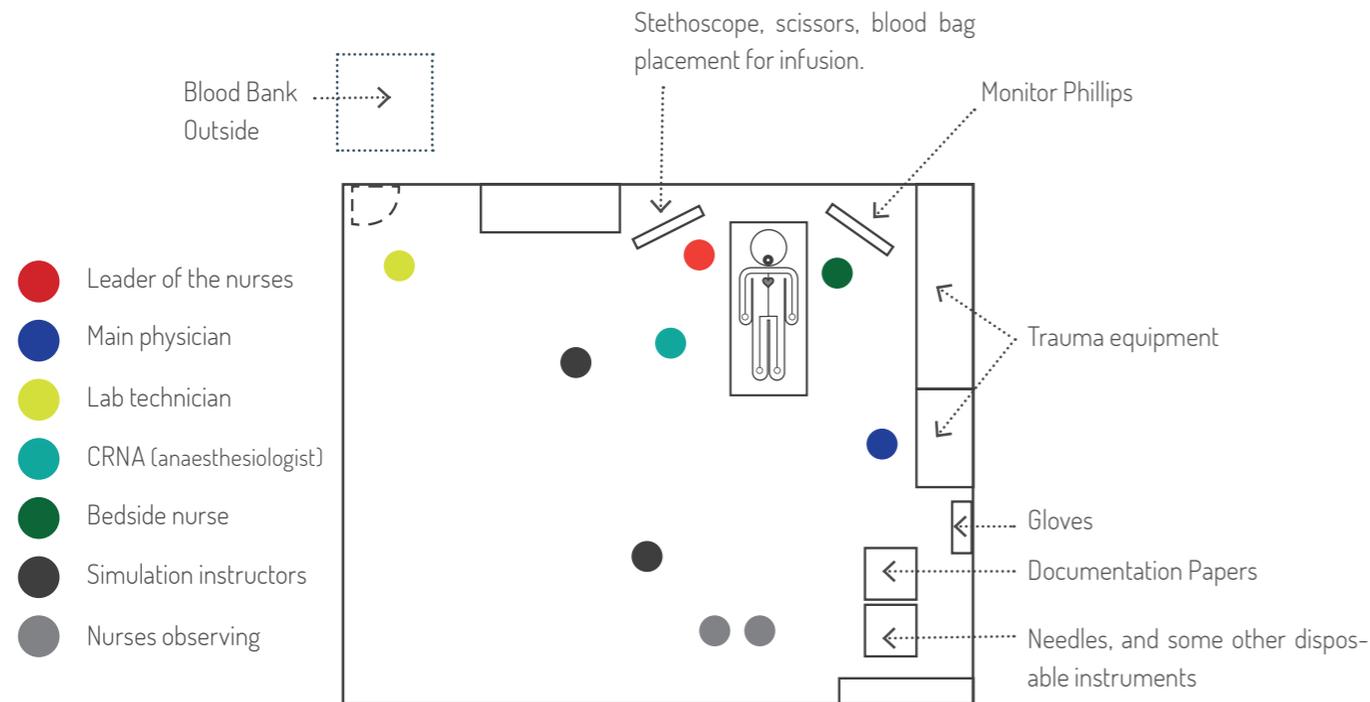


Image 4.2 Top view filming and mapping

Motion Tracking Findings

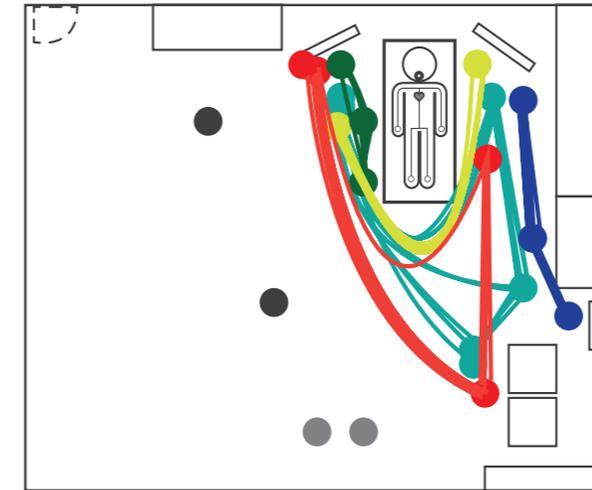
I went to the hospital of Skien to observe a simulation where two different teams of nurses and a doctor were performing in a scenario about blood infusion to a child on a hemorrhage shock. The same scenario was rehearsed twice by the two groups, both groups are used to work together at the hospital, and they have almost the same level of competence.

Below, I show the distribution of the room and what the colors represent, in order to understand the findings.



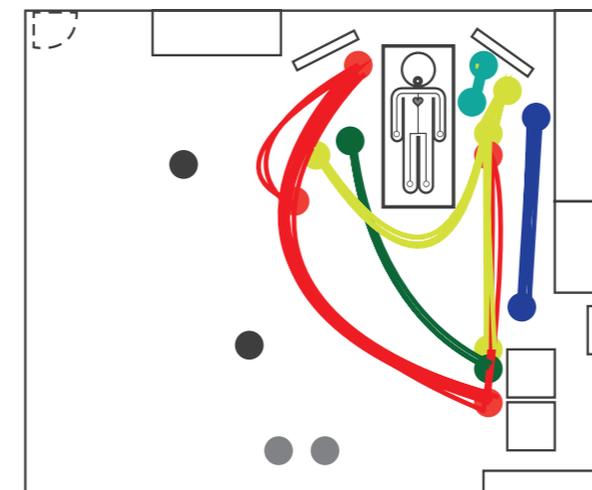
In advance, the instructors introduced the case. So the nurses new, in theory, what the simulation was going to be about. However, the case and the status of the patient was introduced right before the simulation, for them to handle a little bit of surprise.

Team # 1



The first team started by assigning a leader, it was not clear who was going to do what, therefore it seemed that they were hesitating a bit. Suddenly, there was a spill coming from the blood bag they were using for the infusion. The scenario turned to be a bit chaotic and taking more time than usual. As it is noticeable the participants tended to move a lot around the room trying to do the different tasks to save the child. Thus, the visualization is chaotic.

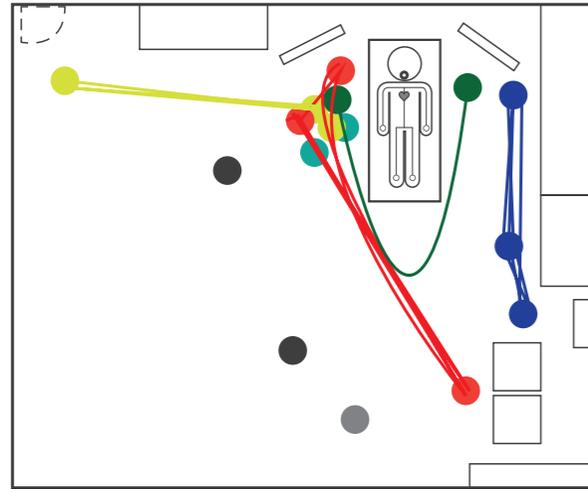
Debrief session #1 -----> Discussion around communication, delegation of tasks and proper use of equipment.



After the debrief session it was possible to notice that the staff was feeling more comfortable with their roles and delegation of tasks. The scenario went smoothly to completion and in less time than the previous. It is possible to see, that the participants were not moving unnecessarily around the room. Even the documentation of the procedures improved significantly.

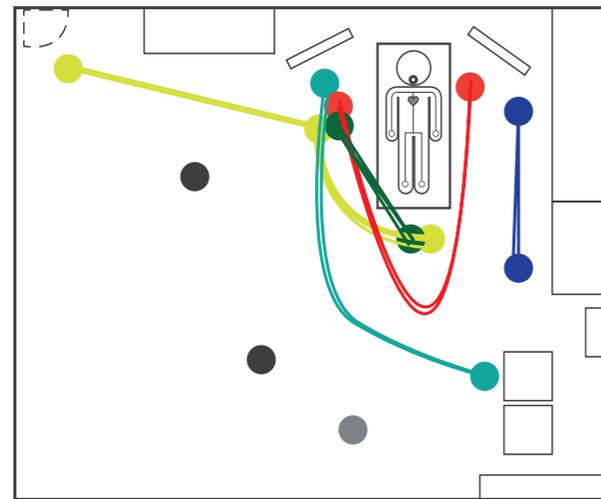
Debrief session # 2 -----> Agreed in what was done right or wrong during both scenarios.

Team # 2



The second team also had a volunteer for the leader role. This team completed the scenario in little time and the procedures were done correctly. And, in comparison with the team #1, they even simulated the call to the blood bank and picking the bag outside the room. It is noticeable that they almost did not move to complete the case, which I found quite interesting, because it was exactly the same scenario with the same procedures as the previous team.

Debrief→ Discussion revolved around delegation of tasks, because it seemed that just the leader did almost the whole job, which in this case is a disadvantage because if this person is missing in a real emergency things will not turn out as they should.



During this second scenario, the group decided to rehearse with a different leader, this leader delegated more tasks during the scenario, and they were even good at communicating with the patient, who in this case was semiconscious. As it is possible to notice, the participants were moving just the necessary around the room, the roles were clear, the timing was perfect and the documentation was suitable.

Debrief→ During this debrief, they talked mainly about the good things that happened during this simulation and what the advantages of proper task delegation are.

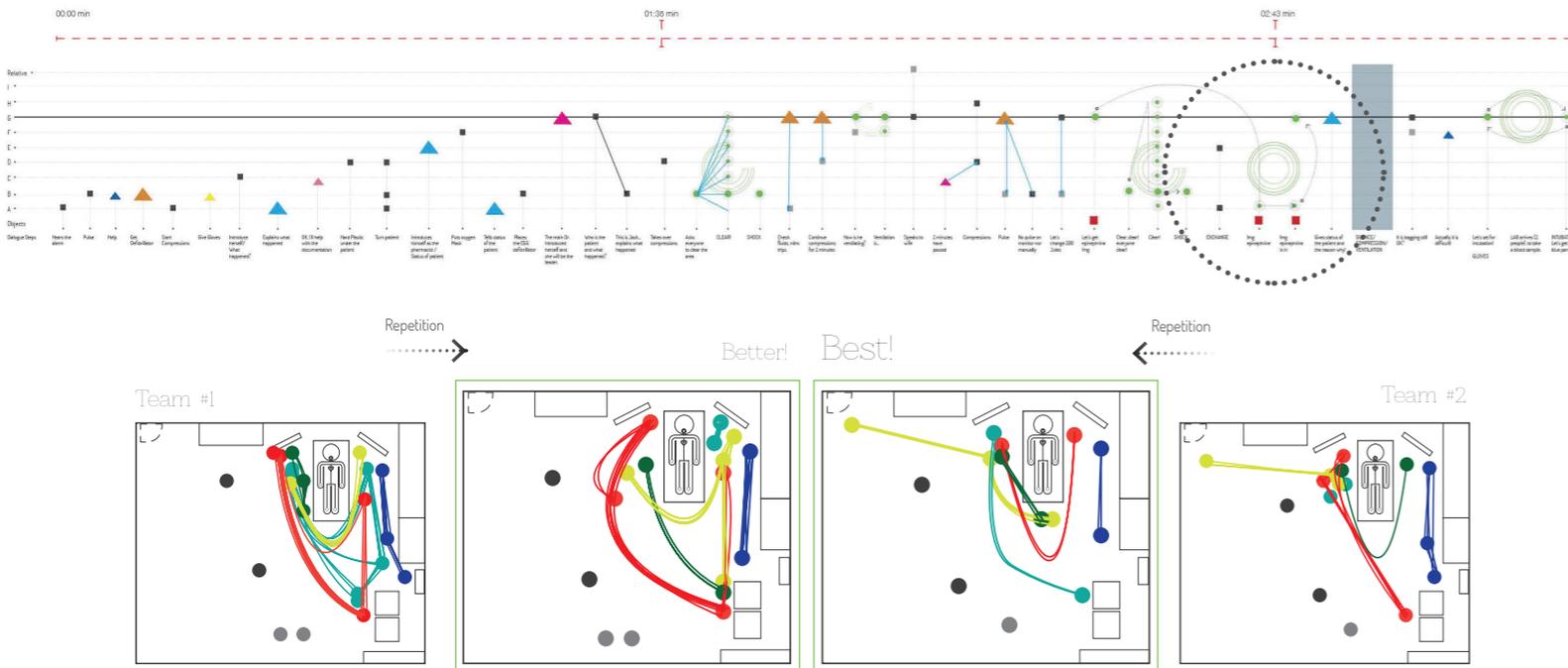
Reflections

What I want to point out here is not exactly the right or wrong performance of the participants, but how the roles and tasks during the scenario are reflected in their movements and communication. It is almost possible to judge, at a glance, that the first scenario from the first team was a bit chaotic, without even being there. Of course, this wouldn't be possible to see if there was not a repetition of the scenario to compare it with.

In my opinion, there is a chance that, by showing this to the first team, they might change their behaviour and try to imitate the distribution of the roles of the second team to improve their performance.

However, what is even more interesting is the comparison of both teams movements. How is it possible that, even though both teams had almost the same level of competence, were performing so differently in the same kind of scenario? Definitely, it has to do with the proper way of delegation of activities therefore, clear roles, the communication among the participants, and last but not least, the right use of resources, both human competence and medical equipment.

But how can this tracking be interpreted? Well, possibly the last rehearsal of the second team, was the best performance. Since I was an observer of the scenario, I know that the performance was actually good. So I decided to show the tracking to other simulation instructors and professionals (Lasse Schmidt, Thom Belda, engineers and designers at Laerdal Medical) that weren't observers in this scenario. I asked them to interpret the information just by looking at the graphics. I did not give them much information, but the type of case. The two instructors were able to say that the best performance was the last one, because for them, it was clear that everyone had a role and something to do.



What can I take further?

From the different analyses with users and stakeholders, I came to the understanding that visualization of motion and communication can be a powerful tool to show the performance of the scenario and the behaviour of the individuals within the team, to both the participants and the simulation instructors. It also shows specific areas for improvement and strengthen the practice of repetition of scenarios, because it allows, the comparison between them. In other words visualization opened the door to give a more appropriate and concrete feedback.



5

THE CONCEPT

First Directions

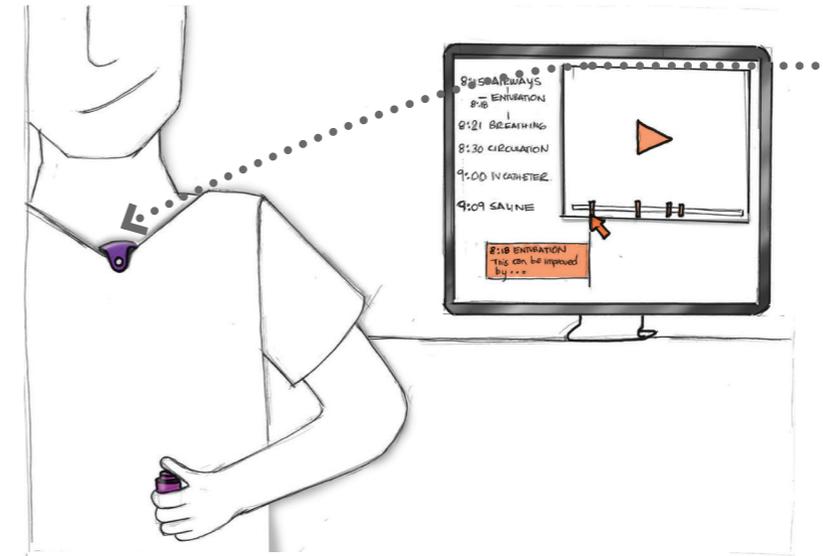
I started looking into different directions where visualization would be a valuable tool to provide feedback or better evaluation of the participants. My ideas revolved around using the data collected to give feedback during the debrief session, instant feedback during the simulation or a tool to simulate communication skills. Some of the sketches:



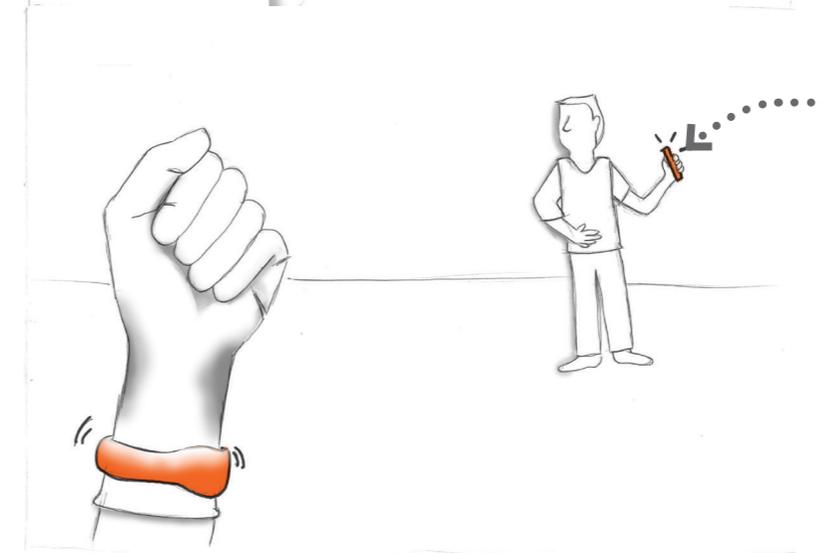
Collect specific tasks of the individuals to provide feedback during the **debrief session**



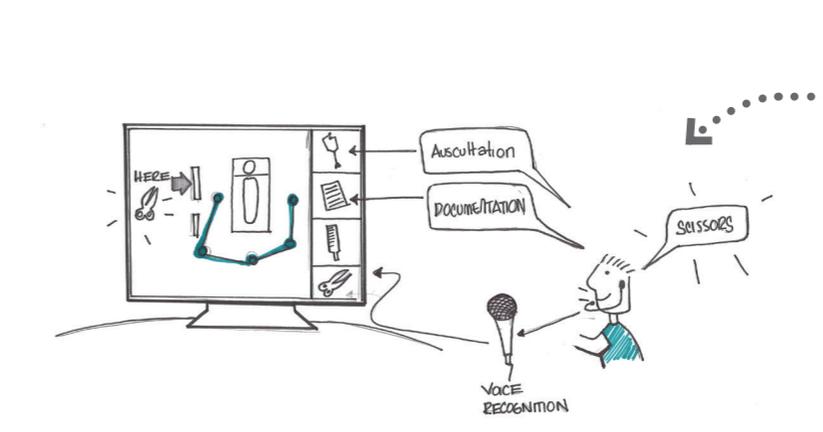
Overview of the footprint of the scenario to **provide feedback** regarding the distribution of tasks.



Collection of critical moments by the simulation instructor, for later **analysis during the video debrief session.**



Simulation instructor providing **real time feedback to the participants**, whenever there was a missed opportunity of closed-loop communication.



A multiplayer software to **simulate communication skills** in order to practice them prior to the real scenario-simulation with the team.

First directions analysis

As mentioned before, from the insights gathered from the interviews, workshops and exploration, I got four main directions to follow, in order to meet the learning needs of users. Therefore, reducing human error during the real performance. Here I explain them in more detail.

1 Tool to simulate team work skills (CRM) prior to Role-play.

Today, it is possible to simulate different procedures and medical skills, however, there are limited tools that allow practitioners or nurses to practice team work skills.

There are some games which allow this practice. However, this represents more time investment for the participants, extra time that probably they do not have in addition to their clinical duties.

2 To provide instant feedback during simulation

During the session many procedures, tasks and mistakes happen. However, there is no more output than the change on the vital signs of the patient what the participants get as feedback. I thought that it could be interesting for them to know, in the moment, what they are performing right or wrong.

After talking to the users and simulation instructor, this what seemed interesting also for them, had some disadvantages: First of all, getting constant feedback can be distracting for the participants, and it might alter the direction of the scenario. Second, getting feedback during the simulation, will make it even less realistic and they will not learn to deal with the lack of feedback they get during the real emergency.

3 Tool to plan alibis and shortcuts for instructors or even students.

This could be a tool which simulation instructors together with the trainees will use to plan better ways to address the different scenarios with the team, almost like in football.

When I discussed this with different users, some of them were sceptical, because this implies to set some time to use this together with the team,

beside that, to plan better strategies is not allowing them to improve in their performance.

4 To design a tool to provide more concrete and measurable individual feedback after simulation

This direction seemed to be the best one. Simulation instructors are looking to ways to provide better feedback for individuals to improve. Even when they have the video for debriefing, it is still difficult to interpret every single action and translate it into concrete feedback.

As I mentioned in pages before, the debrief session is the most important stage of simulation. Here is when the real learning happens, because participants understand the consequences of their actions. If I recap a bit, the process of simulation suggests that the scenario should be rehearsed twice and in between each sessions the team should get a debrief session in order to improve in their different roles. Most of the times the debrief session lasts longer than the scenario simulation. This is due to the importance of providing as much feedback as possible to the individuals.

Taking this into consideration, as an observer of these situations and as a designer, I will suggest to take the debrief session as the main context of my design solution to meet the needs of users. Therefore, use my exploration conclusions in this setting as a tool to provide more concrete and measurable feedback.

YES!
I WENT FOR THIS ONE.
BECAUSE IS THE ONE
THAT MEETS THE NEEDS
OF THE MAIN USER AND
STAKEHOLDERS. I'LL EX-
PLAIN HOW FURTHER IN
THIS REPORT.

Concept Sketch

I started looking into different directions where visualization would be a valuable tool to provide feedback or better evaluation of the participants. After some iterations, this is how the sketch of the concept started.



NOW, THEY USE VEST OR TAGS TO FACILITATE THEIR ROLES

They do not only use these vests or tags during the simulation, but also during the real emergency. In Norway, it is a mark which was implemented in the emergency room in 2010, and that has given a noticeable improvement in the differentiation of roles.



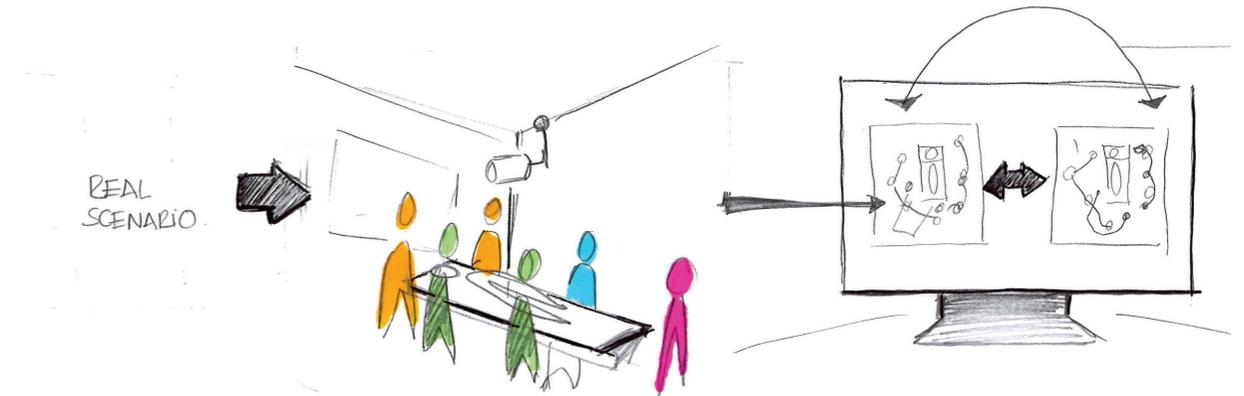
WHY NOT MAKE THIS INTO A SUPER VEST!

A Vest or tag which its color will be tracked by a camera. In order to trace the footprint of the individuals. In other words, motion tracking.



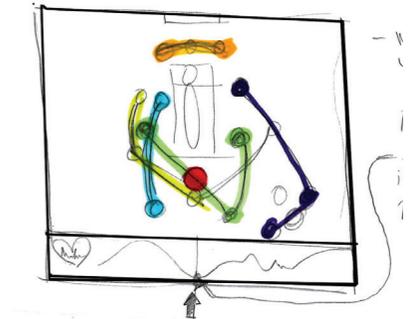
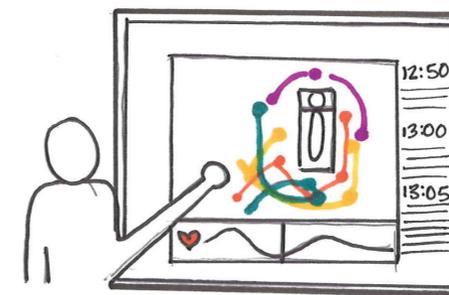
MICROPHONE IN THE VEST

It will also have a microphone, which records what they say and transcribes it into text or individual sound patterns. The system will read the different patterns of the speech and identify closed-loop communication.



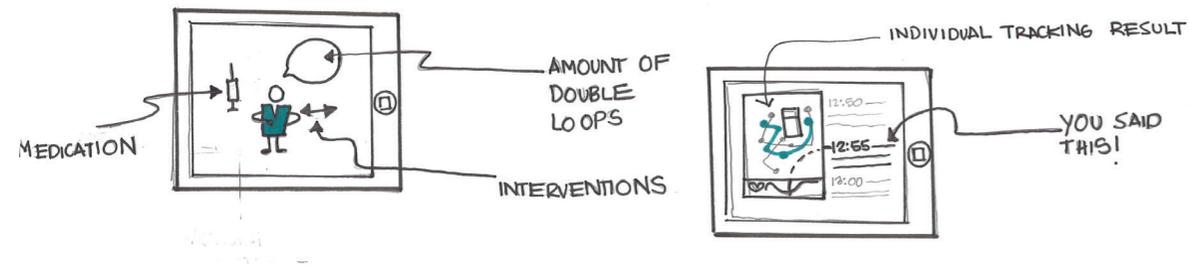
VISUAL SIMULATION SCENARIO

As the drawing above illustrates, if the individuals movements are tracked during the scenario and then visualized for the debriefing sessions, this will allow the simulation instructor to give a more concrete feedback. In addition, if the interface allows the comparison of scenarios, this will even provide a new way of learning for improvement.



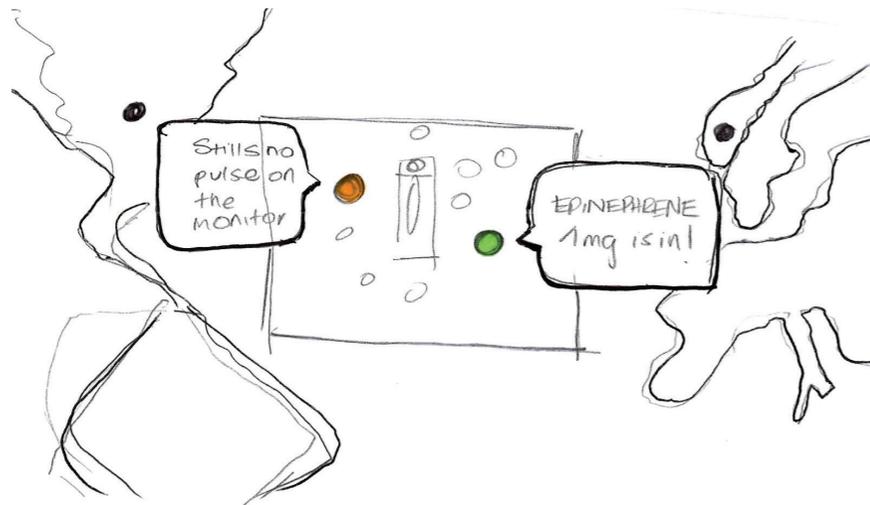
UPGRADE THE CURRENT VIDEO DEBRIEF SYSTEM CALLED SIMVIEW

The movements will be recorded so they will be able to go back and forth, and see where one was or what was one doing when the critical moment came. They can look at how other teams completed the task, maybe being more efficient, using properly the resources, better delegation of tasks, among others.



COMMUNICATION AND DISTRIBUTION OF TASKS

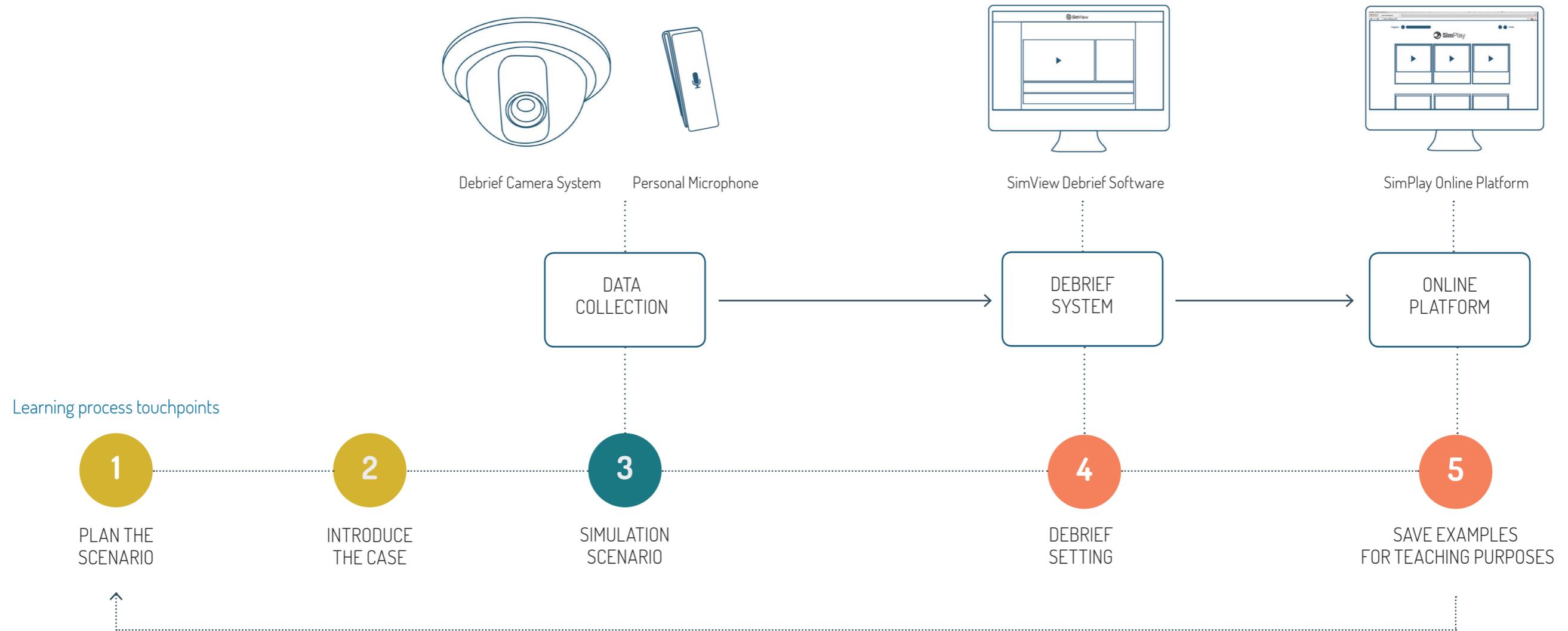
Today, technology allows us to track almost anything, so if we track not just participants movements and speech, but also equipment, this tool will provide us with infographics of the amount of double loops (closed-loop communication), interventions, type of medication that was applied and by whom, etc.



PLATFORM OF KNOWLEDGE

Today simulation instructors use videos from old scenarios, usually from the same institution, to teach or show other teams examples on how the case could be solved. If this debrief system allows to share the video on an professional online platform, this could be seen as a simulation network, where other simulation instructors can take the material from different hospitals or even countries to get better insight for teaching purposes.

System Blue Print



At least two simulation instructors plan the scenario that the medical team will experience. They plan the actions that will allow the team to learn the objectives.

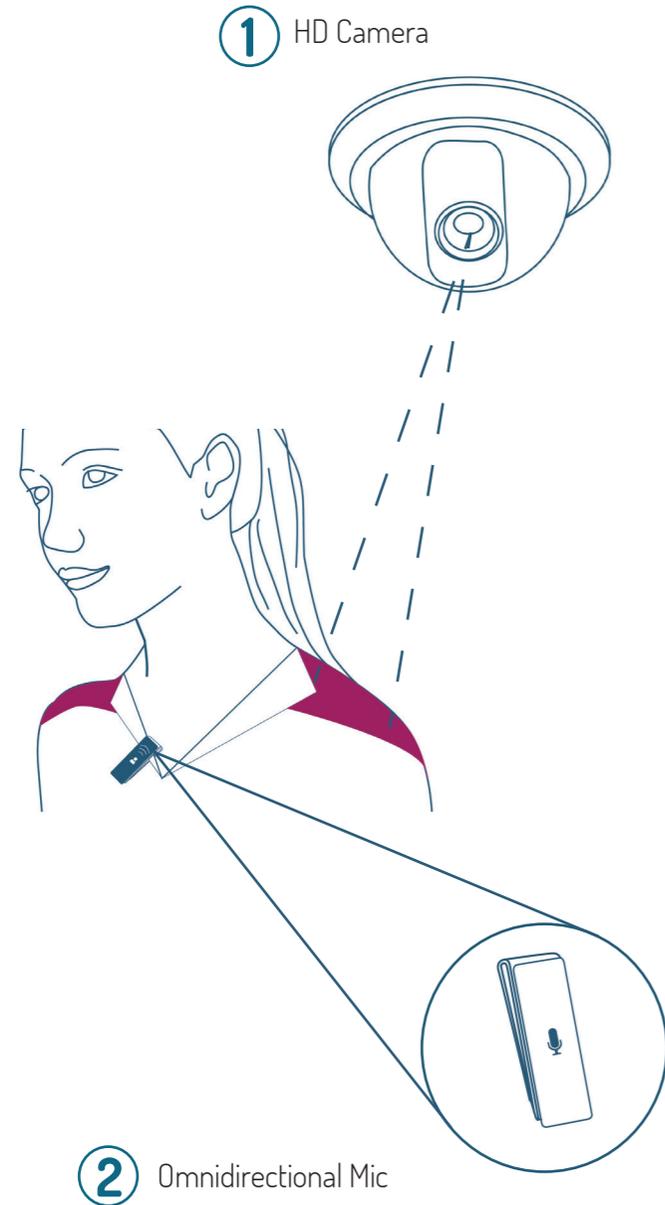
The simulation instructors present the case to the team. Sometimes they present previous examples, or they wait with it until the debrief session.

They divide roles and start performing together with the patient, which in this case is a mannequin.

After the simulation session, the team sits together with the instructors and analyse the scenario with the help of a video debrief system that allows them to see the clinical happenings logged by the mannequin.

If the video has any good example to show in a future class, they will save it in a folder in their computers. This happens often, specially because they use the videos to get insights on different ways to solve the cases.

Data collection



I wanted to also explore the possibilities of existent technology that could track both movement and speech. Therefore, I started by analyzing the current video debrief system from Laerdal (SimView) which already includes the following specifications:

- HD camera inputs simultaneously
- Digital IP, analog, and USB cameras
- Software driven pan-tilt-zoom camera control
- One digital audio input

This information allowed me to understand the system that different medical institutions invest on to give a better debrief sessions to their staff. I also asked myself, how can I take advantage of the current system to collect data for the design solution?

After one successful test with color tracking on a simulation film I recorded from above, I presented my findings to two different developers in order to find the technology that could suit this system. ① With the advances in the filming industry, today it is even possible to measure pulse through a camera. Therefore, both developers suggested definitely color tracking as an smart and cheap solution for the motion tracking feature. Cameras are very precise and can recognize a wide range of colors. This suggestion leads me to take into consideration the current HD camera from the existent video debrief system of Laerdal as a possible infrastructure for the SimPlay upgrade.

However, if the system requires to be even more specific other technology is available, although more expensive. Examples of some of these:

Kinect ONE™: 3D camera sensor which recognizes different people, voices and even objects in the room.

Decawave™: Ultrasound miniature and portable sensor that tracks peoples' indoor positioning just with an error of 10cm.

On the other hand, I also spoke with the developers on how to track the speech of the different participants within the simulation room in order to identify closed-loop communication.

The suggestion is to use a ② miniature omnidirectional microphone, like the ones currently used in reality shows. This is totally wireless and it comes in a necklace and clip presentation. This device detects low and high pitch, and is able to transfer the individual voices to the system with almost no environmental noise.

In summary, as the diagram on the left illustrates, the components required to collect the data from the simulation scenario are:

A visible color tag that participants will wear in order for the HD cameras to be able to track motion.

A personal omnidirectional microphone in order for the system to process the individual speech into sound patterns that will allow the identification of closed loop communication.

Simulation is always performed in a controlled environment, therefore, the participants will not feel uncomfortable by wearing a microphone, since they are used to interact with technology. For example the one in the mannequin and the usual medical equipment.

Raw Data

To design the interface look, I played with raw data.

In the motion tracking case, I recorded a scenario from above at the Ullevål hospital and I put colored tags on the participants in the scenario. Later, a motion tracking effect was applied with After Effects™. The program drew thin colored lines following the path of the participants. In addition, I put circles to grow in the areas where they spent more time, or they used essential medical equipment, thus, to get more valuable information from the scenario.

For the voice tracking and closed loop recognition, I experimented with the dialogues from two different video scenarios. I took the main audio file and broke into sound pieces manually. This pieces represents just the part where the participants are talking isolated from environmental noise. On the right, point number 1. each line represents a person speaking. In the point number 2. all the participants are merged into one sound file again, and on point 3. the sound is compressed. I made this to obtain more information from the data, coming to the conclusion of using the compress sound and assigning a color to each participant sound file, thus, allowing the identification of individuals within the sound.

