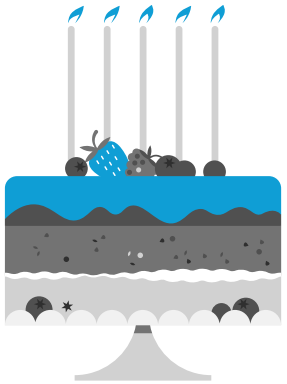
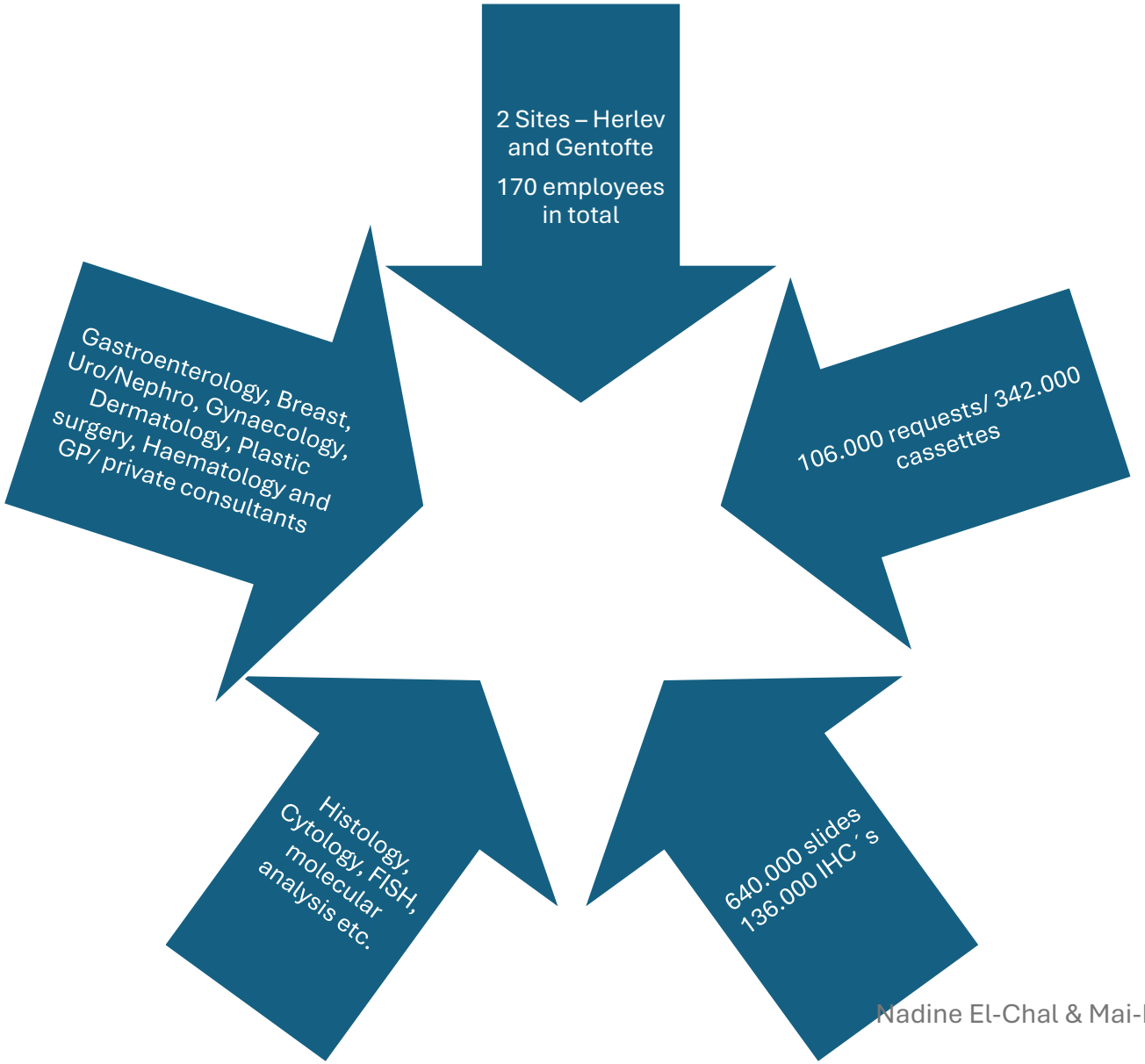
AS410 in the Department of Pathology at Herlev and Gentofte Hospitals

- Almost 10 years with AS410, the beginning, the middle and now…



Our department



Purpose of automation:

- Creating value by sufficient turn around times and high-quality results
- Lack of biomedical lab. scientists
- Work-environment
- Digital pathology

2016 : First in Europe

- At the time:
- Completely new equipment
- Not installed in routine laboratory anywhere, no prior knowledge to rely on
- Simpel robot, one section pr slide online, IHC and SN off-line (lots of manual entering/re-labelling) – (full on-line 2022?)
- Section time 3 min./block
- Trimming +/-
- Only medium/large size nets..

- Primary goal:
- Sectioning all our IHC control slides
- Sectioning rutine, medium and large blocks

IMPLEMENTATION OF AS410 IN 2016

PROJECT GROUP:

2 pathologists & 3 BLS

TESTING:

1. Different net types
2. Tissue processed on Express & VIP
3. Cassettes trimmed on rotation & sledge microtomes
4. Cutting angles 60° and 90°
5. Cutting thickness 3-5µm
6. Frequency of changing blades

EVALUATION:

Sections viewed under microscope according to angle and thickness.

ULTIMATELY

Standardized program ready

TRAINING:

Small group of BLS

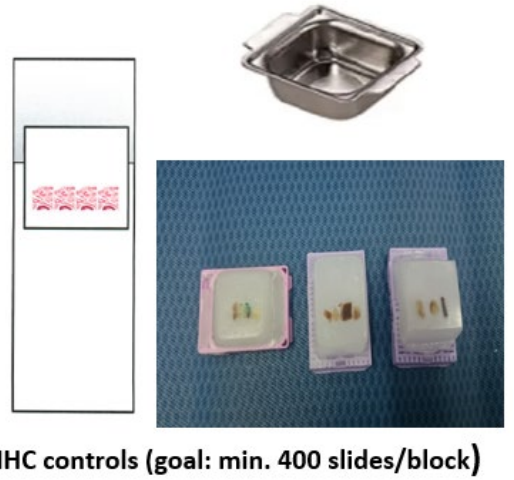
TEST PERIOD 2 MONTHS

Thickness 4 µ

	Parameter NO,	Cut angle	Drip rate	Knife change	Dripping spot	Mount strength	Mount position
1	STANDARD 90M	90°	12µl	Block 18	○●○●●●●●○●	Medium	45mm
2	STANDARD 60M	60°	12µl	Block 12	○●○●●●●●○●	Medium	45mm
3	STANDARD 90L	90°	12µl	Block 18	○●○●●●●●○●	Low	45mm
4	STANDARD 60L	60°	12µl	Block 12	○●○●●●●●○●	Low	45mm
5	SNMM (Extension 40s)	60°	12µl	Block 1	○●●●●●●●●●	Medium	45mm
6	NORMAL	60°	12µl		○●○●●●●●○●	Medium	45mm
7	IHC KONTROL 1	90°	14 µl	Section/1 100	○○●●●●○○○●	Medium	22mm
8	IHC KONTROL 2	60°	14µl	Section/1 100	○○●●●●○○○●	Medium	22mm
9	Dual slide mounting	60°	First 12µl Second 14µl		○●○●●●●●○●	Medium	24mm

IHC Control slides – 2 weeks

- How to get enough slides from each block
- How to place tissue in the block
- Mount position



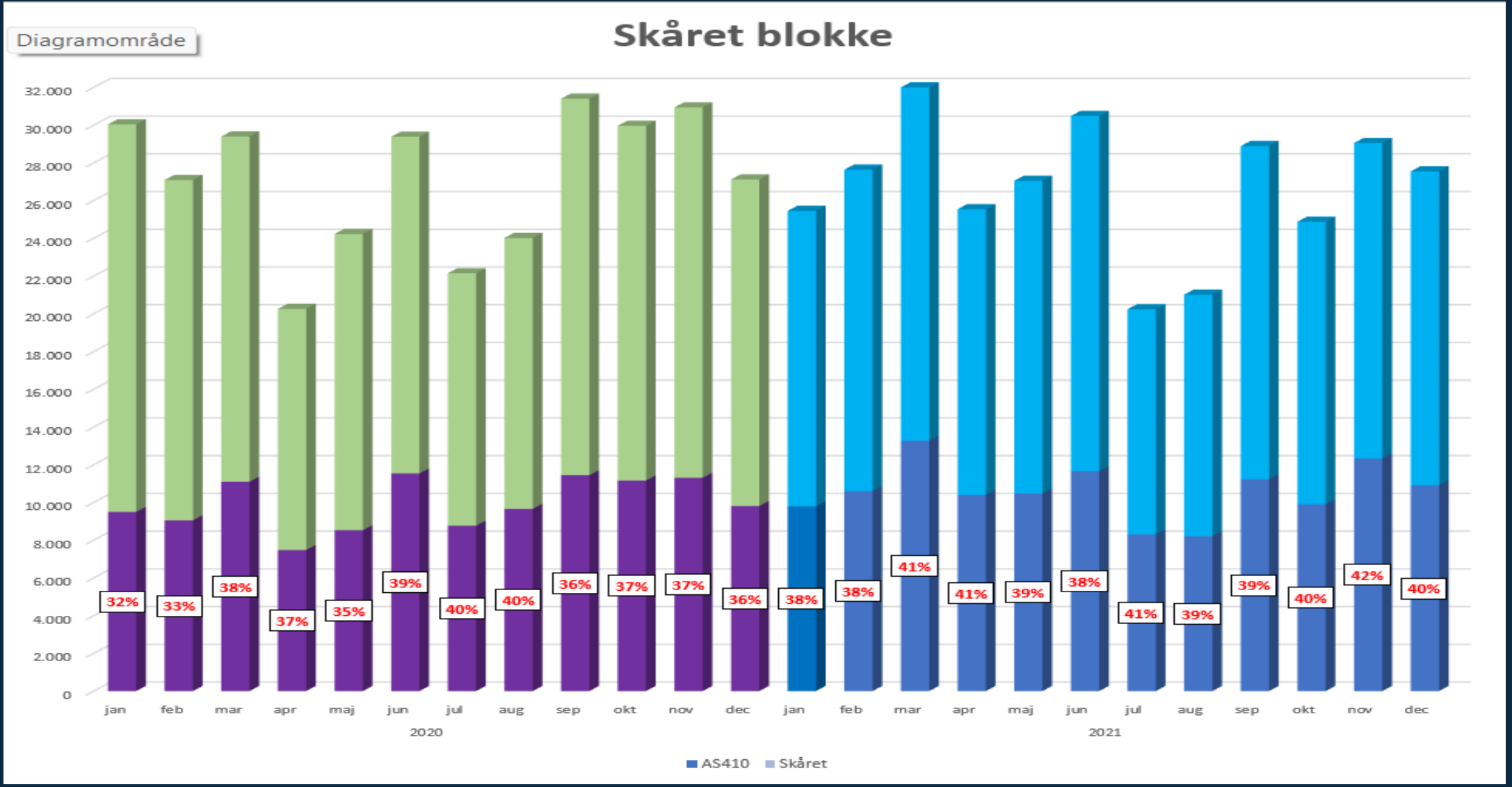
IHC controls (goal: min. 400 slides/block)

The process

- Collaboration with pathologists crucial
- Training on the AS410
- Learning to read the reports and react appropriately
- Learning how to trim manually
- Implementing new workflow/new function in the lab
- Inplementing status changes in order to secure traceability
- Arranging the workspace

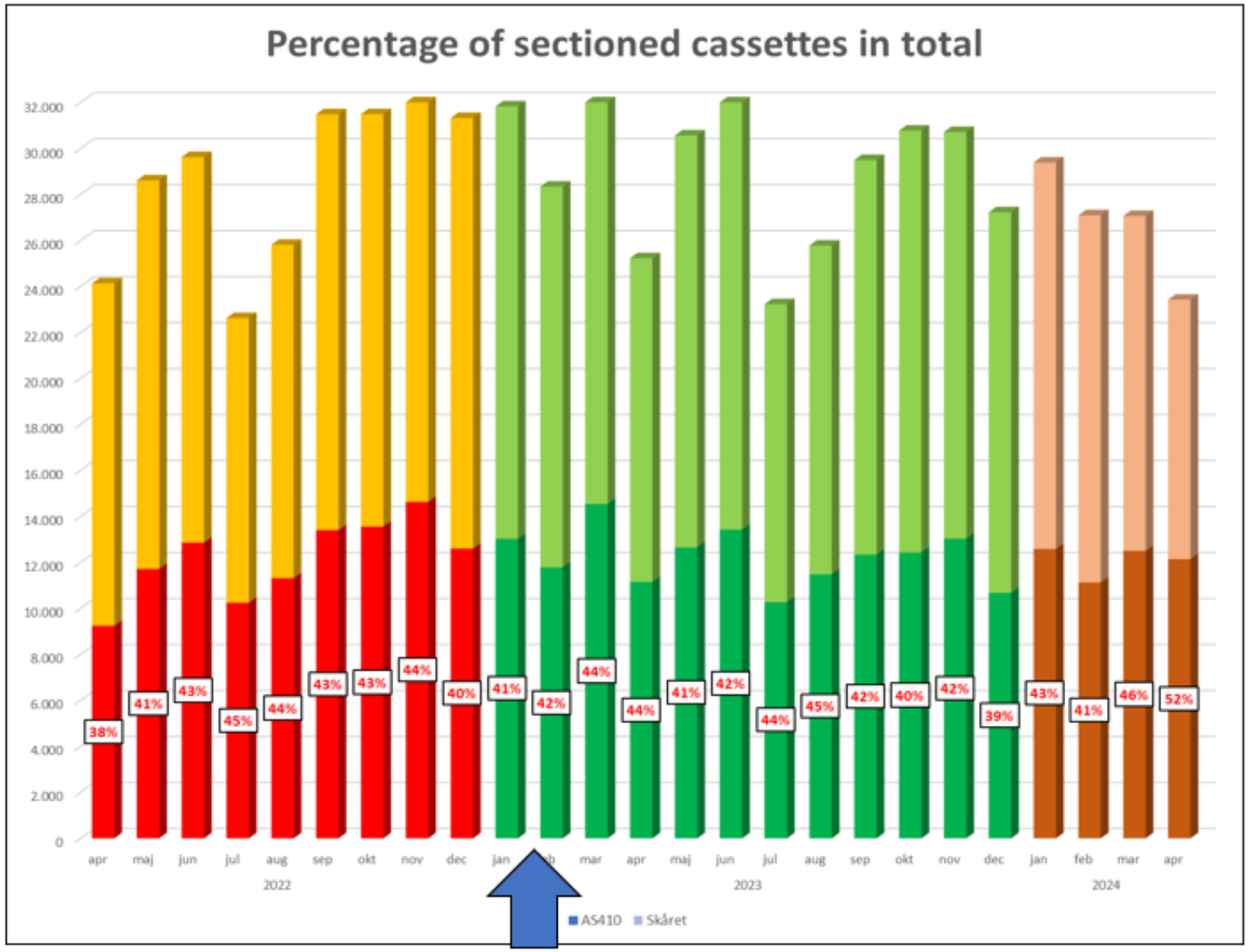
- Within 2 weeks we were sectioning IHC controls
- After careful testing/validation we were sectioning medium size nets within 2 months
- Within 6 months we were sectioning aproximately 30% of our production on AS410
- A new workflow was implemented!

Results from 2020/2021 – 4th unit installed Q4 2020



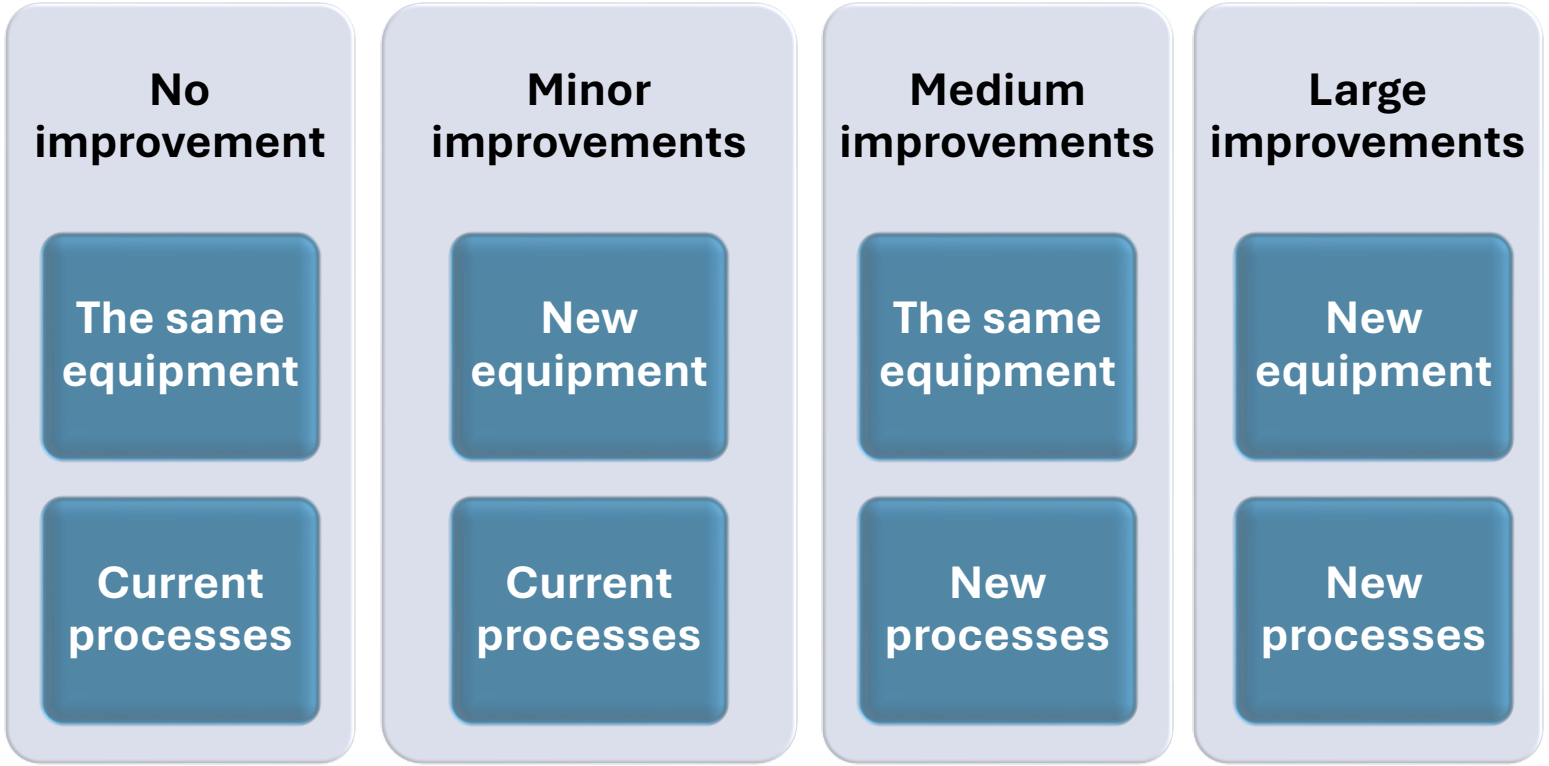
Nadine El-Chal & Mai-Britt Naumann

Time passes – 2022 5th unit installed: Still no change!



Unit no 5 installed

Our experience when implementing new equipment:



2024: We had to optimize the workflow (full process):

How to optimize?

- LEAN toolbox:
- Value
- Valuestream
- Flow
- Pull
- Perfection
- 5S (incl standardize)

Draw workflow

Optimize sectioning protocols – 5 why and 1 how?

Standardize: Slide flow and organisation of workspace

Standardize grossing, tissueprocessing, embedding and trimming

Use shortened polish settings

Basically – use LEAN toolbox (or this and following slides;-)

1.Review of workflow

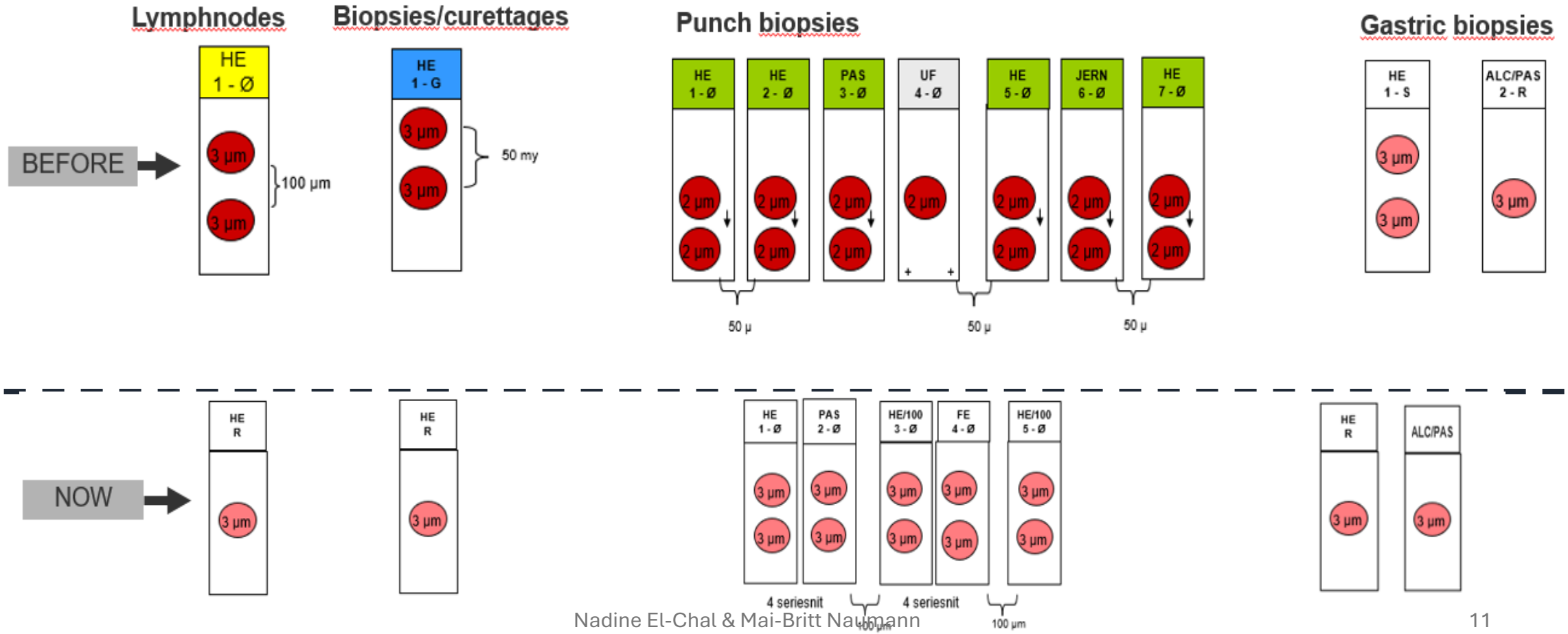
Workflow AS410 – Herlev

	Kl. 7	8	9	10	11	12	13	14	15	16
AS410 - 1	Immun	SNMAM 3 pr. timer							NAT optil 96	**96 blokke**
		SNMM 2,3 pr. time							Evt. SN ubegrænset	
		SNGYN								
AS410 – 1 tirsdag Hist	Blokke klar	24	48	72	96	120	144	168		**168 blokke**
	Blokke tilskæres		24	48	72	96	120	144		**144 blokke**
AS410 - 2	Blokke klar	24	48	72	96	120	144	168	NAT optil 96	**264 blokke**
	Blokke tilskæres		24	48	72	96	120	144		**240 blokke**
AS410 - 3	Blokke klar	24	48	72	96	120	144	168	NAT optil 96	**264 blokke**
	Blokke tilskæres		24	48	72	96	120	144		**240 blokke**
AS410 - 4	Immun	SNMAM 3 pr. timer							Kontroller 400 glas	
		SNMM 2,3 pr. time								
		SNGYN								
AS410 - 5	Blokke klar	24	48	72	96	120	144	168	NAT optil 96	**264 blokke**
	Blokke tilskæres		24	48	72	96	120	144		**240 blokke**
							1056/888/816 hist blokke + SN optil 18 pr. AS pr. dag + nat			

Hist mun

2.Review of protocols

- Meetings with pathologists
- Introduction to new protocols
- Workshops

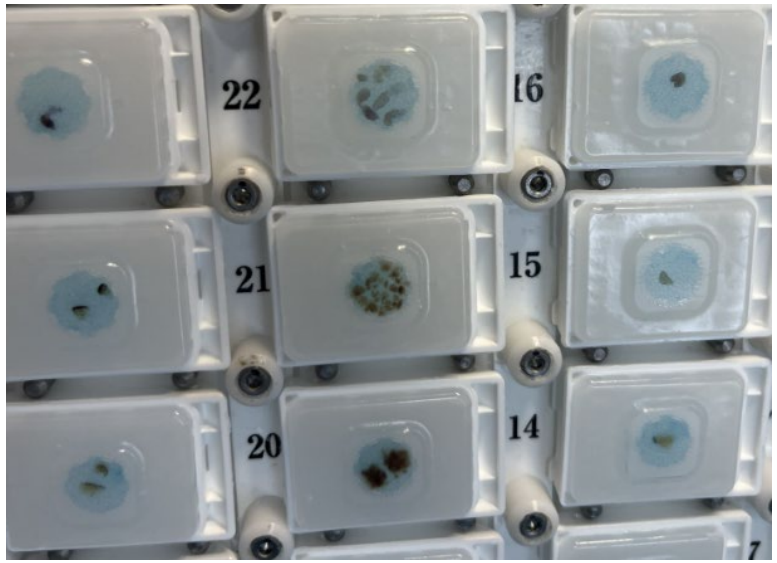


Organ specialities

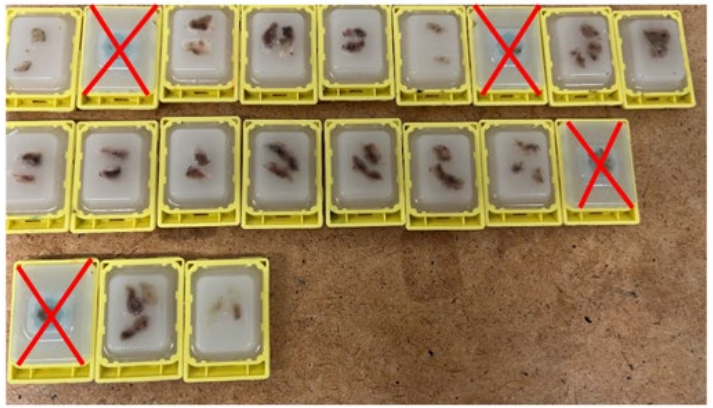
- Breast
- Gastroenterology
- Urology/nephrology
- Gynaecology
- Dermatology/ plastic surgery
- Samples from private clinics

In 2016:' preferable to use only medium size nets', and small nets were not sectioned on AS until 2024

Small size: Oct. 2024



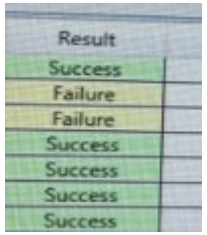
Blocks from an Intestine sectioning of 1 patient



3.Review of slide flow

APPROVED SECTION SLIDES → 1

ALL BLOCKS SECTIONED? →



→ **SECTION EITHER ON AS OR MANUALLY** → 2

PRINT ON SLIDE →

→ **NEW LABEL** → 3

SECTION SLIDES NOT APPROVED:

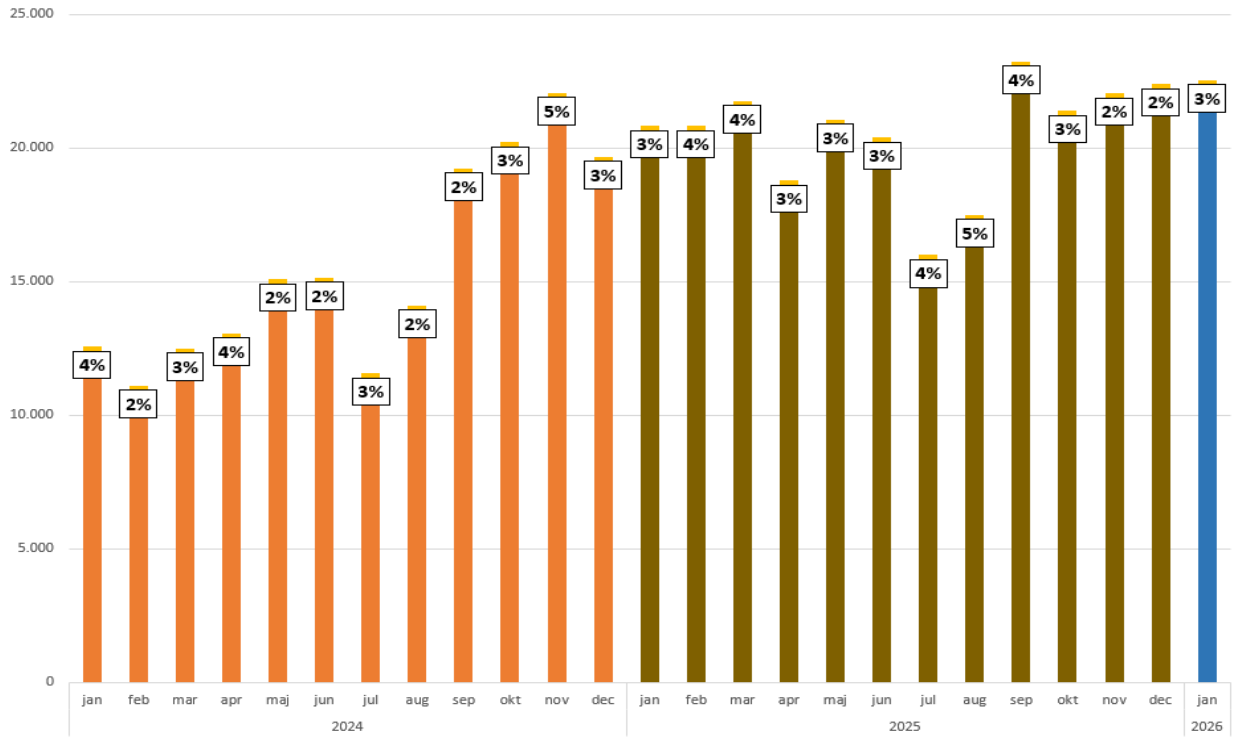
CHANGE OF STATUS FOR BOTH BLOCK AND SLIDES

→ **RE-SECTION MANUALLY** → 4

→ **RE-SECTION ON AS** → 5

STAINING

4. Re-cuts?

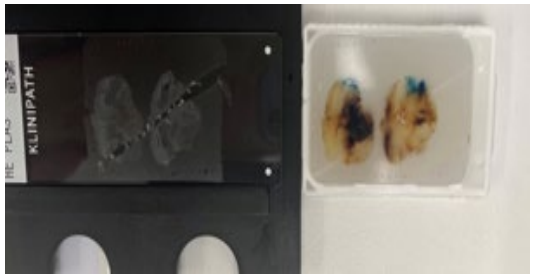


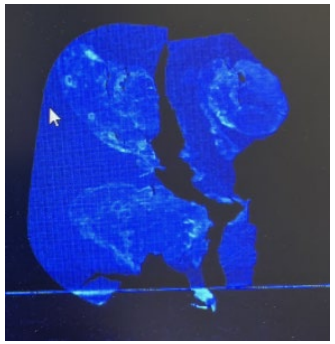
Re-cuts 3-6%

2023	dec	12.594	11.883	711	6%
	jan	13.022	12.579	443	3%
	feb	11.776	11.220	556	5%
	mar	14.535	13.892	643	4%
	apr	11.147	10.609	538	5%
	maj	12.650	12.034	616	5%
	jun	13.420	12.946	474	4%
	jul	10.269	9.826	443	4%
	aug	11.476	11.153	323	3%
	sep	12.337	11.899	438	4%
	okt	12.425	12.025	400	3%
	nov	13.031	12.613	418	3%
	dec	10.670	10.295	375	4%

Re-cuts 2-5%

2025	jan	20.833	20.131	702	3%
	feb	20.833	20.014	**819**	4%
	mar	21.759	20.995	764	4%
	apr	18.776	18.238	538	3%
	maj	21.061	20.411	**650**	3%
	jun	**20.398**	19.856	**542**	3%
	jul	**15.991**	15.399	**592**	4%
	aug	17.495	16.685	**810**	5%
	sep	23.237	22.366	871	4%
	okt	21.393	20.766	627	3%
	nov	22.053	21.506	547	2%
	dec	22.382	21.948	434	2%





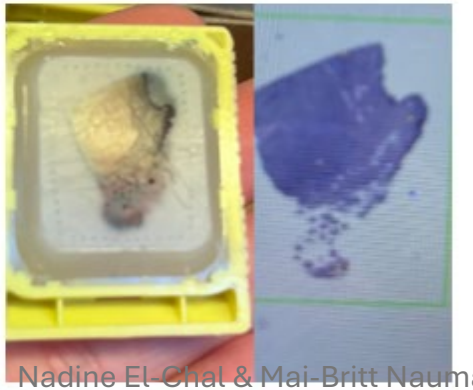
? Good/no good ?

Improvement & workshops

5.Focus on grossing
- Tissue (Thickness & replacement of tissue)
- The 'right' net
-Closing the net correct
-Use of small nets

6. Embedding
-Levelling (one plane)
-No bubble

7.Pre-trimming
-All tissue represented



8.Polish setting adjustment (September 2025)

Polish units have impact on time,polish steps shorten

```
PolishCut No.01 Thickness = 5[µm] (2nd Polishing)
PolishCut No.02 Thickness = 5[µm] (2nd Polishing)
PolishCut No.03 Thickness = 5[µm] (2nd Polishing)
PolishCut No.04 Thickness = 5[µm] (2nd Polishing)
PolishCut No.05 Thickness = 5[µm] (2nd Polishing)
PolishCut No.06 Thickness = 5[µm] (2nd Polishing)
PolishCut No.07 Thickness = 5[µm] (2nd Polishing)
PolishCut No.08 Thickness = 5[µm] (2nd Polishing)
PolishCut No.09 Thickness = 5[µm] (2nd Polishing)
PolishCut No.10 Thickness = 5[µm] (2nd Polishing)
PolishCut No.11 Thickness = 5[µm] (2nd Polishing)
PolishCut No.12 Thickness = 5[µm] (2nd Polishing)
PolishCut No.13 Thickness = 4[µm] (2nd Polishing)
PolishCut No.14 Thickness = 6[µm] (MakingThickness+Additional Polishing) <Tape
PolishCut No.15 Thickness = 4[µm] (MakingThickness Polishing) <Tape Mount>
PolishCut No.16 Thickness = 4[µm] (MakingThickness Polishing) <Tape Mount>
PolishCut No.17 Thickness = 4[µm] (MakingThickness Polishing) <Tape Mount>
```

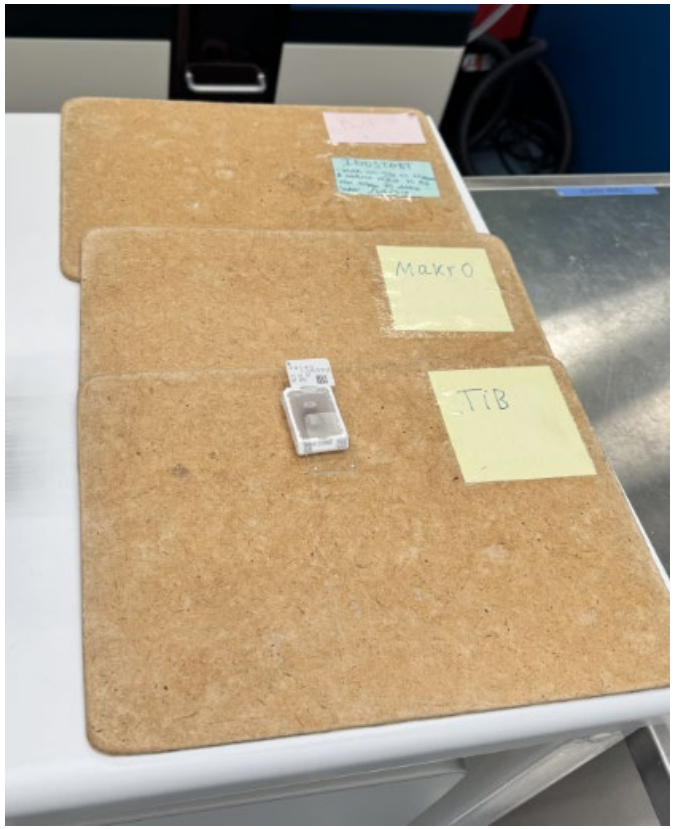
```
PolishCut No.01 Thickness = 7[µm] (2nd Polishing)
PolishCut No.02 Thickness = 7[µm] (2nd Polishing)
PolishCut No.03 Thickness = 7[µm] (2nd Polishing)
PolishCut No.04 Thickness = 7[µm] (2nd Polishing)
PolishCut No.05 Thickness = 7[µm] (2nd Polishing)
PolishCut No.06 Thickness = 7[µm] (2nd Polishing)
PolishCut No.07 Thickness = 7[µm] (2nd Polishing)
PolishCut No.08 Thickness = 7[µm] (2nd Polishing)
PolishCut No.09 Thickness = 7[µm] (2nd Polishing)
PolishCut No.10 Thickness = 6[µm] (MakingThickness+Additional Polishing) <Tape
PolishCut No.11 Thickness = 4[µm] (MakingThickness Polishing) <Tape Mount>
PolishCut No.12 Thickness = 4[µm] (MakingThickness Polishing) <Tape Mount>
PolishCut No.13 Thickness = 4[µm] (MakingThickness Polishing) <Tape Mount>
```

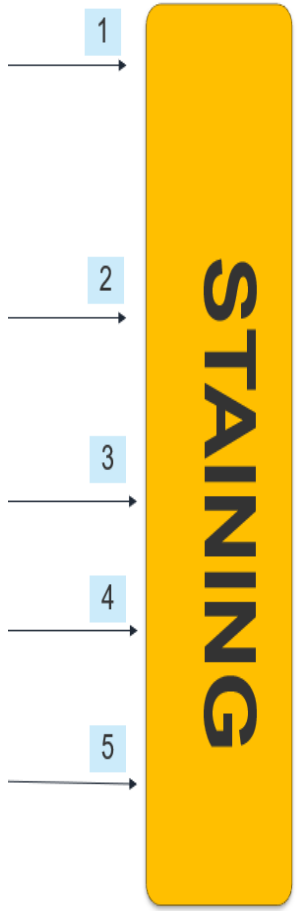
```
PolishCut No.01 Thickness = 10[µm] (2nd Polishing)
PolishCut No.02 Thickness = 10[µm] (2nd Polishing)
PolishCut No.03 Thickness = 10[µm] (2nd Polishing)
PolishCut No.04 Thickness = 10[µm] (2nd Polishing)
PolishCut No.05 Thickness = 10[µm] (2nd Polishing)
PolishCut No.06 Thickness = 10[µm] (2nd Polishing)
PolishCut No.07 Thickness = 4[µm] (2nd Polishing)
PolishCut No.08 Thickness = 6[µm] (MakingThickness+Additional Polishing) <Tape
PolishCut No.09 Thickness = 4[µm] (MakingThickness Polishing) <Tape Mount>
PolishCut No.10 Thickness = 4[µm] (MakingThickness Polishing) <Tape Mount>
PolishCut No.11 Thickness = 4[µm] (MakingThickness Polishing) <Tape Mount>
```

2nd polish max from 5µm → 7µm Saves 4 polish steps

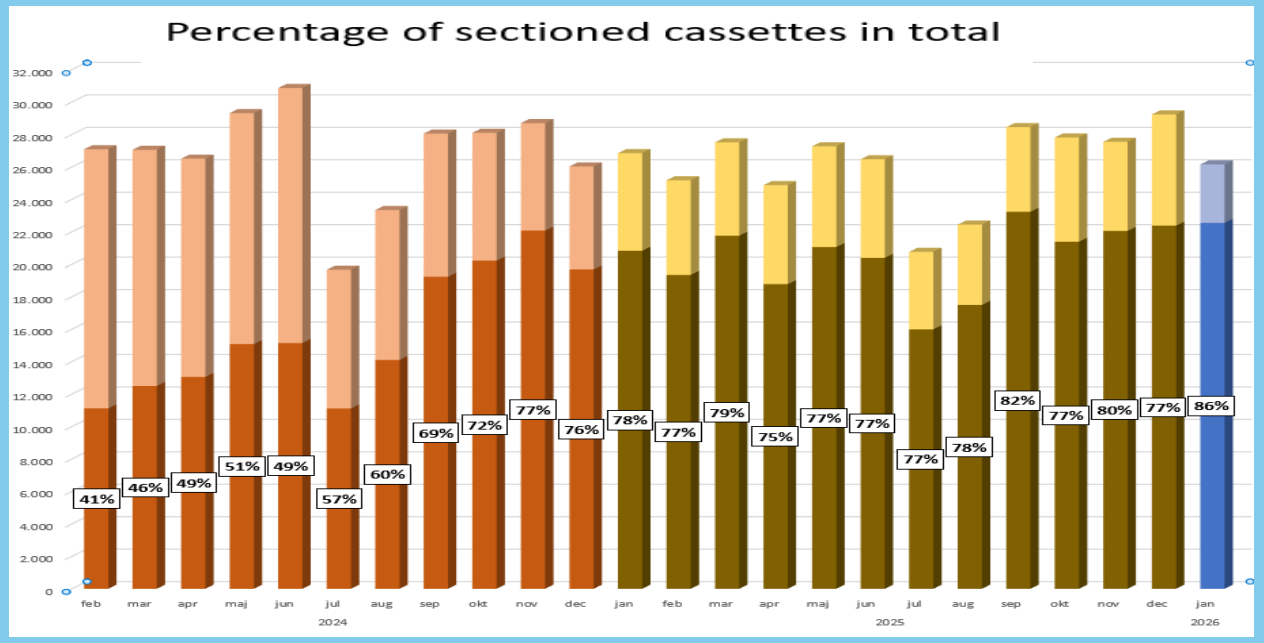
2nd polish max from 5µm → 10µm Saves 6 polish steps

9.Organization in lab



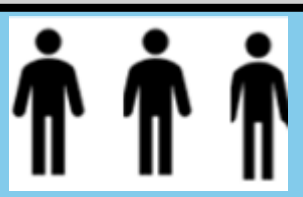


2026:



5 units AS-410M + AT-192

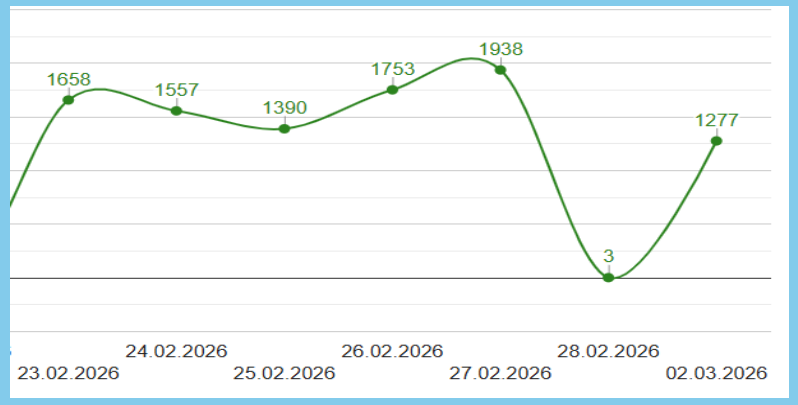
lab. Scientists



Maintenance	15 min/unit
Morning unload + QC Overall time	1,5 hour
Processing hours each unit	Day 7-9½ **(+4 hour nightrun)**

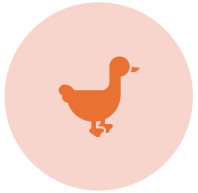
Blocks sectioned/day- 80-87% on AS410

Blocks sectioned /day



What I would do different:

Careful yet brave



Careful validation can trigger overall carefulness and hinder improvement

Deep dive into sectioning protocols – old habits die hard

Pay more attention to workplace culture

Share knowledge, ask questions …reach out (we are many labs on this journey)

Collect data for validation reports

Few specialists on AS410 – a larger group handling on/off procedure

Teach every tech how to plan their workday with AS410

Future goals-almost there:

- 80-90% of all cassettes on AS410 ✓
- Interval-Routine ✓
- Punch biopsies on AS ✓
- Faster section time ✓
- Mixed running programs/run
- Kaizen☺

Thank You!

- Feel free to reach out:

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