

Improvement of management  
efficiency by verifying the  
expiration date of sterilized  
products.

Youngsook IM

Seoul National University Bundang Hospital

# Seoul National University Health System

:Who are we?(medical school & hospitals)



**Main campus(연건)**  
1907



**Childrens Hospital**  
1985



**Bundang Campus(분당)**  
2003



**Boramae City Hospital**



**Gangnam Health  
Outpatient Center**



**Sheakh Khalifa Specialty SNUH  
UAE**



## Overview Bundang Campus



# Smart Hospital – Smart Bed Station

## SMART Hospital

### Personalized information

(health condition, prescription, etc.)

### Patient's safety

(health condition monitoring)

### Convenience service

(Change/cleaning bed sheet, inquiry hospitalization, check/pay)

### Check/apply diet menu

(patient, guardian)

### Entertainment

(TV, internet)

### General information

(hospital life, notice, event, etc.)



Communication Design Award 2014



reddot design award  
best of the best 2013

Communication Design

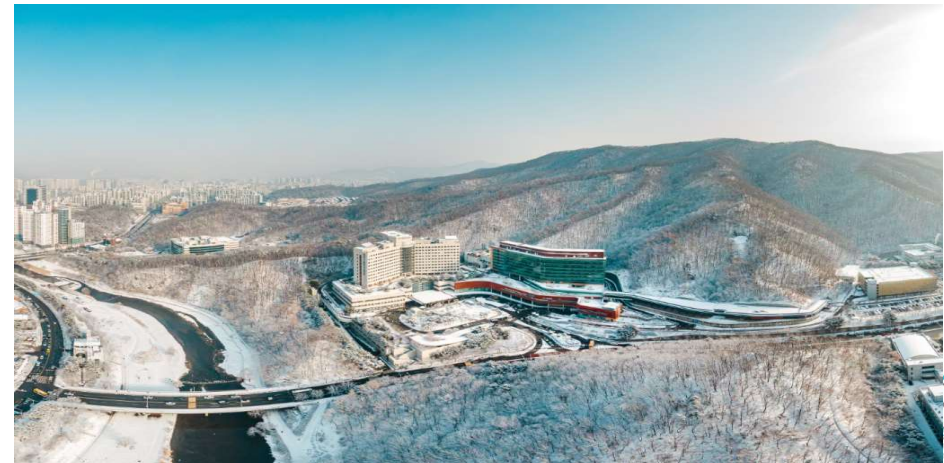
The best works of a category receive the award  
"red dot: best of the best" for highest design quality

© This work was supported by the IT R&D program of SNUBH and SKT.

- MAXIMIZING patient convenience by providing personalized Service
- INCREASING operational efficiencies (e.g. simplifying medical document request)
- REDUCING clinical risk by alert & message functions



## 4 Seasons at Seoul National University Bundang Hospital





## Connection road

Walking Gallery



Sky Walk



## Operation Room

**First hospital to perform laparoscopic gastric cancer surgery in Korea.  
Global standard setter for laparoscopic gastric cancer surgery.**



### Operation Room Observation



**SNUBH practice Coil Embolization  
using multiple Catheter for the 1<sup>st</sup>  
in the world.**



## CSSD in Seoul National University Bundang Hospital

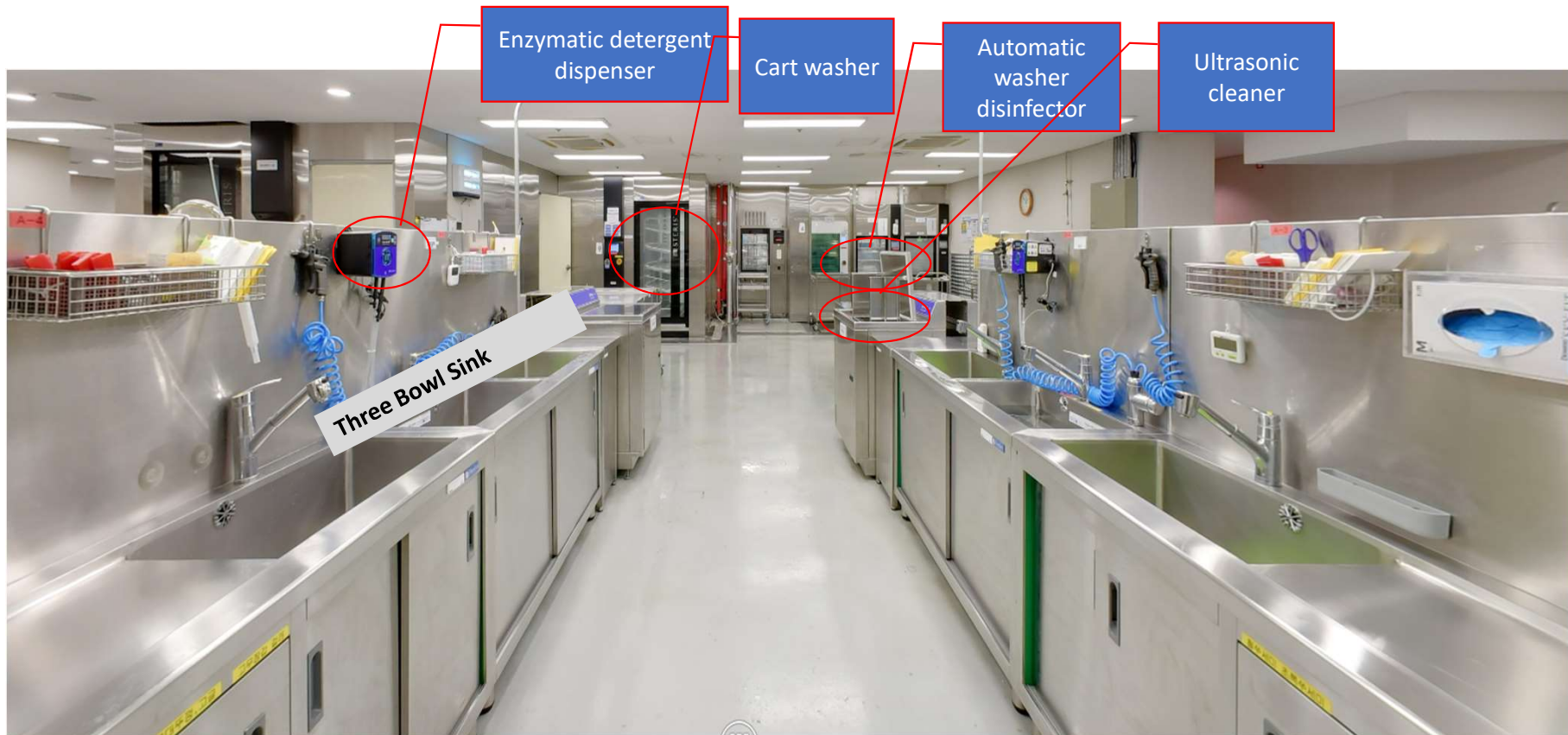
Number of Hospital bed	Outpatients /day	Operating rooms	Number of surgeries/day	(Number)	
				RN	Assistant
1,300	7,000	39	180	11	46

Steam Sterilizer	E.O gas sterilizer	Hydrogen Peroxide Sterilizer	Cart washer	Automatic washer disinfecter	Ultrasonic cleaner	Manual Sink Line	(Number)	
11	9	3	2	9	11	9		

- ❖ We are responsible for the sterilization of reusable instruments in all departments, including operating rooms, wards, and outpatients.
- ❖ Reprocessed surgical instruments by CSSD are perfectly safe both patients and users



## Decontamination area



## Packaging and sterilization area





## My Colleagues~~~



## INDEX



- 1. Selection Background and Expectations**
- 2. Team Members**
- 3. Key Problems and Causes**
- 4. Improvement Plan Progress Schedule**
- 5. Key Indicators and Goals**
- 6. Major Improvements**
- 7. Improvement Effect**
- 8. Sustainable Management Plan**



# Selection Background and Expectations

## Selection Background

1. Time related shelf-life of sterilized products means the longest period for which sterilized products can be stored aseptically and is affected by packaging materials, storage environment, transportation and handling methods, etc.
2. The expiration date of sterilized products in our hospital is the same as that of Seoul National University Hospital in Seoul at the time of opening **without a clear reason.**
3. Recently, Some of hospitals extending the expiration date is increasing due to the qualitative improvement of storage environment and packaging materials, so it is necessary to **adjust the expiration date after verifying the expiration date**

Seoul National University BUNDANG Hospital	Samsung Hospital	Haeundae Paik Hospital	Note
Crepe paper/Non woven wraps 4 weeks	Crepe paper/Non woven wraps 12weeks	Crepe paper/Non woven wraps 12weeks	The shelf life of sterilized products for each packaging material is shorter than other hospitals

4. Sterilized products past the expiration date must be re-sterilized or discarded, **resulting in increased sterile product management tasks and costs.**  
 ※ Current status of re-sterilization: 100 sets of re-sterilization due to expiration of the expiration date out of an average of 200 monthly sets  
 (period: March 1, 2020 to March 31, 2020 (1 month))

## Expectations

1. Verification of expiry date of sterilized products according to our hospital environment and packaging materials

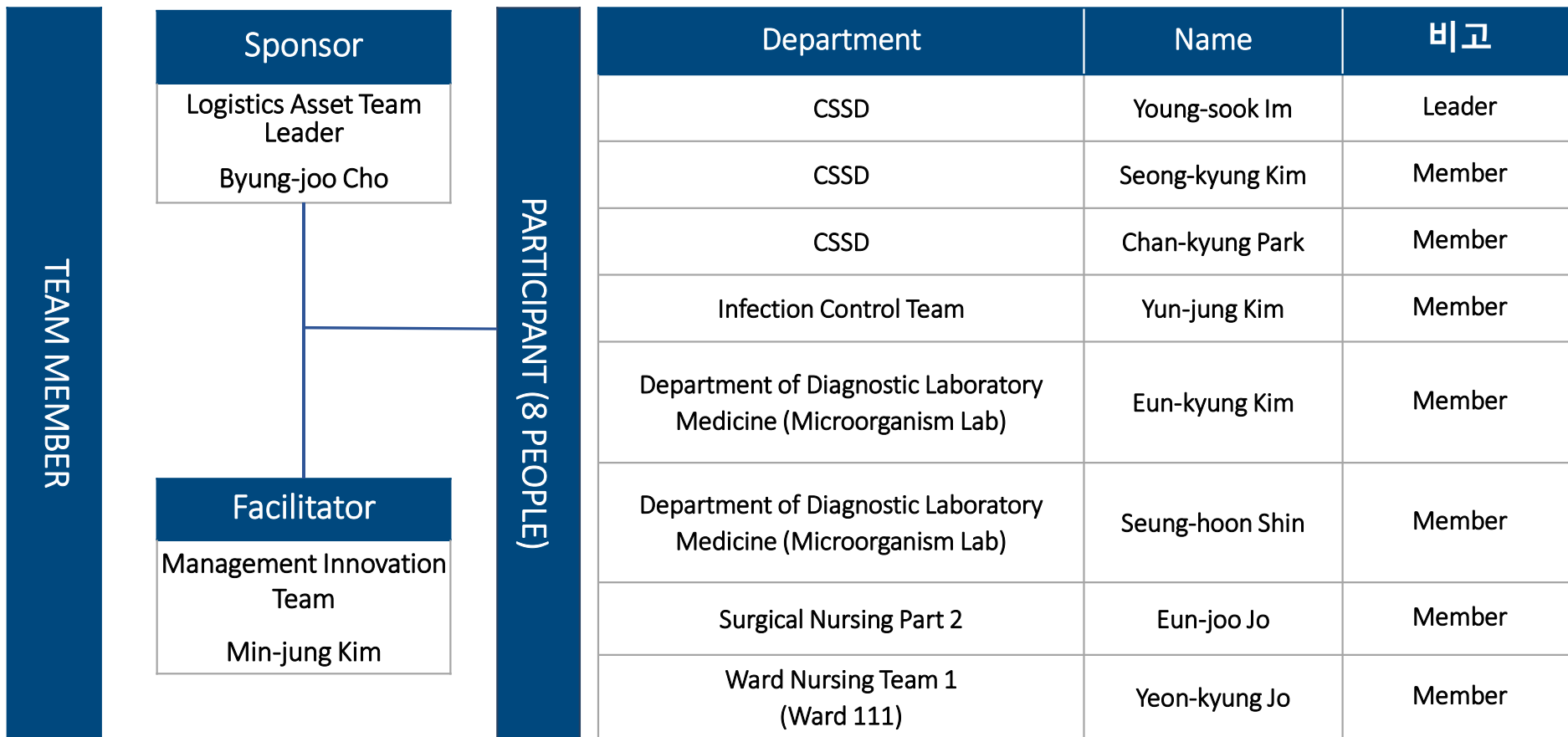
Crepe paper/Non woven wraps :  
4weeks → 12weeks

Rigid Sterilization Container : 4weeks → 12weeks

Paper Plastic Pouch/Tyvek : 24weeks → 36weeks

2. Adjustment of expiry date of appropriate sterilized products
3. Re-sterilization amount reduced by resetting the expiration date

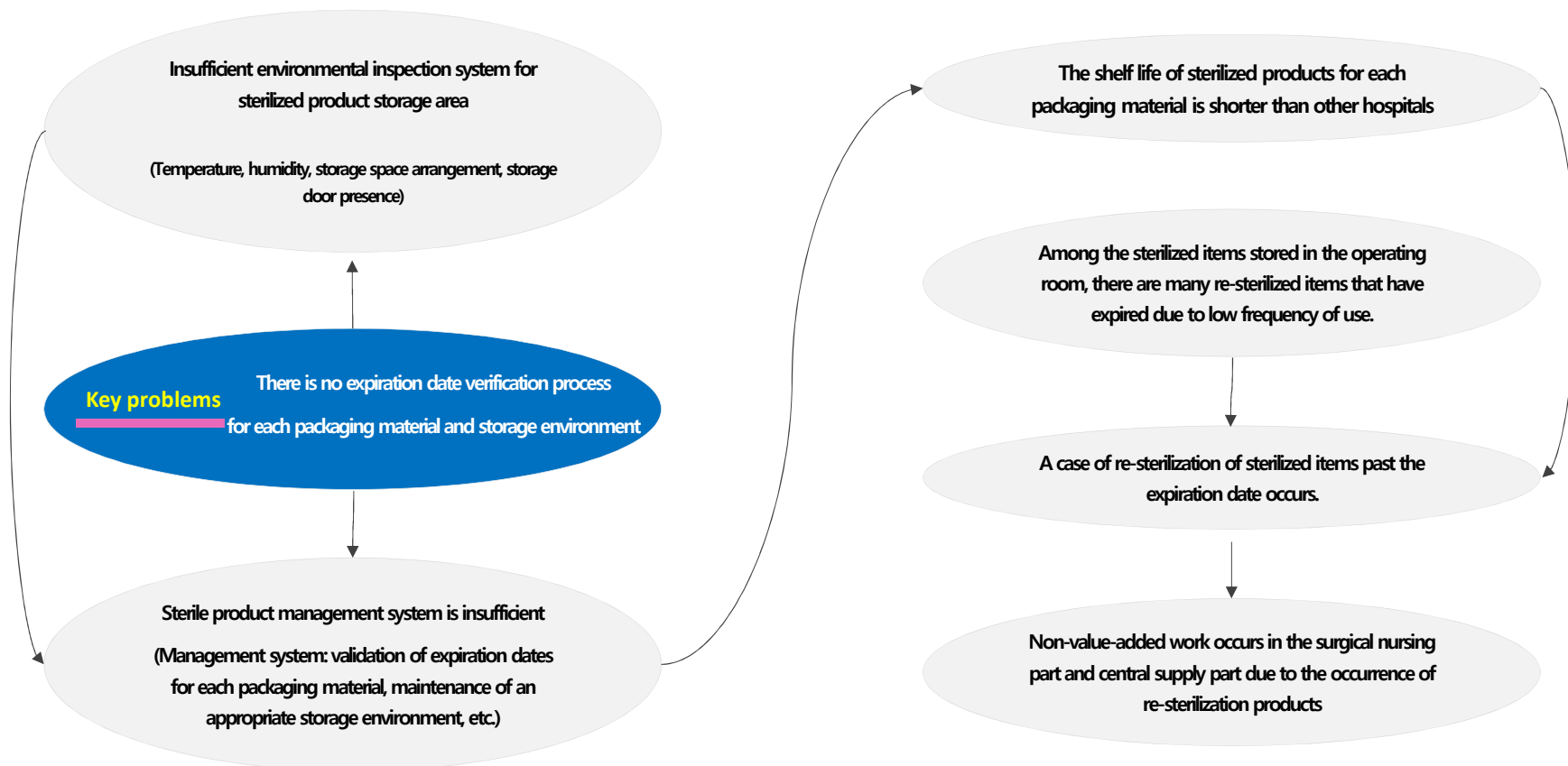
## Team Members





## Key Problems and Causes

- Core issues are selected in consideration of the relevance of issues derived through discussion within the team.



## Improvement Plan Progress

### Identification of storage environment for sterilized products

of the main sterile storage areas.  
Check temperature, humidity and  
environment

### Verification of sterilization expiration date

The expiration date is verified through  
bacterial culture testing in the actual  
storage environment

### Resetting the expiration date of sterilized products







Considering the validated expiration  
date, reset the expiration date of the  
sterilized product

### Check the re-sterilization amount

Re-sterilization amount and problems  
that occur after resetting the  
expiration date  
confirm



## Improvement Plan Progress

Progress	April 2020	May 2020	August 2020	December 2020	January 2021	March 2021	May 2021	August 2021	Enforcer	Note
understanding the current situation and Validity Period Verification design									Young-sook Im Seong-kyung Kim Chan-kyung Park	4 meeting
Sample preparation and sterilization Assignment of selected departments									Young-sook Im Seong-kyung Kim Chan-kyung Park Min-jung Kim	
Crepe paper/Non woven wraps /Rigid Sterilization Container 2 week interval culture test									Seong-kyung Kim Chan-kyung Park Eun-kyung Kim Seung-hoon Shin	
Crepe paper/Non woven wraps /Rigid Sterilization Container Request for approval of extension of infection control committee									Young-sook Im	
Paper Plastic Pouch/Tyvek 2 week interval culture test									Seong-kyung Kim Chan-kyung Park Eun-kyung Kim Seung-hoon Shin	
Paper Plastic Pouch/Tyvek Request for approval of extension of infection control committee									Young-sook Im	

## Key Indicators and Goals

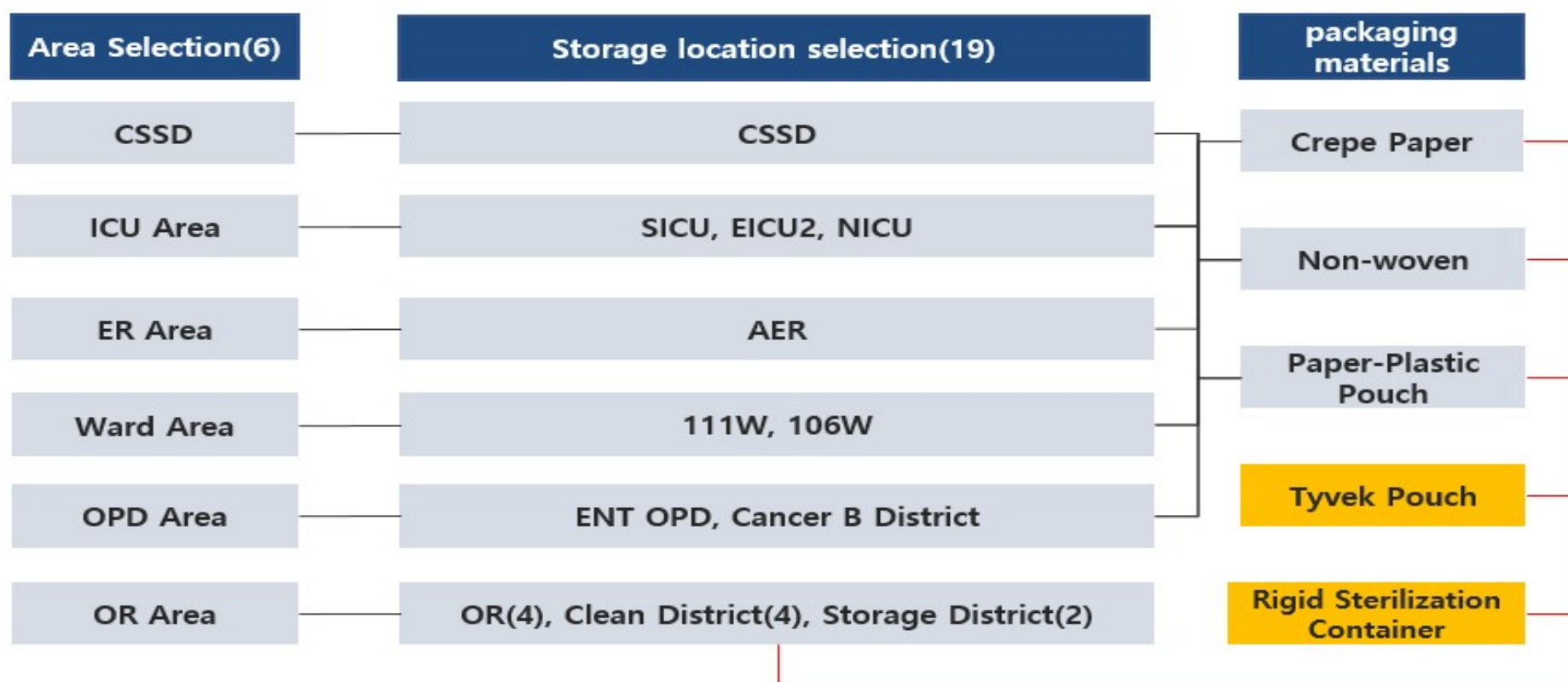
Indicator Name	Current Level	Goal	Rationale for goal
Number of re-sterilization cases (per month)	204cases	82cases	Number of surgeries in 2020, reasons for re-sterilization, Considering the extension of the validity period A 60% reduction target was selected

Metric Definition	Average monthly number of sterilized items that need re-sterilization because they are not used within the expiration date
Indicator Formula	$\Sigma$ The number of sterilized items requested for re-sterilization due to the expiration date factor/ number of months
Indicator Target	Sterilized goods requested to be re-sterilized by the central supply part after the expiration date has passed or is imminent
Exclusion	Paper Plastic Pouch/Tyvek
Measurment Period	July-August, October-December 2020(September is excluded for group activities of majors and full-time doctor)
Data Source	CSSD data

\* Reason for exclusion: Peel pouch and tie bag account for 10% of the total number of re-sterilization cases, and the volume is small and the amount of sterilization is insignificant.

## Selection of Place to Verify Validity Period

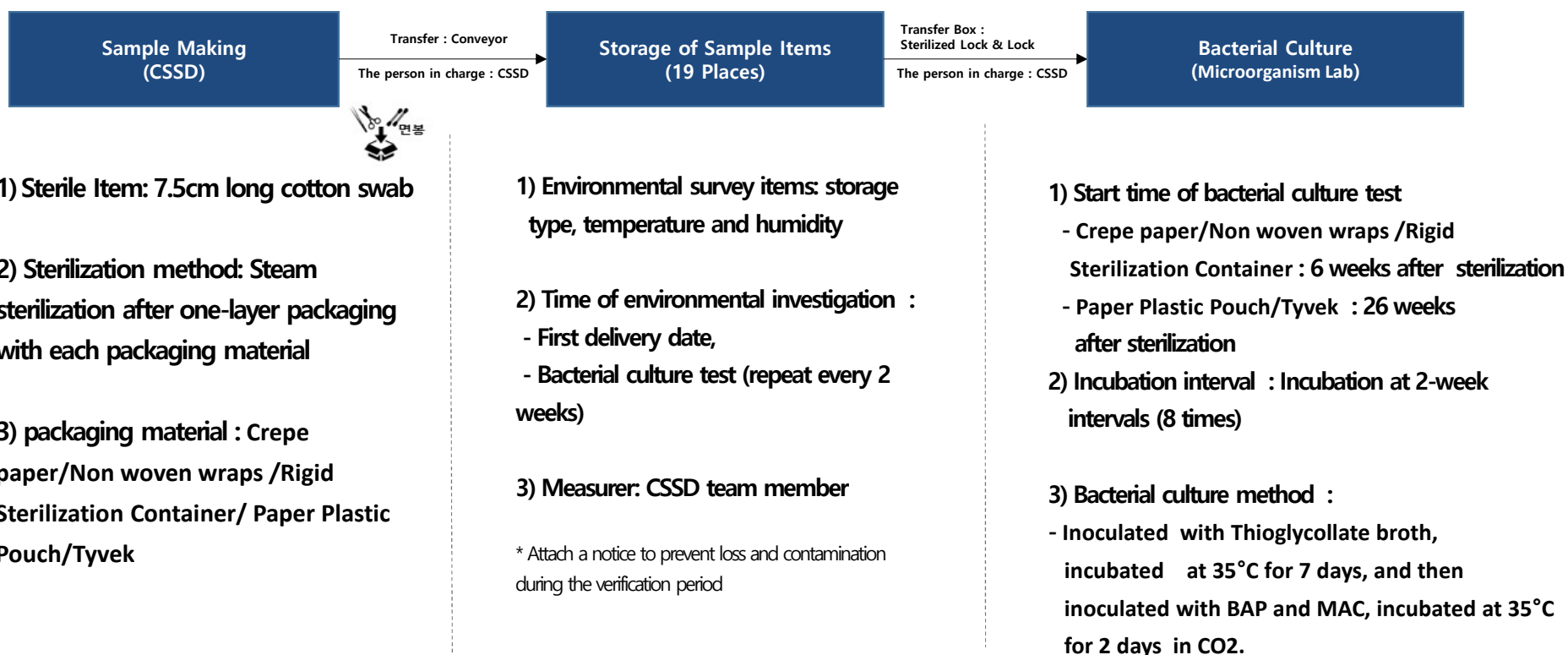
- 19 places with a large amount of sterilized products and weak storage environment were selected





# Expiration Date Verification Plan

- Establishment of an expiration date verification plan considering the maintenance of the existing storage environment for sterilized products and the expiration date of each packaging material



## Step-by-step Scene Photos

### Sample Making



### Transfer after Sterilization



### Temperature and Humidity Measurement



### Send Samples To Lab



### Cultivating in Lab





## Making sample for rigid container










- Make a sample by putting a cotton swab in the 3 types of Rigid Sterilization Container










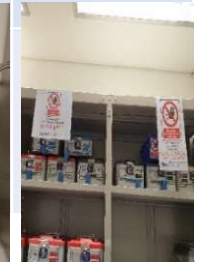
NO	OR 1 Room 3	OR 2 Room 5	OR 3 Room 26	OR 4 Room 39	OR 5 clean area	OR 6 clean area	OR 7 clean area	OR 8 clean area	OR 9 storage room	OR 10 storage room
1										
2										
3										
4										
5										
6										
7										
8										



## Storage environment and goods survey

- The same investigator measured temperature and humidity with same instrument periodically

CSSD	ICU Area			ER Area	Ward Area		OPD Area	
CSSD	SICU	EICU2	NICU	AER	111W	106W	ENT OPD	Cancer B OPD
								

OR 1 AREA						OR 2 AREA			
OR1 storage room	OR2 ROOM 3	OR3 ROOM 5	OR4 Between 4 and 5	OR5 In front of room 17	OR6 In front of room 21	OR7 In front of room 26	OR8 In front of room 39	OR9 In front of room NS	OR10 storage room
									

## Storage environment, temperature and humidity for sterilized products

- The maximum value of temperature and humidity was below than the recommended level of AAMI and Korean sterilization management standards. Therefore, It is necessary to further check the expiration date.

Type of location	19 Places	Temperature(°C)		Humidity(%)		Note(AAMI Recommendation)
		Min	Max	Min	Max	
Opened location	CSSD	19.3	24.1	23.3	67.7	<ul style="list-style-type: none"><li>• Sterile product storage location<ul style="list-style-type: none"><li>- away from drains, windows and vents</li><li>- At least 20-25 cm from the floor</li><li>- At least 40-45cm away from the ceiling or sprinkler head</li><li>- Maintain a gap of at least 5 cm from the outer wall</li></ul></li><li>• Temperature: 24°C or less</li><li>• Humidity: less than 70%</li><li>• Air: positive pressure, minimum number of air exchanges 4 times/hour</li></ul>
	OR ROOM 3	18.9	23	27	59	
	OR ROOM 5	18.7	20.9	30.7	68.5	
	OR Between 4 and 5	19.2	21.6	27.8	56.3	
	<ul style="list-style-type: none"><li>• Closed Style : Maximum Temperature <b>27.3°C</b>, Maximum Humidity <b>74.8%</b></li><li>• Open Style : Maximum Temperature <b>24.5°C</b>, Maximum Humidity <b>67.5%</b></li></ul>					
	OR in front of room SS	19.7	21.9	29.1	67.3	
	OR In front of room NS	20.5	22.9	18.6	54.3	
	OR 2AREA storage room	19.2	22.1	17.8	59.1	
Closed location	SICU	23.7	26.1	17.1	68.3	
	EICU2	23	26.8	12	70.8	
	NICU1	24	26.4	18.1	73.1	
	AER	22.9	26.8	9.1	74.8	
	111W	22.1	26.8	14	67.6	
	106W	23.8	27.3	17.5	70.9	
	ENT OPD	21.1	25.7	12.3	67.6	
	Cancer B OPD	22.2	26.4	10.1	70.4	

❖ AAMI(Association for the Advancement of Medical Instrumentation)

## Culture test results of crepe paper, non-woven wraps, rigid sterilization container.

- Crepe paper/Non woven wraps /Rigid Sterilization Container : There was no cultured bacteria until 20 weeks after sterilization.
- Serilized paper : Bacillus bacteria were detected at 18 weeks.

- Detailed bacterial culture results by cycle

Verification cycle (Date)  packaging material	6week (8/5) *(10/14)	8week (8/19) *(10/28)	10week (9/2) *(11/11)	12week *(11/25)	14week (9/29) *(12/9)	16week (10/14) *(12/23)	18week (10/28) *(2021/1/6)	20week (11/11) *(1/20)	Note
Crepe paper	N.G	N.G	N.G	N.G	N.G	N.G	Growth (AER, EICU2)	N.G	* re-verification date
Non woven wraps	N.G	N.G	N.G	N.G	N.G	N.G	N.G	N.G	
Rigid Sterilization Container	N.G	N.G	N.G	N.G	N.G	N.G	N.G	N.G	

\* N.G(no growth)

- Bacteria detection culture place and type of bacteria

- **18week(10/28) EICU2 Crepe paper – Bacillus spp** 1 \* 10<sup>4</sup>/mL +Rod - Temperature/humidity readings (26.4 °C / 33.1%)
- **18week(10/28) AER Crepe paper – Bacillus spp** 2 \* 10<sup>3</sup>/mL +Rod - Temperature/humidity readings (26.8 °C / 30.7%)

❖ Reason for re-verification :

CNS and Bacillus were separated at 8 weeks of sterilization in Ward 106 (non-woven wraps), OR1 storage room (container), and discussed with the infection control team. It is verified by resetting the sample production and verification period as it appears to be caused by contamination during bacterial culture.



## Culture test results of paper plastic pouch and Tyvek

- The Paper Plastic pouch was free from cultured bacteria until 48 weeks after sterilization, and *Paenibacillus* spp was detected at 38 weeks in the case of the Tyvek.

- Detailed bacterial culture results by cycle

Verification cycle (Date) packaging material	26week (12/23)	28week (1/6)	30week (1/20)	32week (2/3)	34week (2/17)	36week (3/3)	38week (3/17)	40week (3/31)	42week (4/14)	44week (4/28)	46week (5/12)	48week (5/26)
Paper Plastic pouch	N.G	N.G	N.G	N.G	N.G	N.G	N.G	N.G	N.G	N.G	N.G	N.G
Tyvek	N.G	N.G	N.G	N.G	N.G	N.G	Growth (OR In front of room 17)	N.G	N.G	N.G	N.G	N.G

- Bacteria detection culture place and type of bacteria

- **38week(3/17)** OR In front of room 17 **Tyvek** - ***Paenibacillus* species** - Temperature/humidity readings (21.1 °C/ 34.5%)

## Reset the expiration date of sterilized products

- Bacteria culture test results for each packaging material were put on the agenda of the Infection Control Committee and the expiration date was reset.

packaging material	Expiration date after sterilization recommended by the manufacturer	AS-IS	TO-BE	Note
Crepe Paper	<ul style="list-style-type: none"> <li>- After verification of sterilization power, depending on storage environment,</li> <li>- shelf life of 180 days</li> </ul>	4week	12week	Infection control committee (2021. 03. 15)
Non woven wraps	<ul style="list-style-type: none"> <li>- 1 year after sterilization</li> </ul>	4week	12week	
Rigid Sterilization Container	<ul style="list-style-type: none"> <li>- 6 months under aseptic conditions, 90 days shelf life of aesculap container</li> <li>- 6 weeks for open storage, 3 months for closed storage</li> </ul>	4week	12week	
Paper-Plastic Pouch	<ul style="list-style-type: none"> <li>- 5 years after sterilization</li> </ul>	24week	32week	Infection control committee (2021. 09. 01)
Tyvek	<ul style="list-style-type: none"> <li>- 1 years after sterilization</li> </ul>	24week	32week	

## Hospital notice changed sterilized product expiration date

### Crepe paper/Non woven wraps /Rigid Sterilization Container

**멸균 물품 유효기간 연장 안내**

**4월 1일 부터**

- 대상: 『부직포, 멸균지, 하드컨테이너』로 포장한 모든 멸균 물품

부직포	멸균지	컨테이너

- 유효기간: 기존 4주 ▶ **12주**로 연장

변경 전 (4주)		변경 후 (12주)	

- 문의사항: 중앙공급파트장 임영숙 (T.1340)

### Paper Plastic pouch/Tyvek

**멸균 물품 유효기간 연장 안내**

- 시행일: 2021년 9월 13일
- 대상: 필파우치, 타이백 으로 포장한 모든 멸균 물품

필파우치	타이백

- 유효기간: 기존 24주 ▶ **32주 (8주 연장)**

변경 전 (24주)		변경 후 (32주)	

- 문의사항: 중앙공급파트장 임영숙 (T.1340)



## Improvement effect

Indicator Name	Current Level	Improvement Results	Goal
Number of re-sterilization cases (per month)	204cases	35cases (82.8% decrease)	82cases
Improvement performance measurement period	July to September 2021		
Data Source	CSSD data		

### Reduce the cost of re-sterilization

**2021 €/month, 24,255 €/year**

**Savings expected**

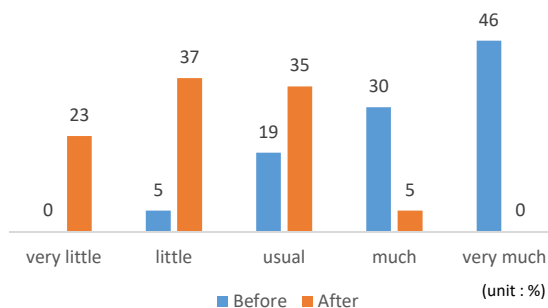
- Re-sterilization cost ( Monthly average) - Before improvement : 2,454 €
- After improvement : 433 €



Rigid container standard: 12 sets at a time,  
Sterilizer standard: 144€ for one-time operation cost,  
Reduced from 17 operations per month to 3 operations per month

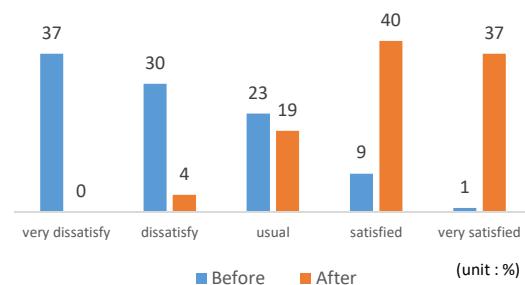
### Decrease in the amount of work to manage the expiration date of sterilized products

**'very little to little' ratio of the effective period management workload has increased**



### Improved satisfaction with sterilized items

**'Very Satisfied and Satisfied' ratio of expiry date management tasks increased**



❖ Survey target: 57 nurses in the operating room, survey period: 2021.10.05~10.12

## Sustainable Management Plan

### Qualitative effect

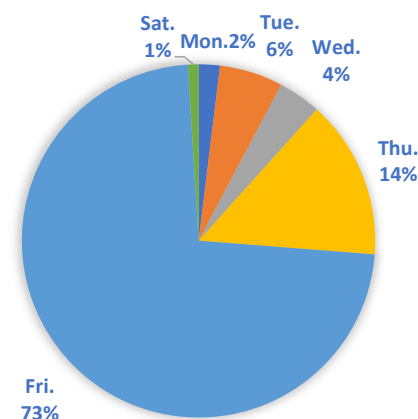
- Improved safety of sterilized product management by verifying and resetting the expiration date of sterilized products
- Creating an environment where you can focus on other tasks by reducing tasks related to sterilization and re-sterilization

I got my real  
friday back

### Continuous management

- Periodic evaluation of sterilization expiry period is required – Certification standard
- 8.5\_Sterilized goods management\_Expiration period indication and management
- Re-sterilization management after expiration date
- Consider shifting to event-related expiration management
- Periodic monitoring and training on the storage environment for sterile products

RE-STERILIZATION RATE BY DAY  
OF THE WEEK





감사합니다~~

THANK YOU~~

GRACIAS~~

[budim@snubh.org](mailto:budim@snubh.org)