Restructuring the CSSD of an Academic Hospital:

Methodology and Analysis

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Outsourcing the CSSD of an Academic Hospital:

Opportunity Identification and Financial Analysis

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Project in fulfillment of the degree “Master in Business Administration”

Outsourcing Project

- **Practical Frame : Key Issues**
  - Define the Business Outsourcing Opportunity
  - Select of Vendor
  - Draft the Outsourcing Contract
  - Monitor, Manage and Modify the Vendor
- **The CSSD Project**
  - Vision and Scope
  - Current State Analysis
  - Optimization Potential
  - Financial Analysis of the Different Scenarios
  - Outsourcing Opportunity Identification

Outsourcing Project

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Methodology & Analysis

- **Managerial View**
  - Not an expert view on sterilization
  - Quality driven project ➔ (economical) spin off
  - Change project ➔ difficult
  - Conclusions and decisions based on data
  - Under-investment
- **Practical – Project management Approach**
  - Based on the UZL project
  - Interaction to learn

The Central Sterilization & Supply Department (CSSD)

- **Mission of CSSD (customer oriented)**
  - Timely delivery of sterile goods
  - Quality (according to European Standards – EN)
  - Efficiency (line process)
- **Activities of the CSSD (Spaulding)**
  - Cleaning
  - Disinfection of semi- / non critical items (mucosa – non intact skin contact)
  - Sterilization of critical items (high risk for infection)
  - Supply of sterile materials

The Central Sterilization & Supply Department (CSSD)

- **Building Blocks**
  - Well trained employees
  - Information System
    - Planning system: information available OR ⇔CSSD
    - Tracing: set level / instrument level
  - Standardization
    - Processes: SOP
    - Equipment and Instruments
    - Infrastructure
  - (External) Validation
  - “Just in time” delivery – pull from the OR

Methodology & Analysis

- **Why this project ?**
  - Suboptimal quality : deterministic for quality of surgical care
  - Optimization potential: line process (<=> job shop) ➔ “manufacturing like”
  - European standards
  - Major investments planned
  - Substantial cost center
  - CSSD often neglected by management
  - Inter-hospital sterilization (?)

Methodology & Analysis

The scope of the project:

- Analysis of the Current Process
  - Flows
  - Capacity – Efficiency measurement
  - Cost Calculation of Current Sterilization Activity
- List of non - conformities
- Optimization potential of process
  - state of the art concept
  - Including cost of different options (instruments, labor, building, IT, ..)

Methodology & Analysis

- **Methodology:**
  - Project Team
    - Business Analysis Team
    - Working Group: involvement and communication
      - Surgeons
      - Nurses
      - CSSD and peripheral collaborators
      - Management team
    - Steering Committee “Optimization CSSD”
    - External Consultant
  - Communication plan

The Sterilization Process at the UZL

- **Current State Analysis (As Is)**
  - Describe “AS IS”
    - Process: sterilization – logistics - flow
    - Infrastructure & Equipment
    - HR – Organizational Structure
    - QM & backup systems
    - IT
    - Financials
      - Labor
      - Investments (instruments / fixed assets)
      - Consumables / materials
      - IT
      - Overhead

Cost per set
Cost per STU/E
Cost per year

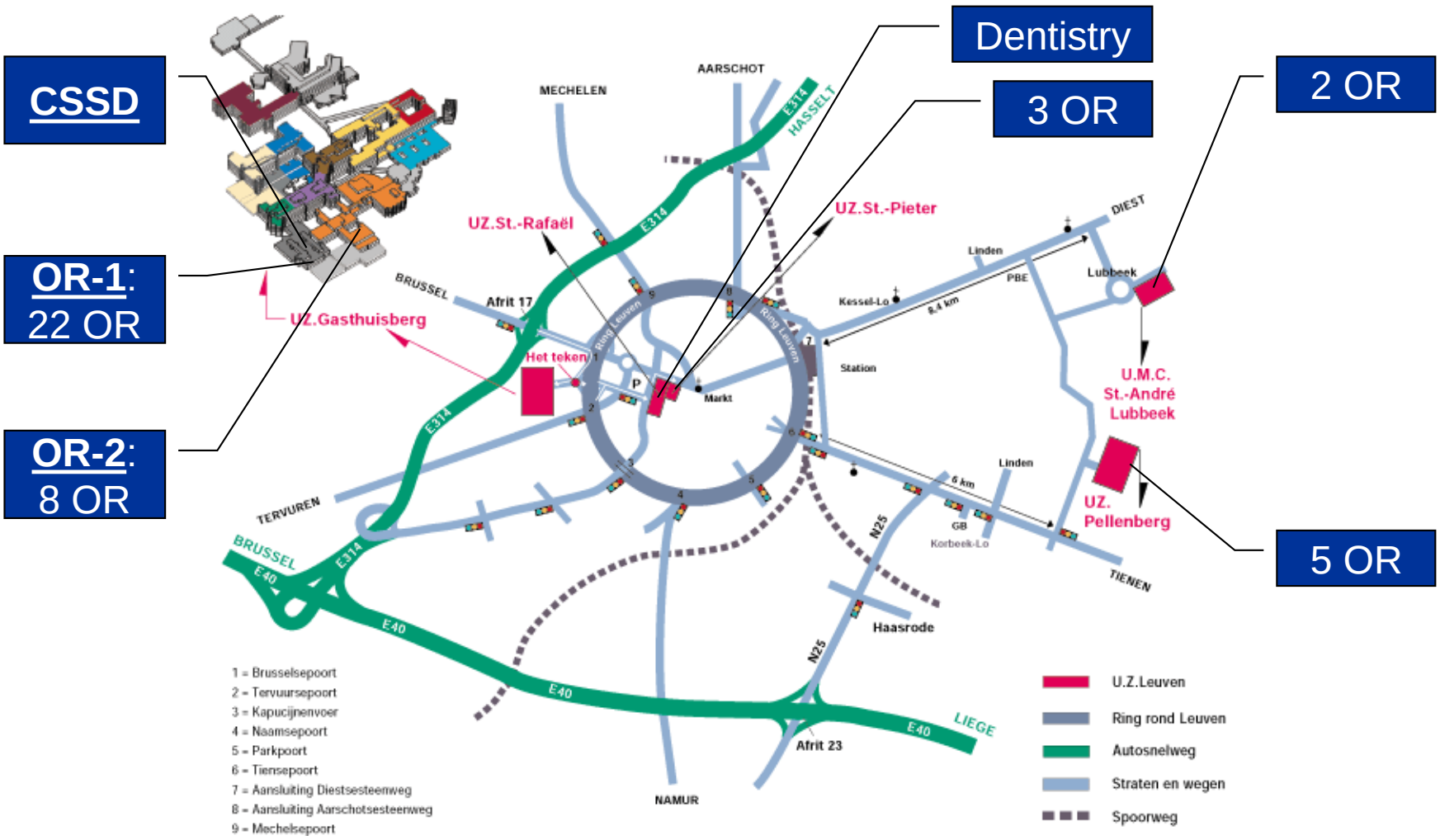
The Sterilization Process at the UZL

- **Current State Analysis (As Is)**
  - Evaluate (Benchmark, SWOT)
- **Develop the future state (To Be)**
  - Concept
  - Risk analysis and mitigation strategy
  - Financials of the Project

The Sterilization Process in the UZL

- **Paucity of data**
  - Units processed?
  - Employees involved in the process?
  - Total cost of sterilization activity?
  - Manually – mechanical cleaning?
  - Amount of instruments used?
  - Quality of final product?
  - Documentation of the process?

The CSSD at the UZL



The Sterilization Process at the UZL

- **Data Collection**
  - Interview: non quantitative items
  - Data collection in HIS
    - Financial data (labor, consumables,..)
    - Process analysis: few
  - 3 month registration period at the set level:
    - flow of individual sets
    - (non) use of sets / volume processed at each site
    - normal – urgent procedure
    - manual cleaning – use of ‘express procedure’

The Sterilization Process at the UZL

- **Data Collection**
  - Labeling of individual sets (code) / instruments
  - Determination of STE per set
  - Registration at every “sterilizer”
    - ID set / number of sets
    - Date – time
    - Operator
    - Cleaning method
  - Registration of cleaning procedure
  - Registration on paper → Access database
  - …..

The Sterilization Process at the UZL

- **Registration Form**

968 R

1 document per sterilisatie Algemene THK,parodontologie E98,99,93

Analyse van de sterilisatie en aanverwante diensten
Registratie sterilisatie

Datum	11/11/2006	Sterilisator (*)	GETTINGE 134°	X
Uur	19 00 :		VAKUCLAV 134°	
Medewerker	Anne Me		Tuttnauer 134°	
			Autoclaaf 121°	

(*) *aankruisen*

Sets

Thk09	hoek /handstukken	32	
Thk04	Endodoos		
Thk05	Endowatjes		
Thk02	Boren -Soniflex -Haken	2	manueel
Thk10	klemmenset (rubberdam)		manueel
Thk03	Elevatoren- Syndesmatomen- Tangen	5	
Thk07	hechtings set 2		
Thk08	hechtings set 5	1	
Thk13	wijsheidstanden ingreep		
Thk11	Paro ingreep		
Thk12	Apex ingreep		

Sets vaatwas

Thk14	Losse instrumenten	< 30	> 30
Thk15	Endoset		
Thk16	mondonderzoek set		
Thk17	Reinigingsset		
Thk18	richtapparatuur		
Thk18	Vullingsset		
Thk19	Speekselzuigers		
Thk20	Diversen		

Losse instrumenten

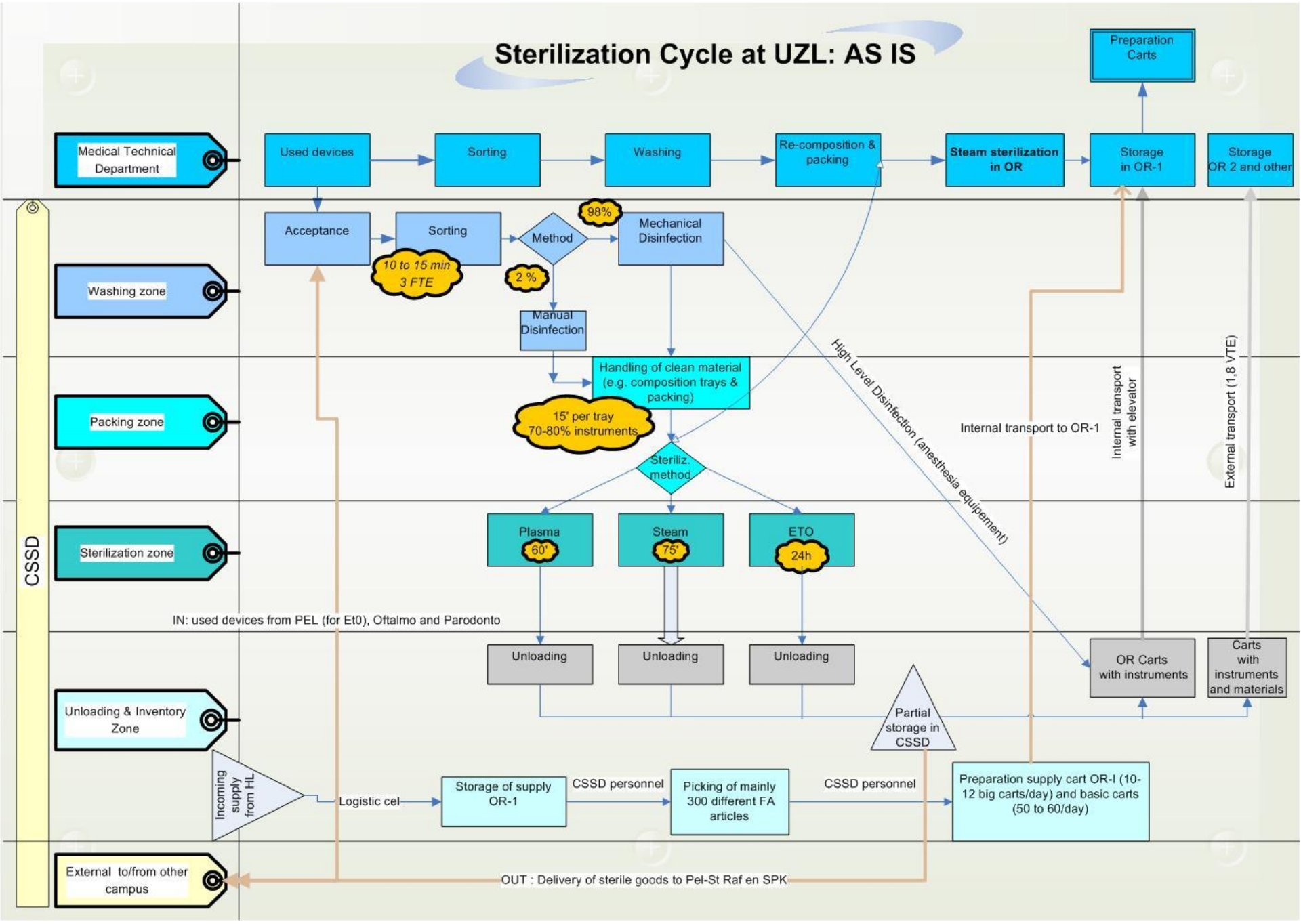
A2	Laminaat diversen	4	manueel
A3	individuele of box gelinkte doosjes met losse instrumenten.		manueel

The Sterilization Process at the UZL

- **Data Collection**
  - *Definitions*: problematic
    - **STU**: 30 x 60 x 30 cm
    - **STE**: 30 x 60 cm, height 6-30 cm
    - **DIN**: (48 x 25 x 5 cm)
    - **Individual sets**
  - *Fragmented* Process: diverse (91 pers)

Main Results of the Analysis

- **Process Analysis**
  - Flow diagram
  - Capacity analysis
  - Instruments


Sterilization Cycle at UZL: AS IS
Preparation Carts
Medical Technical Department
Used devices
Sorting
Washing
Re-composition & packing
Steam sterilization in OR
Storage in OR-1
Storage OR 2 and other
Acceptance
Sorting
10 to 15 min 3 FTE
Method
98%
2 %
Mechanical Disinfection
Manual Disinfection
Washing zone
Handling of clean material (e.g. composition trays & packing)
15' per tray 70-80% instruments
Packing zone
Steriliz. method
Plasma 60'
Steam 75'
ETO 24h
Sterilization zone
CSSD
High Level Disinfection (anesthesia equipement)
Internal transport to OR-1
Internal transport with elevator
External transport (1,8 VTE)
IN: used devices from PEL (for Et0), Oftalmo and Parodonto
Unloading
Unloading
Unloading
OR Carts with instruments
Carts with instruments and materials
Unloading & Inventory Zone
Partial storage in CSSD
Incoming supply from HL
Logistic cel
Storage of supply OR-1
CSSD personnel
Picking of mainly 300 different FA articles
CSSD personnel
Preparation supply cart OR-I (10-12 big carts/day) and basic carts (50 to 60/day)
External to/from other campus
OUT : Delivery of sterile goods to Pel-St Raf en SPK

Main Results of the Analysis

- 1st lesson:

mapping your processes

unveils the ‘hidden factory’ and

is the basis for further analysis

Main Results of the Analysis

- Process Analysis
  - Flow diagram
  - Capacity analysis
  - Instruments

Results of the Analysis

STU per sterilisatieplaats				
	STU			% STU van totaal
	Sets	Laminaat	Totaal	
Oka	26.152	2.516	28.668	20,0%
CSA	41.786	35.595	77.381	53,9%
Ofthalmo	2.955	469	3.424	2,4%
Pellenberg	26.097	2.140	28.237	19,7%
Lubbeek	1.628	1.264	2.892	2,0%
Tandheelkunde	1.957	1.086	3.043	2,1%
Totaal	100.575	43.071	143.645	

Results of the Analysis

- **CSSD**

Gebruik sterilisatoren								
	STE	Aantal sets	Aantal STU	Aantal cycli	Gem. # cycli / dag	Max capaciteit	Gem STU per cyclus	Rendement
Stoom 1	6	13.244	10.980	1.437	5,7	13.500	7,64	81,3%
Stoom 2	6	15.763	12.823	1.911	7,6	13.500	6,71	95,0%
Stoom 3	6	13.338	10.966	1.595	6,4	13.500	6,87	81,2%
Stoom 4	6	15.578	12.629	1.888	7,6	13.500	6,69	93,5%
Stoom 5	6	12.261	9.425	1.446	5,8	13.500	6,52	69,8%
Stoom 6	6	11.887	9.175	1.528	6,1	13.500	6,01	68,0%
Stoom 7	6	10.986	8.166	1.257	5,0	13.500	6,49	60,5%
Sterrad 11	2	5.908	1.577	1.244	5,0	4.500	1,27	35,0%
Sterrad 12	2	5.944	1.641	1.208	4,8	4.500	1,36	36,5%
Totaal		104.908	77.381					

Open: Monday – Friday 08:00 – 21:00h

Statims	0.5	1.382	320	897	0,4	10.125	0,36	3,2%

Results of the Analysis

- **Inefficient / ineffective use of resources**

Manuele reiniging per kern				
	Aantal STU / jaar	Aantal uur / jaar (30 min/STU)	% manueel van totaal STU	Aantal FTE
Kern A	3.508	1.754	83,2%	0,9
Kern B	4.639	2.319	137,3%	1,2
Kern C	2.351	1.176	28,2%	0,6
Kern D	2.345	1.173	72,1%	0,6
Kern E	4.771	2.385	1386,8%	1,2
Oka2	4.888	2.444	73,8%	1,2
Totaal	22.502	11.251	86,0%	5,7

Results of the Analysis

- **Inefficient / ineffective use of resources**

NKO (53 - 6)						
Aantal sterilisaties noodzakelijk dezelfde dag => werkbaar gemiddeld gebruik (*)						
Set_ID	Naam	Aantal_Sets	Minimum	Maximum	Gemiddeld	Aantal sterilisatie zelfde dag
NK126	Camera NKO	1	1	7	2,83	3,54
NK05	Boorsetjes	1	1	4	2,25	2,81
NK10	Mandibula	1	1	3	1,75	2,19
NK122	Tongakylose	1	1	3	1,50	1,88
NK111	H.P.M.P.C	1	1	2	1,33	1,67
NK19	Verhemeltje bak	1	1	2	1,11	1,39

Main Results of the Analysis

- 1st lesson: mapping your processes unveils the ‘hidden factory’ and is the basis for further analysis

- 2nd lesson:

measurement over an extended period

gives accurate data for

further analysis and decision making.

The Sterilization Activity at the UZL: Current State Analysis

Sterilisation Activity UZL : Consolidated P&L 2005				
	#	*standard cost*	2005	
TOTAL COSTS			**4.434.522**	**100,0%**
DIRECT COSTS			**3.539.171**	
Depreciation	**unit**		**595.174**	**13,4%**
Building (33y)	1.815	*m^2*	194.205	€
Disinfectors (10y)	17	*disinfectors*	168.500	€
Sterilizers (10y)	46	*sterilizers*	125.500	€
Maintenance			8.515	
ICT			0	(at present no IT investment)
Infrastructure (CSSD)			98.454	(furniture investment in 2005)
Labour Cost	**48,54**	***FTE***	**2.237.594**	**50,5%**
CSSD	30,40	*42.820*	1.301.728	
Pharmacist	0,30	*174.765*	52.430	
GHB (OR 1-2)	8,16	*42.820*	349.411	
Pellenberg	5,74		245.787	
St Pieter- St Rafael	2,97		127.175	
Lubbeek	0,97		41.535	
Pension plan			119.528	
Operational Costs			**706.403**	**15,9%**
Material used in CSSD			545.488	
Material used in OR 1			67.493	
Material used in OR 2			9.288	
Material used in Pellenberg			66.127	
Material used in Lubbeek			2.220	
Material used in St Pieter-St Rafael			15.787	
INDIRECT Costs		***pm***	**895.351**	(financ rents, general expenses, m **20,2%**
Indirect Cost / M²	1.815	*290*	526.350	290€ per m^2
Indirect Cost / VTE	48,54	*7.602*	369.001	7602€ per FTE
Revenu (budget)			**2.691.963**	
subsection B-2			1.774.105	
subsection A-1 (depreciation, intrests)			398.000	
subsection B-1: indirect costs general services			519.858	
Net Profit / (Net Loss)			**-1.742.560**	

The Sterilization Activity at the UZL:
Current State Analysis

UZ Leuven: actuele situatie							
	CSA	Oka	Ofthalmo	Tandheelkunde	Lubbeek	Pellenberg	Totaal
Huidige kost	2.640.186 €	965.010 €	121.551 €	230.041 €	124.497 €	487.558 €	4.568.843 €
Kost / STU	34,12 €	33,66 €	42,65 €	75,60 €	42,93 €	17,26 €	31,93 €

Main Results of the Analysis

- 1st lesson: mapping your processes unveils the ‘hidden factory’ and is the basis for further analysis
- 2nd lesson: measurement over an extended period gives accurate data for further analysis and decision making.
- 3d lesson: small units are more costly (but always take into account the level of quality i.e. infrastructure, instruments, tracing,..)

Results of the Analysis

- Sterilization process
  - Manual cleaning (time pressure – habits)
  - Under-use US cleaning
  - Use of Statims problematic
  - Variable throughput times (20 min. – 4h)
  - No tracing of sets
  - 1 procedure fits all (instruments)
- Infrastructure
  - Small rooms
  - No separation clean – contaminated
  - Crowding in aisles OR

Results of the Analysis

- Organization
  - Planning available day-1 but frequent changes during OR day
  - Planning not communicated to CSSD
  - No link between available sets and planning
  - Push system to CSSD
  - Inventory (of sets) in the OR
- CSSD is ISO certified / peripheral sites not
- No instrument management system (4-5 Mi0)
- Training
  - 91 persons involved in sterilization
  - No formal training

Results of the Analysis

- Equipment:
  - No independent validation of sterilizers (UZL TD)
  - No validation of washers and disinfectors
  - Suboptimal use of US
  - No seal test of sealing machines
- No back-up procedure

Results of the Analysis

- SWOT Analysis (team meeting)

SWOT Analysis of the Current Process

Strengths		**Weakness**
Location of CSSD and relation to OR		Infrastructural Shortcomings
Sufficient space		No supply management by CSSD
OR planning system		No tracing system
Experience with change management		Suboptimal environment (noise and heat)
ISO certification CSSD		No instrument management system
Multidisciplinary team meetings		Dispersion of sterilisation activities
		Overcapacity
		OR planning system not available for CSSD
		Opening hours (5/7)
		Under investment in training
		no info on peripheral sterilisation process
Opportunities		**Threats**
New headnurse CSSD		High investment costs
New Regulation		Involvement/Cooperation surgeons and nurses OR
Willingness to improve process		
Industrial partnership		
Centralization		

The Sterilization Activity at the UZL: Optimization Potential

- **Major Suggestions**
  - (Partial) Centralization of sterilization activities
    - ↑ quality
    - ↓ redundant equipment (and labor)
  - CSSD coordinates supply of sterile goods
    - ↑ Space in OR
    - ↓ Cost (instruments??)
    - premises:
      - Planning available to CSSD
      - 24/7 opening

The Sterilization Activity at the UZL:
Optimization Potential

- **Other suggestions**
  - Strict separation of different zones
  - Updating of (some) equipment
  - Tracing system
  - Instrument management system
  - Quality Management System (cfr. NIAZ)
  - Training of Employees

The Sterilization Activity at the UZL:
Financial Implications of the Different Options

Options

- State of the art activity at all sites (maintain current number of sites)
- Centralization of all sterilization activities on 2 sites

The Sterilization Activity at the UZL:
Financial Implications of the Different Options

Methodology

- Accounting Approach
- Cash flow approach & NPV (discounted at 5%)
  - 1$ today ≠ 1$ tomorrow
    - Inflation
    - Opportunity Cost of Money
  - Interest of financial manager is the future ⇔ accounting
  - NPV = $\Sigma \frac{CIF_t - I}{(1+r)^t}$

The Sterilization Activity at the UZL:

Option 1: state of the art exploitation at current sites

Overzicht UZ Leuven - CSA			
Personeel			
Kost personeel	50,32	2.269.715,33 €	61,60%
Gebouwen			
Totaal kost gebouwen		174.000,00 €	4,72%
Afschrijving toestellen			
Totaal afschrijving		286.118,11 €	7,77%
Verbruikskosten			
Totaal verbruik		505.296,50 €	13,71%
IT			
Totale kost IT		66.865,09 €	1,81%
Overhead kost			
Totaal overhead		382.496,68 €	10,38%
Totale kost / jaar		3.684.491,71 €	
Aantal chirurgische ingrepen	32.430		
Gemiddelde kost /ingreep		113,61 €	
Aantal sest / jaar	0		
Kost / set		0,00 €	
	106.050		
Kost / STU		34,74 €	

Overzicht UZ Leuven - Ofthalmo			
Personeel			
Kost personeel	3,43	157.732,33 €	53,97%
Gebouwen			
Totaal kost gebouwen		52.200,00 €	17,86%
Afschrijving toestellen			
Totaal afschrijving		23.800,48 €	8,14%
Verbruikskosten			
Totaal verbruik		26.131,75 €	8,94%
IT			
Totale kost IT		6.349,01 €	2,17%
Overhead kost			
Totaal overhead		26.071,39 €	8,92%
Totale kost / jaar		292.284,96 €	
Aantal chirurgische ingrepen	7.425		
Gemiddelde kost /ingreep		39,36 €	
Aantal sest / jaar	33.300		
Kost / set		8,78 €	
	2.955		
Kost / STU		98,91 €	

The Sterilization Activity at the UZL:

Option 1: consolidation current activities

Overzicht UZ Leuven - Tandheelkunde			
Personeel			
Kost personeel	3,06	141.824,20 €	48,81%
Gebouwen			
Totaal kost gebouwen		52.200,00 €	17,97%
Afschrijving toestellen			
Totaal afschrijving		29.095,86 €	10,01%
Verbruikskosten			
Totaal verbruik		37.828,75 €	13,02%
IT			
Totale kost IT		6.349,01 €	2,19%
Overhead kost			
Totaal overhead		23.247,16 €	8,00%
Totale kost / jaar		290.544,98 €	
Aantal chirurgische ingrepen	3.591		
Gemiddelde kost /ingreep		80,91 €	
Aantal sest / jaar	33.300		
Kost / set		8,73 €	
	3.043		
Kost / STU		95,48 €	

Overzicht UZ Leuven - Lubbeek			
Personeel			
Kost personeel	2,54	119.707,83 €	45,86%
Gebouwen			
Totaal kost gebouwen		43.500,00 €	16,66%
Afschrijving toestellen			
Totaal afschrijving		20.497,80 €	7,85%
Verbruikskosten			
Totaal verbruik		51.362,25 €	19,68%
IT			
Totale kost IT		6.639,98 €	2,54%
Overhead kost			
Totaal overhead		19.320,76 €	7,40%
Totale kost / jaar		261.028,62 €	
Aantal chirurgische ingrepen	2.642		
Gemiddelde kost /ingreep		98,80 €	
Aantal sest / jaar	0		
Kost / set		0,00 €	
	2.900		
Kost / STU		90,01 €	

The Sterilization Activity at the UZL:

Option 1: consolidation current activities

Overzicht UZ Leuven - Pellenberg Optie 1				
Personeel			Kost per item	% van totaal
	Aantal FTE	13,03		
	Personeelskost		601.394 €	58,95%
Gebouw				
	Totaal m²	300,00 m²		
	Totaalkost gebouw		87.000 €	8,53%
Afschrijving toestellen				
	Sterilisatoren	30.695 €		
	Lastoestellen	2.154 €		
	Desinfectie	26.028 €		
	Ultrasone	5.385 €		
	Meubelair	6.817 €		
	Reversed osmose	2.045 €		
	Totaal afschrijving		73.125 €	7,17%
Verbruikskosten				
	Sterilisatoren	47.950 €		
	Desinfectie	29.000 €		
	Ultrasone	918 €		
	Verpakking sets	54.950 €		
	B&D test	3.825 €		
	Totaal verbruikskosten		136.643 €	13,39%
IT				
	Hardware	8.729 €		
	Software	14.287 €		
	Totaal IT		23.016 €	2,26%
Overhead cost				
	Totaal overhead		99.042 €	9,71%
Totaal kost / jaar			1.020.219 €	
Aantal chirurgische ingrepen		5.545		
Gemiddelde kost /ingreep			183,99 €	
Aantal sets / jaar		33.300		
Kost / set			30,64 €	
Aantal STU / jaar		28.250		
Kost / STU			36,11 €	

The Sterilization Activity at the UZL:

Option 2: centralization at 2 sites

Overzicht UZ Leuven - CSA - Optie 2				
Personeel			Kost per item	% van totaal
	Aantal FTE	59,07		
	Personeelskost		2.668.303 €	63,72%
Gebouw				
	Totaal m²	700,00 m²		
	Totaalkost gebouw		203.000 €	4,85%
Afschrijving toestellen				
	Sterilisatoren	151.143 €		
	Lastoestellen	3.231 €		
	Desinfectie	105.908 €		
	Ultrasone	14.360 €		
	Meubelair	13.634 €		
	Reversed osmose	6.817 €		
	Totaal afschrijving		295.093 €	7,05%
Verbruikskosten				
	Sterilisatoren	194.923 €		
	Desinfectie	48.500 €		
	Ultrasone	1.224 €		
	Verpakking sets	253.000 €		
	B&D test	7.650 €		
	Totaal verbruikskosten		505.297 €	12,07%
IT				
	Hardware	24.005 €		
	Software	42.860 €		
	Totaal IT		66.865 €	1,60%
Overhead cost				
	Totaal overhead		449.016 €	10,72%
Totaal kost / jaar			**4.187.574 €**	
Aantal chirurgische ingrepen		46.088		
Gemiddelde kost /ingreep			**90,86 €**	
Aantal sets / jaar				
Kost / set				
Aantal STU / jaar		114.842		
Kost / STU			**36,46 €**	

Investment in Small Surgical Instruments

CSA optie 2 - Pellenberg optie 1				
	Gemiddeld	Maximum	Verschil	Verschil (%)
Pellenberg	25.000,00 €	92.500,00 €	67.500,00 €	270,00%
Ofthalmo	40.000,00 €	112.000,00 €	72.000,00 €	180,00%
Lubbeek	150.750,00 €	234.000,00 €	83.250,00 €	55,22%
Tandheelkunde	3.750,00 €	45.500,00 €	41.750,00 €	1113,33%
Oka2	68.324,54 €	184.638,66 €	116.314,12 €	170,24%
A kern	6.718,20 €	71.580,03 €	64.861,83 €	965,46%
B kern	18.164,25 €	29.547,86 €	11.383,61 €	62,67%
C kern	70.655,14 €	149.246,37 €	78.591,23 €	111,23%
D kern	56.575,73 €	59.804,15 €	3.228,42 €	5,71%
E kern	10.826,40 €	11.535,63 €	709,23 €	6,55%
Totaal	450.764,26 €	990.352,70 €	539.588,44 €	119,71%

Investment in Small Surgical Instruments

CSA optie 2: extern voor 3 locaties				
	Intern		Extern	
	Gemiddeld	Maximum	Gemiddeld	Maximum
Ofthalmo	17.500,00 €	56.000,00 €	40.000,00 €	112.000,00 €
Lubbeek	136.750,00 €	175.500,00 €	150.750,00 €	234.000,00 €
Tandheelkunde	3.750,00 €	31.250,00 €	3.750,00 €	45.500,00 €
Totaal	158.000,00 €	262.750,00 €	194.500,00 €	391.500,00 €
Verschil intern - extern			36.500,00 €	128.750,00 €
Verschil intern - extern %			23,10%	49,00%

The CSSD: Conclusions

- Critical for core business
- Underinvestment by management
- Major improvements: Q ➛ €
- Analysis based on data is feasible
- Expert input advised (internally ⇔ externally)
- Standardization of processes – equipment - instruments
- Financial Analysis based on cash flow
- Change project ➛ early communication

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