

Calculating Cost per Cycle in CSSD

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Every Management Review Meeting



KPI:

**Last month you have reduced your CSSD budget by 5%.
This month you have to reduced it by 10%.**

What much does it take to reprocess this?



- › How much does it cost to reprocess this Kerrison in Peel Pack or with Set?
3, 5, 10, 15 AED?
- › Does your CSSD budget justifies the output that you produce?

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What is Cost per Cycle?

Ecolux Professional Laundry Solutions

Equipment
Detergents
Service
Installation

Cost Per Cycle

Wash & Dry from £2.00 All-in-one

Equipment
Service plan
Installation
Detergents
Unique to CPC
Just add water.

What is Cost per Cycle?

- › It is the total cost incurred to the CSSD to process per load of instruments.
- › It includes end to end cost that might be involved in the processing of instrument.
- › It gives you insights into the costs involved in processing the instruments and prepare you for optimization.
- › CPC is the first step towards optimization.



How will it help in CSSD?

- › You get in-depth insights of each dollar spent in CSSD.
- › CSSD can better prepare to present the stake holders the cost involved in processing.
- › Future investments can be made based on this study.



Your experiences ?

- › Have you ever used it?
- › At what scale?
- › What were the challenges?
- › What were the outcomes?

Lets Start But First !!!!!

- › Do not use it for any Kiwi Medical products that you are using



Calculating Cost Per Cycle

1. Cost per WD cycle/Sterilizer cycle
2. Cost per Tray/STU
3. Cost per Single/Supplementary Instrument

Types of Expenses in CSSD

To Calculate the cost we need to know our expenses

1. Fixed Expenses
2. Moderately Proportional Expenses
3. Directly Proportional Expenses

Types of Expenses in CSSD

1. Fixed Expenses

Examples

- › Rent
- › Management Wages/Salaries
- › Asset Depreciation

Types of Expenses in CSSD

2. Moderately Proportional Expenses

Examples:

- › Daily Test Cycles
- › Regular Maintenance
- › Stationery
- › Electricity – Average (Morning/Evening)

Types of Expenses in CSSD

3. Directly Proportional Expenses

Examples

- › Wages
- › Consumables (Indicators, Detergents, Tip Guards, etc)
- › Packaging Materials
- › Water

Cost per Tray in WD / Sterilizer

Simple Formula for calculating cost for everything **except Labor**

$$\text{COST PER Tray in WD} = \frac{\text{COST OF MATERIAL}}{\text{NUMBER OF STU}}$$

$$\text{Cost per Tray (in WD)} = \frac{\text{Cost of Material (Wash Indicator + Detergent + Water + Electricity) + Fixed Charges}}{12 \text{ Trays (Number of Baskets)}}$$

$$\text{Cost per STU (in WD)} = \frac{\text{Cost of Material (12 + 8.75 + 1.5 + 3) + 2.8}}{12}$$

$$\text{Cost per STU (in WD)} = \frac{25.25}{12} = \text{AED } 2.33 / \text{STU}$$

AED 350/5 L – Det

AED 10.41 / 1000 L – Water

AED 29.4 fils/kWH – Electricity

Cost per cycle WD/Sterilizer

Simple Formula for calculating cost for everything except Labor

COST PER CYCLE in WD = COST OF MATERIAL x NUMBER OF TIMES USED

Cost per cycle (in WD) = Cost of Material (TOSI + DETERGENT + WATER + ELECTRICITY)

Cost per CYCLE (in WD) = Cost of Material (12 + 8.75 + 1.5 + 3)

Cost per CYCLE (in WD) = 25.25 = AED 25.25

AED 350/5 L – Det

AED 10.41 / 1000 L – Water

AED 29.4 fils/kWH – Electricity

Cost per Unit

Simple Formula for calculating cost for everything except Labor

$$\text{COST PER Unit in Sterilizer} = \frac{\text{Cost of Material} \times \text{Number of Used}}{\text{NUMBER OF STU}}$$

$$\text{Cost per unit (in Sterilizer)} = \frac{\text{Cost of Material (Indicators + Packaging + Trayliner + Electricity + Water)} \times \text{Packages}}{100 \text{ Peel Packs}}$$

$$\text{Cost per unit (in Sterilizer)} = \frac{\text{Cost of Material (0.5 + 0.15 + 0 + 2.94 + 1.41)} \times 100}{100}$$

$$\text{Cost per unit (in Sterilizer)} = \frac{500}{100} = \text{AED 5 / Peel Pouch}$$

AED 100/200 Pieces – Class 5
AED 300 / 2000 pcs – 10 x 30 cm Pouch
AED 29.4 fils/kWH – Electricity
AED 10.41 / 1000 L – Water

Calculating Labour Cost



LABOUR COST

Labor cost is one of the highest expenditure of the CSSD and one of the most difficult to calculate.

Calculating Labour Cost is Difficult

- Labor cost varies by many factors
 - Age
 - Type of Instrument to be cleaned/sterilized
 - Loaner
 - Overtime
 - Etc

Calculating Labour Cost

TO MAKE THINGS EASY WE HAVE A SIMPLE FORMULA

$$\text{Cost of Processing per Instrument} = \frac{\text{Employee Salary} \times (\text{Time to decontaminate} + \text{Time to Assemble})}{\text{Seconds}}$$

Calculating Labour Cost

But every instrument is different one takes 25 seconds and other 125 how do we differentiate?

1. Open Instruments – Requires to Open the Instrument prior to Processing ex Clamp/Scissors
2. Closed Instruments – Does not requires any opening. Ex. Langenback Retractor
3. Lumen – Instruments that requires irrigation Ex. Suctions

Calculating Labour Cost

- Using a calibrated stop watch an investigator records the time to decontaminate each instrument type and assemble it within an instrument tray.
- The process is done for both sets and peel packs. Peel pack will definitely take more time to pack.
- Ex. Rohit has a salary of AED 5000 and he works 8 hours a day i.e 28,800 seconds i.e 0.1736 AED
- Rohit takes 2.7, 3.2 and 7.2 seconds to decontaminate a closed, open and lumen instruments.
 - Adding that into formula

$$\begin{aligned} &= \text{Employee Salary per seconds} \times (\text{Time to decontaminate} + \text{Time to Assemble}) \\ &= 0.1736 \text{ AED} \times 2.7 \text{ seconds} \\ &= \text{AED } 0.468 \text{ to decontaminate a closed Instrument.} \end{aligned}$$

Calculating Labour Cost

- Similarly we do it per set (We know the type of instruments per set) and also per peel packs.

A hospital in US did a project to determine the true cost of instrument trays and a potential strategy for optimization.

Calculating Labour Cost – Experiment

- Then they studied how many instruments were not used in a set whenever that set was used for surgery by using a formula for Instrument Utilization.

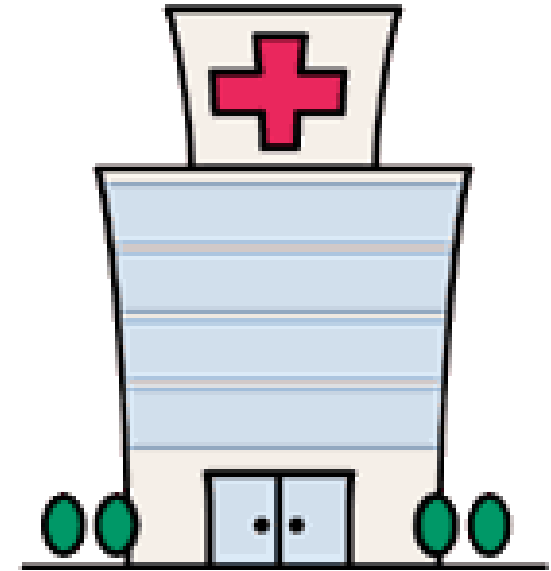
$$\text{Instrument Utilization} = \frac{\text{Instrument Count (Used)}}{\text{Instrument Count (Total)}}$$

(Total)

- They observed three plastic surgeons performing five types of procedures that utilized the **Plastic Soft Tissue Tray**. Of the 98 instruments in this tray, 0 (0%) instruments were used in all cases observed, 41 (40%) instruments were used in some of the cases observed and 58 (59%) instruments were used in none of the cases observed.
- They also observed four general surgeons performing five types of procedures that utilized the Major Laparotomy Tray. Of the 110 instruments in this tray, 0 (0%) instruments were used in all cases observed, 83 (75%) instruments were used in some of the cases observed and 27 (25%) instruments were used in none of the cases observed

Case Study – Hospital in Al Ain

- › This was a single-site, observational study conducted on the CSSD of a large 410 bedded multi-speciality hospital in Al Ain, Abu Dhabi
- › The objective of the study was to calculate the cost involved in processing individual instruments by considering all the factors.
- › Following Factors were considered during the study:



Case Study – Hospital in Al Ain

1. Staff Salary Charges
2. Water, Electricity and Rent
3. Asset Depreciation
4. Consumables
5. Management Salary
6. Instrument Maintenance



Case Study – Hospital in Al Ain

Calculating Labor Charge

Instruments were categorized into

1. Closed Instruments (No opening Required) :
e.g. Retractor or Osteotome
2. Open Instruments (Requiring the technician to open Instruments prior to processing) :
e.g. Clamp or Scissor
3. Lumen Instruments (Instrument that require irrigation during for cleaning): e.g. Suction



Case Study – Hospital in Al Ain – CALCULATING LABOR CHARGES

With a calibrated stop-watch time was measured to clean a tray of 5 Instruments of each type.

For tray 5 Instrument tray was measured for cleaning and packing and the value was divided by 5 for Individual Instruments

| Packaging | Type of Instruments | Time for Decontamination | Time for Packing | Total Time |
|-----------|---------------------|--------------------------|------------------|-------------|
| Tray | Closed | 5 Seconds | 18 Seconds | 23 Seconds |
| | Open | 8 Seconds | 30 Seconds | 38 Seconds |
| | Lumen | 35 Seconds | 42 Seconds | 77 Seconds |
| Peel Pack | Closed | 5 Seconds | 130 Seconds | 135 Seconds |
| | Open | 8 Seconds | 130 Seconds | 138 Seconds |
| | Lumen | 35 Seconds | 145 Seconds | 180 Seconds |

Case Study – Hospital in Al Ain

Calculating Labor Charge – Lumen in a Peel Pack

We applied the following formula to calculate the cost of labor

$$\text{Cost of Processing per Instrument} = \frac{\text{Employee Wage}}{\text{Work Time (Seconds)}} \times (\text{Time to Decontaminate} + \text{Time to Assemble})$$

$$\text{Cost of Processing per Instrument} = \frac{6000 \text{ AED}^*}{691,200 \text{ Seconds}^{**}} \times (180 \text{ Seconds total time to clean and pack})$$

$$\text{Cost of Processing per Instrument (Labor Charged)} = 1.562 \text{ AED} / \text{Lumen Instrument in Peel Pouch}$$

* 8 Hours/Day, 24 Days/Month ** Average salary of CS Tech in UAE

CASE STUDY – HOSPITAL IN AL AIN

Depreciation/ Maintenance and Rent

Depreciation we have
calculated as 10%
Annually

Rental we have
calculated as actual.

PPM calculated as
actual.

Management Salary
and Compliance
Charges (DED, etc.)
can be added.

| Particulars | Number | Amount |
|--|-------------|------------------|
| Sterilizer | 2 | 310,000 |
| Washer Disinfector | 2 | 250,000 |
| Plasma Sterilizer | 2 | 430,000 |
| Packing Table | 2 | 15,000 |
| Sealer | 2 | 20,000 |
| Ultrasonic | 3 | 15,000 |
| Total Value of Equipment | | 1,040,000 |
| Depreciation Value (A) | Day | 284 |
| Rent (B) | Day | 1095 |
| PPM (C) | Day | 41 |
| Total (A + B + C) | | 1420 |
| Number of Instruments Processed Daily | 1070 | 1.32 |

Cost of Equipment Depreciation and Rent calculated per Instrument
= AED 1.32

CASE STUDY – HOSPITAL IN AL AIN

Utilities and Repair

Abu Dhabi Electricity
and Water Authority
Electricity: 20fils/kW
Water: Aed 7.84/1cum

Rental we have
calculated as actual.

| Particulars | Number | Amount |
|---|-----------------------|------------|
| Water (WD + Sterilizer + Manual) | 2685 Liters Cold/ Day | 22 |
| Water (WD + Sterilizer + Manual) | 328 Liters RO/ Day | 107 |
| Electricity (Total) | kW/Hr | 56 |
| Total Water and Electricity (A) | | 185 |
| Test Cycle (WD, Ultrasonic, Autoclave, BI) (B) | | 104 |
| Instrument Repair (C) | | 10 |
| Total (A + B + C) | | 299 |
| Number of Instruments Processed Daily | 1070 | 0.28 |

**Cost of Water, Electricity, Daily Test Cycle and Instrument Repair
= 0.28 AED / Instrument**

CASE STUDY – HOSPITAL IN AL AIN

Consumables

Detergent/Lubricant/Brushes/Accessories are common

Instrument cost for tray consisting of an average of 20 Instruments/Tray

| Particulars | Instrument packed Individually | Instrument in a Tray |
|-------------------------------------|--------------------------------|----------------------|
| Detergent and Lubricant | 0.04 | |
| Tray Liner/Container Accessory/Tape | 0 | 0.04 |
| Tip Protector | 0.80 | 0 |
| Brushes and Accessories | 0.013 | |
| Packing Material | 0.123 | 0.06 |
| Documentation Label | 0.11 | 0.003 |
| Total | 1.073 | 0.103 |

Cost of Consumables per Instrument in
Tray = 0.103
Peel Pack = 1.073

Case Study – Hospital in Al Ain

- › Post this calculation we can bifurcate the costs based on following
 - Plasma Cycle – Plasma Consumables
 - Implants – Additional BI
 - Peel Pack – Pouch + Indicator
 - Sets – Wrappers + Indicators + Trayliner + Tape

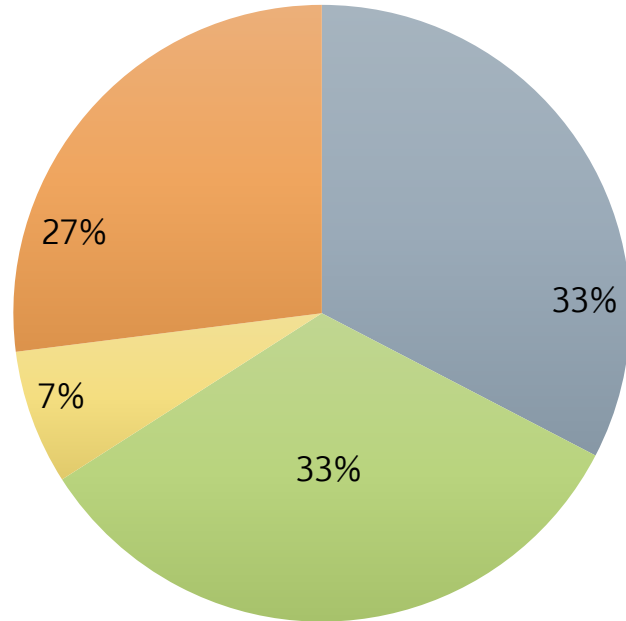
- › We calculated cost of Instrument in a Peel pack and Instrument packed in a set of 30 Instruments.

Calculating Cost – FINAL STRUCTURE

| Packaging | Instrument Type | Labor | Depreciations /Maintenance /Rent | Utilities and Repair | Consumables | Total |
|-----------|-----------------|-------|----------------------------------|----------------------|-------------|-------|
| Tray | Closed | 0.2 | 1.32 | 0.28 | 0.11 | 1.91 |
| | Open | 0.32 | 1.32 | 0.28 | 0.11 | 2.03 |
| | Lumen | 0.66 | 1.32 | 0.28 | 0.11 | 2.37 |
| Peel Pack | Closed | 1.16 | 1.32 | 0.28 | 1.07 | 3.83 |
| | Open | 1.18 | 1.32 | 0.28 | 1.07 | 3.85 |
| | Lumen | 1.54 | 1.32 | 0.28 | 1.07 | 4.21 |

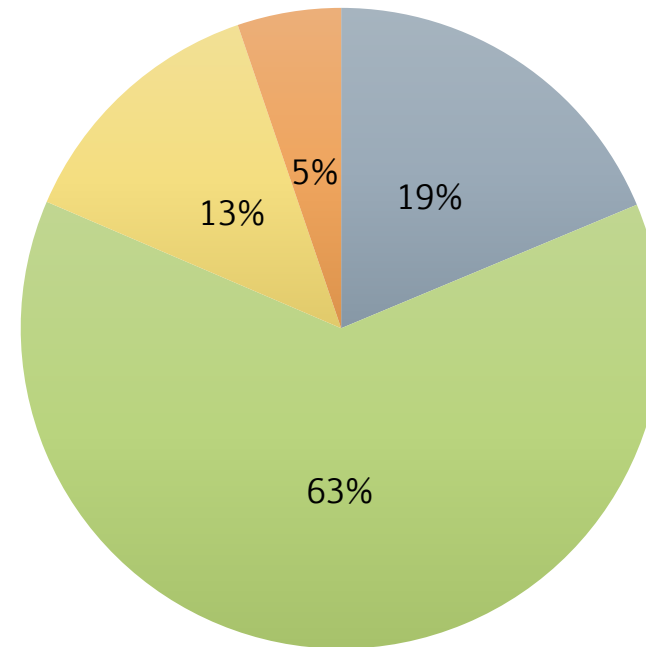
Comparison of Cost for Peel Pack and Tray

For Peel Pack



- Labor
- Depreciations/Maintenance/Rent
- Utilities and Repair
- Consumables

For Tray



- Labor
- Depreciations/Maintenance/Rent
- Utilities and Repair
- Consumables

Practical Advantages of calculating cost per cycle

- › Optimization of Sets
- › Impact of Failed Cycles

Practical Implementation - Optimization of Sets

- › The cost to process the instruments in peel pack is almost **2 times** the cost per set.
- › However, a real cost comparison between peel-packed instruments and trays must take into account the cost of unnecessarily processing of instrument.
- › i.e. If an instrument in a tray is used only once in every ten times the tray is opened and reprocessed, then the real cost of that instrument per use is ten times the reprocessing cost.

Practical Implementation - Optimization of Sets

- › example : Adson forcep were used 9/10 times in Laparotomy Cases wherease J-Curve Forceps were used in 1/10 time.
- › So why not pack it in peel packs instead of a set.
- › A calculation was done and it was concluded that it is more cost effective to peel pack an instrument than set if it is used in less than 42% of cases where it was available.

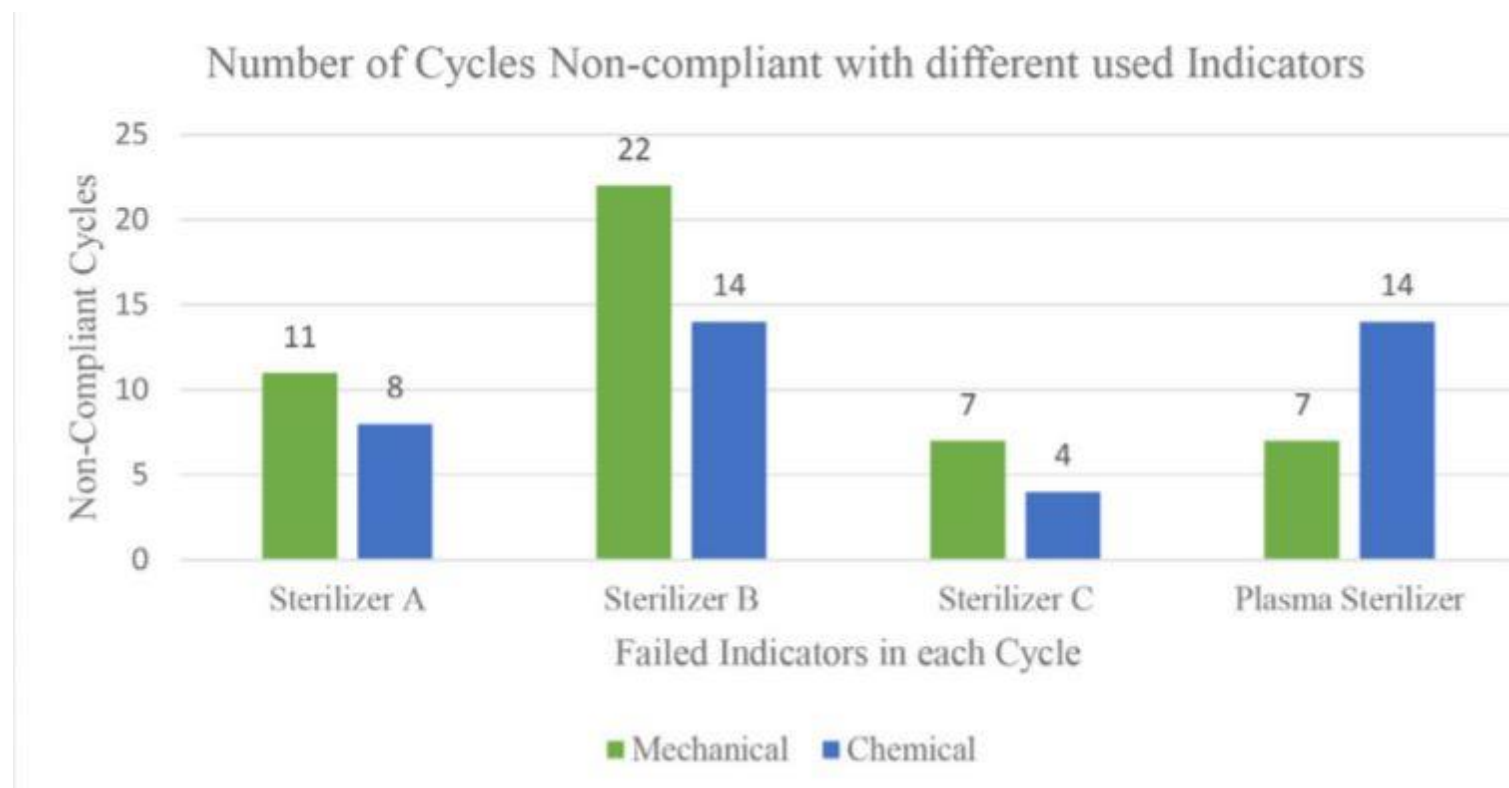


Practical Implementation - Impact of Failed Cycles

- › A study was conducted in a large multispeciality hospital to calculate cost to redo a sterilization cycle due to non-compliance.
- › 1451 cycles of steam sterilization were observed out of 5 autoclaves A,B,C,D,E
- › Sterilizer A – 280 cycles (261 Compliance, 19 Non Compliance)
- › Sterilizer B – 234 cycles (198 Compliance, 26 Non Compliance)
- › Sterilizer C – 293 cycles (282 Compliance, 11 Non compliance)
- › Sterilizer D – 313 cycles (313 Compliance)
- › Sterilizer E – 330 cycles (330 Compliance)

Practical Implementation - Impact of Failed Cycles

- › Out of the Non-Compliance there were two types of Errors – Mechanical and Chemical.

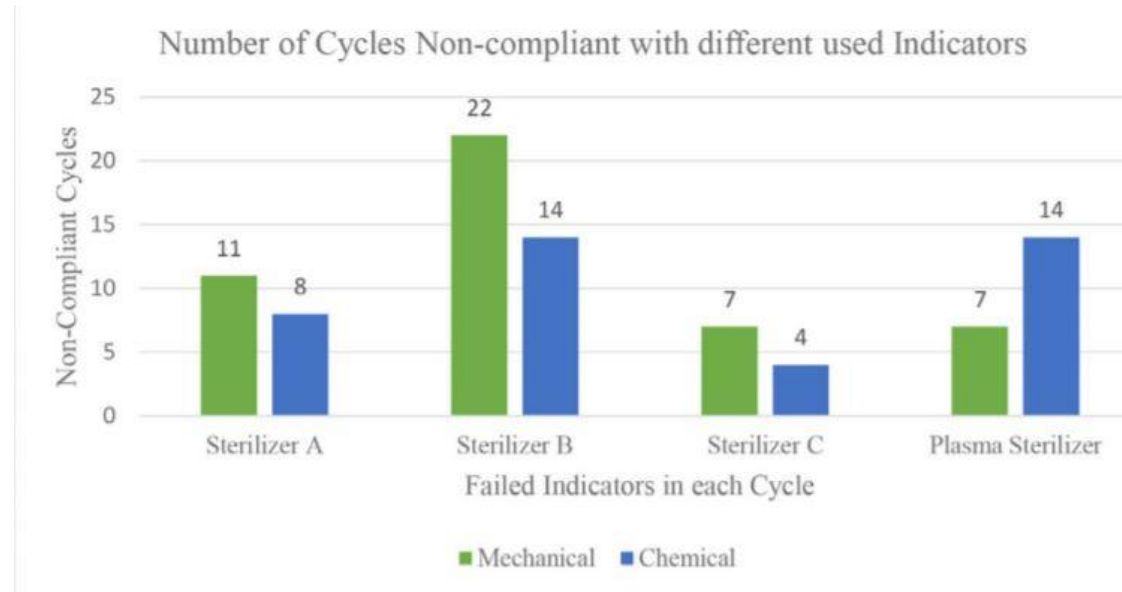


Practical Implementation - Impact of Failed Cycles

- › One Sterilizer accommodated 15 Sets (Average 30 Instruments / Tray)
- › For **Mechanical faults**, and **Chemical Indicator** Failure the un-sterile packs were loaded into another sterilize.
- › The cost of re-sterilization is **AED 625/Load**



Practical Implementation - Impact of Failed Cycles



So for

$$\text{Sterilizer A} = 8 \times 625 = 5,024$$

$$\text{Sterilizer B} = 14 \times 625 = 8,750$$

$$\text{Sterilizer C} = 4 \times 625 = 2,500$$

$$\text{Total Cost of Re-Sterilization} = 16,274 \text{ Dirhams}$$

Practical Implementation - Impact of Failed Cycles

Root Cause Analysis to the reason of failure was

1. Delayed Maintenance
2. Non Availability of Parts
3. Over-Utilization of Sterilizer (14 Hours/Day)

Steps taken to Improve

1. Instead of 6 months maintenance schedule was changed to 4 months. –

Cost = 1500

2. Inhouse bank of essential spare parts of Sterilizer (door gasket, solenoid valves, pressure valves, pneumatic valves) **Cost = 980**

3. Training to staff for handling and operating sterilizer. A practical test should be conducted once in 3 months to evaluate the skills and knowledge of the CSSD technicians. **Cost = 250**

Total Money Saved = 16274 – 2730 = 13,544

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Cost Efficiency– I am READY

Know where do you spend = Steps for cost saving

Cost Efficiency– I am READY



Yes, I am ready for the targets.
Now I know, where do I spend.

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Thank You and Questions

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