



Welcome

to the 20<sup>th</sup> World Sterilization Congress





UMC Utrecht

# Meta analysis of ScopeControl data of 5 hospitals

H.J. Noordmans

*University Medical Center Utrecht, The Netherlands*



University Medical Center Utrecht

## Introduction

Bad image  
during OR,  
please help!





# Problem can be caused by several components in endoscopy chain

Element

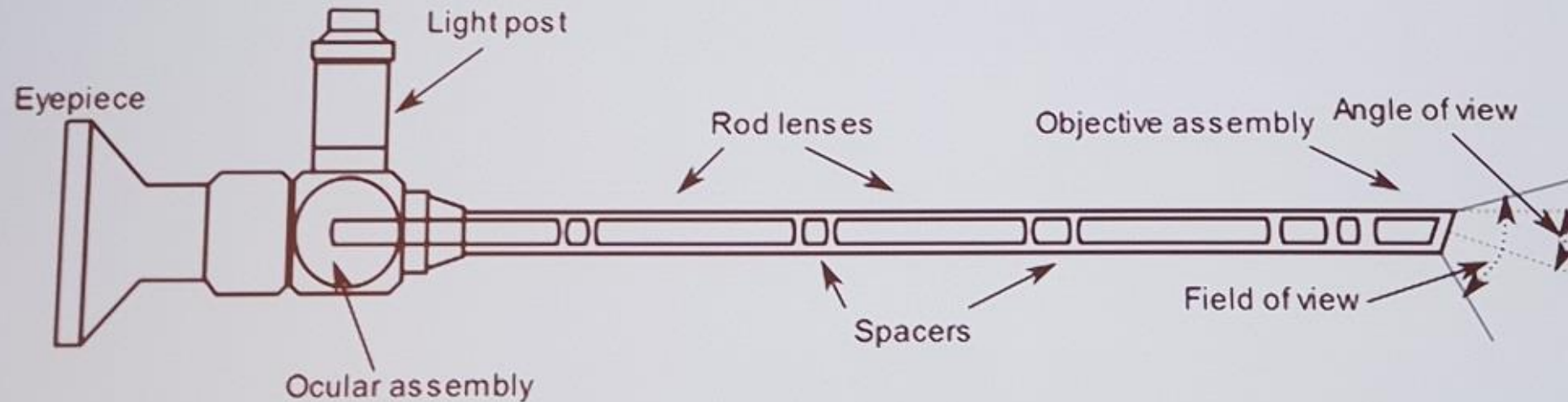
Calibration by

- Light source → Power meter
- Light cable → Transmission box
- Endoscope → Naked eye/ScopeControl
- Endoscope camera → Manufacturer
- Camera processor → Manufacturer
- CRT/LCD → Monitor calibration tool



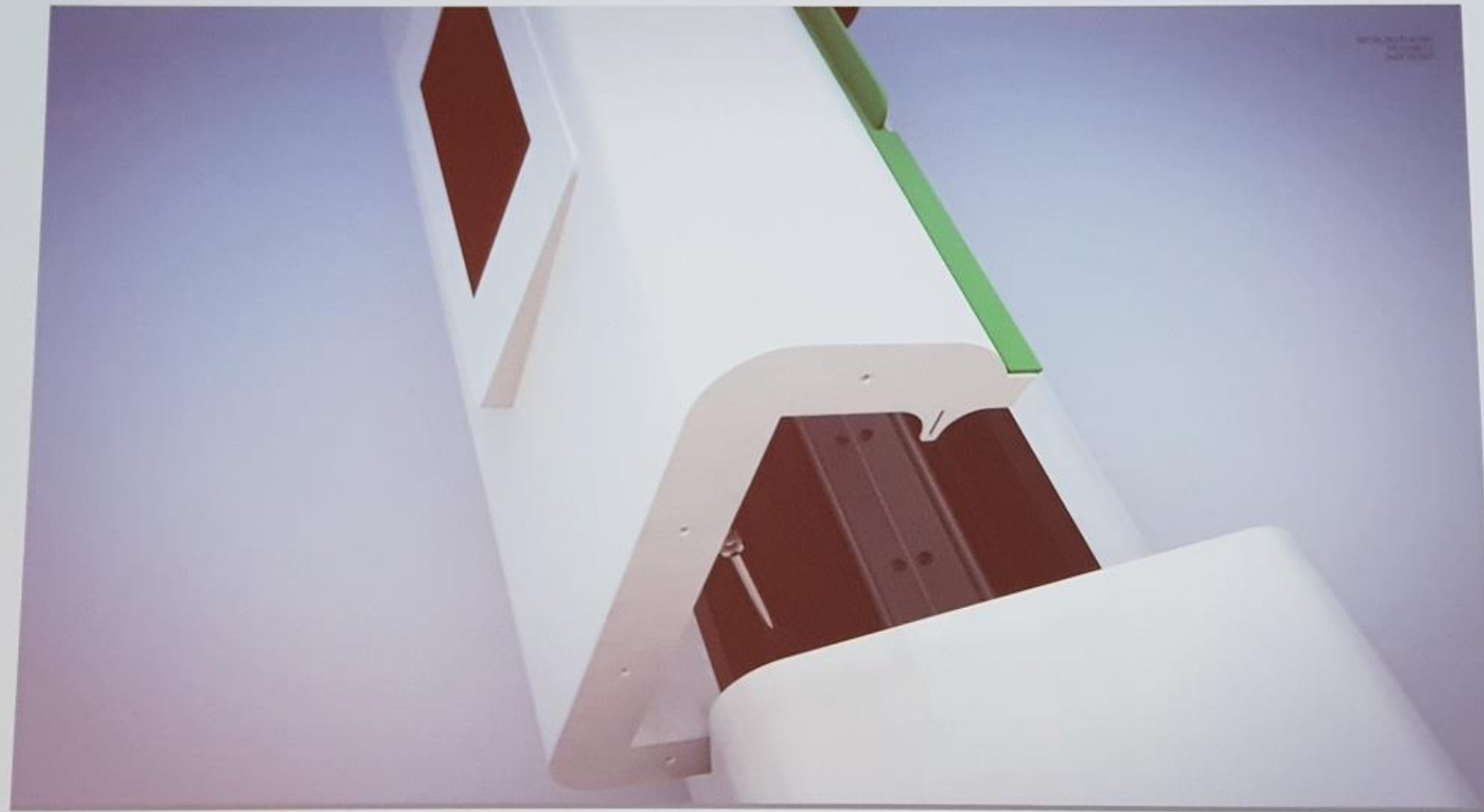
# Rigid endoscope

- Costs € 2500-5000
- Re-used because of costs
- Costs reprocessing sterilization department ~ € 60





# ScopeControl, DOVIDEQ Medical



# ScopeControl, DOVIDEQ Medical



# ScopeControl

## Why?

- Endoscopes degrade over time
- Lenses break or get dirty
- Illumination fibers break
- Glue colorizes due to heat and radiation



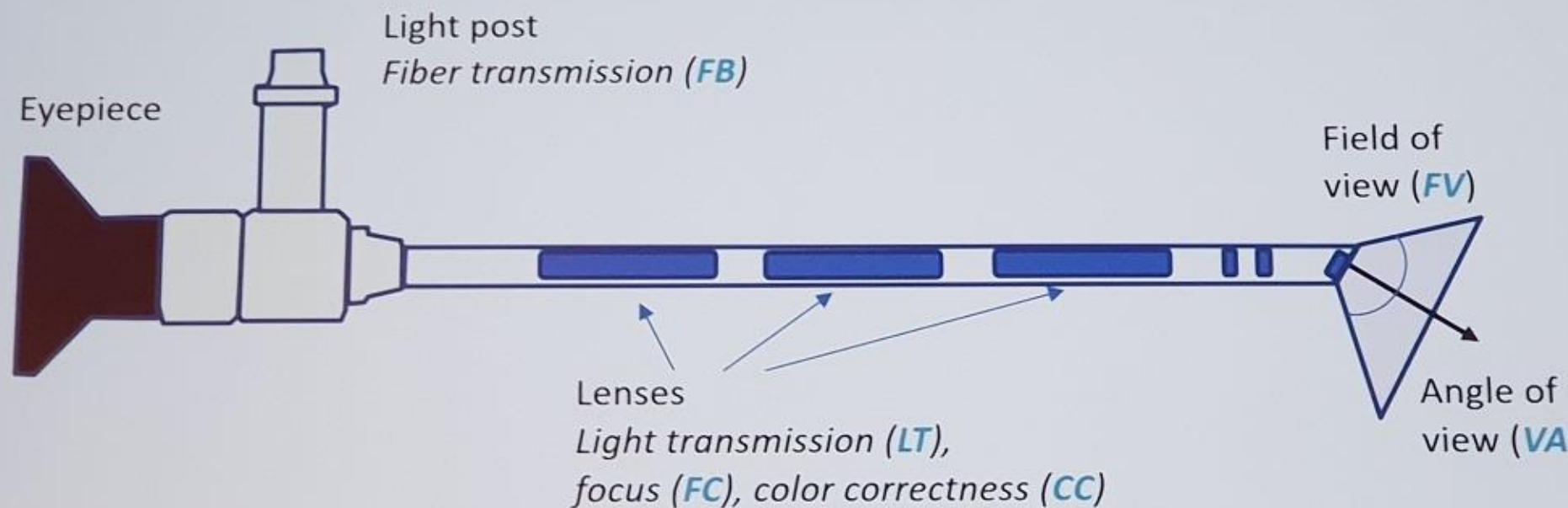
## ScopeControl

- Check endoscope at sterilization department after cleaning, before sterilization
- Reject endoscope when one optical parameters drops below threshold.





# Six optical parameters measured by ScopeControl



# Lens parameters drop below threshold..



Home

**Results: FAILED** ★ BASELINE RESULT

**Selected endoscope**  
Brand: Storz  
Typenumber: 28731 BWA  
Serial: Castbasics 1714838

Date last test 24-03-2013 20:17

[Start test](#) [Select other endoscope](#)

Detailed results

<b>Light transmittance</b> ✘	★ BASELINE RESULT	<b>View angle</b> ✔	★★★ CERTIFIED RESULT
<b>Discoloration</b> ✘	★ BASELINE RESULT	<b>Field of View</b> ✔	★ BASELINE RESULT
<b>Focus</b> ✔	★ BASELINE RESULT	<b>Fibers</b> ✔	★ BASELINE RESULT

 **DOVIDEQ**

[Home](#) [Help](#)





# Rejection thresholds

## Lens parameters

- Light transmission (LT), color correctness (CC), focus (FC)
- Quality questionable when parameter drops below 70% of that of a new one

Reasoning: Endoscope image is critical for good assessment of tissue or treatment

## Fiber parameters

- Fiber transmission (FB)
- Quality questionable when parameter drops below 30% of that of a new one

Reasoning : Not that important for image quality, light sources have plentiful power, camera chips very sensitive, and fibers are hard to repair.

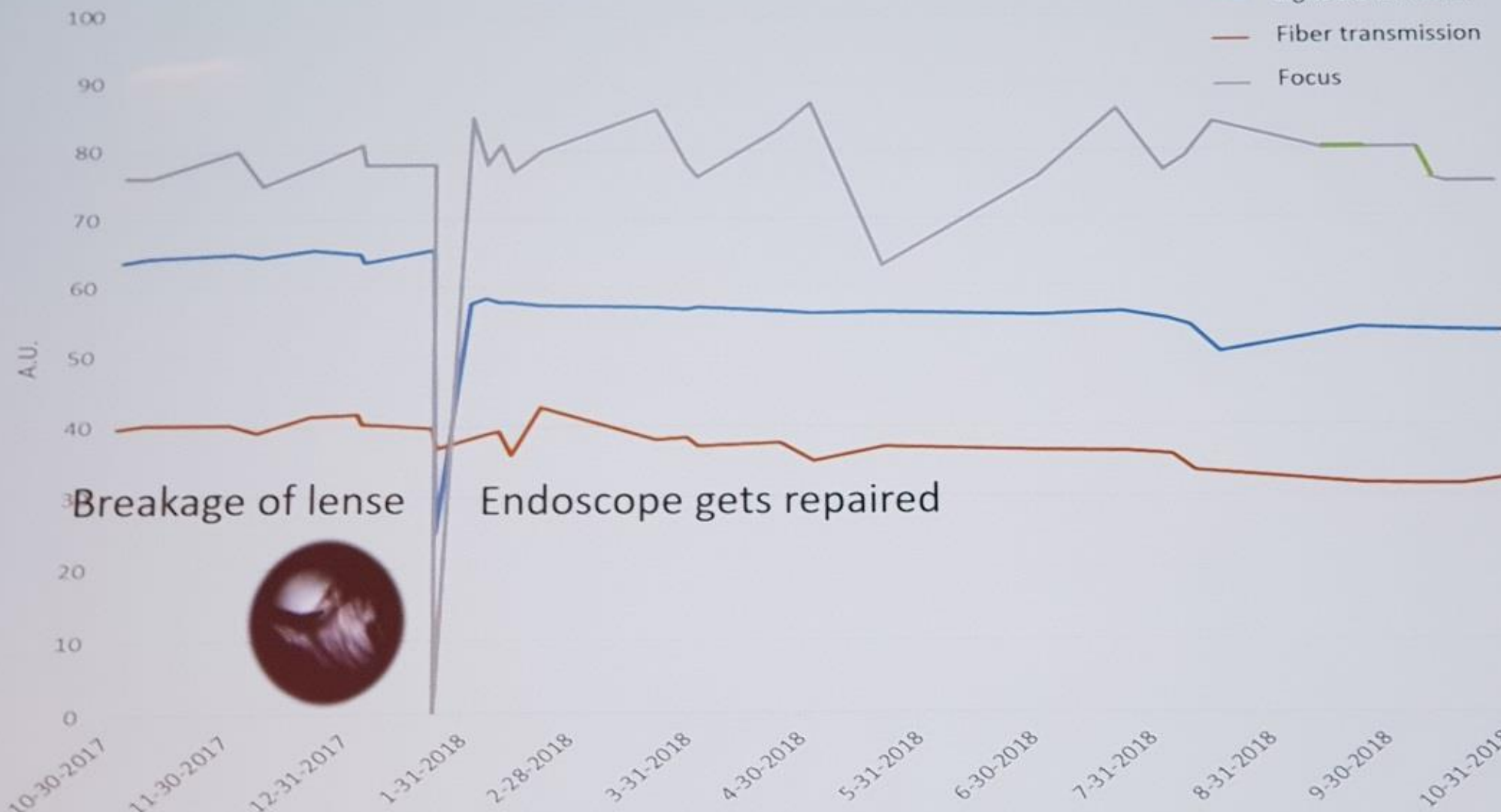
## View angle and angle of view

- Only important for new or repaired endoscopes

Reasoning: Parameters do not change over time. If front lens fails it also affects lens parameters so this will stand out nevertheless.



### Measurement values over time



Breakage of lense



Endoscope gets repaired





# Every measurement is stored in a central database

Research questions

- How quickly do endoscopes degrade?
- Which factors influence degradation?
  - Endoscope: Brand, type
  - Hospital: logistics (transportation)
  - Cleaning & sterilization
  - Usage (surgery)



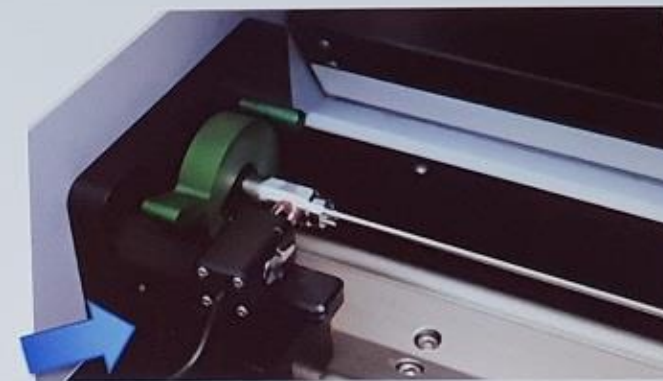
# Measurement data

2014-2018 around 50.000 ScopeControl measurements from 5 hospitals

- Checked that measurement values are stable over time with reference endoscope

## Corrections applied:

- Periods with sensor failures (e.g. broken cable)
- New endoscope types require adaptations to ScopeControl
- Misregistrations as serial numbers are often hidden from user -> measurements stored under generic LOT number.
- Measurement errors when wrong light connector is used





# Input data

meas\_all-basket number3.xlsx - Excel

Bestand Start Invoegen Pagina-indeling Formules Gegevens Controleren Beeld Ontwikkelaars ACROBAT Power Pivot Team Geef aan wat u wilt doen... Noordmans, H.J. Delen

DG25070 00004089

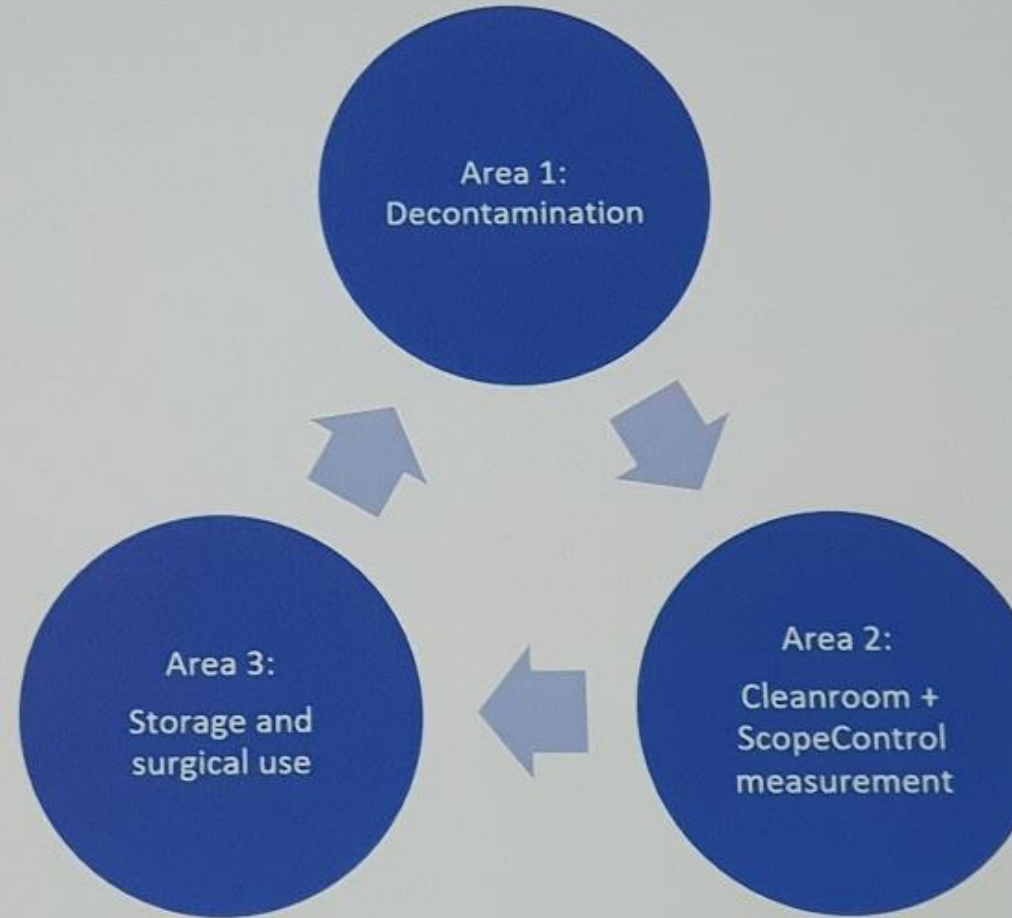
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
1	id	ms	hospital	testrunid	date	time	is muted	is deleted	my muted	Brand	scopeid	orig scopetype	Scopetype	same scopetype	orig serialnumber	Serialnumber
17223	137563	45	6490	29-3-2016	10:01:39	0	0	0	1	Wolf	166	8672,421	8672,421	WAAR	5000107346	5000107346
17224	137562	45	6491	29-3-2016	10:07:16	0	0	0	1	Storz	5	26006 BA	26006 BA	WAAR	469796 S	469796
17225	137561	45	6492	29-3-2016	10:11:39	0	0	0	1	Storz	435	27005 BIA	27005 BIA	WAAR	1563430	1563430
17226	137560	45	6493	29-3-2016	10:17:22	0	0	0	1	Storz	210	27005 BA	27005 BA	WAAR	394589 S	394589
17227	137559	45	6494	29-3-2016	10:27:43	0	0	0	1	Storz	139	27005 CA	27005 CA	WAAR	IP03	IP03
17228	137558	45	6497	29-3-2016	13:06:13	0	0	0	1	Storz	514	7230 AA	7230 AA	WAAR	865276	865276
17229	137557	45	6498	29-3-2016	13:06:13	0	0	0	1	Storz	145	26011 BA	26011 BA	WAAR	566334	566334
17230	137556	45	6499	29-3-2016	13:06:13	0	0	0	1	Wolf	501	8672,422	8672,422	WAAR	5000276519	5000276519
17231	137555	45	6499	29-3-2016	13:06:13	0	0	0	1	Wolf	547	8672,422	8672,422	WAAR	5000306707	5000306707
17232	137554	45	6499	29-3-2016	13:06:13	0	0	0	1	Storz	99	27005 BA	27005 BA	WAAR	1226059S	1226059S
17233	137553	45	6499	29-3-2016	13:06:13	0	0	0	1	Storz	62	7230 AA	7230 AA	WAAR	671882S	671882S
17234	137552	45	6499	29-3-2016	13:06:13	0	0	0	1	Meekers Medical	432	450300	450300	WAAR	28532	28532
17235	137551	45	6499	29-3-2016	22:02:57	0	0	0	1	Wolf	169	8672,421	8672,421	WAAR	5000107393	5000107393
17236	137550	45	6499	29-3-2016	22:15:20	0	0	0	0	Storz	38	26003 BA	26003 BA	WAAR	1391703	1391703
17237	137549	45	6506	29-3-2016	22:19:53	0	0	0	1	Olympus	331	WAS3000A	WAS3000A	WAAR	08J	59349
17238	137548	45	6507	29-3-2016	22:25:06	0	0	0	1	Olympus	320	WAS3005A	WAS3005A	WAAR	08J	59357
17239	137547	45	6508	29-3-2016	23:30:31	0	0	0	1	Storz	103	27005 BA	27005 BA	WAAR	1470251S	1470251S
17240	137546	45	6509	29-3-2016	23:35:55	0	0	0	1	Wolf	170	8672,421	8672,421	WAAR	5000115998	5000115998
17241	137545	45	6512	29-3-2016	23:45:01	0	0	0	1	Wolf	553	8672,421	8672,421	WAAR	sn5000324002	5000324002
17242	137544	45	6513	30-3-2016	0:11:13	0	0	0	1	Wolf	178	8672,422	8672,422	WAAR	5000112625	5000112625
17243	137543	45	6514	30-3-2016	0:26:59	0	0	0	1	Wolf	526	8672,421	8672,421	WAAR	5000318716	5000318716
17244	137542	45	6515	30-3-2016	0:32:15	0	0	0	1	Wolf	174	8672,421	8672,421	WAAR	5000219561	5000219561
17245	137541	45	6516	30-3-2016	0:59:02	0	0	0	1	Storz	144	26011 BA	26011 BA	WAAR	541759	541759
17246	137540	45	6517	30-3-2016	1:26:53	0	0	0	1	Storz	577	27018 AA	7218 AA	ONWAAR	438064 S	438064
17247	137539	45	6518	30-3-2016	12:38:11	0	0	0	1	XION Medical	531	125 304 120	125 304 120	WAAR	106674	106674
17248	137538	45	6519	30-3-2016	12:44:48	0	0	0	1	XION Medical	509	125 304 123	125 304 123	WAAR	106678	106678
17249	137537	45	6520	30-3-2016	12:50:11	0	0	0	1	XION Medical	534	130 303 160	130 303 160	WAAR	106669	106669
17250	137536	45	6521	30-3-2016	13:02:49	0	0	0	1	Wolf	179	8672,422	8672,422	WAAR	5000112642	5000112642
17251	137535	45	6522	30-3-2016	13:09:15	0	0	0	1	Wolf	620	8686,414	8686,414	WAAR	5000182330	5000182330
17252	137534	45	6523	30-3-2016	13:13:02	0	0	0	1	Storz	562	7230 AA	7230 AA	WAAR	120ABC	120ABC
17253	137533	45	6524	30-3-2016	16:10:59	0	0	0	1	Storz	560	27005 AA	27005 AA	WAAR	SN 1207 AV	1207AV
17254	137532	45	6525	30-3-2016	16:18:47	0	0	0	1	Storz	301	27005 BA	27005 BA	WAAR	1384886 S	1384886
17255	137531	45	6526	30-3-2016	16:28:00	0	0	0	1	Storz	256	27005 AA	27005 AA	WAAR	1365579	1365579

50000 measurements



# Adding basket scanning information

Reason: ScopeControl measurement not always performed (50-70%)





## Adding surgical usage information

- Endoscope is used for which surgery
- By which department
- By who?
- Duration of surgery
- Are two endoscopes used of same type?





Measurements Repairs Longfly/kan/angle Basketbars OR usage Config

Measurement: LT

Horizontal: DATE Vertical: LINE

Logarithmic  
 Show muted  
 Dates along x-axis  
 Add basket scan moments

Split repairs  
 Show trend  
 Show OR duration  
 Minimal point #: 5  
 Filter duration #: 5

Legend: << >>

**Developed software tool**

- Hospital
- 141
  - 41
  - 419
  - 46

**Hospital selection**

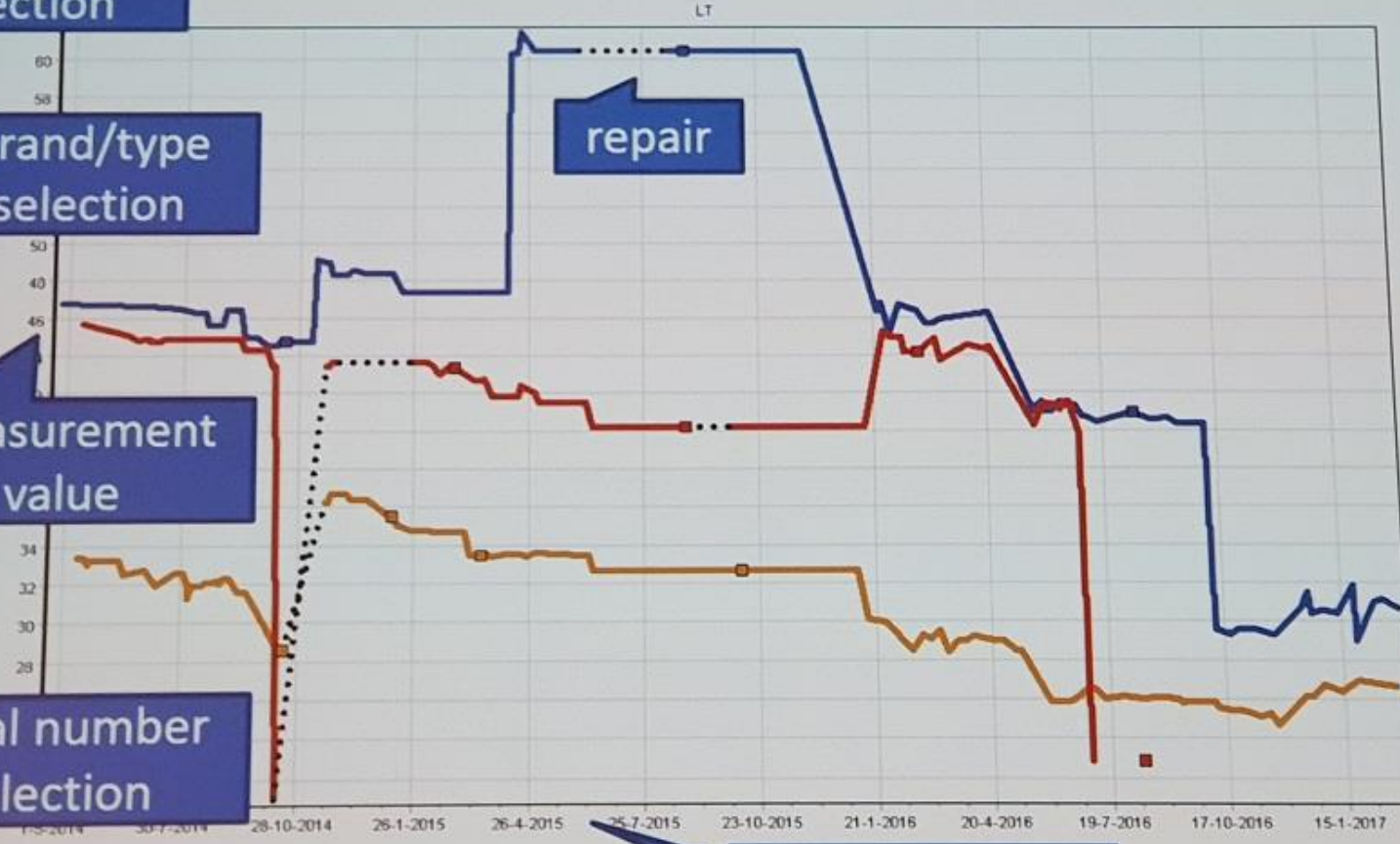
- Brand and type
- 2700SAA:Cystoscope: #1262:L300:D4:A0
  - 2700SBA:Cystoscope: #1671:L300:D4:A3
  - 2700SBA:Cystoscope: #138:L300:D4:A3
  - 2700SCA:Cystoscope: #16:L300:D4:A70
  - 2700SFA:Cystoscope: #20:L300:D4:A3
  - 2701SD:Cystoscope: #110:D4:A30
  - 2701SWA:Unknown: #210:D0:A0
  - 2701BAA:Cystoscope: #42:L180:D2.7:A0
  - 2701BD:Arthroscope: #14:L180:D2.7:A30
  - 2701BBA:Cystoscope: #4:L180:D2.7:A30
  - 28721BWA:Arthroscope: #390:L175:D4:A30
  - 28721CA:Arthroscope: #3:L0:D0:A70
  - 28721CWA:Arthroscope: #14:L0:D0:A70
  - 28731BWA:Arthroscope: #571:L180:D4:A70
  - 50230BA:Arthroscope: #10:L0:D0:A
  - 7200A:Arthroscope: #4:L0:D4:A0
  - 7200B:Arthroscope: #13:L0:D4:A30
  - 7200C:Arthroscope: #16:L0:D4:A70

**Brand/type selection**

- Serial number
- 1214217:45:28731BWA:40
  - 1221199:45:28731BWA:63
  - 1374069:45:28731BWA:27
  - 1524371:45:28731BWA:11
  - 1574775:45:28731BWA:70
  - 1567750:45:28731BWA:28
  - 1490867:45:28731BWA:1
  - 1659856:45:28731BWA:3
  - 1659856A:45:28731BWA:1
  - 1671322:45:28731BWA:54
  - 170830:45:28731BWA:55
  - 170831:45:28731BWA:57
  - 690650:45:28731BWA:1
  - 692118:45:28731BWA:34
  - 695305:45:28731BWA:33
  - M00424:45:28731BWA:1

**Measurement value**

**Serial number selection**

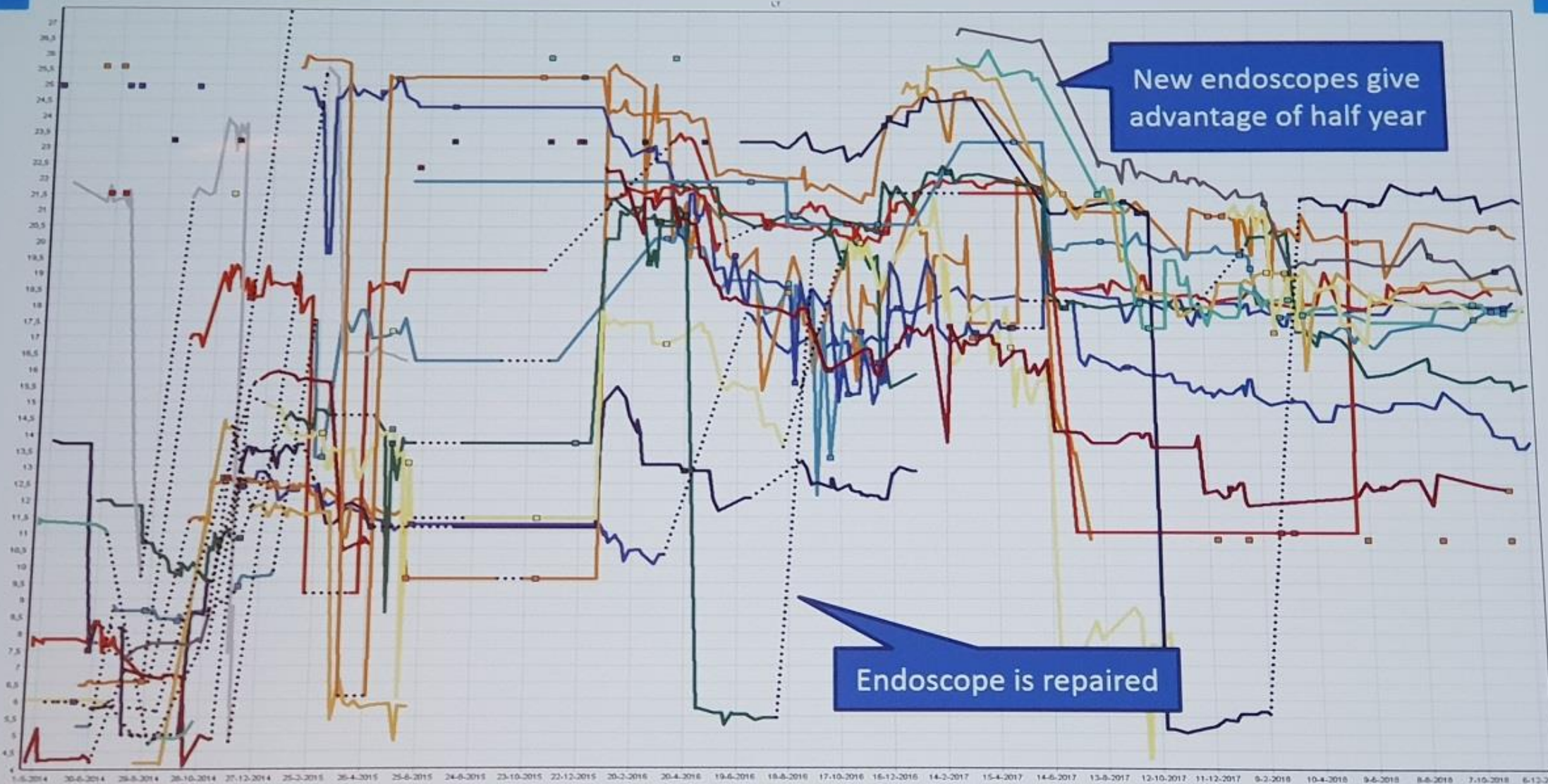


- 1221199
- 1374775
- 1397758

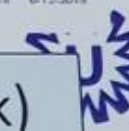
**Time axis**



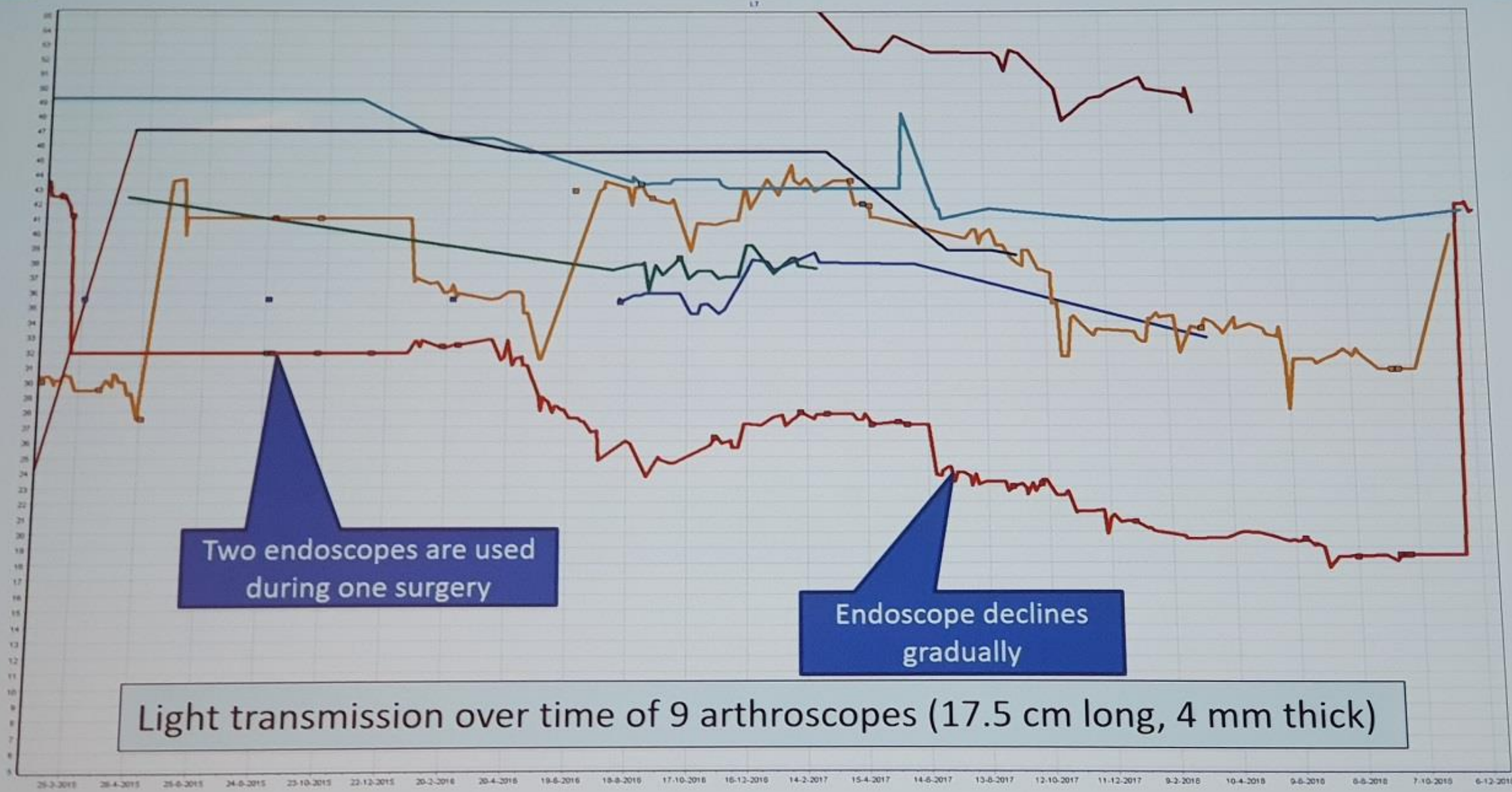




Light transmission over time of 24 pediatric cystoscopes (27 cm long, 2.7 mm thick)





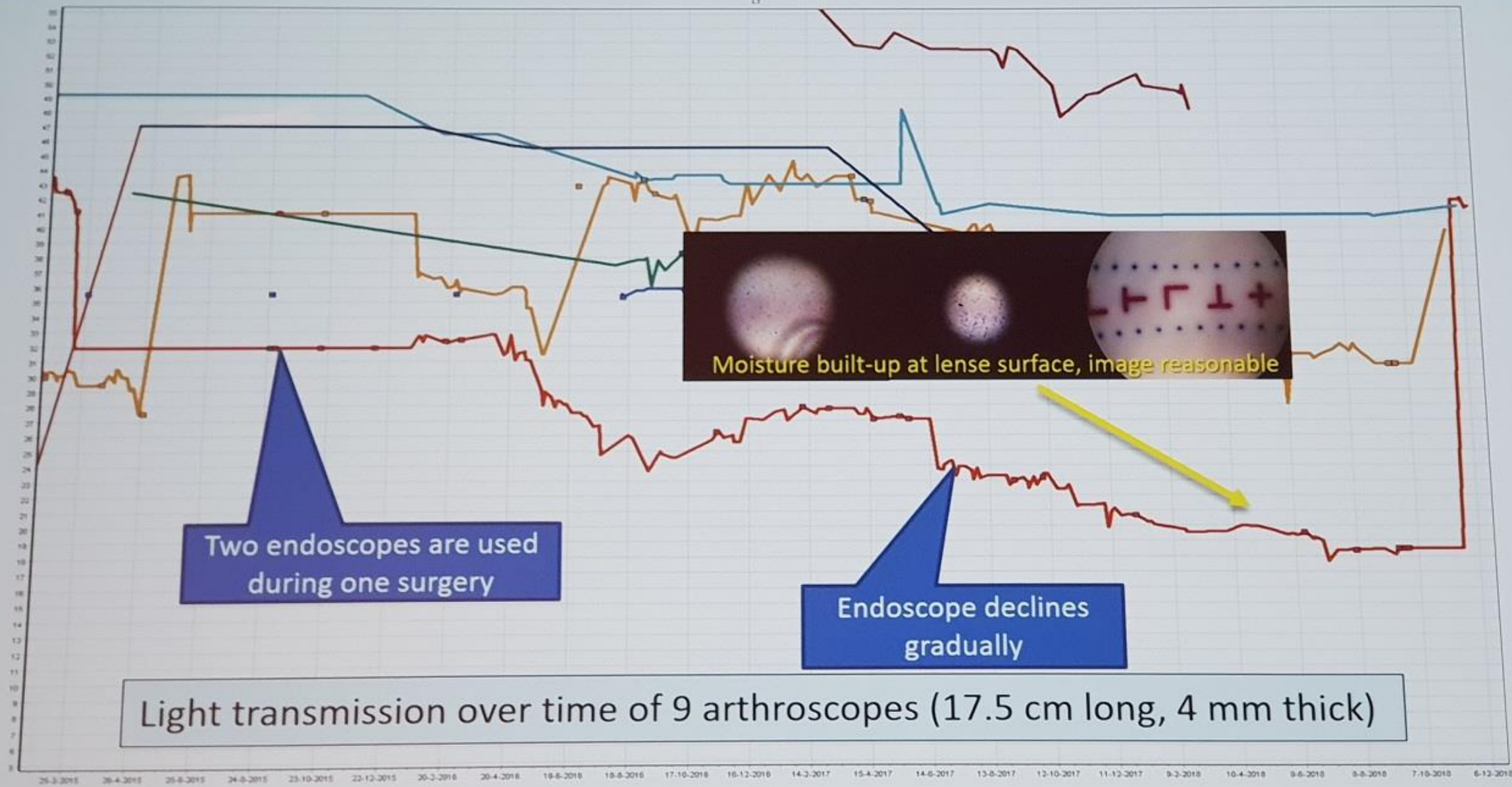


Two endoscopes are used during one surgery

Endoscope declines gradually

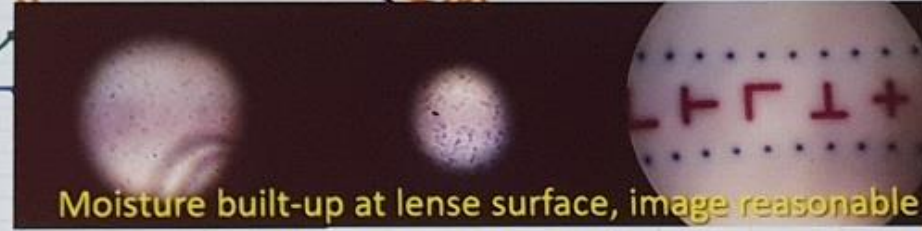
Light transmission over time of 9 arthroscopes (17.5 cm long, 4 mm thick)



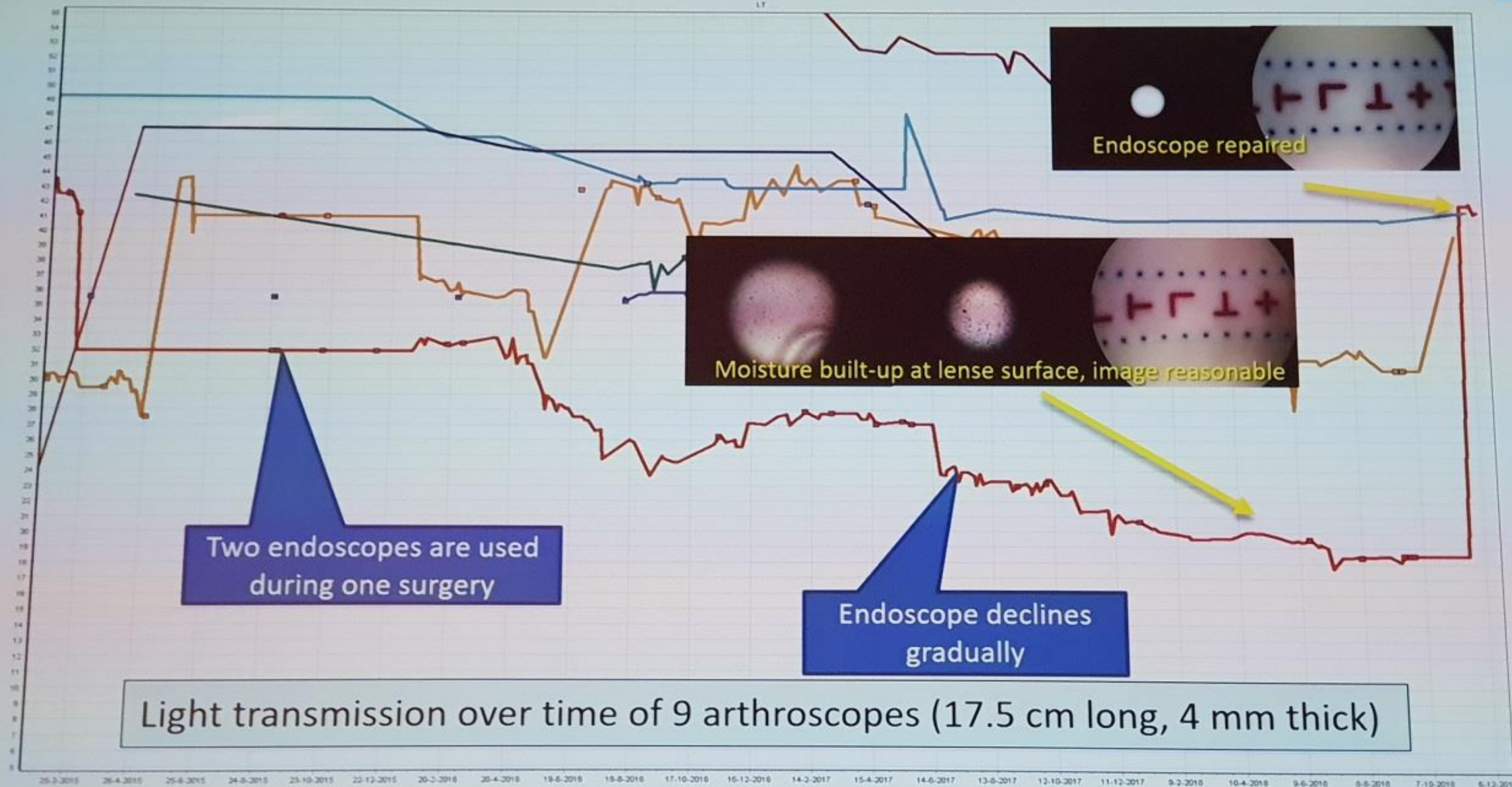


Two endoscopes are used during one surgery

Endoscope declines gradually



Light transmission over time of 9 arthroscopes (17.5 cm long, 4 mm thick)



Two endoscopes are used during one surgery

Endoscope declines gradually



Light transmission over time of 9 arthroscopes (17.5 cm long, 4 mm thick)

25-3-2015 26-4-2015 25-6-2015 24-8-2015 23-10-2015 22-12-2015 20-2-2016 20-4-2016 19-6-2016 18-8-2016 17-10-2016 16-12-2016 14-2-2017 15-4-2017 14-6-2017 13-8-2017 12-10-2017 11-12-2017 9-2-2018 10-4-2018 9-6-2018 8-8-2018 7-10-2018 6-12-2018



# Quality of an endoscope is a subjective measure

How to measure opinion from user?

Ask questions when they find endoscope of low quality

**Klachtenformulier kwaliteit optiek**  
Vul in met balpen of potlood (stift vervaagt in wasproces). Laat label in mandje zitten bij transport naar sterilisatie, ook wanneer er geen klachten zijn.

<input type="checkbox"/>	Beschadigd	<input type="checkbox"/>	Geheel onscherp beeld
<input type="checkbox"/>	Te weinig licht	<input type="checkbox"/>	Deels onscherp beeld
<input type="checkbox"/>	Rare kleuren	<input type="checkbox"/>	Tijdelijke waas

Anders, nl.: \_\_\_\_\_

Dit formulier is onderdeel van de klinische validatie van de ScopeControl.  
Contact: Herke Jan Noordmans, 088-7551855, h.j.noordmans@umcutrecht.nl



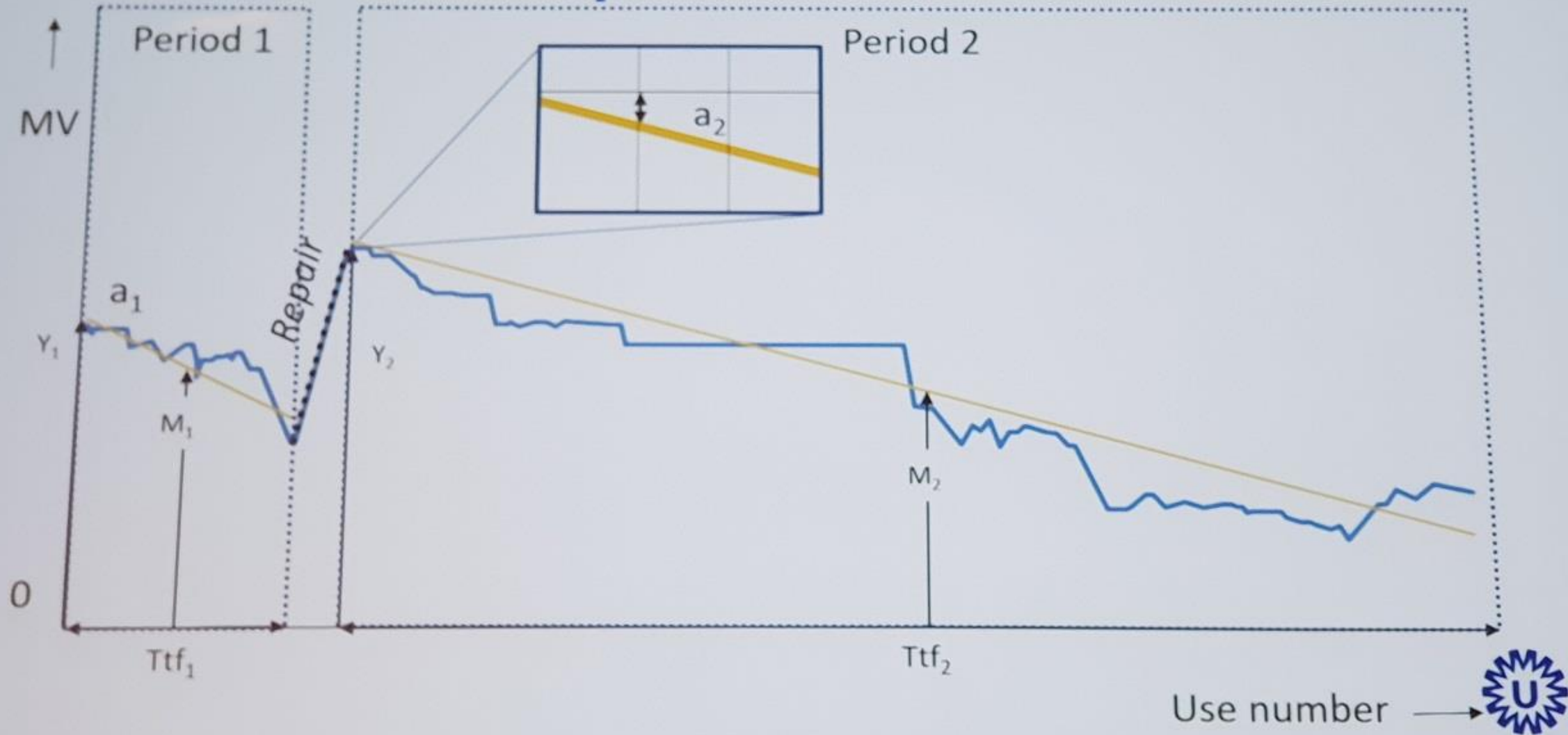
500 labels introduced. Only 4x feedback. Does not work..

Still discussion whether quality is sufficient for next use versus availability of endoscopes

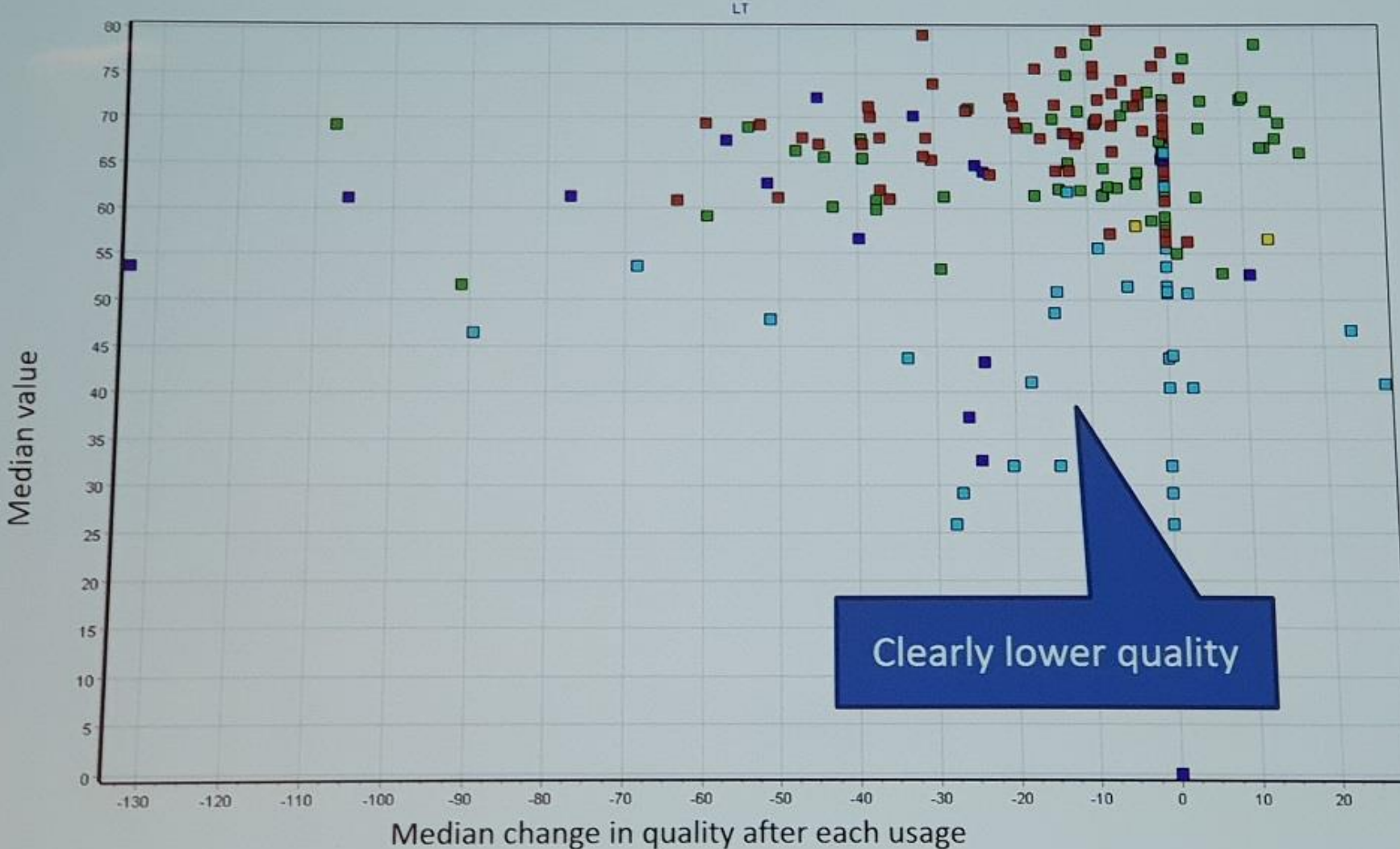




# Calculated trend parameters



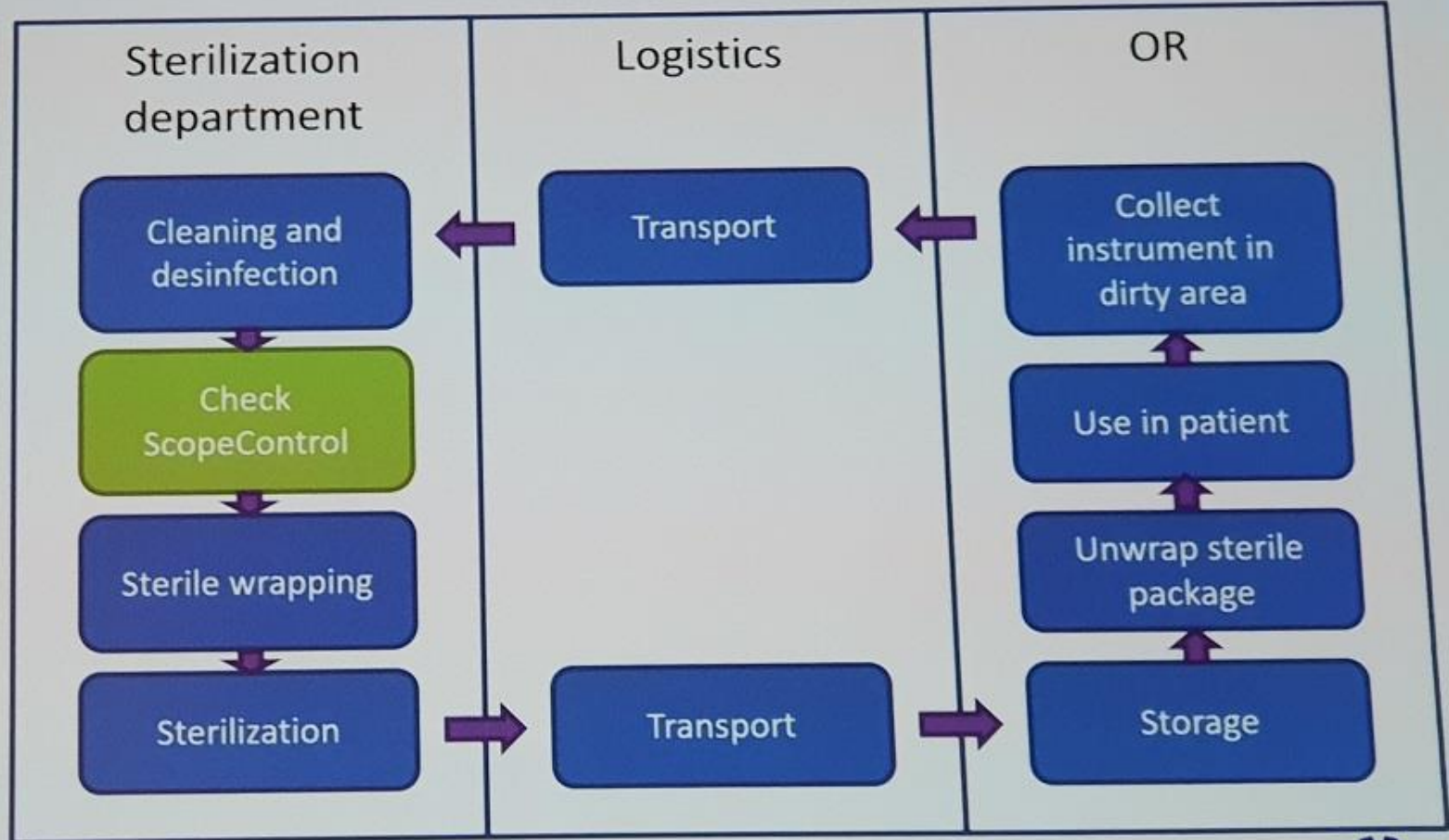
### Lens light transmission of one endoscope type



# Sterilization process

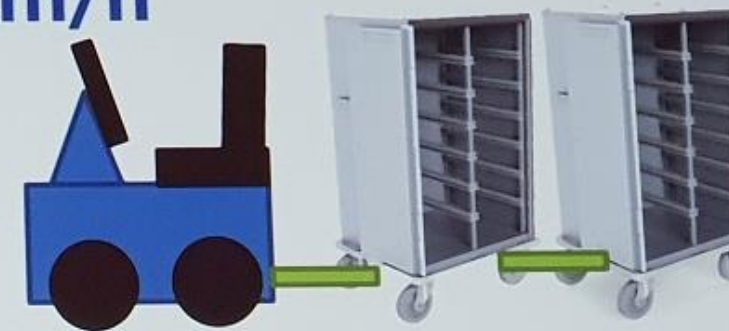
Many steps

- Which factors influence degradation?
- Quality is only checked at one moment





# Example: transport between general and children's hospital through tunnel, driving at 25 km/h



# Idea 1: To end discussion between OR and sterilization department



Users can decide for themselves whether they still want to use the endoscope, or use a good quality endoscope for a delicate surgery and one with less quality for quick inspection.

Also: Users can decide that sterilization department is allowed to replace with e.g. quality below 30%.





## Idea 2: Tracking individual endoscopes

User scans chip or code on instrument

- No risk of choosing wrong endoscope



Laser printed codes:

Useable only when added by manufacturer

Attaching afterwards: hard to do because of different materials, possibility of breaking CE mark, hard logistics, code fades over time.



## Idea 2: Tracking individual endoscopes

User scans chip or code on instrument

- No risk of choosing wrong endoscope



RFID, van Straten Medical



Laser printed codes:

Useable only when added by manufacturer

Attaching afterwards: hard to do because of different materials, possibility of breaking CE mark, hard logistics, code fades over time.

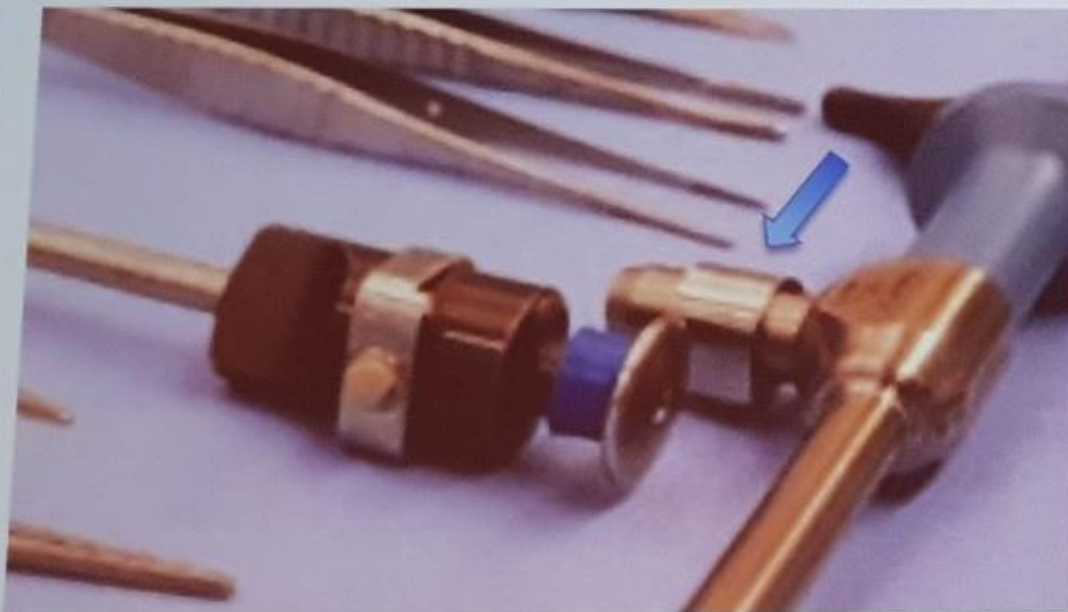




## Idea 2: Tracking individual endoscopes

User scans chip or code on instrument

- No risk of choosing wrong endoscope



Laser printed codes:

Useable only when added by manufacturer

Attaching afterwards: hard to do because of different materials, possibility of breaking CE mark, hard logistics, code fades over time.

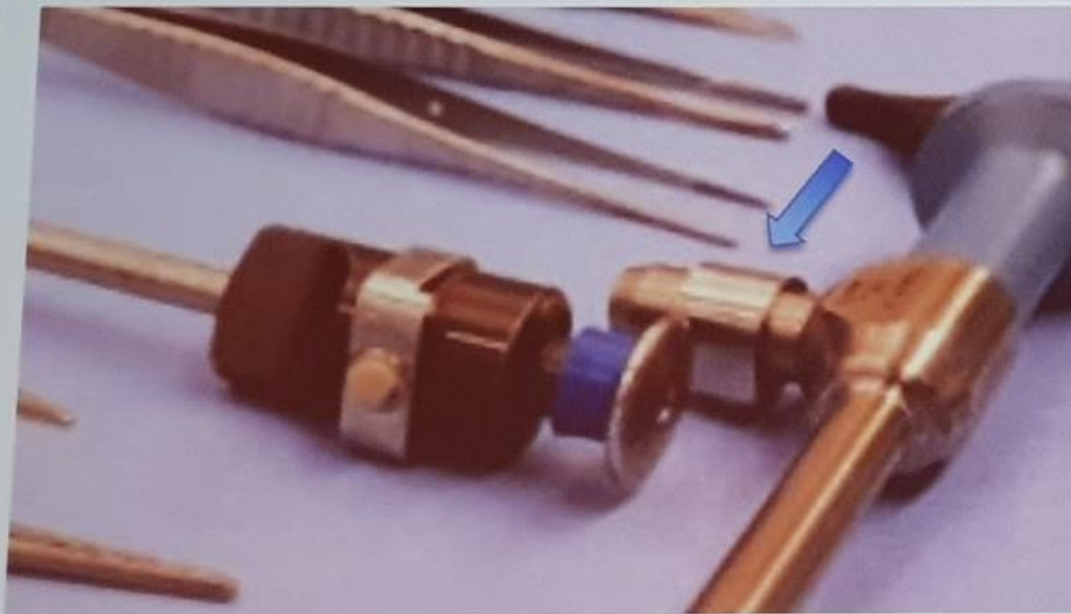
RFID, van Straten Medical



## Idea 2: Tracking individual endoscopes

User scans chip or code on instrument

- No risk of choosing wrong endoscope



RFID, van Straten Medical



Laser printed codes:

Useable only when added by manufacturer

Attaching afterwards: hard to do because of different materials, possibility of breaking CE mark, hard logistics, code fades over time.



**DoviSCAN**

<https://www.dovideqmedical.com/>



**KeyDot**

[https://www.keysurgical.com/  
products/instrument-tracking/keydot](https://www.keysurgical.com/products/instrument-tracking/keydot)





# Conclusions

- ScopeControl valuable instrument to measure optical quality of rigid endoscopes in clinical process
- Big data analysis becomes possible
  - Linkage with hospital data (Electronic Health Record)
- View on biggest quality/money losses



# Questions?



- Contact [h.j.noordmans@umcutrecht.nl](mailto:h.j.noordmans@umcutrecht.nl)

