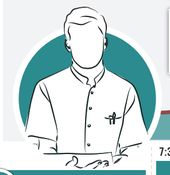
A WORKING DAY OF AN ICU NURSE

In this layer experiences of nurses regarding the activities are visualized. The red line shows whether their experience is positive or negative and the blue graph visualizes the experienced pressure. The quotes illustrate how these experiences are generated.



"Verbal hand off between colleagues is valuable to me. I can just ask things and I don't have to look them up."

"There is only one computer. When you click on your patient to prepare your medication, there are already four others looking over your sholder."

"It feels good when the patient is in his bed uncluttered and nicely."

"After a night shift at half pas seven you're completely done with it. You just want to go home and go to bed."

"The mornings are not necessarily busy, but you are working constantly."

"I think personal care is beautiful moment. I can be valuable for a patient who cannot do anything himself."

"I am proud when I see something earlier than the doctor. That we collaborate. You don't have to be a doctor to know everything or a nurse to execute everything."

"I always want people or doctors to discuss things with me. Like, " I want to wake this patient up, is that okay with you?" "

"How doctors do sometimes feels a bit denigrating. I cannot stand that. Let me do my job, I don't tell you how to put on a white coat."

"I always have a pile of post-its with me. The things people say to me in the corridor, I just forget. So I write those things down."

"I like to get more responsibility. We have influence on the treatment plans."

"The checks after the doctor's visit are satisfying. We apply new treatment and the effect is visible immediately."

"Some things have priority. At those moments I have to check the computer every 5 minutes: 'is there a result already?' That is really annoying."

"The whiteboard is filled out sporadically. I don't think it is reliable."

"As long as I am honest, I feel good about it. Honest about the risks and that I do not know."

"I am the anchor. I am the man in the white suit, but I am also someone with feelings. I think it is our task to make everyone feel safe and heard."

"I try to update HiX every two hours."

"I think that we have to check off too many rules in the system, whereby we are actually only filling out forms instead of being focused on the patient all the time."

"I notice that colleagues feel uncomfortable handing off their to dos when it is lunch time."

"Lunch time is magnificent moment of the day, because you are aloud to hide for half an hour. That is lovely."

"It is often unclear what type of infection prevention needs to be implemented for what disease. We have to look that up very regularly."

"During the afternoon, everything happened at the same time. I thought, he is ready, I can write my report, go home, I am finished. But then all hell broke loose because two doctors wanted to make an echo, and the room was a mess."

"The check at 14:00 is often busy, because the doctors made a new treatment plan during MDO. That should be applied before the evening shift arrives."

"The hand off can be chaotic. There is twice as much personnel, it is visiting hour and new patients could still come in."

Experience

1 THE TIMELINE

This layer explains the reason of the activities in the layer above from a nurse-perspective. Why do they do what they do?

	7:30	8:00	9:00	10:00	11:00	12:00	12:30	14:00	14:30
	PATIENT HAND OFF	PREPARING MEDICATION	PERSONAL CARE	DOCTOR'S VISIT	PROCESS DOCTOR'S VISIT	UPDATE FAMILY	CHECK UP	LUNCH	ADMINISTRATION	CHECK UP	PATIENT HAND OFF
	At the start of their shift, nurses want to get up to date about who the patient is they are going to take care of. What is his/her history? What are the plans for treatment? What deserves extra attention?	Preparation is key at an ICU, since every situation could unexpectedly be interrupted. To be able to anticipate to these interruptions, everything is prepared as good as possible.	Most patients at the ICU are sedated and cannot take care of themselves. To make patients and family as comfortable as possible, nurses make sure the patient and his/her bed is clean and neat.	Of the ICU team, the nurse is at the bedside most of the time and is able to notice different things than the doctors. The visit the moment for the nurse to share his/her insights with the physicians and represent the patient's needs.	Once a new treatment plan is established, the changes have to be implemented. Nurses pay extra attention to the effects of the changes in order to identify whether the doctor's decisions have the intended results.	The family of a patient deals with many emotions while their family member is at the ICU. Nurses comfort them as well as possible by taking away as much unclarity as they can.	An ICU patient's health changes rapidly. Therefore, the nurse checks upon his/her progress regularly. Has the medication still the desired effect? Is it possible make it more comfortable for the patient?	An ICU nurse has always many tasks to finish during the day, especially when it is interrupted by a deteriorating patient. During the lunch they are zoned out completely for a moment to reload.	Administration takes quite some time and is often postponed to the end of the shift. By reporting, nurses help their colleagues to continue the work and get them up to date about the latest insights and treatment.	In this last check up before the end of the shift, the decisions made during the MDO are implemented, the last status is measured to include in the report and the room is left as neatly as possible for their colleagues.	To make sure their colleagues continue the work in a way that is best for the patient, unclarities in the report are explained and some unreported details are added verbally. Finally, the pumps are validated together.
This layer provides more detail about the activities explained above.	Reading patient overview Dividing patients Reading reports Verbal hand off Validation of pumps	Prepare medication according to HiX Check medication of colleague	Changing bed sheets Daily hygiene of patient Administering medication Helping colleague	Update doctor about progress Ask remaining questions Discuss treatment plans	Process changes in treatment plans	Update family about progress Answering questions of family	Check upon patient Administering medication Implement treatment plans Validation of pumps	Short hand off 30 mins break Monitor patients of colleagues	Summarize changes during the day	Check upon patient Administering medication Implement treatment plans	Verbal hand off Validation of pumps
COLLEAGUE INTERACTIONS This layer gives insight in the way a nurse interacts with his/her colleagues. The darker blocks indicate when colleagues are occupied with other activities.	Answering questions, Validation of pumps	Check medication	Helping out with personal care	Medical exmination, Update treatment				Monitor patients, Short hand off			Asking questions, Valadation of pumps
	PATIENT HAND OFF	DOCTOR'S VISIT									
RESOURCES This layer shows when a nurse interacts with what type of information resocource.	Additional information (e.g. expected scans) Patient overview (whiteboard or sheet) Patient summary Nurse, physician and MDO reports Measurement validation Personal notes Patient overview (sheet) Notes on whiteboard	Medication list Medication verification Medication schedule Medication verification Personal notes ABCD-method	Changes in treatment plans Physician report Trend overview Personal notes ABCD-method	Physician report Personal notes ABCD-method Protocols			Measurement validation Trend overview Medication schedule Personal notes ABCD-method	Summary of patient Personal notes Patient overview (sheet)	Changes in treatment plans Nurse report Personal notes	Measurement validation Trend overview Medication schedule Personal notes ABCD-method	Additional information (e.g. characteristics of family) Measurement validation Personal notes ABCD-method

TRANSFER OF A PATIENT

"Colleagues have a hand time to say to radiology they cannot come now. When you try that anyway you have to stress and hurry. That is not safe for the patient."

"It is a nice collaboration with the doctor that comes along, because you are together responsible for that patient."

"In fact, you don't have time to untangle everything after a scan. You actually want to continue with what you were doing before the scan."

"I count on about 30 minutes for a transfer. After that it takes almost another half an hour to untangle everything."

	20 MINS	30 MINS	20 MINS
	PREPARE FOR TRANSPORT	TRANSPORT	CLEANING PATIENT ROOM
	Preparing for transport can be time consuming, since all machinery need to be disconnected safely. Transporting a patient is one of the most risky activities at the ICU, because the patient leaves the monitored environment.	During transport, two nurses have to guide the patient. When a patient is intubated, the attendance of a doctor is obligatory. The scan itself is interesting for nurses to see and gives them an opportunity to learn more about their patient.	After a scan, the lines between the machinery and the patient are always entangled. Untangling these lines can be time consuming. Definetly when the sheets and the patient need to be cleaned as well.
	Check transportation car Select most important medication Disconnect machinery Connect machinery to transportation car	Transport patient Support examination	Disconnect machinery of transportation car Reconnect machinery Untangle lines Change bed sheets and clean patient (if necessary)
	Helping out with preparations	Transport patient	Helping out with cleaning up
	Examination request Decision about additional examination	Transport patient	
	Call with time and location examination Pass on examination details to nurse Pass on time of examination to doctor ABCD-method		ABCD-method

2 INSIGHTS

FOLLOW THE STANDARD

At the ICU, many **processes regarding treatment are standardized** to guarantee execution of evidence-based guidelines. This is for example also applied when a patient is admitted to the ICU after surgery. However, **other information transfers**, as for instance the patient hand off between nurses, **are often shaped by habit and preference**.

"I think we need a standardization in the patient hand off. You see that it differs per nurse now."

TIMING HEALS WOUNDS

At the ICU, nurses know exactly where the other nurses are and what they are doing. For the remaining members of the ICU team this is not always the case. For example, the physiotherapist often treats his patients in the morning, but it is unclear when and he does not know when the nurse has planned her activities with the patient. When they both planned physically tiring activities, the patient ends up being exhausted, while he should put is energy in recovering. **When schedules would be tuned, the tasks at the ICU could be executed more effectively.**

"When the physiotherapist comes after personal care, a patient is often too tired to do his exercises. That is a shame. When that is better tuned, I can make sure the patient is well rested."

A LOT ON OUR PLATE

As many other care facilities, the ICU suffers of time pressure caused by personnel shortage. Pressure also comes forward from being pushed by other departments, badly tuned schedules, unexpected events or nurses' own will to hand off everything neatly to their colleagues. As pressure could be seen als negatively experienced busy moments, the graph shows that the pressure is highest around shift changes and unexpected interruptions and lowest during lunch. An example of a moment of pressure is dealing unexpected treatment changes coming from the MDO at the end of the shift. **Experiencing pressure during work could cause mistakes that endanger patient safety.**

"We are here to work, not to paint our nails, but it must remain safe."

"You risk forgetting things or doing things wrong when you have to do everything at the same time."

SELECTIVELY FLEXIBLE

A nurse's schedule is partly structured and is often interrupted when a patient deteriorates or needs extra examination. Nurses are **used to unexpected changes at the ICU and are excited by the thrill** of it. Some interruptions have as a consequence that work needs to be done twice, for instance when a doctor wants to make an echo just after the bed was cleaned. **When extra work is a result of bad communication, nurses can get annoyed or feel unvalued.**

"If I would have known they wanted to make an echo, I would have waited. I could have done the personal care afterwards."

LET'S JOIN FORCES

During the day, there are multiple moments that the whole ICU team collaborates in determining a patient's treatment. Important moments are the doctor's visit and the MDO. During the doctor's visit, **the nurse can be critical towards medical desicions and show his/her expertise in patient care**. Some doctors embrace the nurse's input, others tend to follow their own insights. At the EMC nurses are not joining the MDO due to logistics and time pressure. The results of the MDO are shared with the nurses afterwards and can have an impact on their planning at the end of the day.

"He sees something and reacts to that instinctively, without putting it into context. They are esponsible, but I am at the bedside for 90% of the day."

SAY THE WORD

Verbal communication is the most preferred means of communication since it is the fastest way to bring a colleague up to date. It is used to remind a colleague of something, to add extra insights to nurse reports during patient hand offs, to explain personal situations of patients or to point to changes in treatment plans. When a colleague needs help, he just turns his head into the hallway and asks.

"We do not write down everything, because it is not always relevant. So sometimes you get some extra information verbally."

WHERE DOES ALL INFORMATION COME FROM?

At the ICU many different resources are used to retrieve information from. Most of the information is registered in the PDMS, so it can be found by other colleagues. Since verbal communication is a highly prefered means of communication, people are an important source if information. These people could be colleagues, but also the family of the patient. Generally used resources can be found in the table below, sorted by type of needed information. The means that are used to be reminded of specific information, next to registering information, are indicated italic.

"HiX tells me what I have to do and in the protocol I can find how to do it."

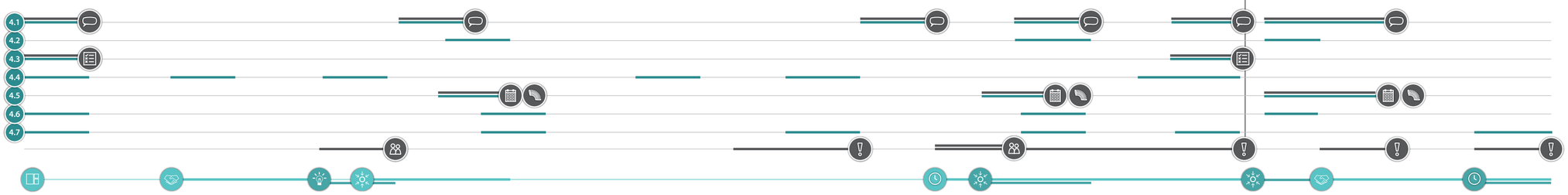
	PDMS	Other resources
VITAL INFORMATION		Machinery, pager
MEDICAL INFORMATION		
Treatment	Patient summary, physician, MDO, nurse reports, medication tab	Verbally (changes in treatment), *personal notes*
Relevant insights	Nurse report	Verbally, *personal notes*
Trends and measurements	Measurements tab	
PERSONAL INFORMATION		
Preferences	Patient summary	Family, *whiteboard in the patient room, verbally*
Medical history		Family
SCHEDULES	*Medication tab*	*Whiteboard of the team*
REQUIRED ACTIONS	*Medication tab*	Protocols, verbally, *personal notes*

Treatment = target values, medication, exercising schedules

INSIGHTS, NEEDS AND OPPORTUNITIES

This layer shows the moments the insights, needs and opportunities are most applicable. The need 'having overview' applies to the entire day.

Insight
Need
4.1 Opportunity



3 GENERAL NEEDS

In their work, nurses have a number of needs that could be generalized into five main subjects. These needs lead to a basis that serves as inspiration for the design of the dashboard of New Comliance.

INVOLVE ME

Nurses want to be involved by the other team members in everything concerning their patient, ranging from treatment agreements to meetings with the family of the patient. In this way, they always know what is agreed on and what information they can reveil to the family.

HAVING AN OVERVIEW

To be able to provide the best care possible, **nurses want to have a complete and reliable overview of the current state of their patient** and be notified when this changes. In this way, they can jump in when their patient's safety is threatened.

SPENDING TIME WELL

The work of ICU nurses is all about the patient. In their opinion, the **time spent on activities that distract them from providing care should be limited**. For instance, administrative tasks or looking for specific agreements take a large part of their daily routine and could be executed more efficiently.

HELPING HAND

Teamwork is very important for an ICU nurse. A team eases work and improves patient safety. **Nurses are proud of their team and want to be there for there colleagues.** However, in the heat of the moment it is not always easy to let your colleagues know when you need help.

SHARING EXPERTISE

Nurses are curious people who enjoy a challenge and continue developing themselves. **Gaining new knowledge, as well as sharing their knowledge with students and colleagues adds to a positive working experience.**

4 OPPORTUNITIES

Based on the general needs of ICU nurses and their current workflow, seven opportunities could be formulated to improve the working context at the ICU. They give insight in solution areas and are an inspiration for the design of the dashboard.

The underlying problems all have a consequence on the efficiency or effectiveness of the work of an ICU nurse and therefore add to the working pressure. By solving the corresponding issues, work satisfaction as well as patient safety could be improved.

4.1 ALL INFORMATION STORED

Often, information is communicated verbally because the message comes across quickly, the information is not easily findable in another system or the information was not reported at all. **When information is solely transfered verbally, the memory and interpretation of the receiver and the communication skills of the messenger are the determining factors for the reliability of the information.** Especially when this information was transfered through a third person, part of the information gets loss inevitably.

4.2 NOTICING UPDATES

When physicians decide to change the treatment of a patient, these changes often need to be implemented immediately. During the doctor's visits the nurses are present, but during the MDO or other meetings they are not. Although the changes are reported in PDMS, they are also verbally communicated since the nurse is not notified about changes by PDMS itself. **When a doctor is delayed or withheld from notifying the nurse, changes could yet come to light at the start of the new shift.**

4.3 STANDARDIZED INFORMATION

Standardization is used to guarantee care according to evidence-based guidelines. These guidelines are mostly implemented in healthcare processes, rather than in communication and information transfer processes (e.g. during patient hand off between nurses). Consequently, **information transfer differs per person, whereby the information received differs each time.**

4.4 OVERVIEW AND PRIVACY

At the ICU, two types of whiteboards are used: a central whiteboard with an overview of patients and dedicated nurses, and patient specific whiteboards located in the patient boxes. Both whiteboards are used for having overview, to transfer information between colleagues or to be reminded of meetings and specific agreements. However, **the information on the patient specific whiteboards is not updated regularly and both types of whiteboards suffer from privacy restrictions**. This results in an unreliable and incomplete overview.

4.5 TUNED SCHEDULES

All members of the ICU team have their own schedule, that once in a while coincides with the schedule of the nurse. **There are planned moments of collaboration, however the exact details are not always communicated clearly.** Consequently, nurses sometimes have to redo their work or one's work cannot be done effectively.

4.6 DIFFICULT SEARCH

Often extra information about tasks need to be looked up to clarify the task or to assure the right execution. **Most agreements about treatment are integrated in reports with free text and differing writing styles, which makes it difficult to find back specific information.** The bad findability also applies to information as for instance specific protocols or manually composed assignments, which are hidden somewhere in the complicated structure of PDMS.

4.7 USABILITY PDMS

The PDMS is the most used information system at the ICU by the entire team. **Although very important, it is the least popular system due to its usability issues.** It is slow and it lacks complete integration of the needed functions, whereby the work takes more time than necessary and a nurse's workflow becomes less efficient.

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