

# CareFusion: the Pyxis MedStation ES system's benefits in medicine dispensing

Final report presentation  
Helsinki, June 29<sup>th</sup> 2015

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# Executive summary

## Objectives and approach

- The aim of the project was to identify the benefits of utilizing the Pyxis MedStation ES system for medicine dispensing compared to manual dispensing
- The medicine dispensing of the Malmi hospital ward 4 (Pyxis MedStation ES system utilized) was compared to the Haartman hospital ward 6's (manual) dispensing
- Data was gathered through observing, interviewing and conducting a survey. When possible, existing numeric data was utilized

## Results

- This study's results support the implementation of the Pyxis MedStation ES system
  - Improves patient safety
  - Frees time for nurses to work elsewhere
  - Eases traceability and enables the limiting of access to drugs
  - Makes ordering faster
- The study's results cannot confirm the Pyxis system's possible effects on wastage

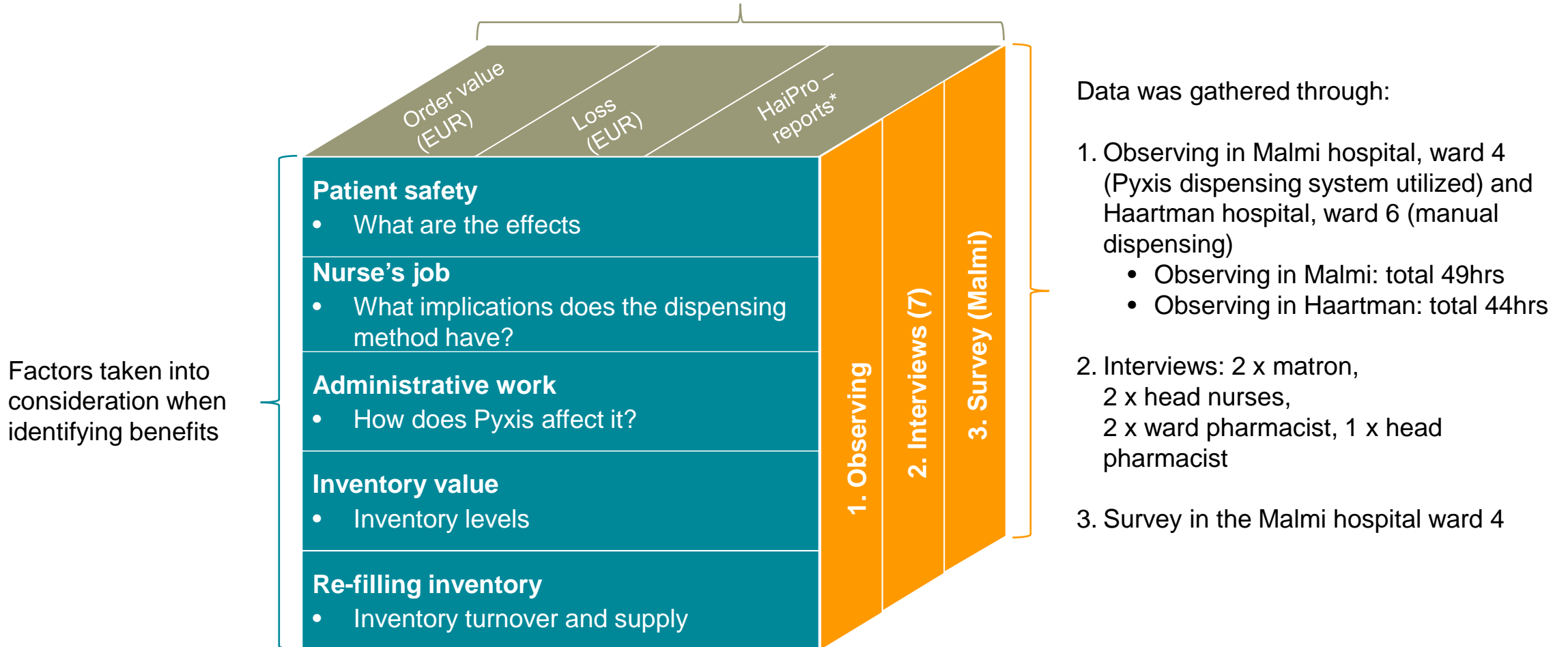
## Recommendations

- Standardize the speed in which the system delivers medicine: replace the (older) Cubie pockets that function abnormally to newer pockets that operate in a more standardized speed
- Enable the system to follow the inventory level of liquids: configure the system so that it can indicate the level of liquids and send an order for confirmation if necessary
- Improve work ergonomics: make possible for the nurse to lay down the medication list elsewhere than flat on the system
- Developed and make medicine dispensing even easier: integrate the system with a medicine database e.g. Duodecim

# Scope, objectives and approach

# The aim of the project was to identify the benefits of utilizing the Pyxis MedStation ES system for medicine dispensing compared to manual dispensing

Existing numeric data, which was used to complement the gathered data



Note: \* HaiPro is a system that is largely used in Finland to report incidents relating to patient safety

# The medicine dispensing of the Malmi hospital ward 4 (Pyxis MedStation ES system utilized) was compared to the Haartman hospital ward 6's (manual) dispensing

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## Malmi hospital, ward 4

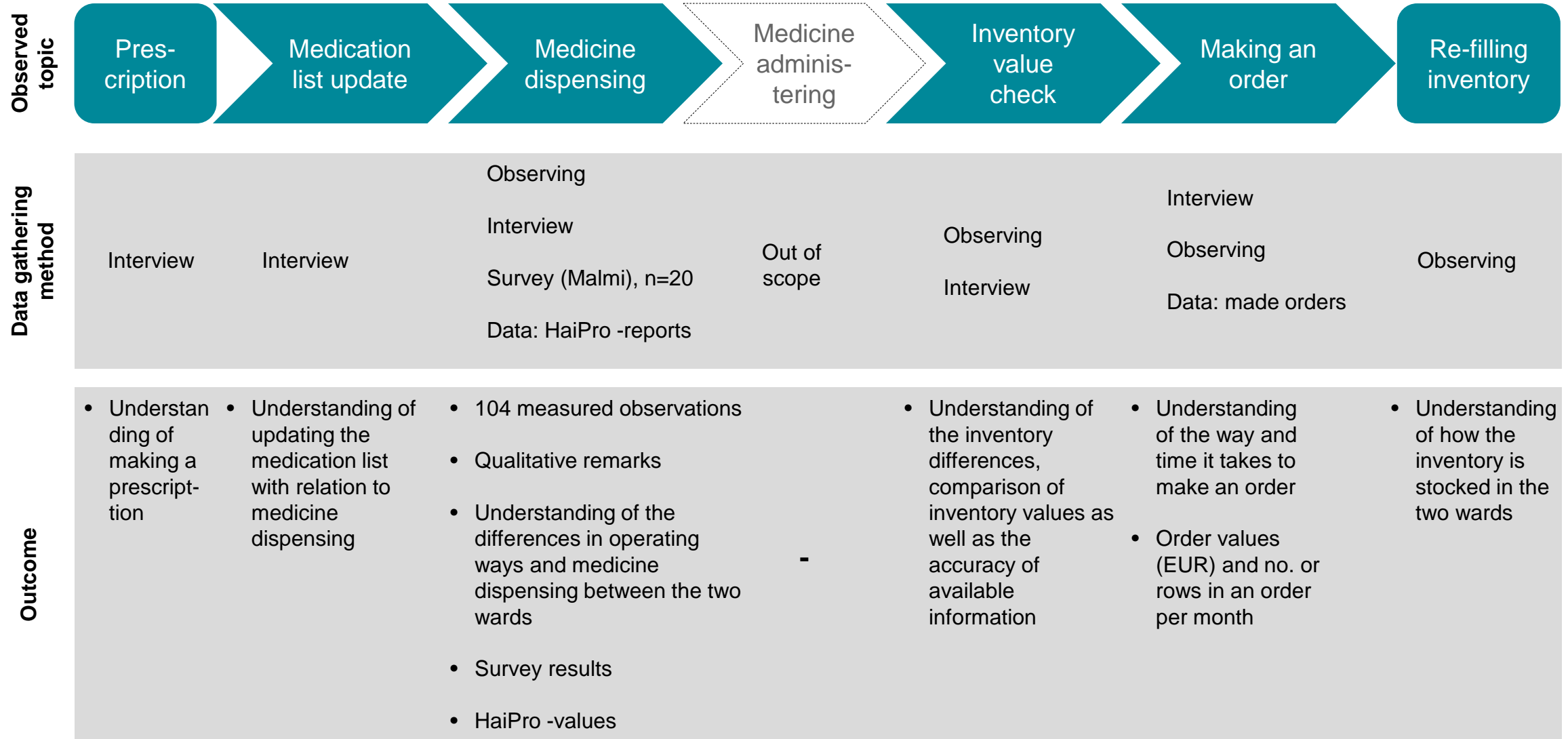
- 24 patient beds, 17 nurses
- 6 nurses in the morning and evening shifts, 2 nurses in the night shift
- 2 nurses responsible for medicines / shift
  - One nurse distributes the drugs that will be administered in one period to half of the ward at a time
- The ward pharmacist distributes the medicine to the patients that will be discharged when requested / as needed during the morning shift
- The night shift nurse prepares both the i.v. antibiotics for the morning as well as the respective documentation
- Access to drugs is limited through biometrics

## Haartman hospital, ward 6

- 24 patient beds, 22 nurses
- 6 nurses in the morning and evening shifts, 2 nurses in the night shift
- The ward pharmacist distributes half of the ward's medicine for the next 24 hrs to a medicine tray. The nurse in the medicine dispensing shift distributes the remaining half of the ward's medicine for the next 24 hrs
- The filled medicine trays are kept in the medicine cart
- 6 nurses (4 patients / nurse) performs a double-check of the dispensed medicine before administering the drugs to the patient
- All those who have access to the medicine room have access to all drugs

# Methodology

Data was gathered through observing, interviewing and conducting a survey. When possible, existing numeric data was utilized



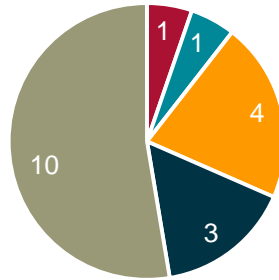


# Four actions were measured in the medication room during the observation period

Metric	Medicine dispensing	Double check	Dispensing of one medicine	Error in dispensing
Definition	The total time it takes for a nurse to dispense the medicine for X number of patients	The time it takes for a nurse to check the medicine in a patient's medicine cup for X number of patients	The time it takes for a nurse to dispense one unit of medicine to one patient for one dose	An error that has occurred within medicine dispensing
Note	The differences in dispensing medication (24 hrs vs. one delivery) has been considered in the analysis by assuming that one patient receives medicine four times per day	Only used in the Haartman hospital. Time includes the preparation of s.c. and i.v. medicine	-	Subcategories: medicine in excess, medicine missing, error in the medication list, not distributed to patient
Start	The nurse takes out the medication list	The nurse takes out the medicine cups that are to be checked	The nurse take out the medication list	-
Finish	The nurse has dispensed all medicine, returned the medicine package to hits place and closed the cabinet drawer/door	The nurse has gone through all medicine cups that are to be checked	The nurse has distributed one medicine and returned the medicine package to its place and closed the cabinet drawer / door	-
Unit	Minutes	Minutes	Seconds	Number of errors

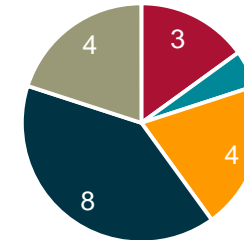
# The Malmi hospital ward 4 nurses were asked to fill in a survey on the Pyxis MedStation ES system

How long have you worked as a nurse for? (n=19)



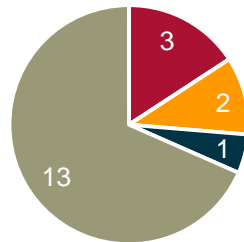
■ Less than 1 year ■ 1-2 years ■ 2-5 years ■ 5-10 years ■ Over 10 years

How long have you used the Pyxis MedStation medicine dispensing system? (n=20)



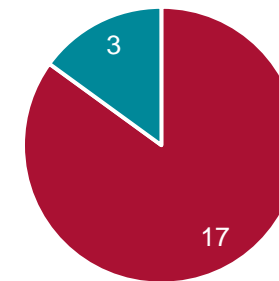
■ Less than 1 month ■ 1-2 months ■ 2-4 months ■ 4-5 months ■ Over 5 months

Estimate how often you use the Pyxis MedStation medicine dispensing system in a shift: (n=19)



■ 1 time ■ 2 times ■ 3 times ■ 4 times ■ 5 or more times

Have you dispensed medicine manually? (n=20)



■ Yes ■ No

# Results

# The study's results support the implementation of the Pyxis MedStation ES system

Patient safety



Nurse's job



Administrative work



Inventory value



Re-filling inventory





# The Pyxis MedStation ES system improves patient safety

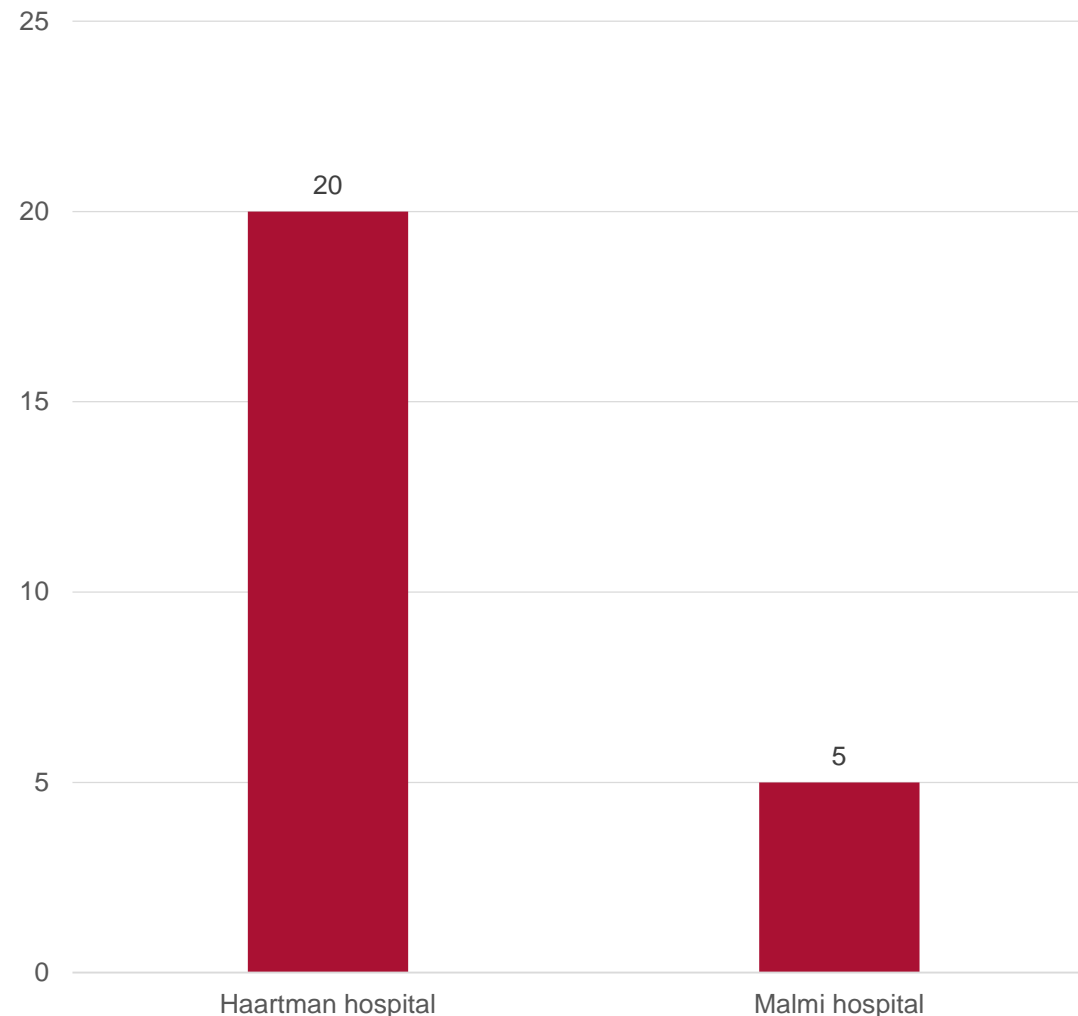
## Dispensing errors

- The system decreases the possibility for an incorrect selection
  - Cubie -pockets remove the possibility for an incorrect selection
  - Matrix -pockets were seen as less safe
- Possible changes made in the prescription are implemented faster than when dispensing medicine for 24 hours

## Other remarks (due to the operating model)

- The double checking of the medicine causes additional touching of the medicine, with varying practices. There is no double-checking conducted with the Pyxis system
- Dispensing per dose (as opposed to 24h medicine at once) removes the necessity to temporarily store the medicine e.g. in a medicine cart

Dispensing errors during the observation period





# Survey results: the Pyxis MedStation ES system improves patient safety

- 75% of the respondents perceive the medicine dispensing system to improve patient safety

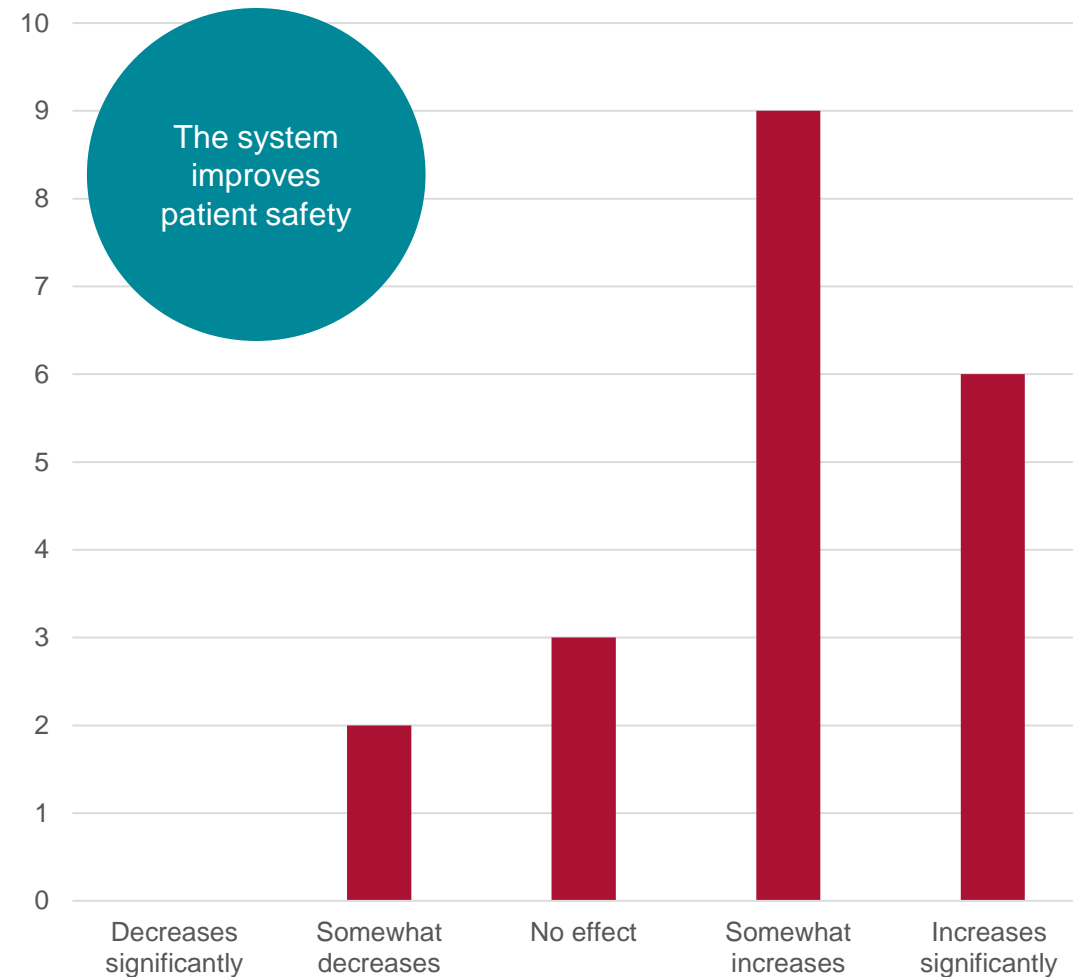
”

The pockets with lids are good, secure and safe. (...) Patient safety is decreased notably by the pockets without lids!

When dispensing half pills you can make mistakes by taking a whole pill

”

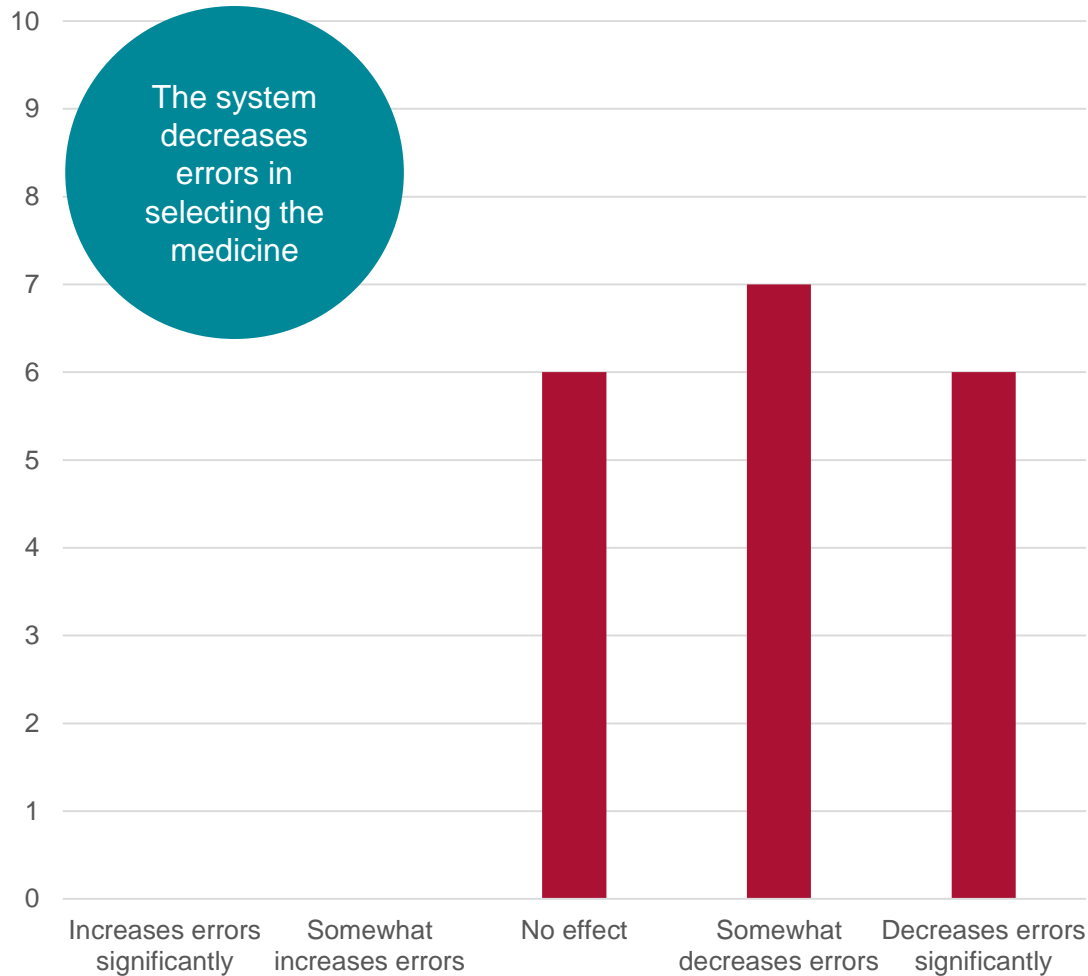
How does the Pyxis MedStation -medication system affect patient safety? (n=20)



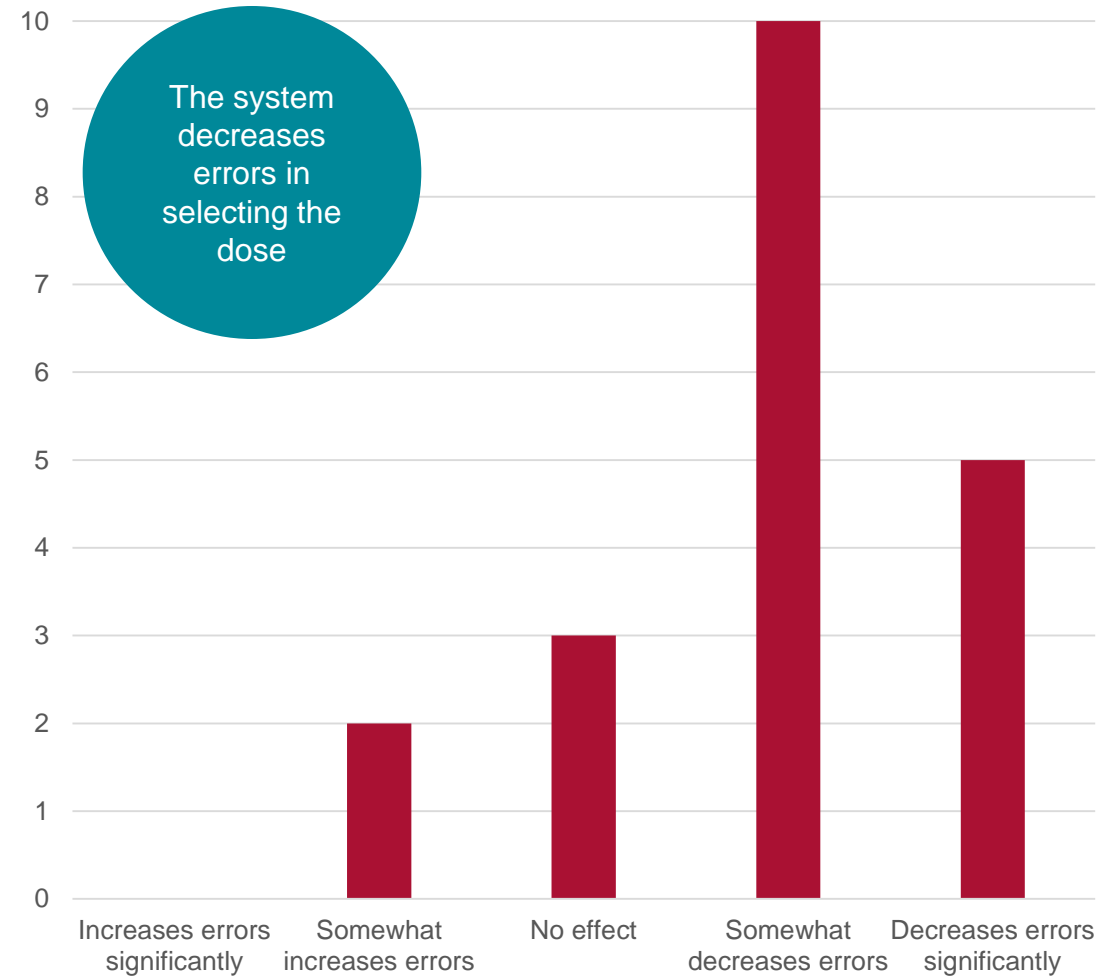
# Survey results: The Pyxis MedStation ES system decreases errors both in selecting the medicine and its dose



How does the Pyxis MedStation -system support you in choosing the right medicine? (n=19)



How does the Pyxis MedStation -system support you in selecting the correct medicine dose? (n=20)

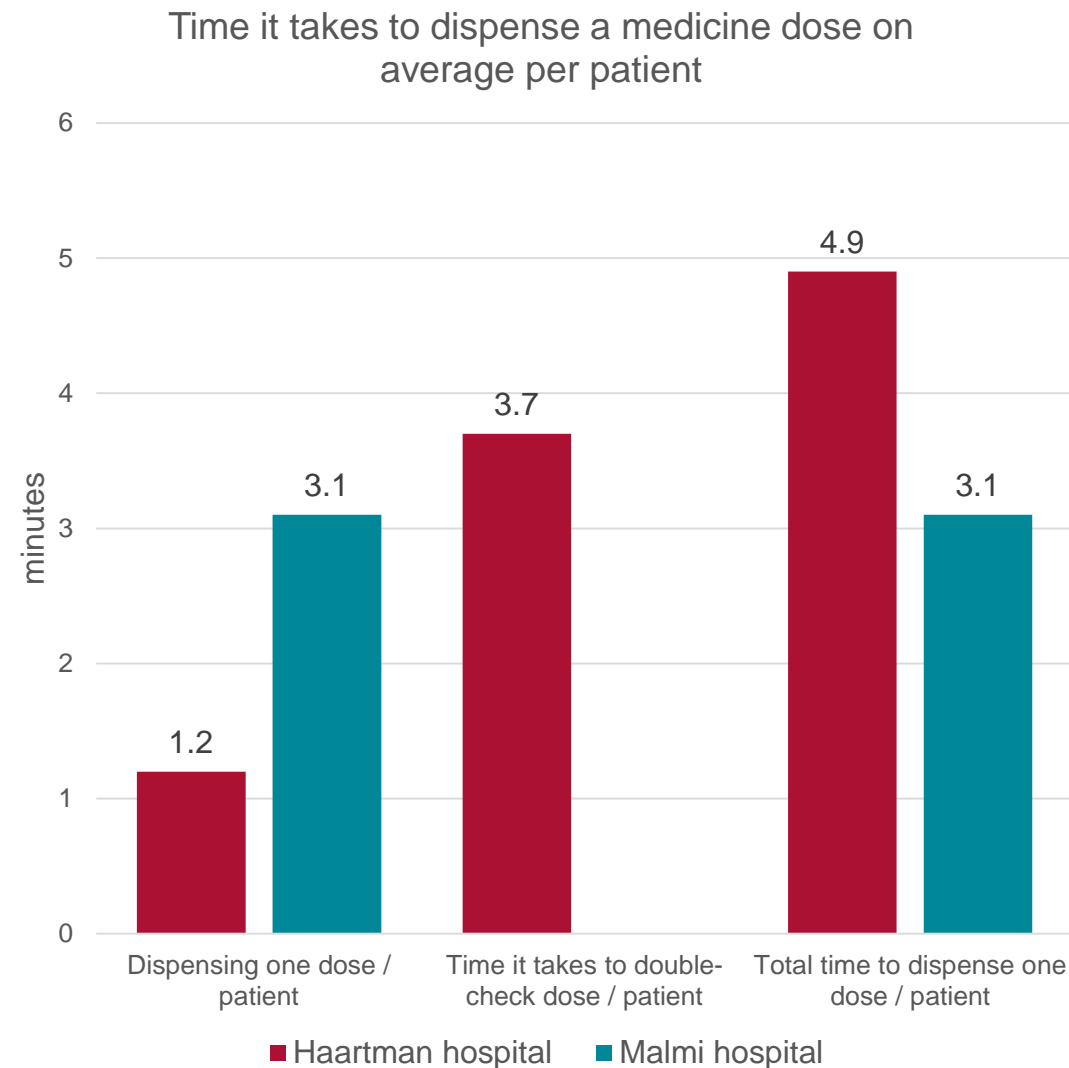




# The Pyxis MedStation ES system frees time for nurses to work elsewhere

## Time it takes to dispense the medicine

- The total time to dispense the medicine is one third less when using the dispensing system
- On average, the time it takes to dispense medicine per patient is less when dispensing manually than using the Pyxis system
  - In the Haartman hospital the ward pharmacist and medicine nurse dispense the medicine to the ward's patients for 24 hrs
- The double checking takes approximately four minutes per patient
  - Most commonly six nurses conduct the double check to their patients' medicine cups
  - The time includes the time it takes to prepare the s.c. and i.v. medicine





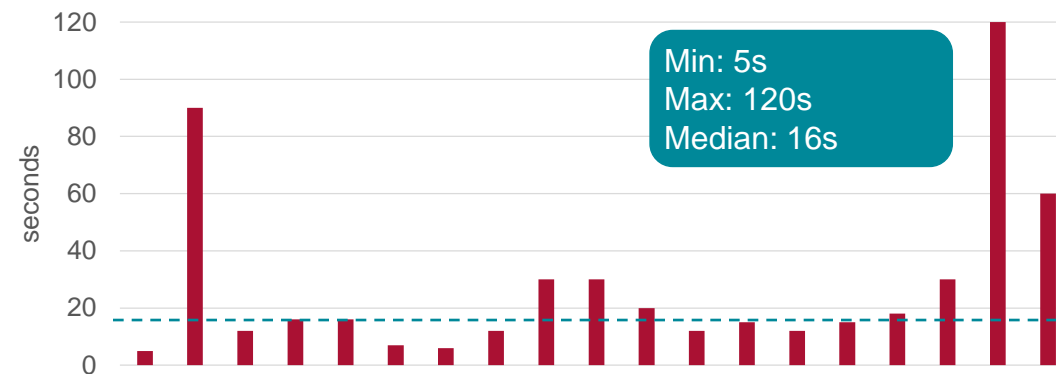


# The Pyxis MedStation ES system frees time for nurses to work elsewhere

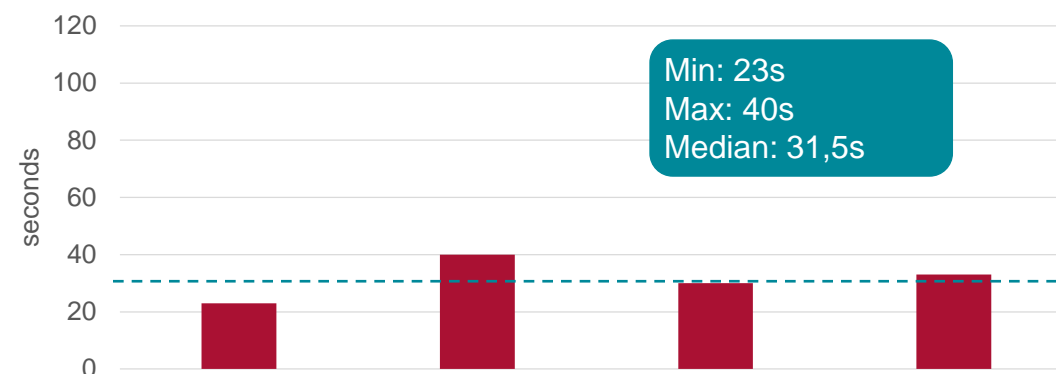
## Time it takes to dispense one medicine

- The median time to dispense one medicine manually is shorter, but the variance is significant
  - The nurses' experience and knowledge of the medicine room, as well as the differences between wards' medicine rooms affect the results, especially concerning fill-in / temporary nurses
- The system evens out the time differences between nurses it takes to dispense one medicine: the system works the same way regardless of the medicine room and/or its order

Dispensing one medicine at Haartman hospital, ward 6



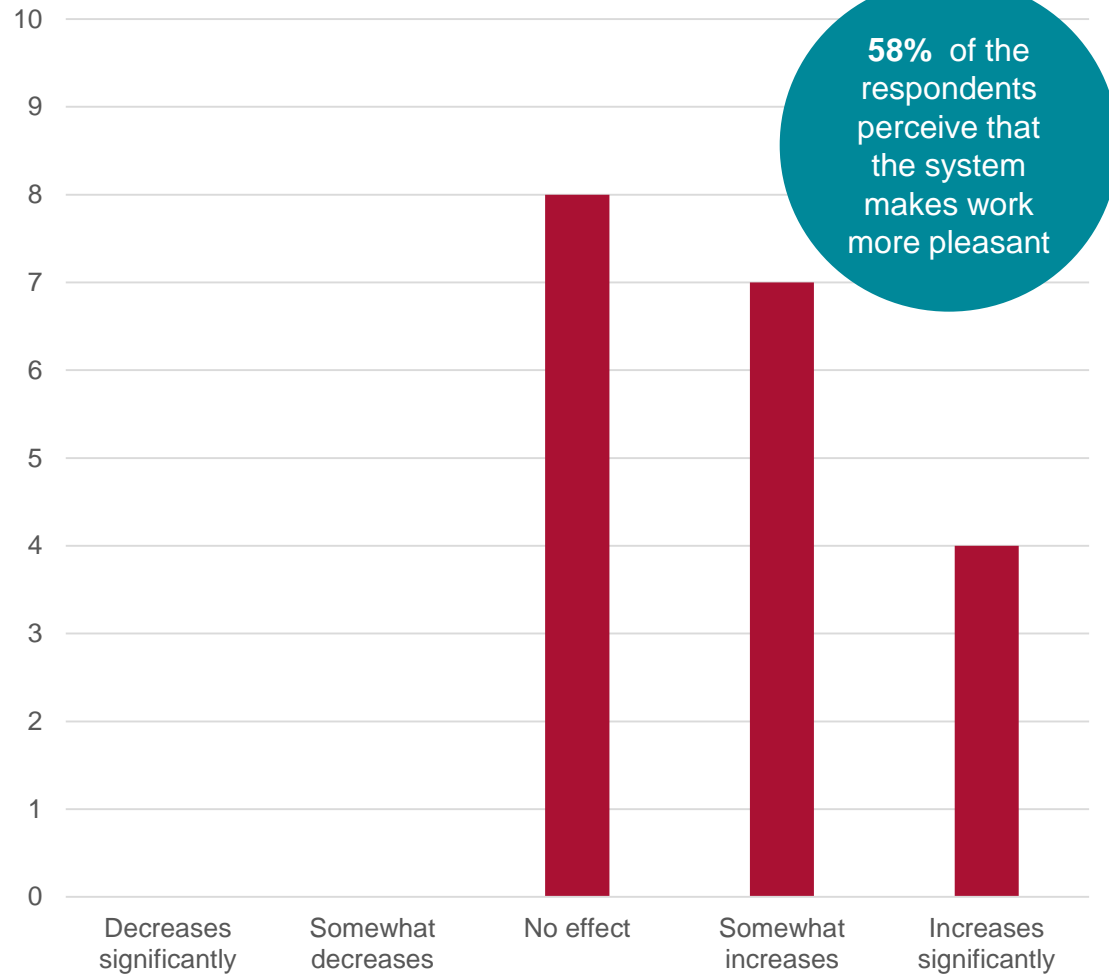
Dispensing one medicine at Malmi hospital, ward 4



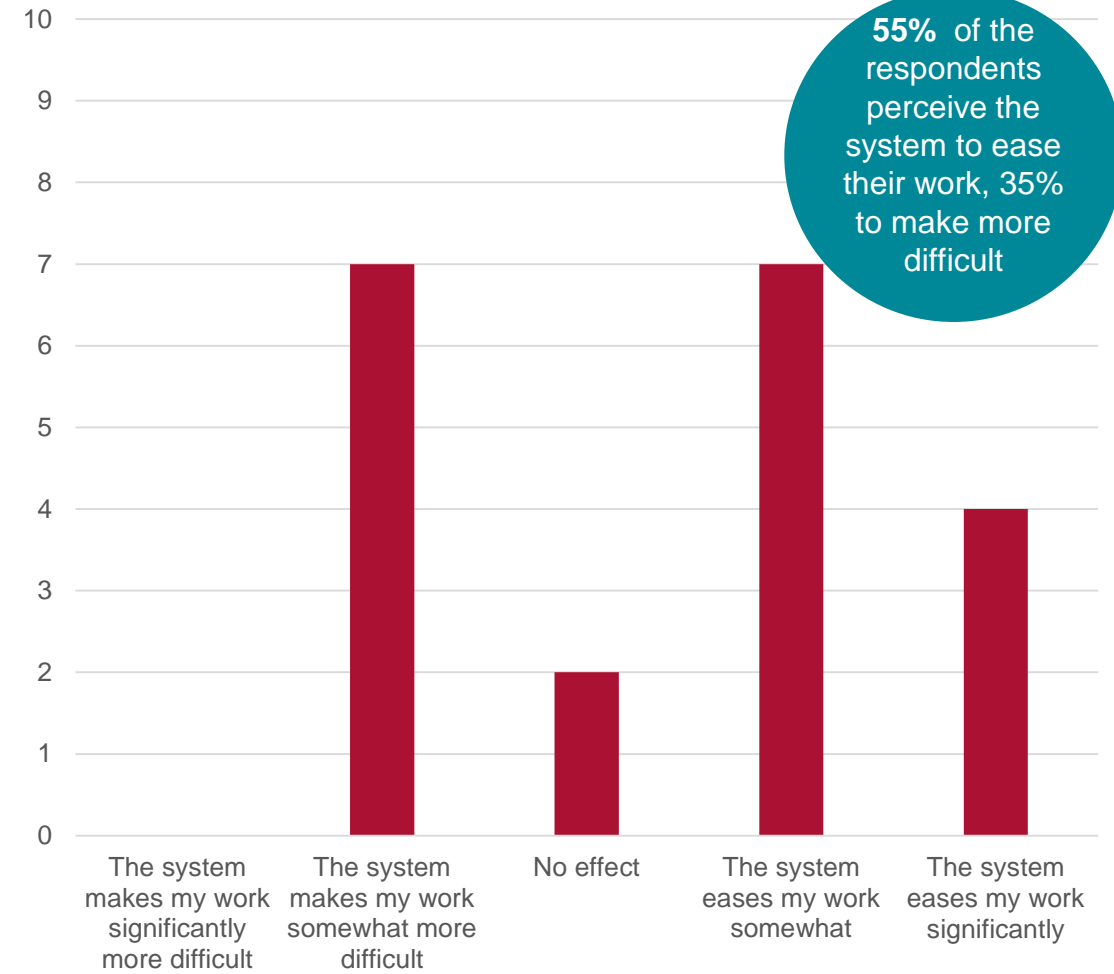
# Survey results: over half of the respondents perceive that the system makes work more pleasant and eases the nurses' job



How does the Pyxis MedStation -system affect how pleasant your work is? (n=19)



How does the Pyxis MedStation -system ease your work? (n=20)

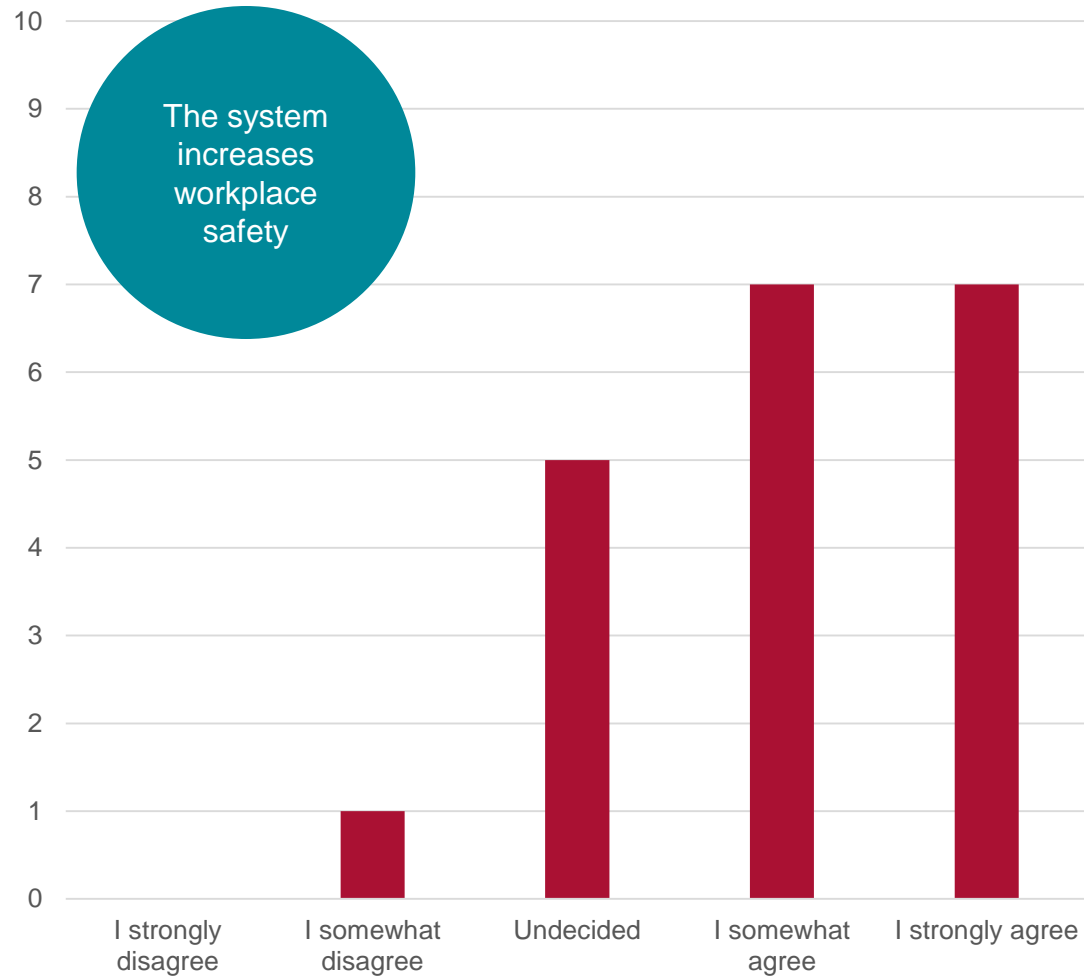


Source: survey at Malmi hospital ward 4, 5/2015  
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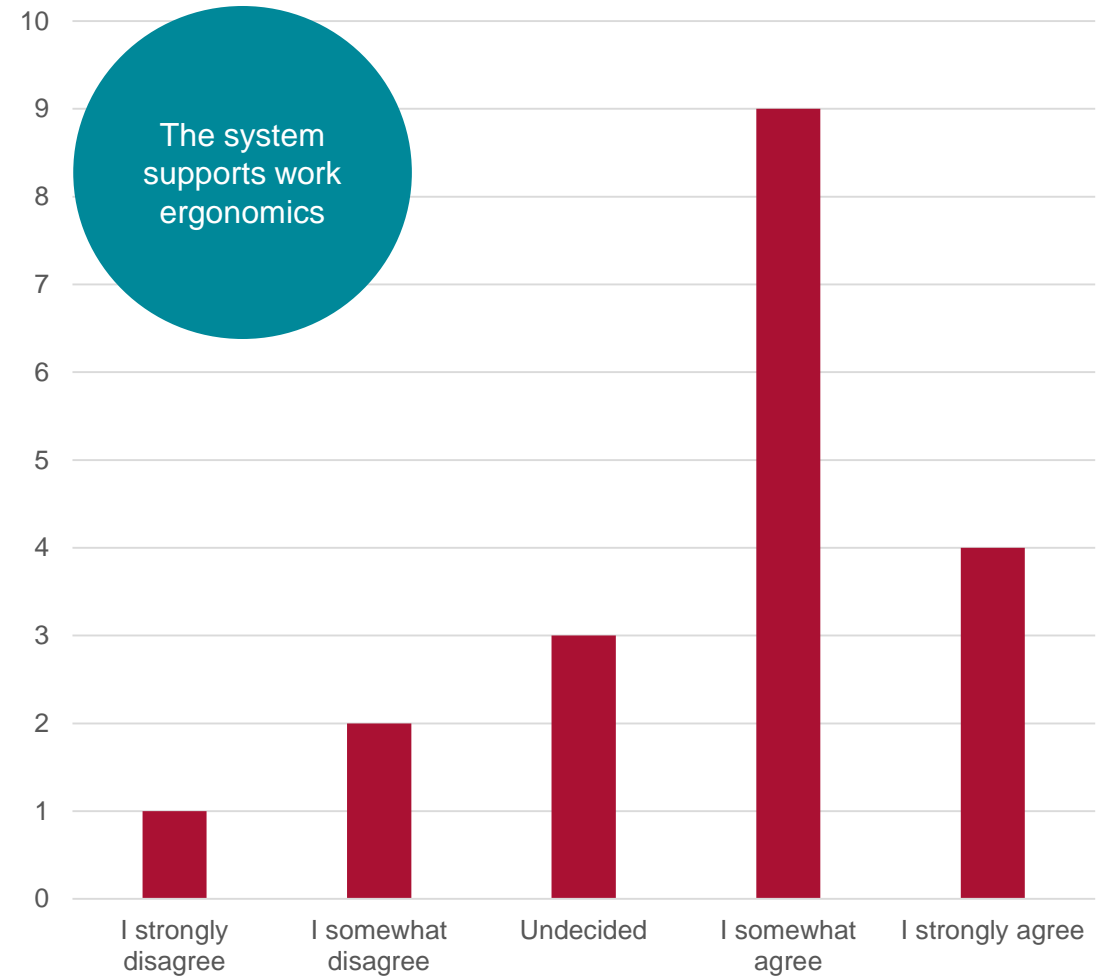
# Survey results: the system increases workplace safety and supports good ergonomics at work



Statement: the Pyxis MedStation -system increases workplace safety. (n=20)



Statement: I have good work ergonomics when using the Pyxis MedStation -system. (n=19)



# The Pyxis MedStation ES system eases traceability and enables limiting the access to drugs



## Traceability:

- Traceability is more accurate and faster with the system than going over the medical records of each patient individually
  - The feature is emphasised if there is a marking missing in the documentation tracking the use of narcotic drugs
- The system logs the use of all drugs, not just narcotic drugs / opiates

## Limiting the access to drugs:

- The system removes the possibility to abuse narcotic drugs if the nurse is not granted access to them
  - Biometrics is a more effective way to limit access than a key that is available for all users of the medicine room



# The Pyxis MedStation ES system enables a real-time view of inventory levels



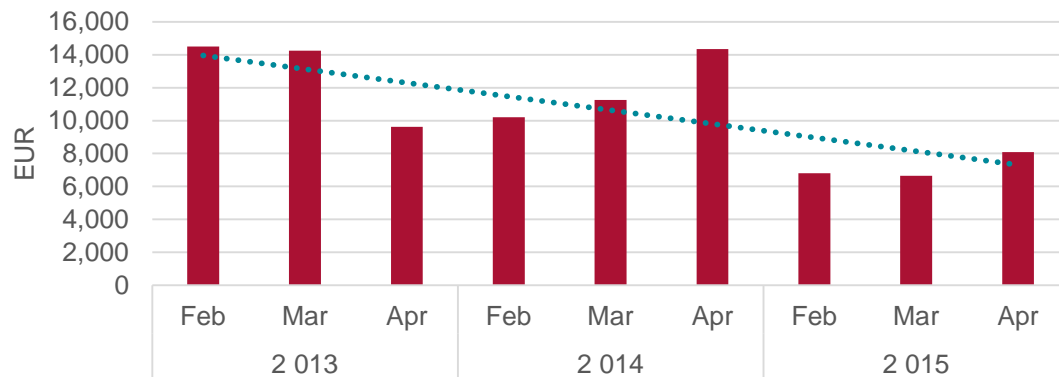
## Malmi hospital

- Inventory cost is not monitored
- No. of SKUs in inventory May 13<sup>th</sup>: 544
- Inventory count result June 3<sup>rd</sup>: 17 000 EUR, 548 SKUs
- The ward's inventory level can be checked whenever
  - Possibility to simultaneously check a different ward's inventory level
- No budget for medicine spend

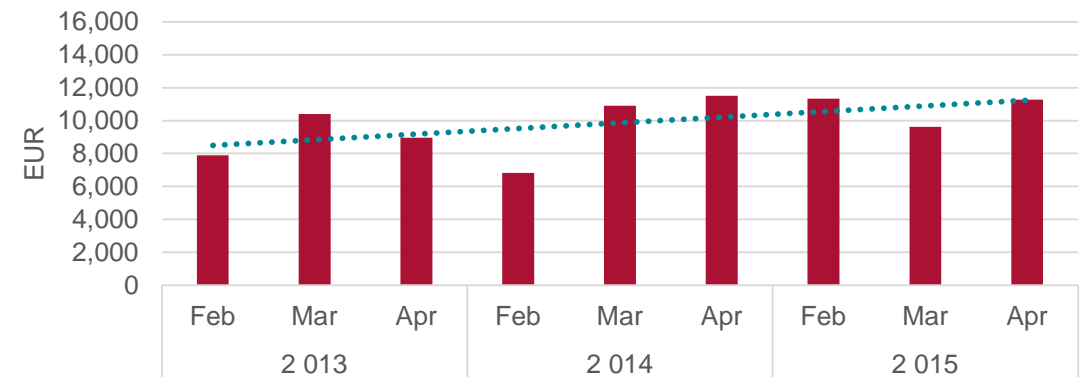
## Haartman hospital

- Inventory cost is not monitored
- No. of SKUs in inventory May 12<sup>th</sup>: unknown
- Inventory count result June 3<sup>rd</sup> – 4<sup>th</sup> : 23 700 EUR, 827 SKUs
- Knowledge of the inventory level is based on the ward pharmacist's memory and yes/no estimate
- No budget for medicine spend

Medicine orders (EUR) Malmi hospital ward 4  
February-April 2013-2015



Medicine orders (EUR) Haartman hospital ward 6  
February-April 2013-2015



# The Pyxis MedStation ES system enables a real-time view of inventory levels



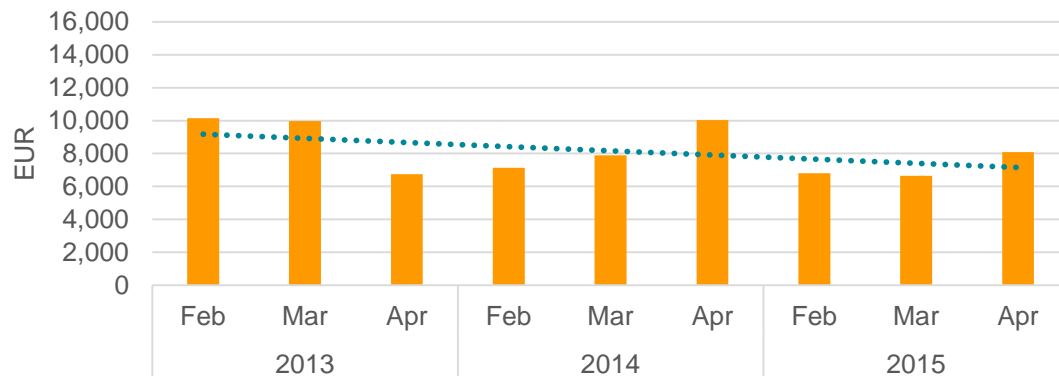
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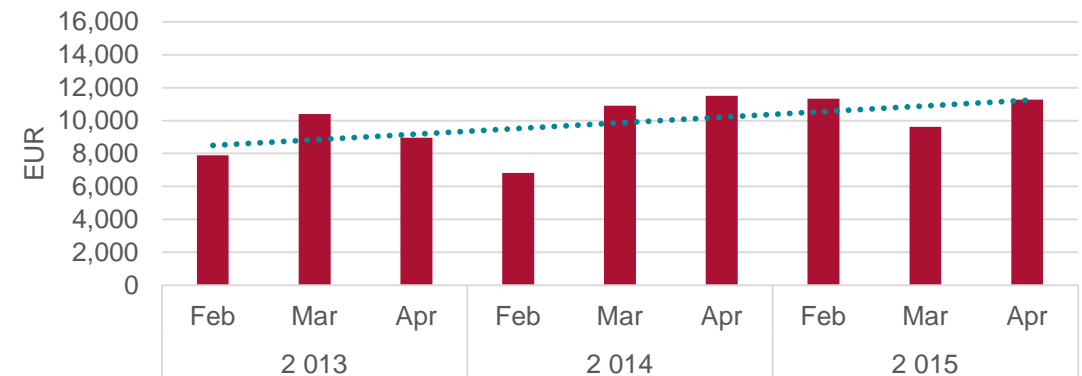
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Corrected medicine orders (EUR) Malmi hospital ward 4 February-April 2013-2015



Medicine orders (EUR) Haartman hospital ward 6 February-April 2013-2015



Note: The Malmi hospital orders are corrected for 2013 and 2014 to correspond to the patient bed number of 2015

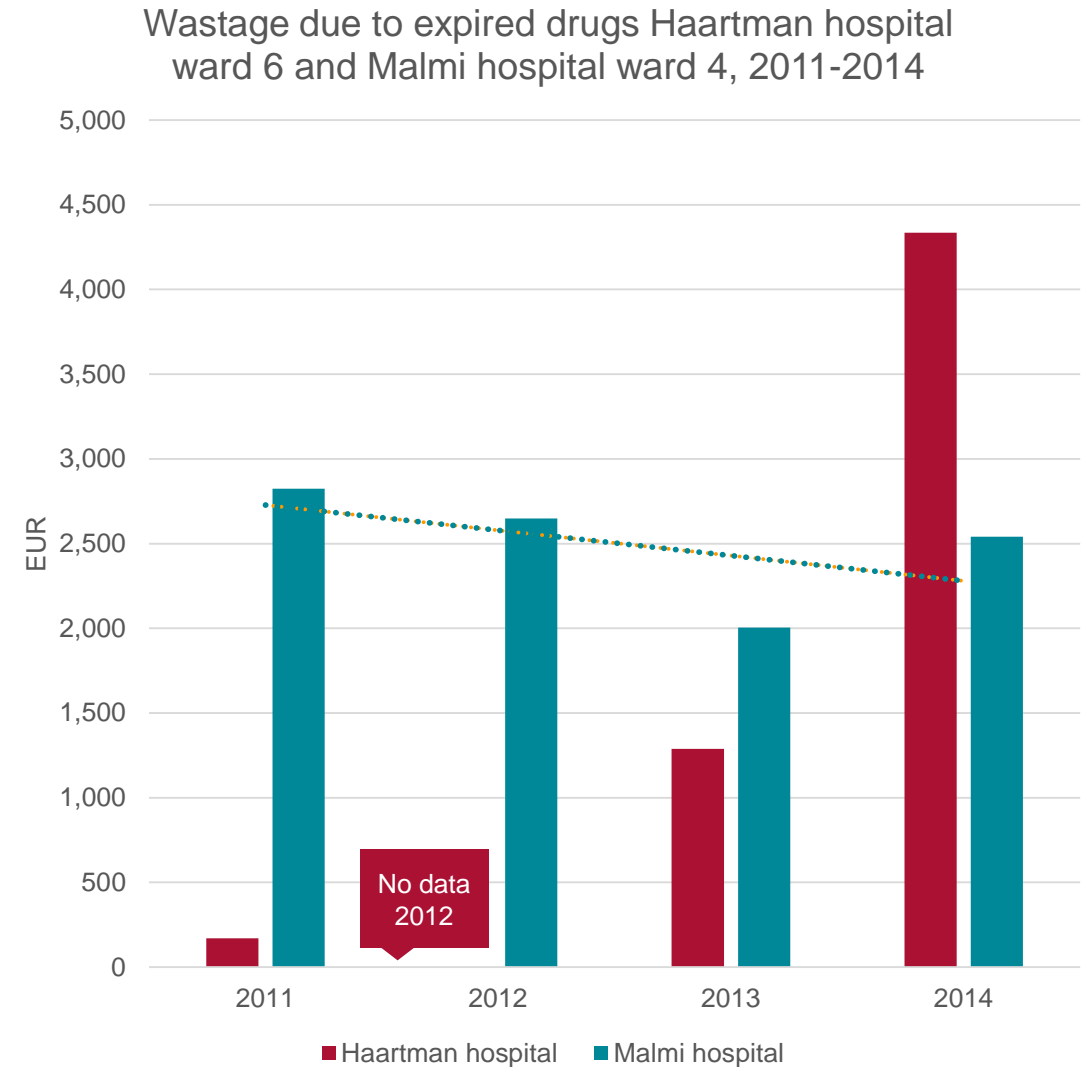
Source: City of Helsinki pharmacy 2015; interviews in Haartman hospital ward 6 and Malmi hospital ward 4, 5/2015, inventory count 3.-4.6 Haartman hospital ward 6 and Malmi hospital ward 4

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# The results cannot confirm the Pyxis MedStation ES system's possible effects on wastage



- Wastage due to expiration is returned to the City of Helsinki pharmacy
  - Wastage (expired medicine) can be delivered directly as medicine waste to be disposed of, but reported to the city pharmacy
  - No recorded wastage data for Haartman hospital ward 6 in 2012
- In both of the wards at the Haartman and Malmi hospitals the wastage (wrong/contaminated, etc. medicine) is gathered in a waste bin
  - Haartman hospital ward 6 has a 10L waste bin for pills, which is emptied roughly once a year
  - Malmi hospital ward 4 has a 5L waste bin for pills, which is emptied roughly every six months





# The Pyxis MedStation ES system makes ordering faster

## Malmi hospital

- When the inventory level for a drug reaches the set minimum, an order to replenish the drug is sent automatically for confirmation from the Pyxis-system to the ordering system
- The order can be made from one room and one computer
- The time it takes to make one order is estimated between 2-15 minutes / ward:
  - Most often 5 minutes
  - ~2 minutes if there is nothing to check in the order
  - ~15 minutes if order information has to be cross-checked with a different ward

## Haartman hospital

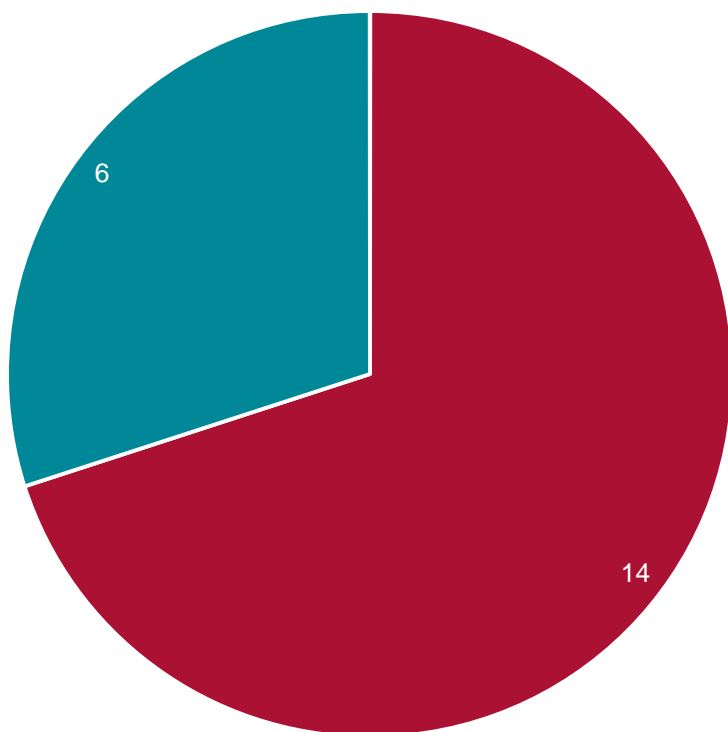
- Missing items are identified by going through all medicine packages individually, as well as all patients' medication lists
- In order to complete the order, one has to visit multiple rooms
- The time it takes to make one order is estimated between 30-60 minutes / ward





# Survey results: the system is not infallible in terms of medicine availability

Has a medicine been out-of-stock from the Pyxis MedStation-system when you would have needed it?  
(n=20)



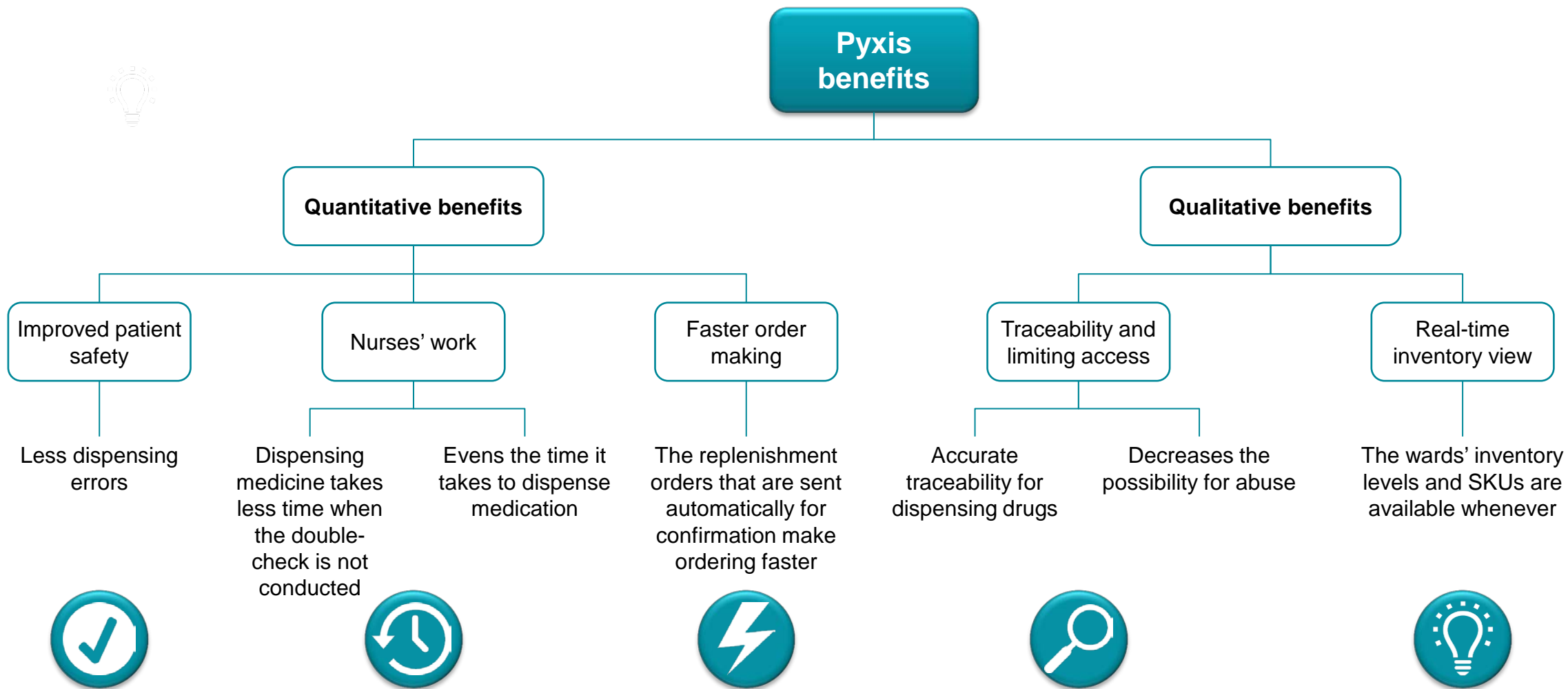
■ Yes ■ No

## Out-of-stock medicine

1. Doximycin i.v.
2. Oxynom 5mg
3. Miacalcic
4. Aciclovir
5. Furesis i.v.
6. Zinacef i.v.
7. Somac
8. Trikozol
9. Oxamest
10. Bioclarid
11. Roxithromycin
12. Kaleorid 1g
13. Predmisolon 20 mg
14. Sodium bicarbonate

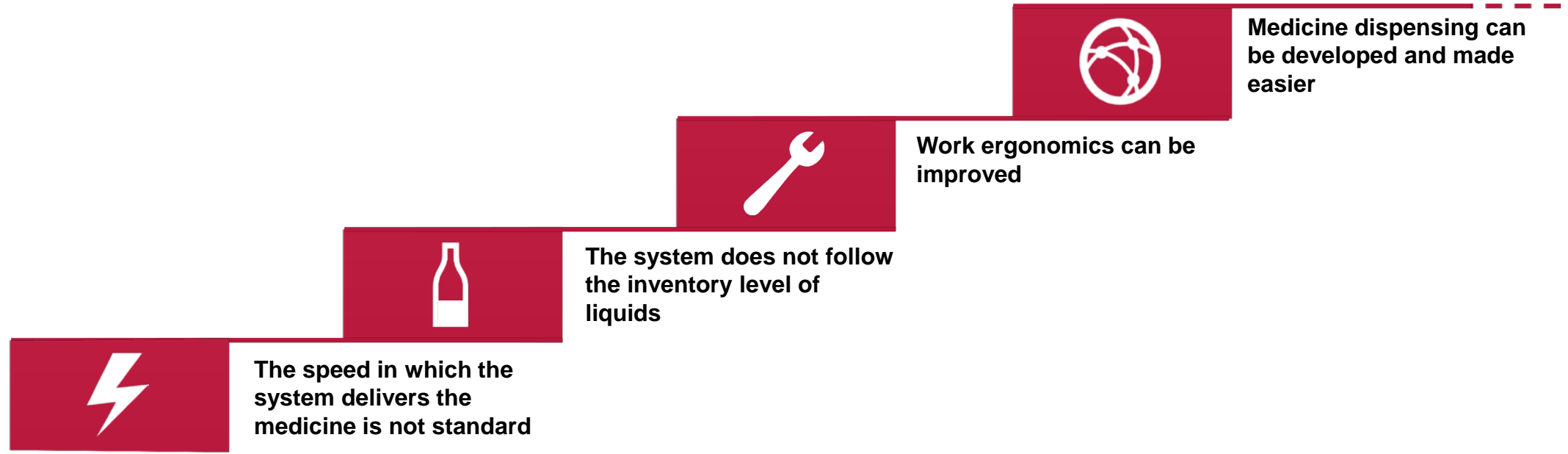


# The benefits of the Pyxis MedStation ES system based on this study



# Recommendations

# Four steps were identified in order to improve the medication system in the short to medium terms

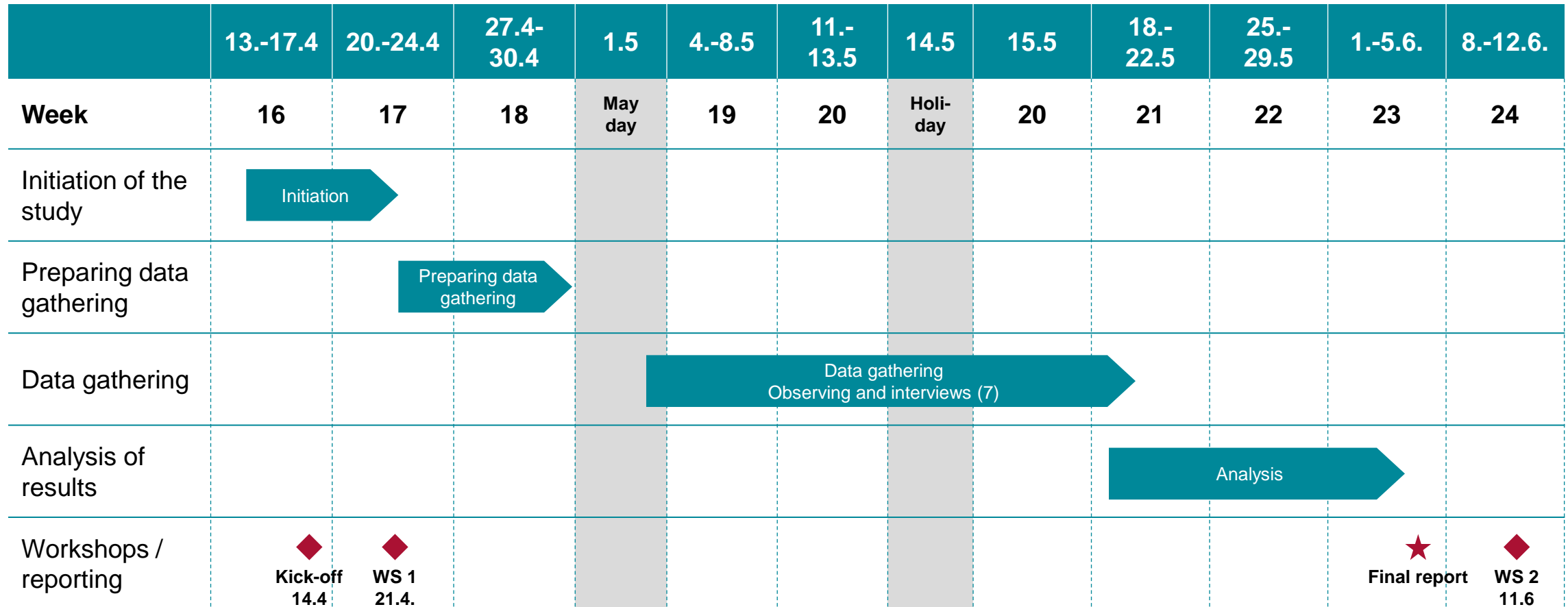


- Recommendation:**
- Replace the (older) Cubie pockets that function abnormally to newer pockets that operate in a more standardised speed
  - Increase training
  - Configuring the monitoring of inventory levels so that the system can indicate the level of liquids and send an order for confirmation if necessary
  - Possibility for the nurse to lay down the medication list elsewhere than flat on the system
  - Raising the height of the lower drawers / re-arranging the contents
  - Integrating the system with a medicine database e.g. Duodecim

- Benefits:**
- Ensures a more even speed in medicine dispensing
  - Positive effect against resistance to change
  - Expands the minimum inventory level control to liquids
  - Ease further the making of orders
  - Makes work more pleasant
  - Positive effect against resistance to change
  - Eases the work in cases where an alternative drug has to be searched
  - A greater realization of benefits

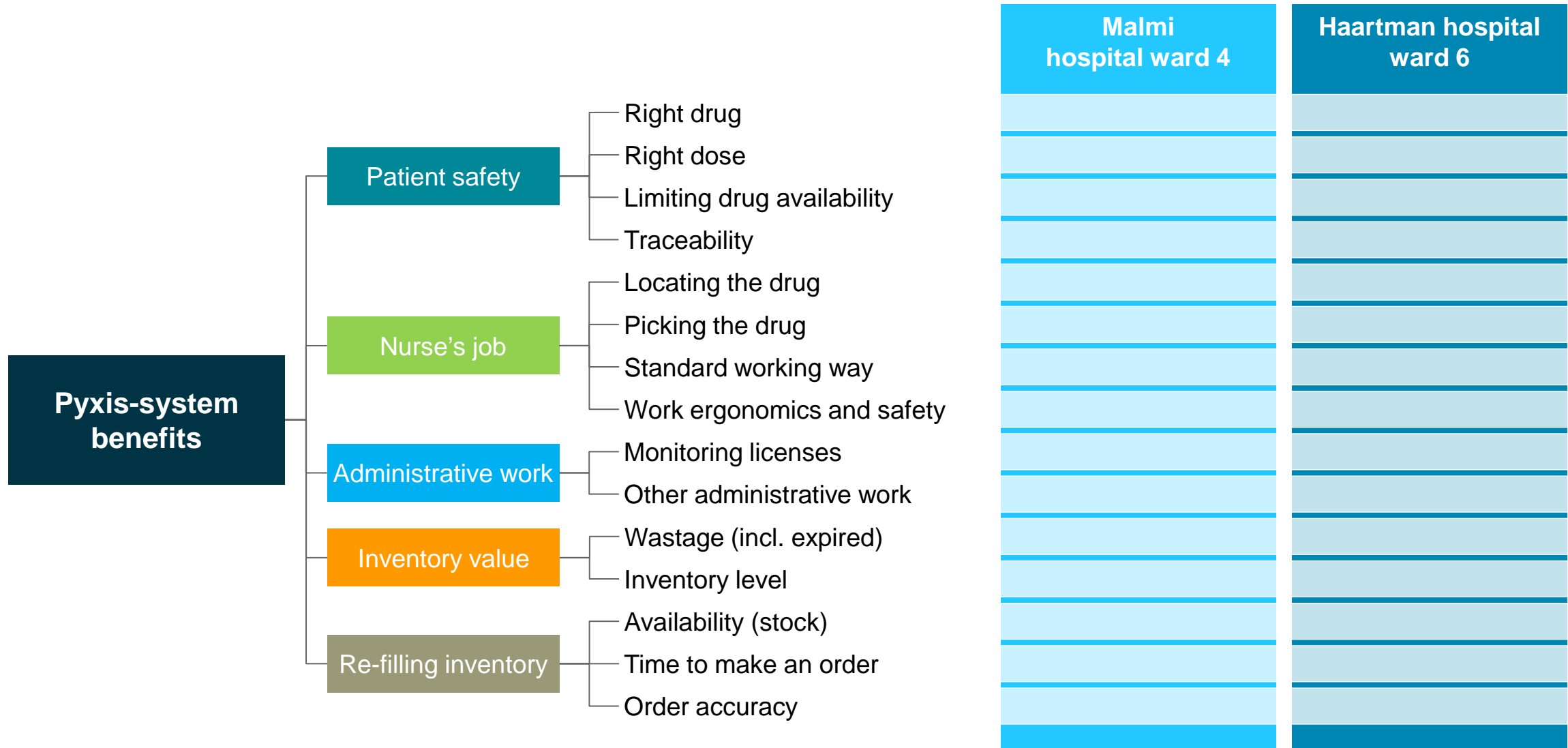
# Appendices

The study was conducted in April-May 2015, and the results were presented in the beginning of June

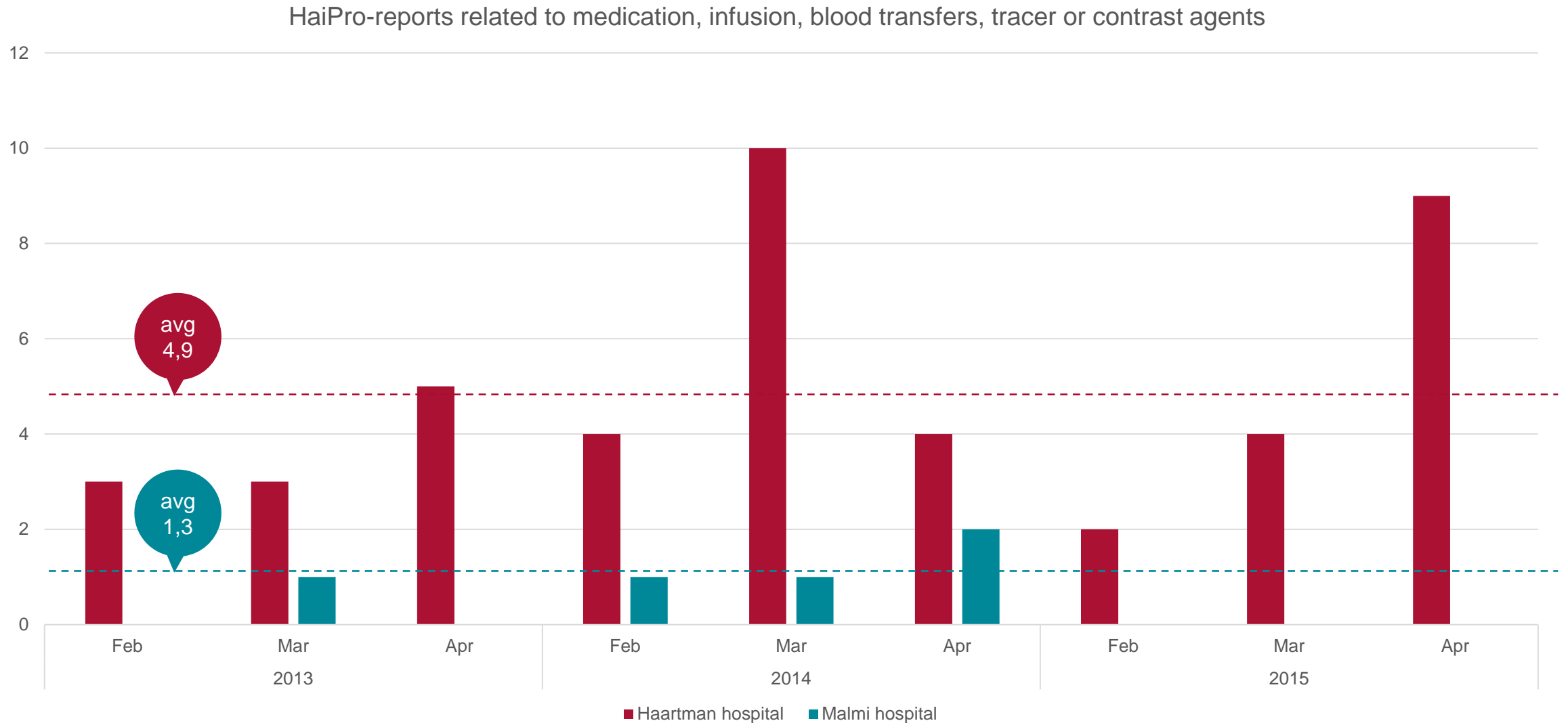


◆ Workshop (WS) with representatives from the Malmi and Haartman hospitals

The structure for the study was based on a working hypothesis of the benefits, which was tested in defined wards of the Malmi and Haartman hospitals



# HaiPro-reports 2013-2015 Feb-Apr from Malmi hospital ward 4 and Haartman hospital ward 6



Note: HaiPro is a system that is largely used in Finland to report incidents relating to patient safety



## Interviewed professionals

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Name	Organization	Role	Date
Katri Jaakkola	Haartman hospital	Head nurse	12.5.2015
Linda Karisalmi	Haartman hospital	Ward pharmacist	12.5.2015
Johanna Nummila	Malmi hospital	Ward pharmacist	13.5.2015
Anne Lunden	Haartman hospital	Matron	15.5.2015
Liisa Skippari	City of Helsinki pharmacy	Head pharmacist	15.5.2015
Seija Moilanen	Malmi hospital	Head nurse	21.5.2015
Maritta Lindholm	Malmi hospital	Matron	27.5.2015