

# Development activities in Denmark in the field of CSSD

## The use of robotics and automatisisation to achive a better work enviroment and efficiency



- Gentofte Hospital; Automatic Storage and Packing of Case Carts with Robots, Trine Frederiksen



- Julius, an Autoclave Able Case Cart Trolley and Automatic Handling Instrument Containers, Pia Hilsberg



- CSSD Projects at Copenhagen Capital, Gitte Antonisen



## Modern Technologies and Procedures

- A model, based on operation activity, which can calculate the necessary personnel resources needed in the CSSD, Pia Hilsberg

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A robot came to town

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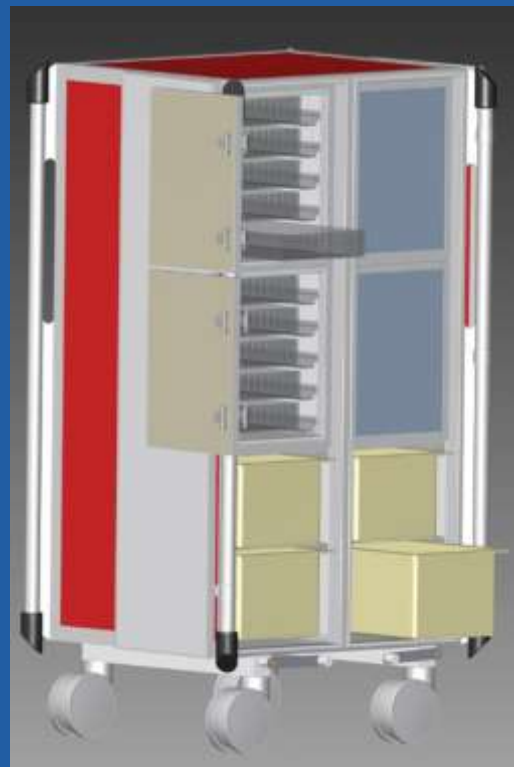
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# JULIUS - The autoclavable Case Cart

Every day around 4000 instrument trays are sterilized at Danish hospitals.

A big part of these can be packed, handled in a more efficient and safe way with Julius



# IMPROVED WORKING ENVIRONMENT



**Faster and simpler preparation  
in the operating theatre**

**Hilsberg Partner**  
• PROJEKLEDELSE  
• RÅDGIVNING  
• UNDERVISNING

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# IMPROVED PERFORMANCE

## Tested and proven in the floor sterilizer at the Regional Hospital in Viborg







For further information on Julius or a calculation of the benefits/savings that Julius offers to your hospital, please contact

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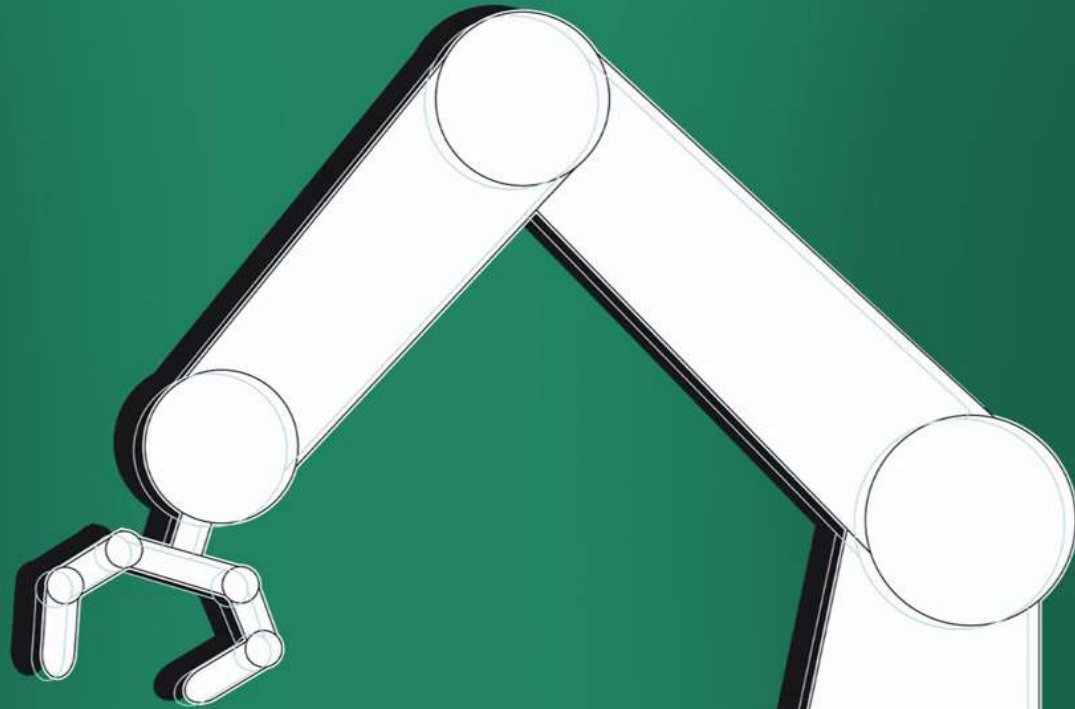
or

**Pia Hilsberg**

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# Automatic handling of the instrument containers



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# Automated CSSDs of the future

in the Capitol Region of Denmark

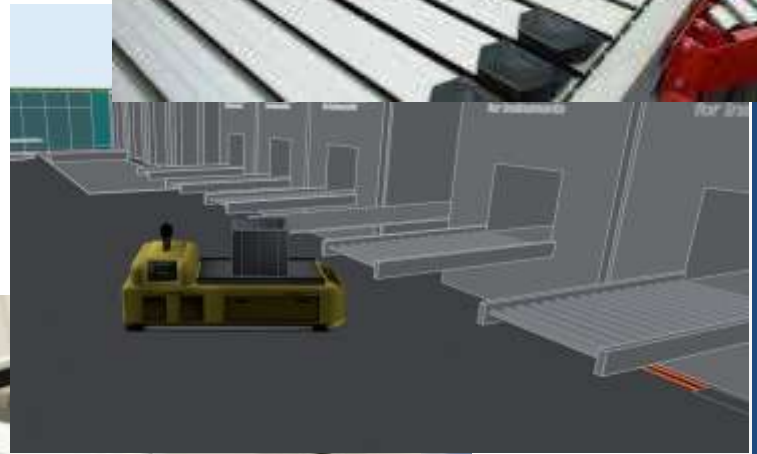
Gitte Antonisen, Hilsberg & Partner

# Two new CSSDs serving the Capital Region of Denmark



- Capital Region of Denmark:
  - 1.6 mill. Citizens
  - Several major hospital
- In the future:
  - 243,000 surgical procedures
  - 466,500 instrument containers
  - 81,500 ISO baskets

Total cost estimated to €150mill.  
Ready for use primo - medio 2018



**Sterilization**

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# Generic model for resource planning in central service sterile department (CSSD)

## Model

1. Time studies for determining the **direct** time for handling instruments.
2. Total number of surgical procedures in an exactly defined period of time, listed as **SKS-codes**.
3. The SKS-codes are coupled with instrument usage and associated packing lists to score **direct** time.
4. Determination of **indirect** time and **training** time.
5. Calculation of **net** time per SKS-code on chapter level.
6. Calculation of the collective need for human resources for a given amount of surgical procedures.



# 1. Time Studies

## Direct time

Basic time

Special sub-procedures

+Indirect time

+Training time

Net time

Net time

+Breaks and holidays

Workload

Basic time Instrument tray with:	Average time in sec.
01-10 instruments	480 sec.
11-20 instruments	500 sec.
21-30 instruments	636 sec.
31-40 instruments	900 sec.
≥40 instruments	1116 sec.

Sub-procedure	Average time in sec.
Dismantling of instrument	9 sec.
Rinsing and soaking of the instrument	27 sec.
Handling instrument for ultrasonic treatment	11 sec.
Manual cleaning of instrument	300 sec.
Supplementation with implants (splints, screws)	120 sec.
Lubrication of the instrument	5 sec.
Assembly of the instrument	29 sec.
The instrument needs extra protection, e.g. tip protectors	10.8 sec.
Functional test of the instrument	15 sec.
Control of the instrument under a microscope	5 sec.

## 2. Total number of surgical procedures in an exactly defined period of time, listed as SKS-codes

Example of list showing SKS-codes, surgical procedures and number of procedures over a given period of time:

<b>SKS-code - Surgical Procedure</b>	<b>Number of procedures 2013</b>	<b>Number of single package instruments</b>	<b>Tray ID (number)</b>	<b>Tray ID (number)</b>	<b>Tray ID (number)</b>
<b>KJAH01 Laparoscopy</b>	439	4	2	5	
<b>KJEA01 Laparoscopic appendectomy</b>	277	3	4	7	
<b>KJKE02 Endoscopic trans duodenal papillotomy</b>	231	6	8		
<b>KJAH00 Exploratory laparotomy</b>	174	3	1		
<b>KJFA15 Endoscopic polypectomy of the colon</b>	168	3	9	10	
<b>KJJA20 Biopsy of liver</b>	153	0	20		

# Link between time calculation and SKS-Codes

## Scorecard

Number of instruments in the tray	Time in sec.
1-10	480
11-20	500
21-30	636
31-40	900
≥40	1116
Score of special sub-procedures	Time in sec.
Instrument has to be dismantled	9
Rinsing and soaking the instrument	27
Handling instruments for ultrasonic cleaning	11
Manual cleaning procedures	300
Supplementation with implants (splints, screws)	120
Control of instrument under a microscope	5
Lubricating the instrument	5
Mantling of instrument	29
The instrument has extra protection, e.g. tip protectors	11
Functional test	15
It is an EndoWrist instrument	600
It is an EndoWrist optik	300

## Packing list

Laparoscopy , Nr. 2			Reprocessing/score
Instruments	Size	Catalog number	
2 Foerster sponge forceps	25cm	14-355-25	
2 Towel Clamp Backhaus	13cm	13-909-13	
2 Haemostatic Forceps	18cm	13-383-18	
1 Needle holder, Mayo Hegar		20-642-20	
1 Dissecting scissors, Mayo-Stille	17cm	11-931-17	
1 Dissecting forceps	18cm	12-301-18	
1 Dissecting forceps, Micro Adson	12cm	12-406-12	
1 Probe	18cm	16-100-18	
1 Dissecting forceps, Maryland	5mm	RS005-000 RS140-000 RS000-526	Dismantling Ultrasonic treatment Assembled Function test
1 Grasping forceps	5mm	RS005-000 RS140-000 RS000-520	Dismantling Ultrasonic treatment Assembled Function test
1 Coagulation electrode, Bipolar	5mm	LP480-000	Pretreatment, enzyme
1 Cable		HH310-13	
1 Scissors Metzenbaum, curved left		RS005-000 RS140-000 RS000-590	Dismantling Ultrasonic treatment Assembled Function test
1 Trocar set	10mm	TR350-100	Dismantling Ultrasonic treatment Function test

17 instruments	500 sec.
4 instruments, dismantling	36 sec.
4 instruments ultrasonic treatment	44 sec.
3 instruments assembled	87 sec.
4 instruments function test	60 sec.
1 instrument pretreatment with enzyme	27 sec.
Total handling time	754 sec.
	12,6 min.

SKS-Code - Surgical Procedure	Total time in min.	Total time in sec.	Number of procedures 2013	Number of single package instruments	Single pack sec. 284 sec.	Tray ID (number)	Sec.	Tray ID (number)	Sec.
KJAH01 Laparoscopy	45,9	2752	439	4	1136	2	716	5	900
KJEA01 Laparoscopic appendectomy	44,9	2692	277	3	852	4	820	7	1020
KJKE02 Endoscopic trans duodenal papillotomy	36,4	2184	231	6	1704	8	480		
KJAH00 Exploratory laparotomy	24,4	1465	174	3	852	1	613		
KJFA15 Endoscopic polypectomy of the colon	30,6	1837	168	3	852	9	505	10	480
KJJA20 Biopsy of liver	8,0	480	153	0	0	20	480		

41 minutes is a weighted **direct** average time per reprocessing instrument at SKS chapter level in chapter KJ (gastrointestinal surgery)

## 4. Determination of indirect time and training time and 5. Calculation of net time on chapter level

- **Indirect** time is the time required for other tasks related to the reprocessing of surgical instruments. The **indirect** time must be added to the measured **direct** handling time.
- Time used for **training**.

Hospital 1: Indirect time and training time **17.4%**

Hospital 2: Indirect time and training time **20%**

This percentage is added to the **direct** time to get the **net** time.

The total weighted average net time for KJ chapter (gastrointestinal surgery) is then (41 minutes + 17.4 %) 48.1 minutes. This is the amount of time, with which KJ operations is burdened at the CSSD.

# More results of calculated SKS chapter codes:

SKS-code	Surgical procedure	Weighted average net time in minutes, Inpatient	Weighted average net time in minutes, outpatient	Weighted total average net time in minutes
KF	Heart/ vascular	82.6	32.6	81.5
KK	Kidney	35.0	28.5	32.1
KE	Teeth, mouth, jaw	82.0	32.5	54.5
KJ	Digestive organs, spleen	50.8	45.6	49.7
KD	Ear, nose, larynx	59.5	47.2	57.8
KC	Eye and eye area	27.1	20.0	26.9

## 6. Calculation of the collective need for human resources for a given amount of surgical procedures

- The current surgical procedures extended to chapter level used to calculate the total **net time**. To this must be added **breaks, holidays and days off** to get the total number of employees.
- The model calculation does not include human resources for management, quality assurance work and transport tasks.
- The model is continually qualified in relation to the actual data available.
- The model can be used to calculate the need for human resources for an entire CSSD, but can also be used for changes in procedures within the different surgical specialties (SKS-code).

# Key message – robotics, automatisisation and modern procedures in Denmark

- Automated storage and case cart packing with robots
- JULIUS - The autoclavable Case Cart
- Robot handling instrument containers in the unclean area.
- Project plans for automated CSSD using different kind of technologies and few manual processes left.
- A model which can be used to calculate the human resource needs for an entire CSSD