



# THE FUTURE OF ERCP AND EUS

New insights from training to certification and expertise

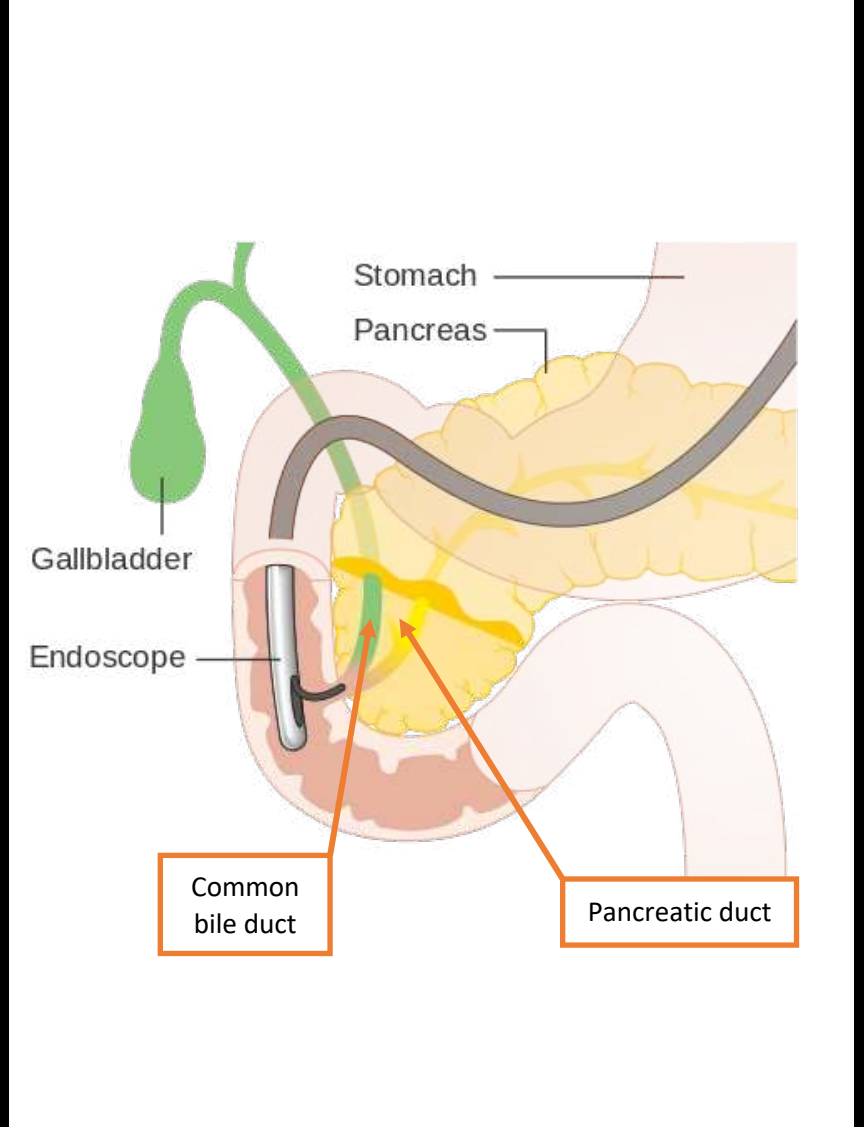
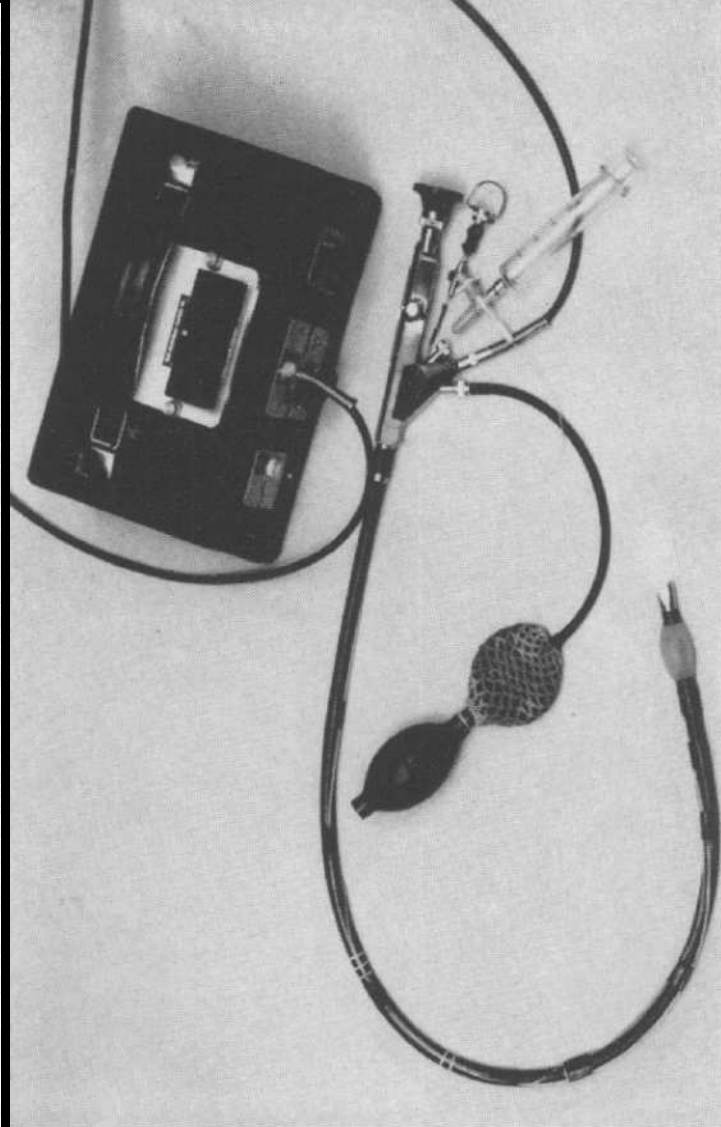
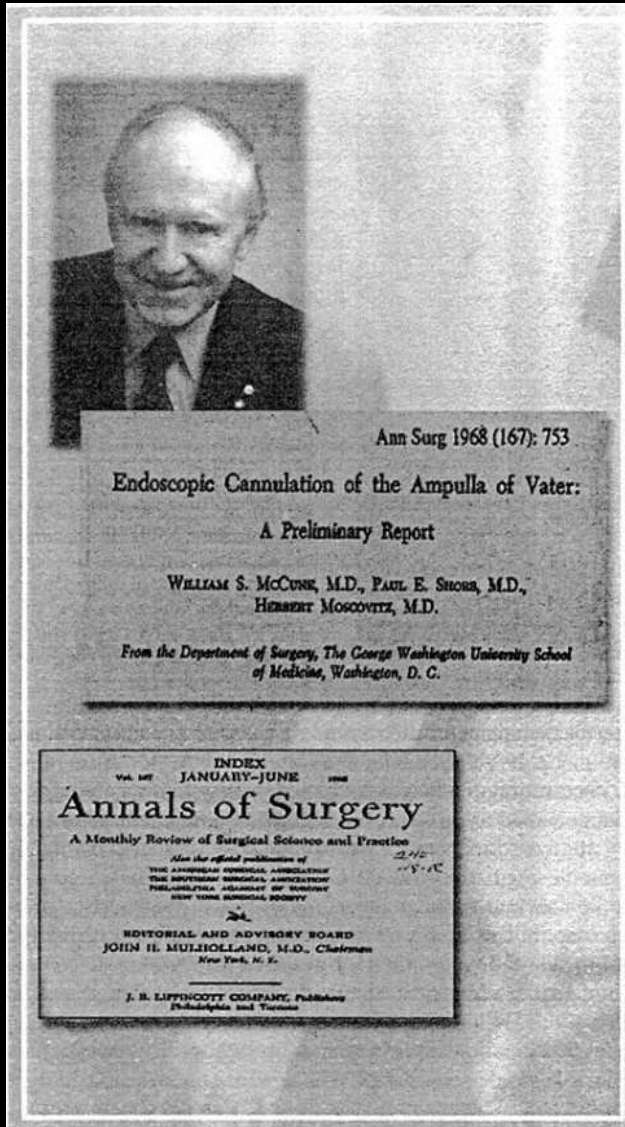
Sara Teles de Campos

10<sup>th</sup> Septembre 2024

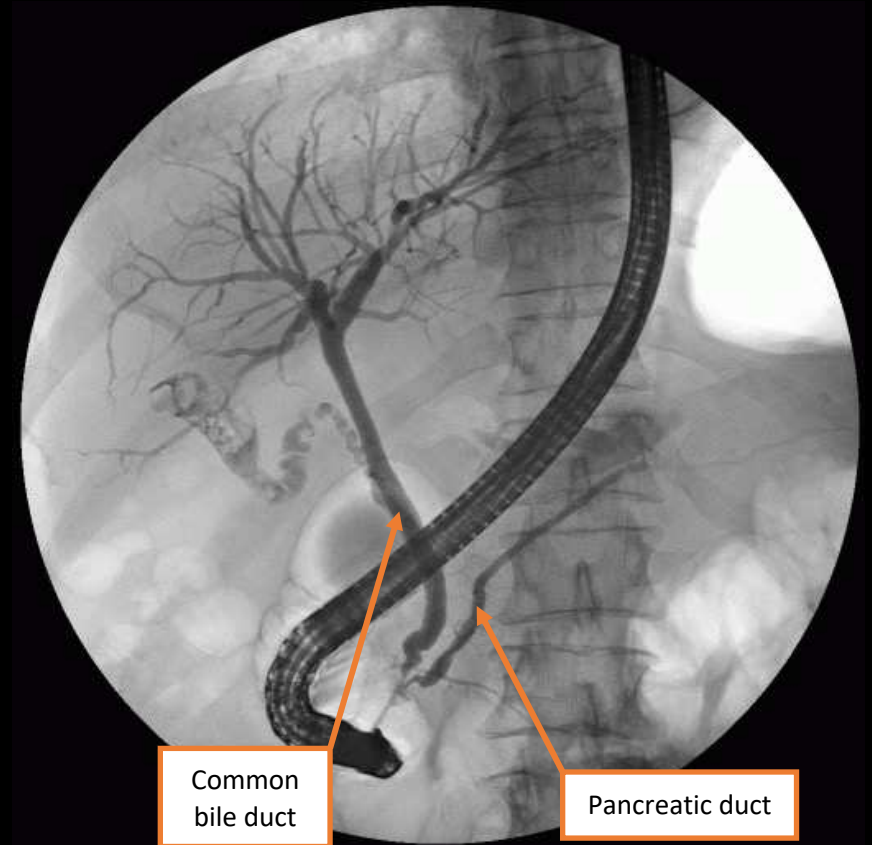
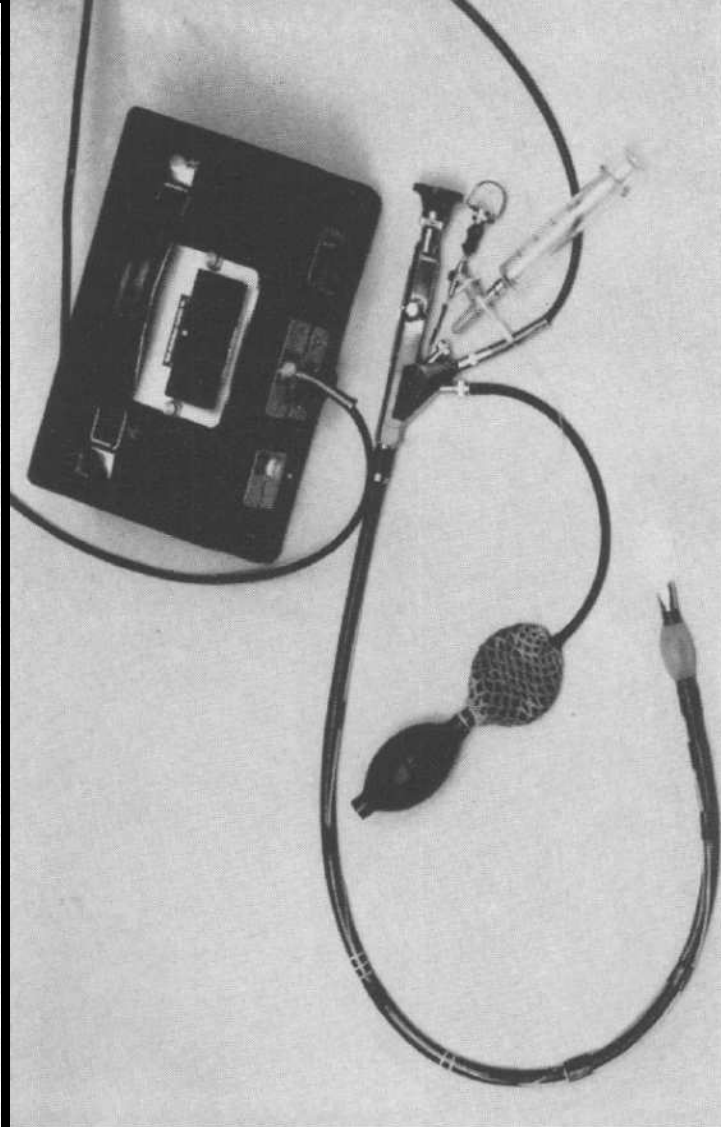
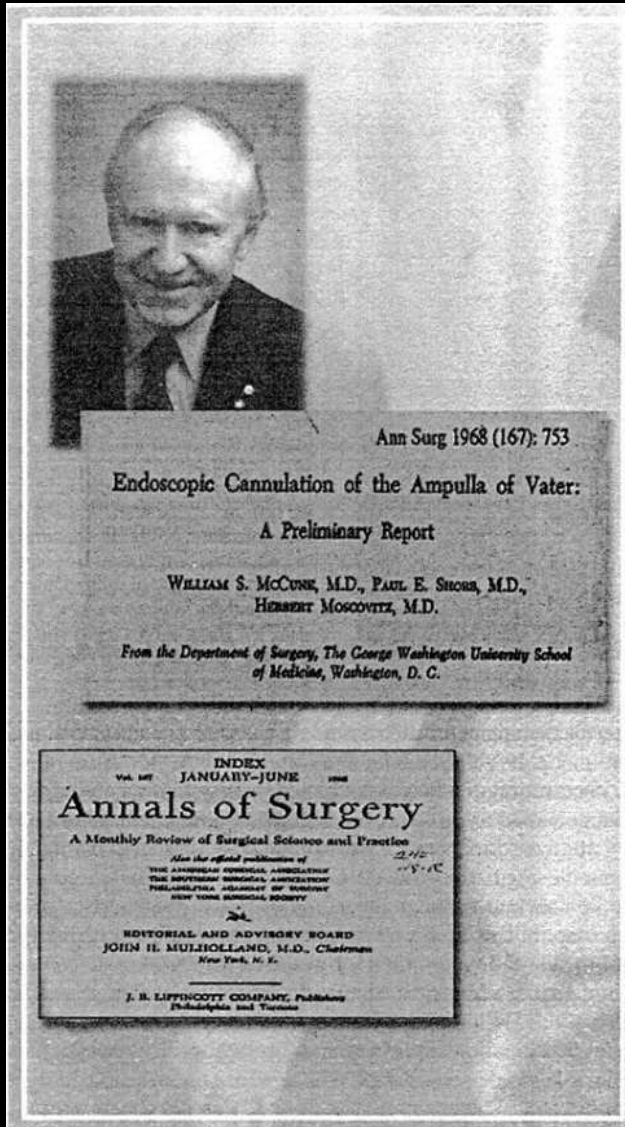
*L'Empire des Lumières, René Magritte*

Supervisor PhD: Prof. Dr. Marianna Arvanitakis  
Chairperson of Supervisory committee: Prof. Dr. Jacques Devière  
Members of Supervisory committee: Prof. Dr. Arnaud Lemmers, Prof. Dr. Daniel Bléro

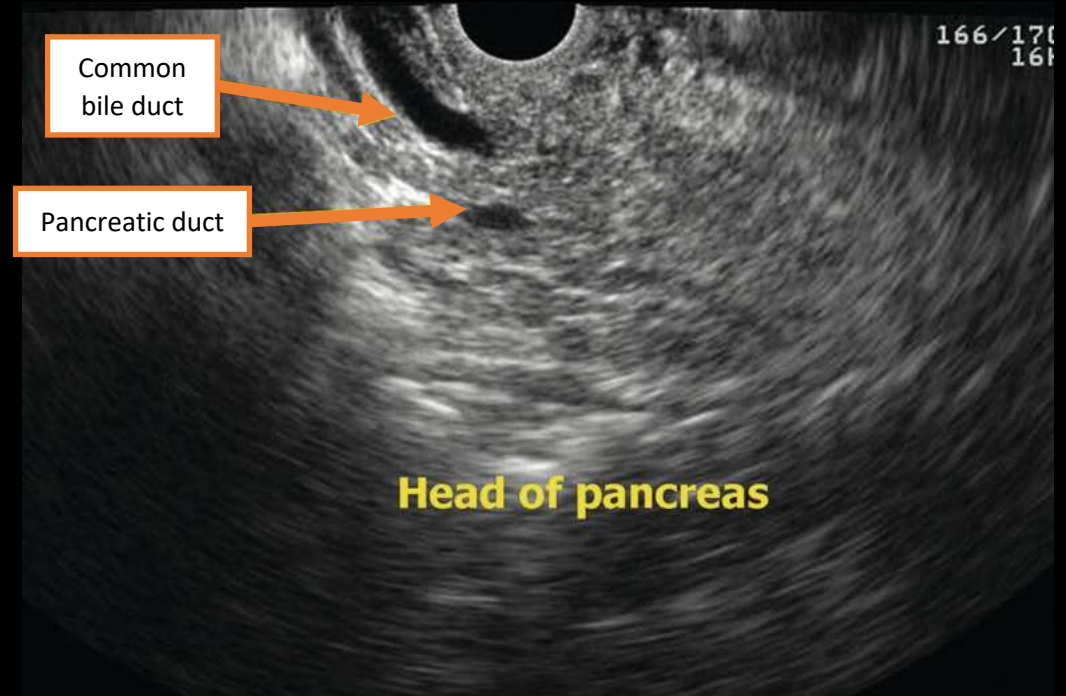
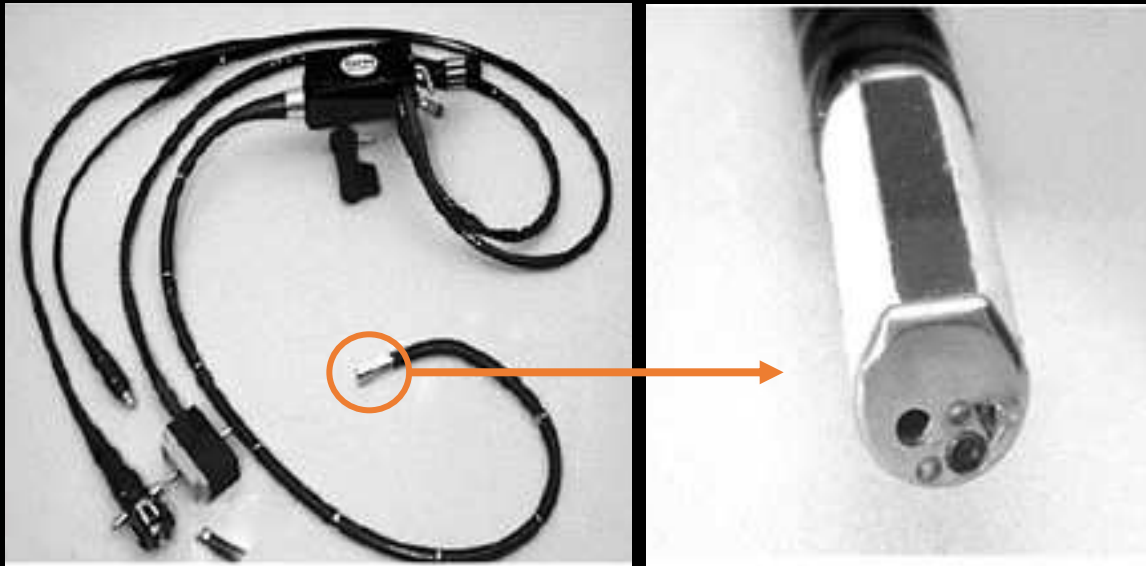
# ERCP



# ERCP



# EUS



# ERCP & EUS

Both initially as **diagnostic** tools, but evolved into **therapeutic** modalities

**Complementary** tools in the management of **biliopancreatic** conditions

Sinergy unfolds in **four distinct dimensions**

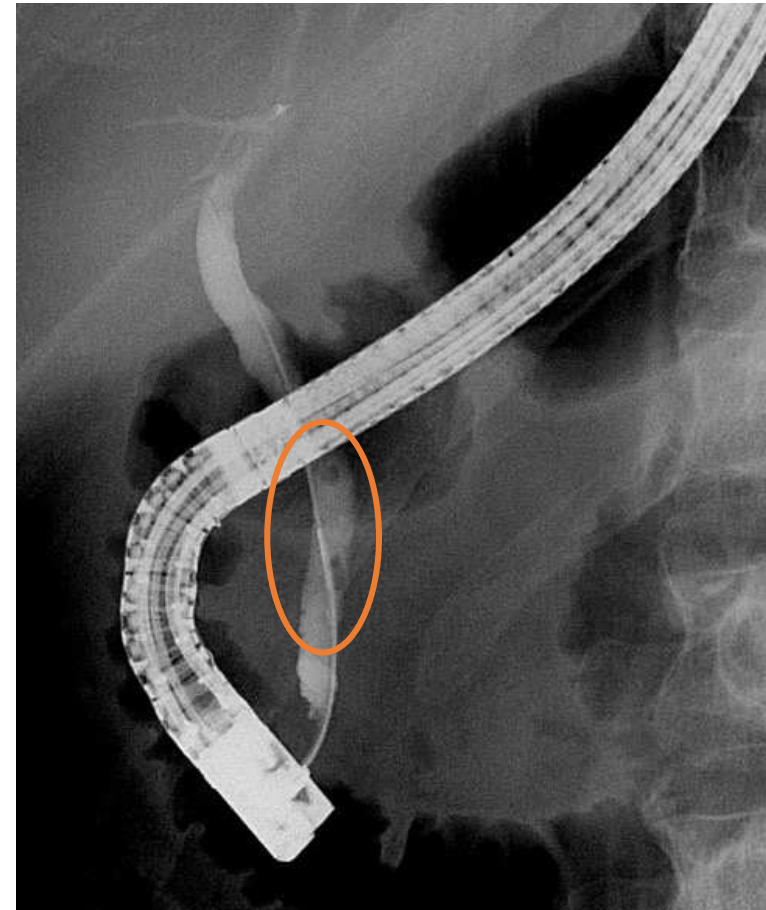
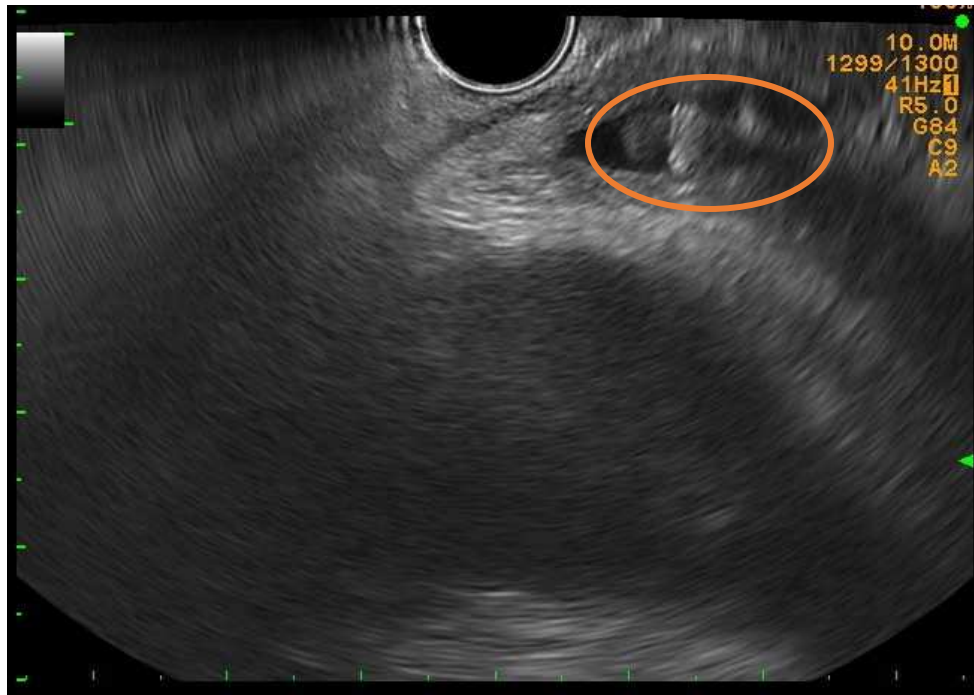
EUS

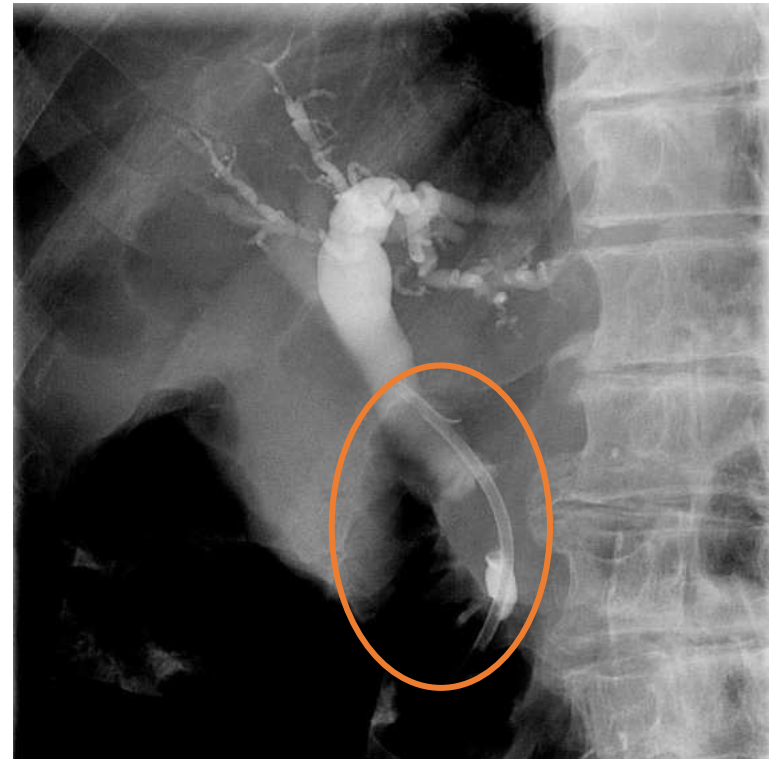
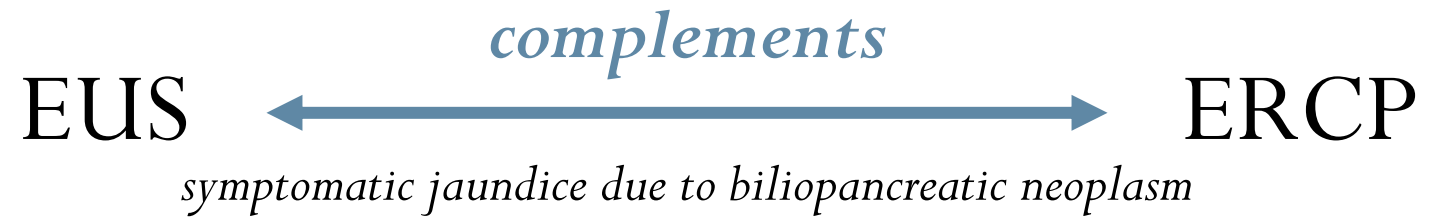
*indicates*

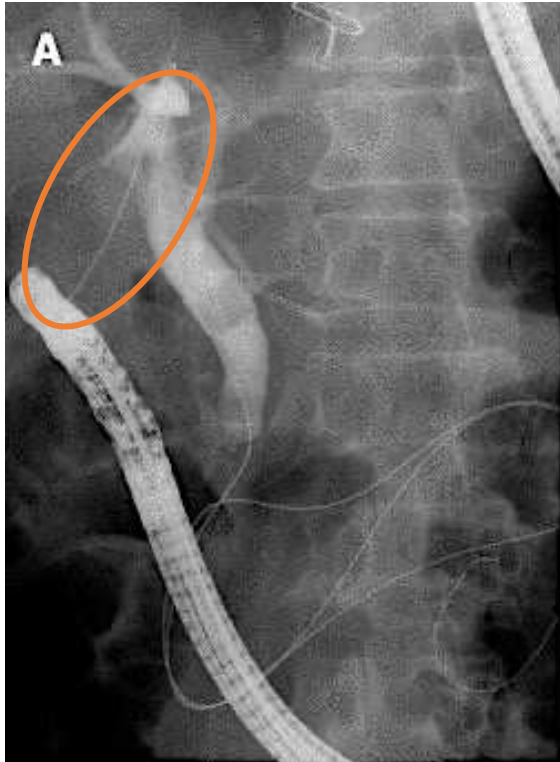
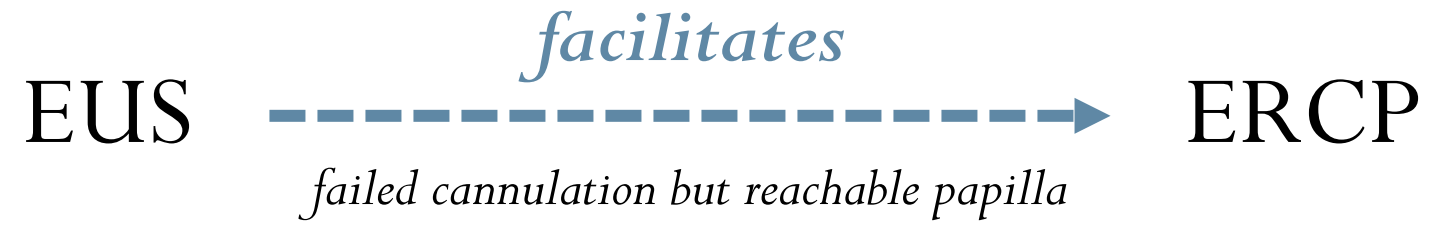


ERCP

*intermediate risk of choledocholithiasis*

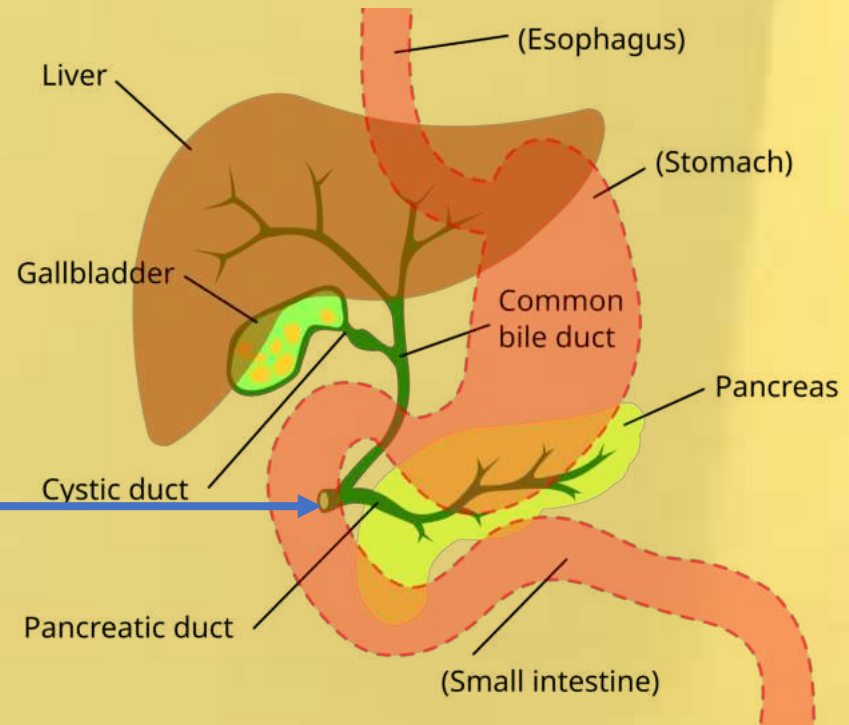
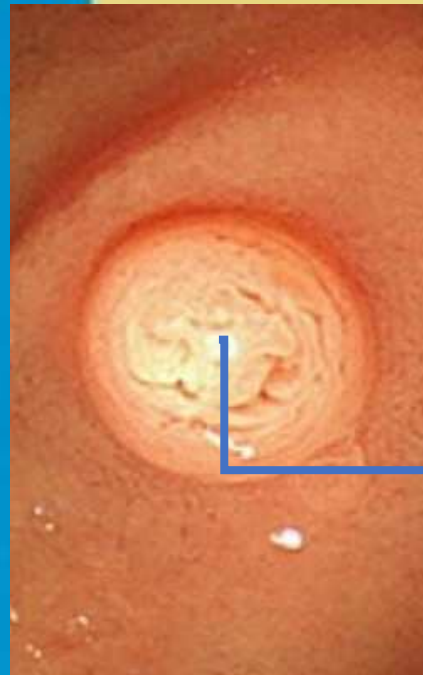


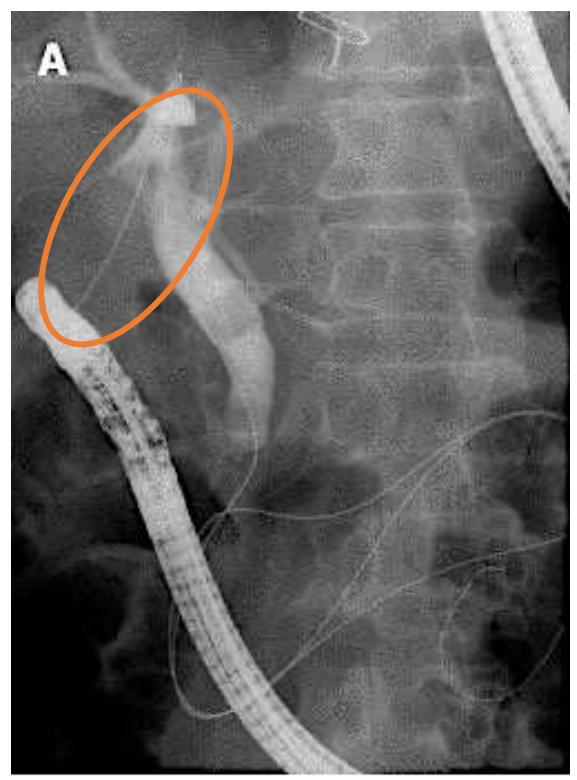
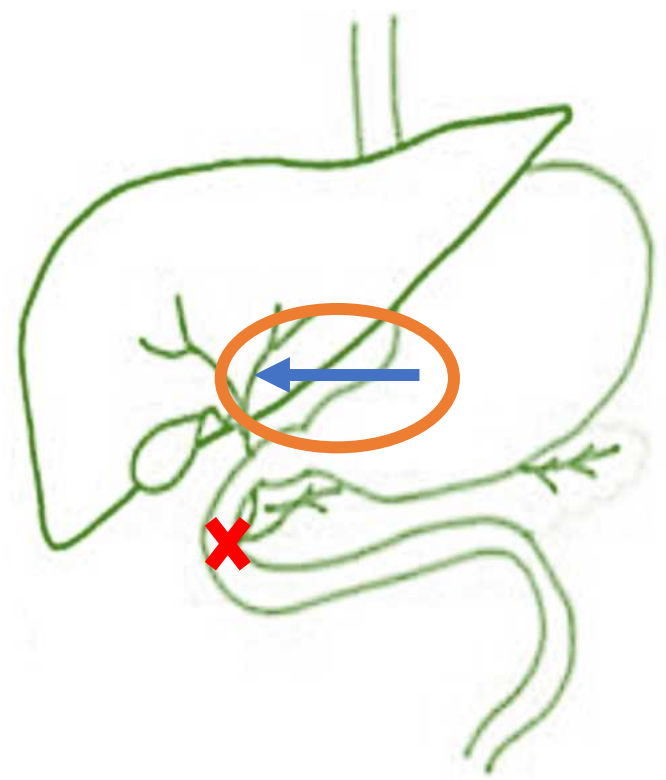
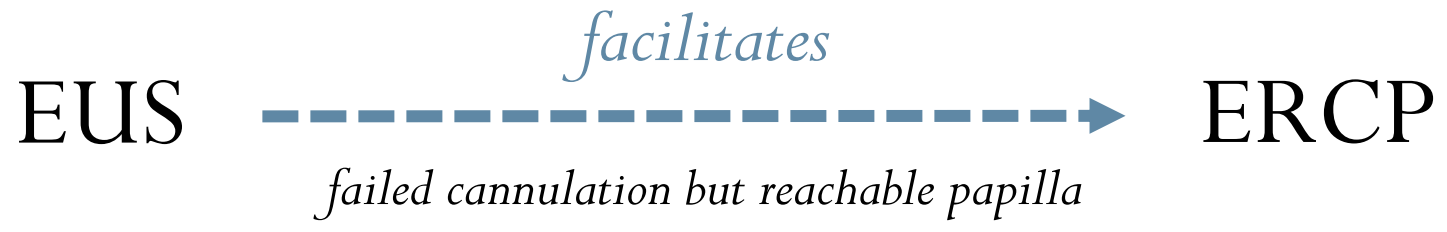






## *Papilla of Vater*



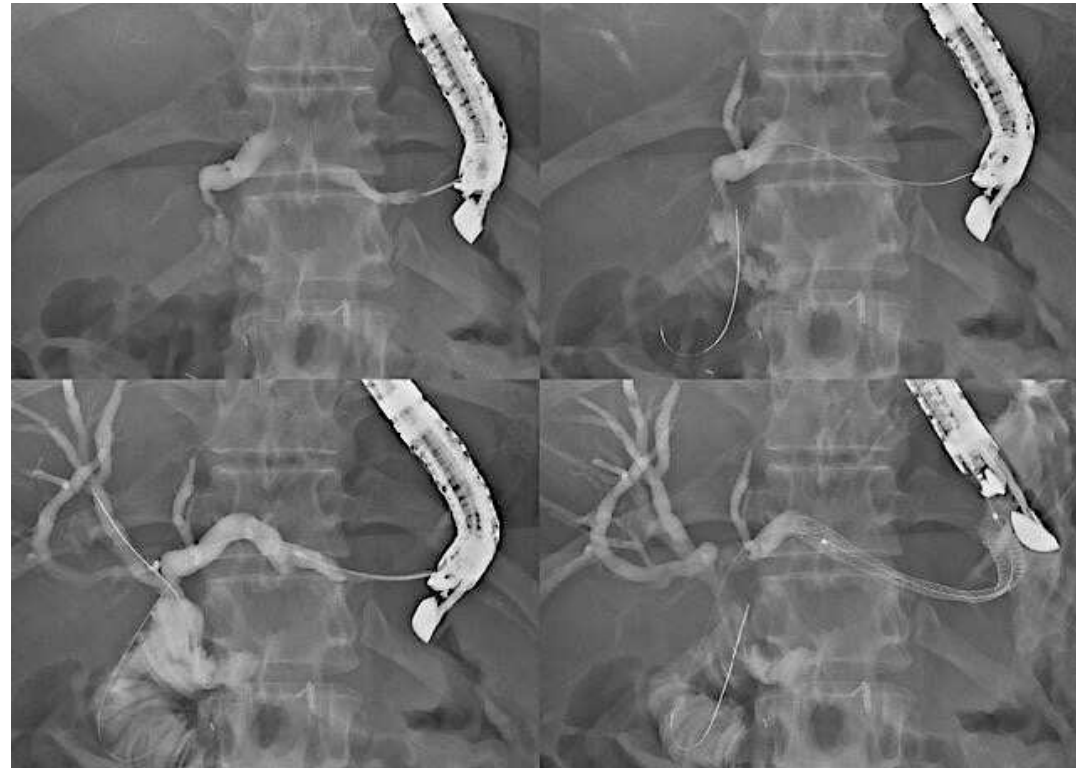
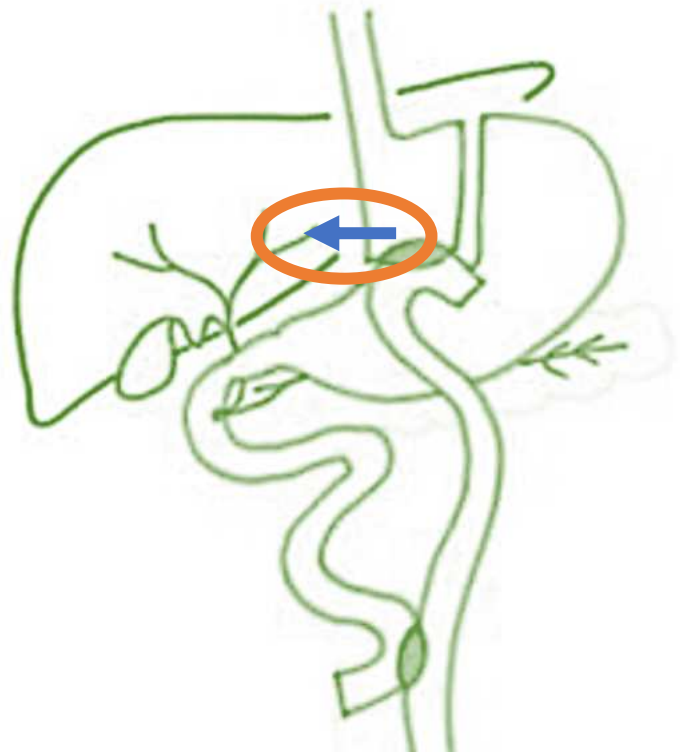


EUS

*substitutes*

ERCP

*unreachable papilla*



# ERCP & EUS

To be done by the **most appropriate endoscopists**

And in the **most suitable conditions**

# TRAINING

**Comprehensive** ERCP/EUS training

Operator-dependent nature

Technical complexity

# TRAINING

## **Comprehensive** ERCP/EUS training

Operator-dependent nature

Technical complexity

*Extended learning curves*

# TRAINING

## **Comprehensive** ERCP/EUS training

Operator-dependent nature

Technical complexity

*Extended learning curves*

***Different paces of learning***

*Trainee's skills*

*Trainer's teaching abilities*

*Training intensity*

*Comprehensiveness of training programs*

*Access to complementary models*

# TRAINING

From a purely *caseload-based* training approach towards a  
**competence-based model**



# TRAINING

Conventional **apprenticeship training** model

| Advantages         | Drawbacks                               |
|--------------------|---|
| High realism       | Limited trainee hands-on exposure       |
| Low cost           | Variability in training experience      |
| Direct mentorship  | Potential for prolonged procedure times |
| Immediate feedback | Potential concerns for patient safety   |

# TRAINING

Conventional **apprenticeship training** model

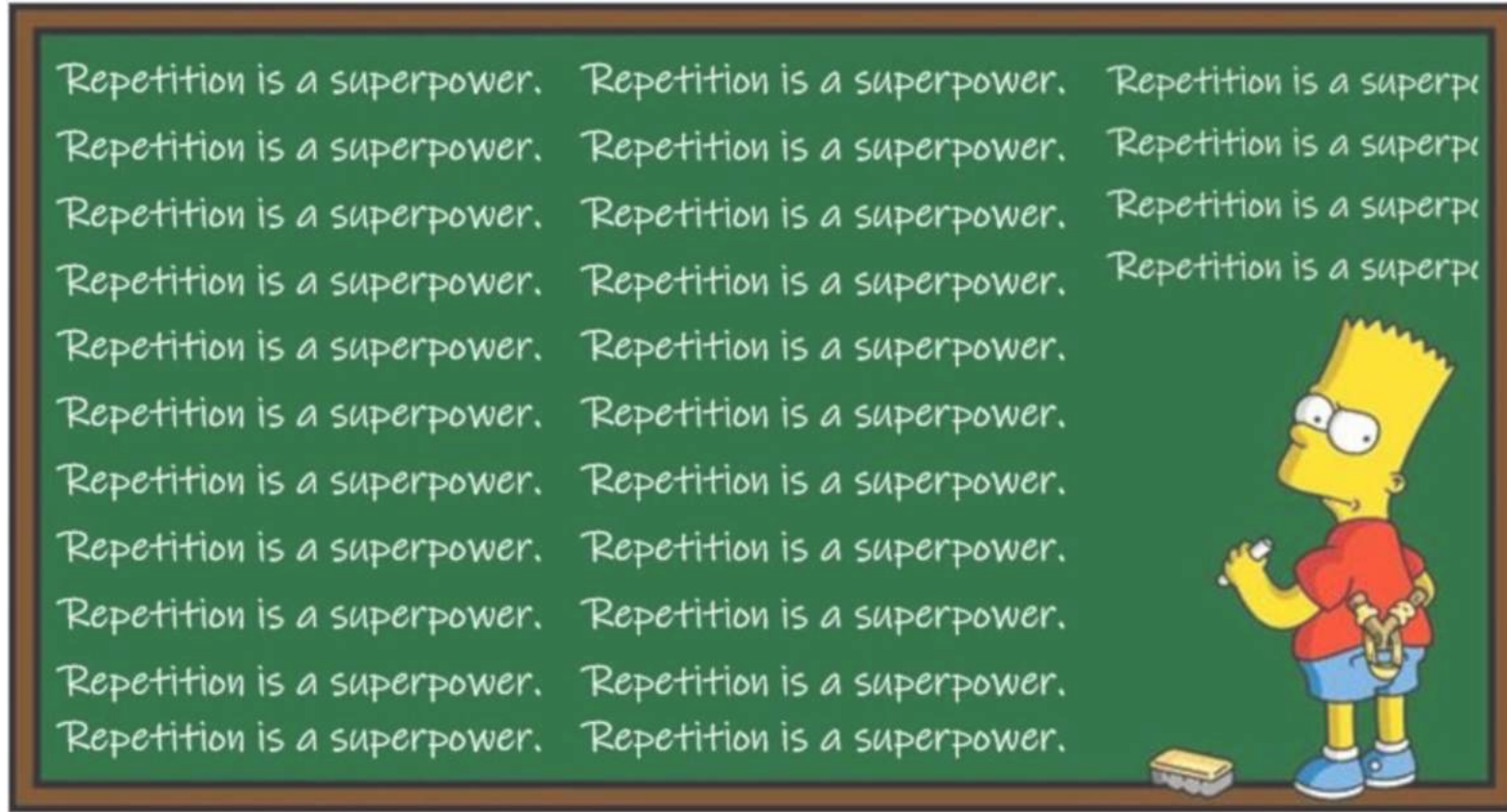
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# TRAINING

**Simulation-based training** could be a solution

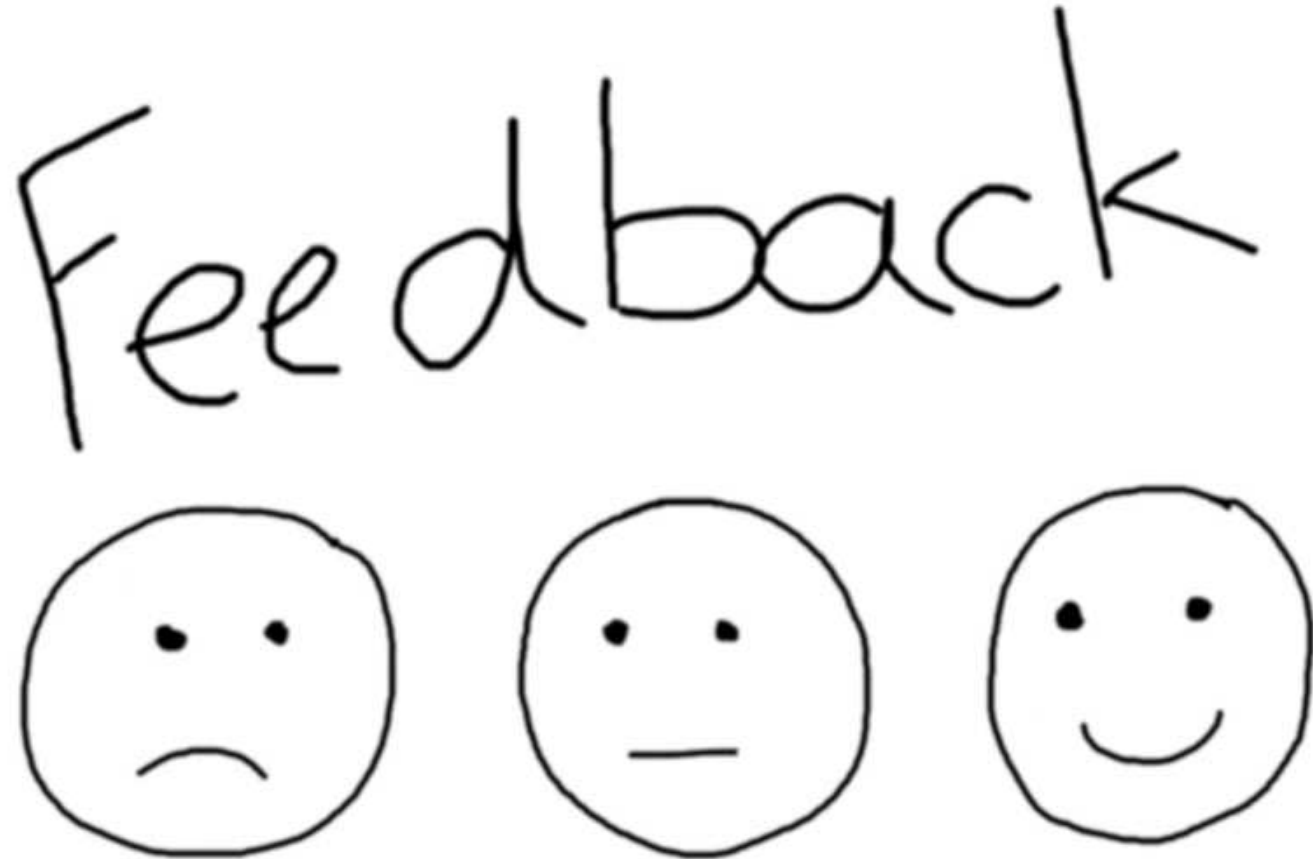


1. Trainees can build their skills at a **pace** that suits them, without the risk of harming patients.



2. Trainees can **repeatedly** practice incremental steps or specific scenarios until they achieve mastery.

3. Simulation training can provide **immediate feedback**, facilitating quicker learning and correction of mistakes.





# *CONSISTENCY IS EVERYTHING*

4. Simulation ensures a **comprehensive**, effective and **standardized** training experience, regardless of the variability in clinical case availability.

5. Simulation may enable **objective assessment** of trainee skills through performance metrics.





# TRAINING

Several simulation-training models:



*Mechanical*

# TRAINING

Several simulation-training models:



*Mechanical*



*In-vivo*

# TRAINING

Several simulation-training models:



*Mechanical*



*In-vivo*



*Ex-vivo*

# TRAINING

Several simulation-training models:



*Mechanical*



*In-vivo*



*Ex-vivo*



*Virtual-Reality*

# TRAINING

Several simulation-training models:



*Lack of availability*

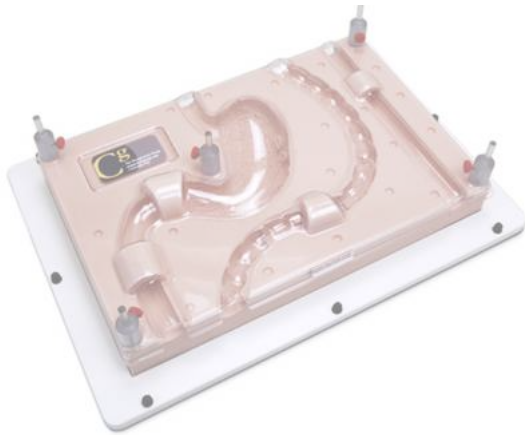
*Lack of trained trainers*

*Lack of dedicated time for training*

*High costs*

# TRAINING

Several simulation-training models:



*Lack of availability*

*Lack of trained trainers*

*Lack of dedicated time for training*

*High costs*

***Lack of validation***

# TRAINING - Gaps

Structured training **programs**

Suitable **trainees**, qualified **trainers**, appropriate training **centers**

Effective **complementary training tools**

# ERCP PERFORMANCE

Requires not only a deep **comprehension of related-AEs**

| AEs                    | Frequency   |
|------------------------|-------------|
| Post-ERCP pancreatitis | 3.5 - 9.7%  |
| Bleeding               | 0.3 - 9.6%  |
| Cholecystitis          | 0.5 - 5.2%  |
| Cholangitis            | 0.5 - 3%    |
| Perforation            | 0.08 - 0.6% |

From mild to life-threatening



# ERCP PERFORMANCE

But also, **identification of related risk-factors**

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Risk factors for ERCP-related AEs

*Patient-related*

Patient age and gender

Bilirubin level

Previous history of post-ERCP pancreatitis

*Procedure-related*

ERCP indication

Cannulation difficulty

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# ERCP PERFORMANCE

But also, **identification of related risk-factors**

---

Risk factors for ERCP-related AEs

*Operator-related?*

Center case volume

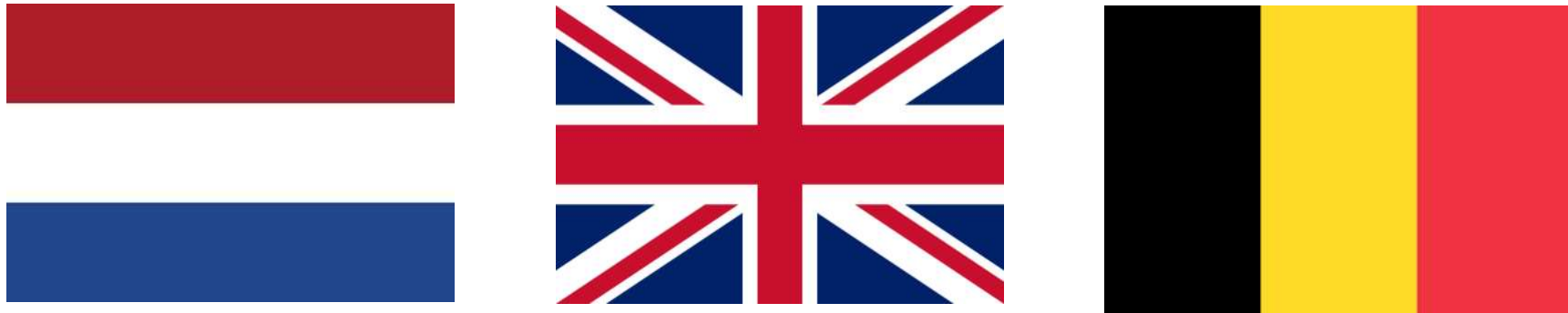
Operator case volume

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# PERFORMANCE

**Volume** ↔ **Outcomes**

**Pancreatic and Esophageal surgery**



***CENTRALIZATION IN HV CENTERS***

Polonski A. J Gastrointest Surg 2019; 23: 2081–2092  
Onete VG, et al. HPB 2015; 17: 736–742  
Gooiker GA, et al. British Journal of Surgery 2014; 101: 1000–1005  
De Wilde RF, et al. British Journal of Surgery 2012; 99: 404–410  
Van Rijssen LB, et al. HPB 2017; 19: 919–926  
Pal N, et al. Journal of Gastrointestinal Surgery 2008; 12: 353–357  
Wouters MWJM, et al. Ann Surg Oncol 2009; 16: 1789–1798  
Munasinghe A, et al. Annals of Surgery 2015; 262: 79–85  
Flamey N, et al. Acta Chirurgica Belgica 2023; 123: 31–35

# PERFORMANCE

## *Challenges...*

1. **Healthcare provider:** potential for inadequate infrastructure, shortage of specialized staff
2. **Patient:** reluctance to travel longer distances, long waiting times, lack of awareness of benefits
3. **Payer:** potential increased costs
4. **Politically:** regional interests, different regulations between public and private, bureaucracy, absence of specialization boards

# PERFORMANCE

## *Challenges...*

1. Healthcare provider: potential for inadequate infrastructure, shortage of specialized staff
2. Patient: reluctance to travel longer distances, long waiting times, lack of awareness of benefits
3. Payer: potential increased costs
4. Politically: regional interests, different regulations between public and private, bureaucracy, absence of specialization boards

## *Lack of reliable data...*

# ERCP PERFORMANCE - Gaps

If the hypothesis of **ERCP centralization** is validated,  
a **restructure of ERCP services** could be considered...

# RESEARCH QUESTIONS

1. **How** should ERCP & EUS training be?
2. How is ERCP & EUS training now?
3. **Who** should do ERCP & EUS ?
4. **Which** interventions could improve ERCP training?
5. **Where** should ERCP be performed?

1. How should ERCP & EUS training be?



## Curriculum for ERCP and endoscopic ultrasound training in Europe: European Society of Gastrointestinal Endoscopy (ESGE) Position Statement



### Authors

Gavin Johnson<sup>1</sup>, George Webster<sup>1</sup>, Ivo Boškoski<sup>2</sup>, Sara Campos<sup>3</sup>, Stefan Karl Gölder<sup>4</sup>, Christoph Schlag<sup>5</sup>, Andrea Anderloni<sup>6</sup>, Urban Arnelo<sup>7</sup>, Abdenor Badaoui<sup>8</sup>, Noor Bekkali<sup>9</sup>, Dimitrios Christodoulou<sup>10</sup>, László Czako<sup>11</sup>, Michael Fernandez Y Viesca<sup>12</sup>, Istvan Hritz<sup>13</sup>, Tomas Hucl<sup>14</sup>, Evangelos Kalaitzakis<sup>15,16</sup>, Leena Kylänpää<sup>17</sup>, Ivan Nedoluzhko<sup>18</sup>, Maria Chiara Petrone<sup>19</sup>, Jan-Werner Poley<sup>20</sup>, Andrada Seicean<sup>21</sup>, Juan Vila<sup>22</sup>, Marianna Arvanitakis<sup>12</sup>, Mario Dinis-Ribeiro<sup>23</sup>, Thierry Ponchon<sup>24</sup>, Raf Bisschops<sup>25</sup>

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**Consensus** among endoscopists in ERCP/EUS training

The outcome of Delphi process, formulating questions in the PICO format, using GRADE framework

**Recommendations**, with quality of **evidence** and strength of recommendation

**Framework** to develop and maintain skills in ERCP & EUS

## ERCP and EUS training in general

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### Pre-requisites

*Trainees:* prior competence in UGIE, familiarity with imaging

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### Training conditions

*Trainers:* highly experienced

*Facilities:* HV centers, dedicated surgery and interventional radiology, MDM, research, service improvement initiatives

*Program:*  $\geq$  12-month;  $>$  300 ERCP /  $>$  250 EUS; structured and systematic, access to simulators and other learning resources

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### Competence

Regular, formal, with validated tools focusing on both numbers and performance

### assessment

measures; prior to commencing independent practice; self-assessment

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### Continuous learning

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Web-based survey to determine crucial points  
in the **professional development** of  
**53** ERCP Experts worldwide



## To Become a “Chief”:

**Formal** training **combining** ERCP/EUS

In a **different** department

Start **early** (average age 31yo)

**Long** period of training (average 27m)

**Research** in ERCP/EUS (76.5%)

## Investments:

“Choosing the right mentor” (n=7)

“Doing a fellowship” (n=8)

“Maintaining continuous learning” (n=8)

“Observing other Experts” (n=10)

**“Time and practice”** (n=14)

*“Practice isn’t the thing you do once you’re good.  
It is the thing you do that makes you good”*

*Gladwell M, “Outliers”*





## Developments outside endoscopy:

**Sports** (sailing, fencing, climbing) (n=10)

Research (translational, clinical, or bioengineering) (n=8)

*“Sports teach you to manage performance anxiety and stress, change in tactics, and mental flexibility”*



# Obstacles

**“Lack of dedicated time for training”** (n=11)

**“Peer competition”** (n=10)

“Lack of resources” (n=8)

“Lack of procedure volume” (n=7)

“Lack of support” (n=5)

“Time constraints with family” (n=5)



# Advices to be followed:

“Be **resilient** and don't give up”

“Be **careful and concerned with patient safety**”

“Observe others”

“Be **patient** and take your time”

“Be **responsible** and know your limits”

“**Work** hard”

“Keep on learning”



# To achieve long-term success in ERCP never forget...

## “Personal life”

“Having the possibility of teaching”

“Providing high work quality”

“Optimizing your patients’ outcomes”

“Developing a good relationship with your team”

“Collaborating in GI societies”



*“It is the supportive relationships we build, and we are outside  
our job that define the future professionals we will become”*

2. How is ERCP & EUS training now?

# Web-based survey

*Aim: How ERCP & EUS training programs are conducted in Europe*

41 experts, **41** departments (out of 50; 82%)

30 trainees (out of 70; 42.9%)

**18** countries



| <i>Application process</i>                     | <i>Training centers</i>          | <i>Trainers</i>                         |
|--|----------------------------------|---|
| Interview, CV,<br>recommendation letter: 87.8% | Combined ERCP/EUS training: 100% | Experienced trainers: 80.5%             |
|  | Adequate facilities: >90%        | <i>Train the trainers</i> course: 29.3% |
|  | $\geq 12$ months: 53.7%          |   |

| <i>Volume of procedures</i>   | <i>Training curriculum</i>                                  | <i>Competence assessment:</i>  |
|---|---|--|
| <p><b>≥ 300 ERCP / ≥ 250 EUS: 3%</b></p> <p><i>100-150 ERCP: 43%</i></p> <p><i>up to 150 EUS: 69%</i></p> | <p>Formal curriculum: 53.7%</p><br><p>Simulators: 27.3%</p> | <p>65.9%</p> <p>Prior to independence: 29.6%</p> <p>Validated tools: 25.9%</p> <p>Self-performance register: 36.7%</p> |

## *General opinion regarding training:*

### *TRAINEES*

Too many trainees simultaneously

Lack of procedure volume

Trainer's inability to let the trainee "touch" the scope

### *TRAINERS*

Lack of time

Burden with clinical and bureaucratic requirements

Lack of formal support

No remuneration



3. Who should do ERCP & EUS?

# Web-based survey

## Aim:

1. **Current application** process for ERCP & EUS training
2. TPD /Experts' values and beliefs regarding critical personal attributes for **selectively choosing** trainees
3. TPD/Experts' values to **disqualify** a trainee
4. Perspectives between TPD/Experts and Trainees' opinions



*L'art de la conversation, René Magritte*

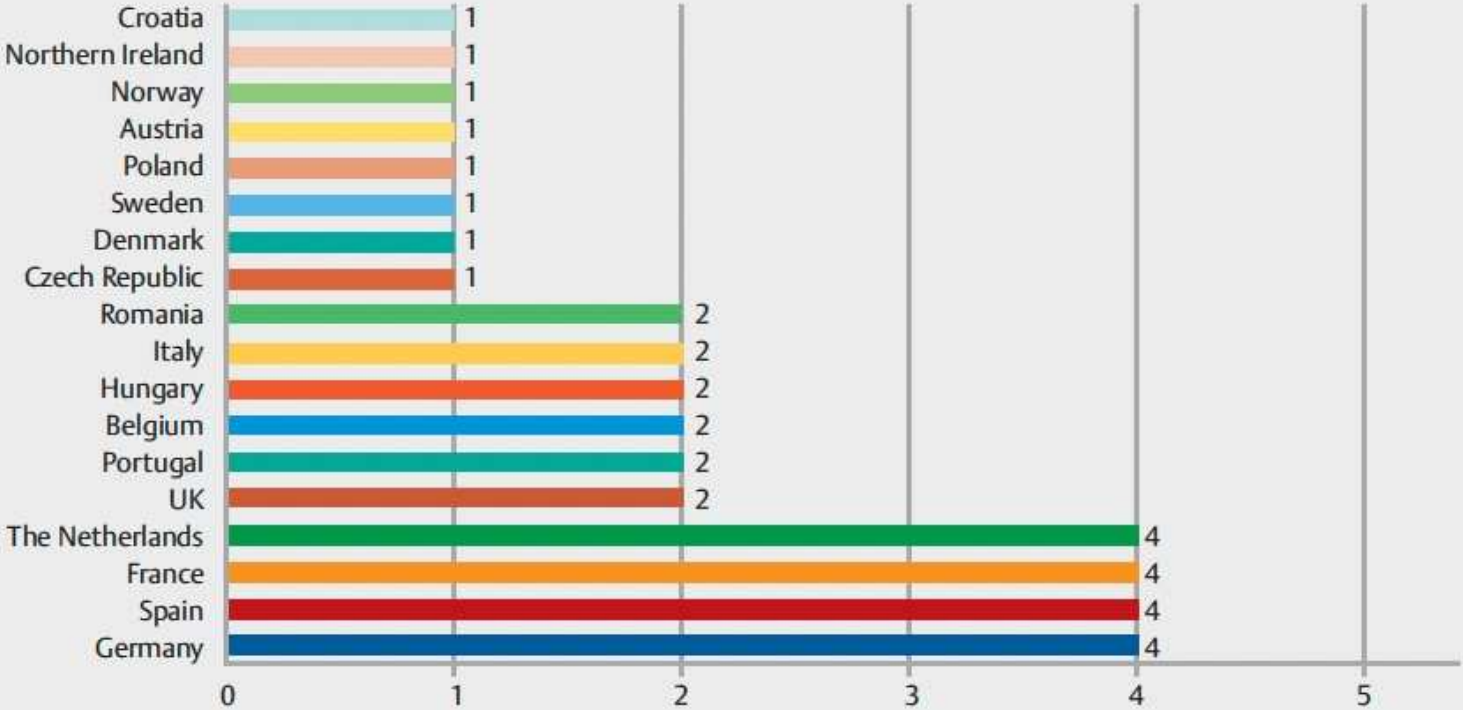
*Who will excel in advanced endoscopy? A study assessing Experts' criteria and perceptions regarding selection of ERCP/EUS trainees*

Endoscopy International Open 2023 Mar 23;11(3): E268-E275

Best moderated poster presentation prize in Education in GI at UEG Week 2022

S. Campos, J. Devière, M. Arvanitakis

Participants: 36 TPD/Experts, 25 Trainees, 18 European countries

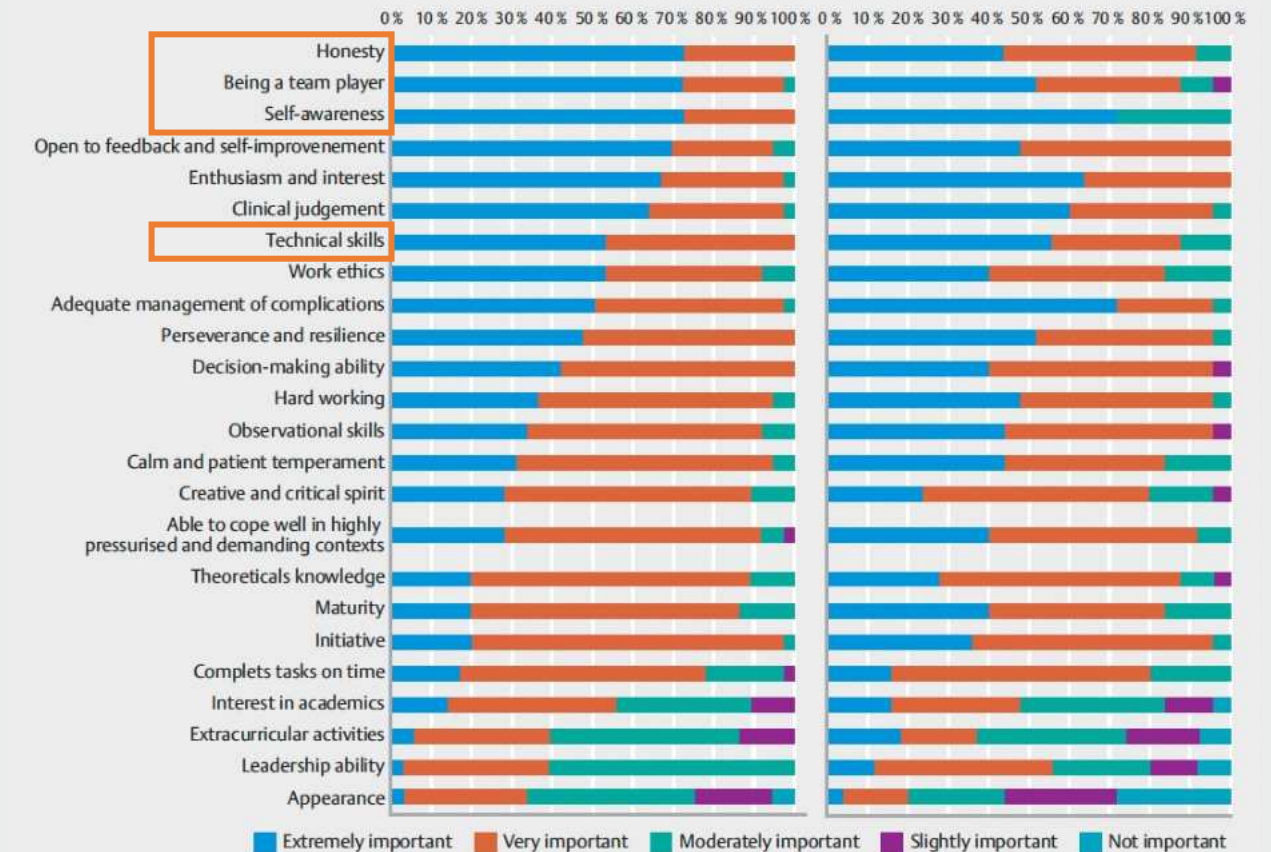


# Characteristics to excel

Mostly related to **personality traits**  
And **cognitive skills**

**Technical skills as 7<sup>th</sup>**

High agreement between TPD/Experts  
and trainees



## Criteria for disqualification

72.7% identified fellows below the expected

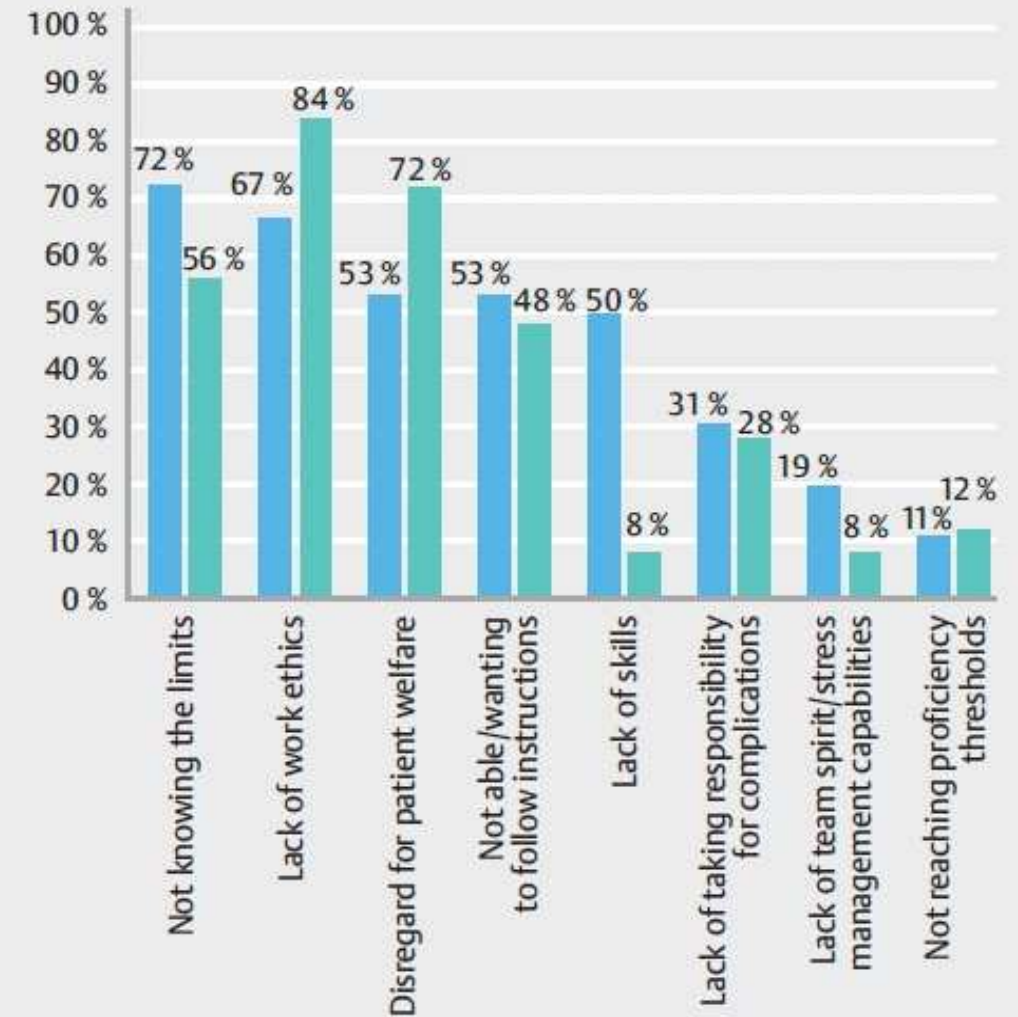
22.2% disqualified a trainee

Mainly due to:

“disregard for patient welfare”

“lack of work ethics”

High agreement between TPD/Experts and trainees





5. *What else* could be improved  
in ERCP training?

# Simulation-based training

Increasingly proposed to possibly accelerate trainee **learning curves**  
in high-risk procedures, while lowering **patient risk**

# Boškoski-Costamagna ERCP Trainer

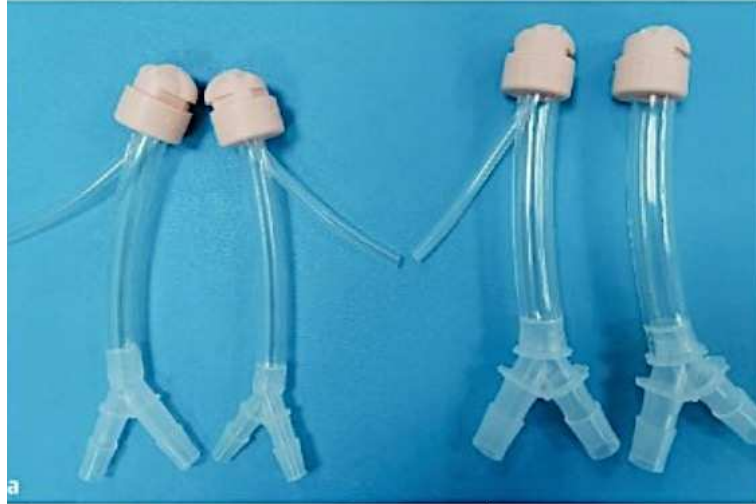


Van der Wiel S et al. Endoscopy International Open Endoscopy International Open 2018; 06: E758–E765

*Face and content validity of a biological papilla designed for Boškoski-Costamagna ERCP simulator*  
Gastrointestinal Endoscopy 2023 Nov; 98(5):822-829.e1. S. Campos, I. Boskoski, T. Voiosu, M. Arvanitakis, G. Costamagna, J. Devière



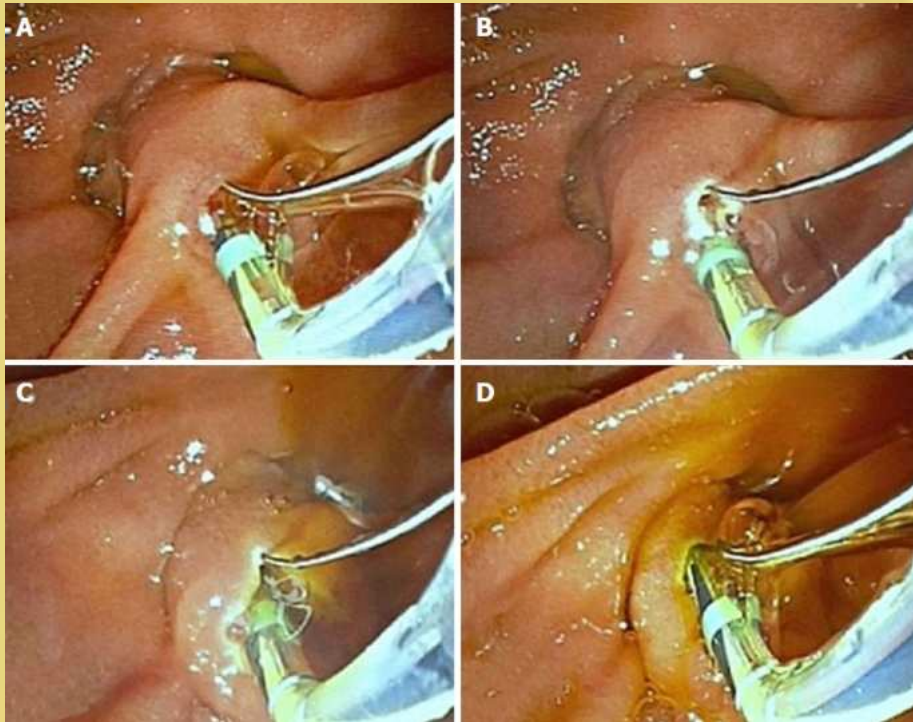
# Boškoski-Costamagna ERCP Trainer



Voiosu T et al. Endoscopy International Open, 25 Jan 2021, 9(2):E145-E151

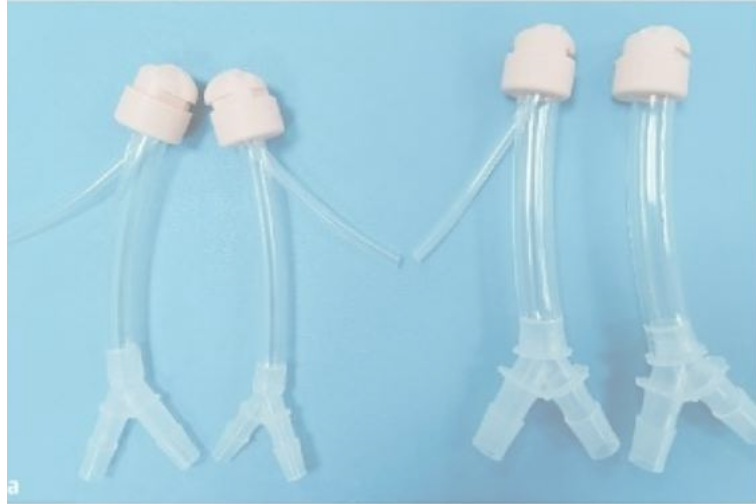
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## *Biliary sphincterotomy*



- Key therapeutic step
- High-risk step
- Associated with the endoscopist's experience

# Boškoski-Costamagna ERCP Trainer

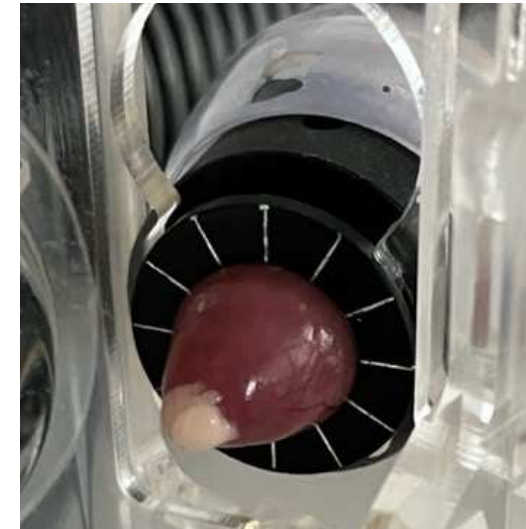
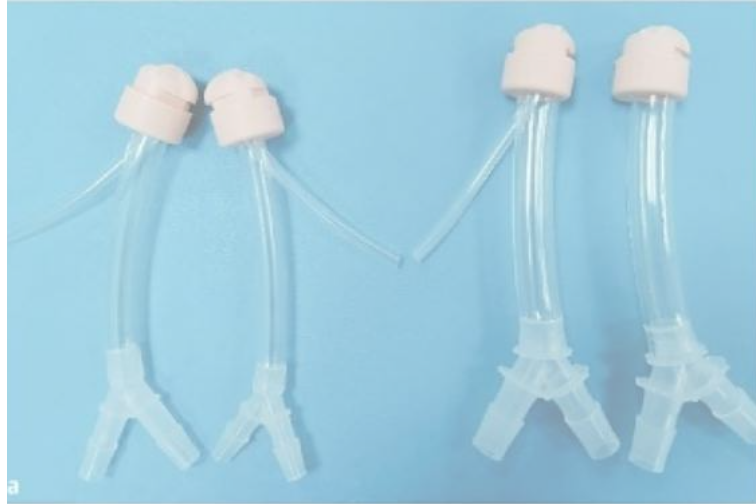


↓ *HAPTIC FEEDBACK*

Van der Wiel S et al. Endoscopy International Open 2019; 07: E757–E761

Face and content validity of a biological papilla designed for Boškoski-Costamagna ERCP simulator  
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# Boškoski-Costamagna ERCP Trainer



# Novel biological papilla



# Novel biological papilla



*Sphincterotomy*



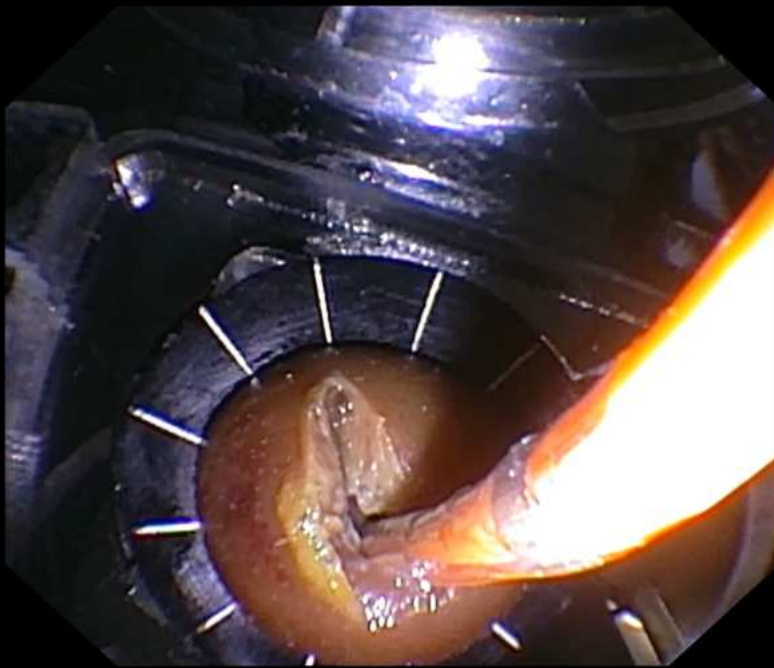
*Precut*



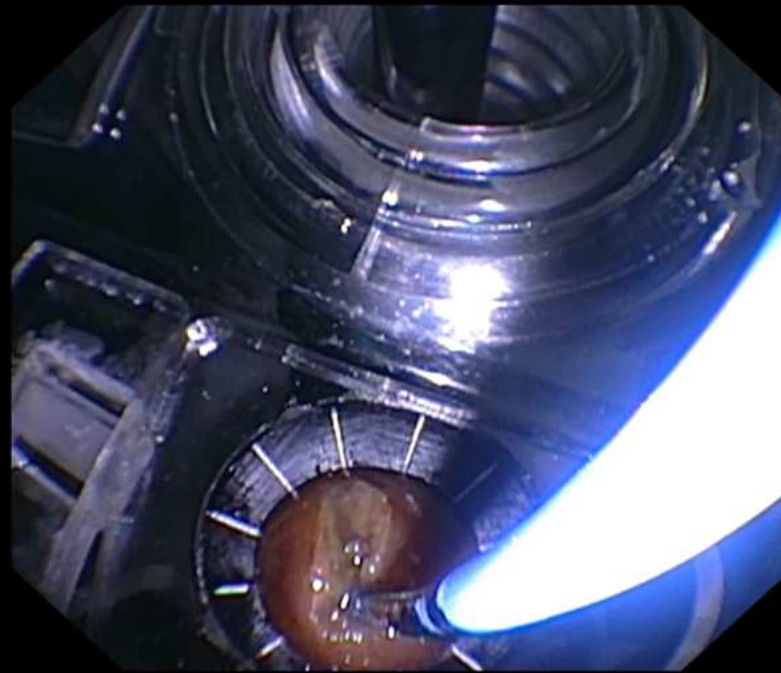
*Fistulotomy*



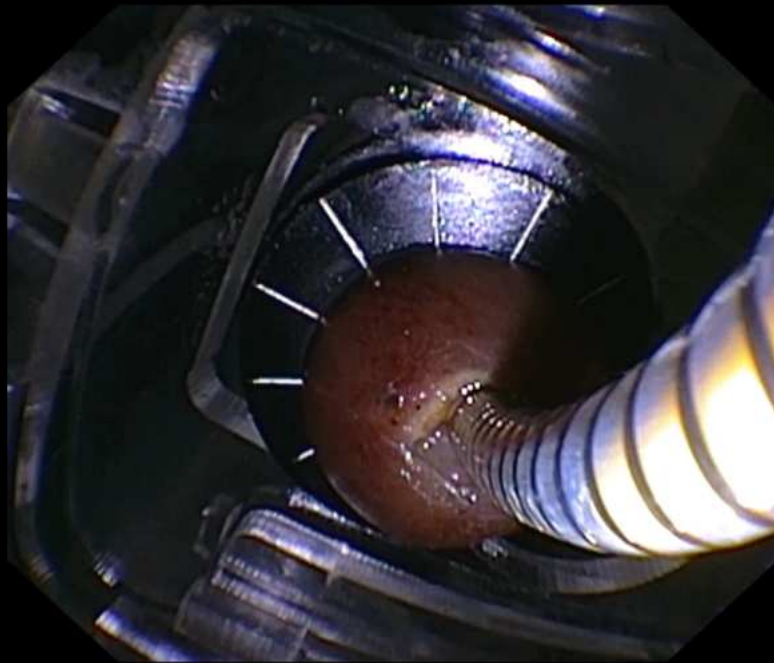
*Balloon  
papillary  
dilation*



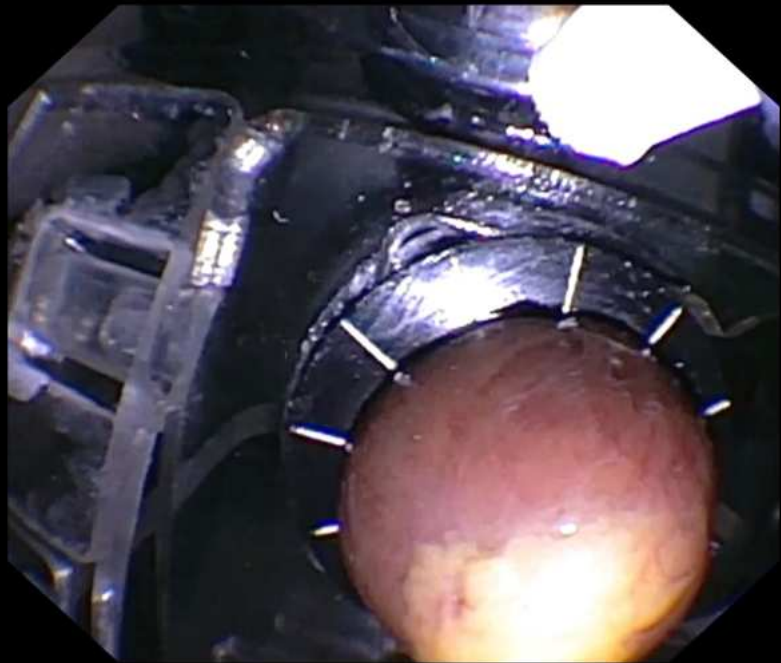
*Balloon  
extraction*



*Stent  
placement*



*Papillectomy*





# Novel biological papilla

## - *Face and content validation* -

10 "non-experienced" Vs 9 "experienced" participants

Training **sphincterotomy, precut, papillectomy**

Questionnaire to rate appreciation on the **realism** and **didactic value**

# FACE validity

General appearance: 4/5

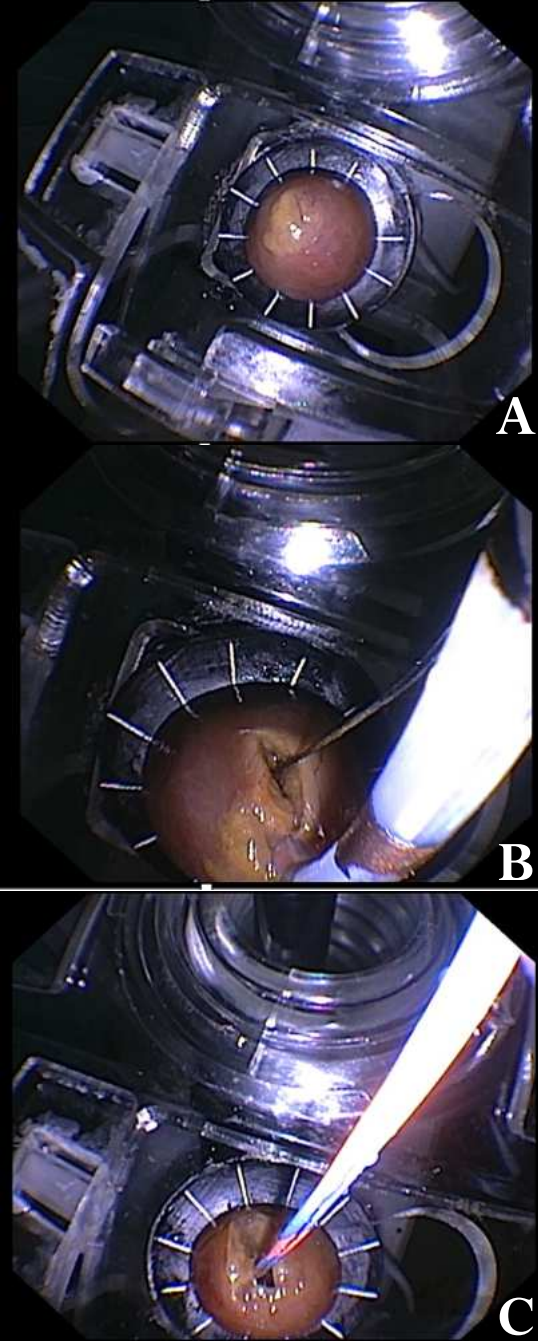
Sphincterotomy: 4/5

Precut: 4/5

Papillectomy: 5/5

No statistically significant differences regarding between groups

Overall realism: **ICC = 0.743**; 95% CI (0.237-0.969)



# CONTENT validity

Expertise gained with this papilla is **transferrable into clinical setting: 5/5**

Useful to be included in an ERCP **training curriculum: 5/5**

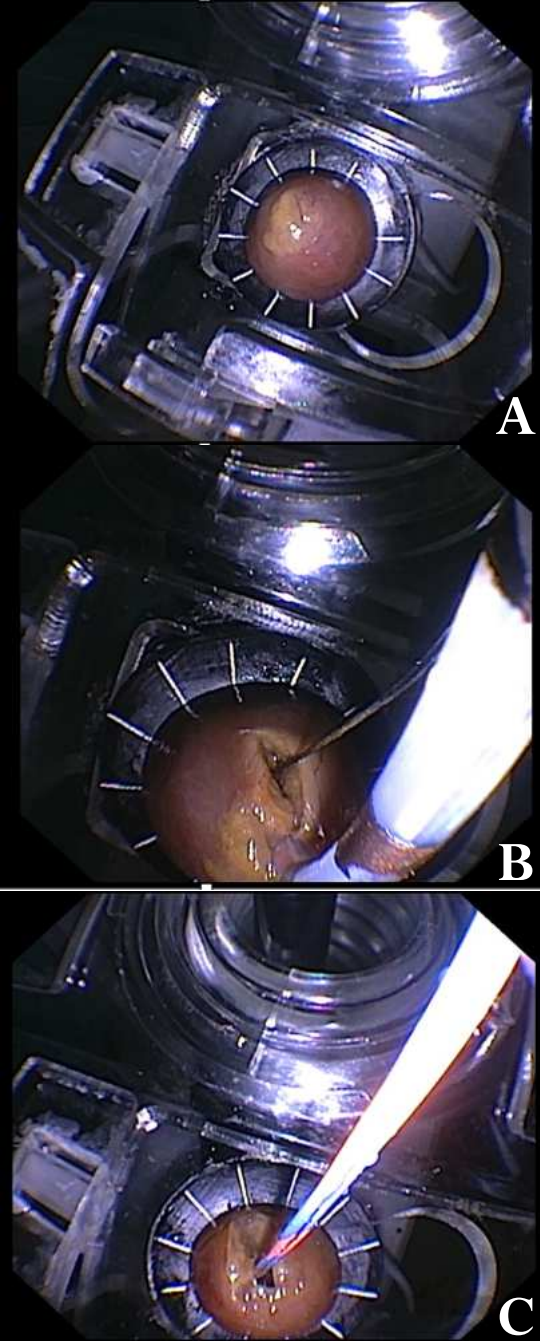
Useful to be included in training novice endoscopists: 5/5

Useful to be included in training **intermediate** endoscopists: 5/5

Useful to be included in training experienced endoscopists: 3/5

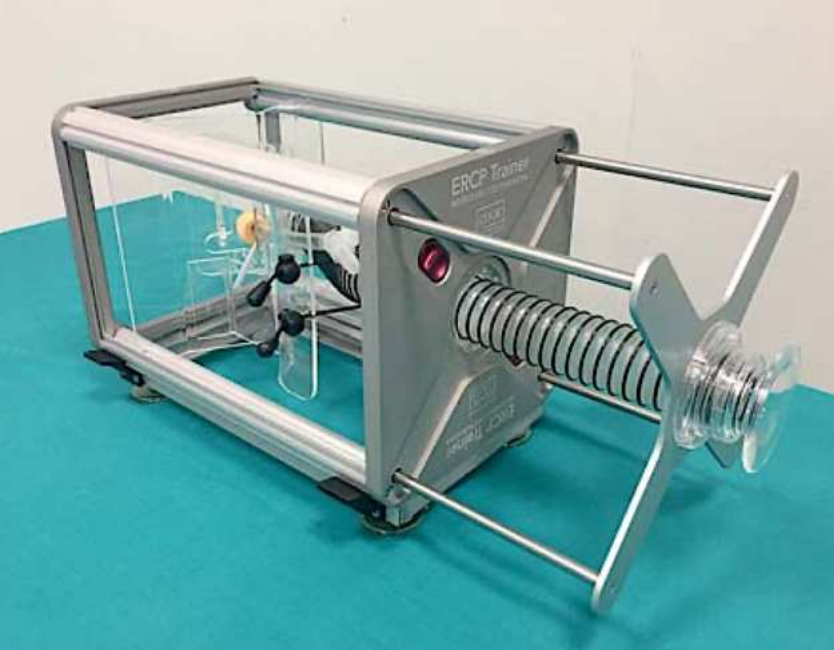
Useful for (re) certification in ERCP: 3/5

**Overall realism: ICC = 0.858**; 95% CI (0.555-0.977)



# PREDICTIVE validity

## Boškoski-Costamagna ERCP Trainer

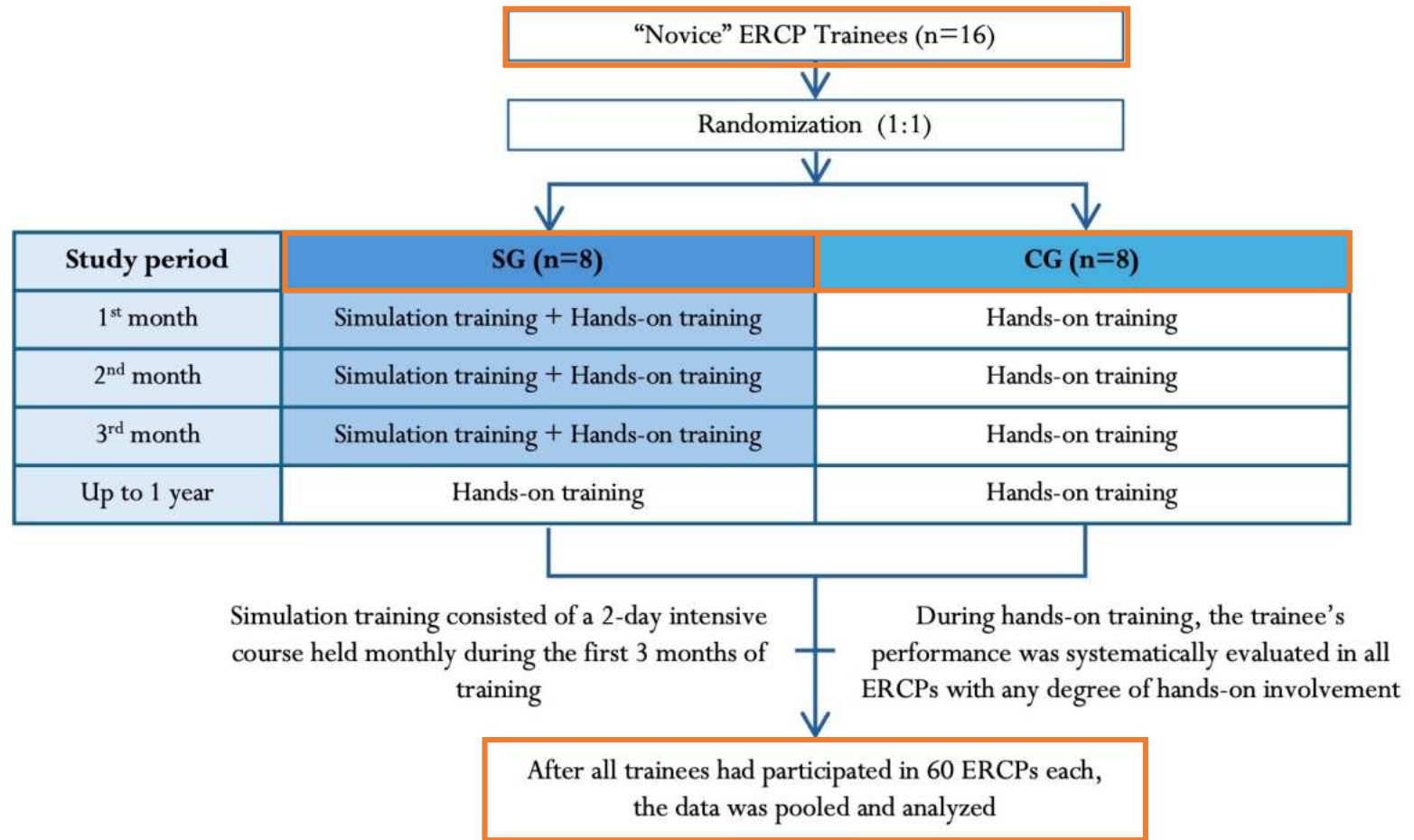


Prospective, multicenter, parallel arm, RCT, 1-year duration

- **Primary outcome:** Overall trainee's competence rate
- **Secondary outcomes:** biliary cannulation success, AEs



*ERCP Simulation-Training course, September 2022*

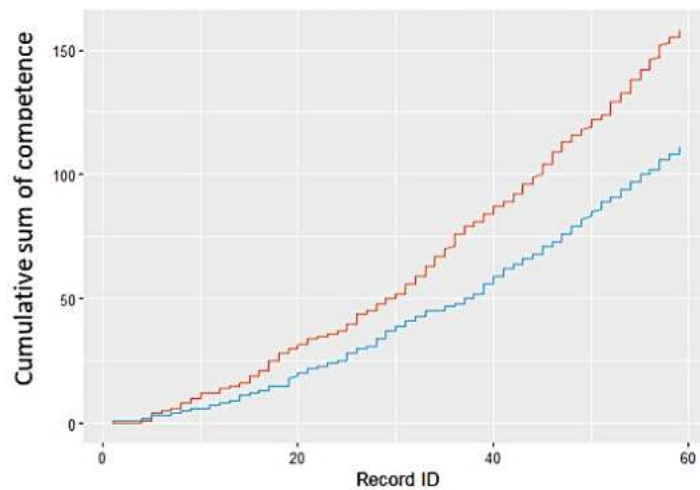


# 1,106 ERCPs: **Simulation > Control**

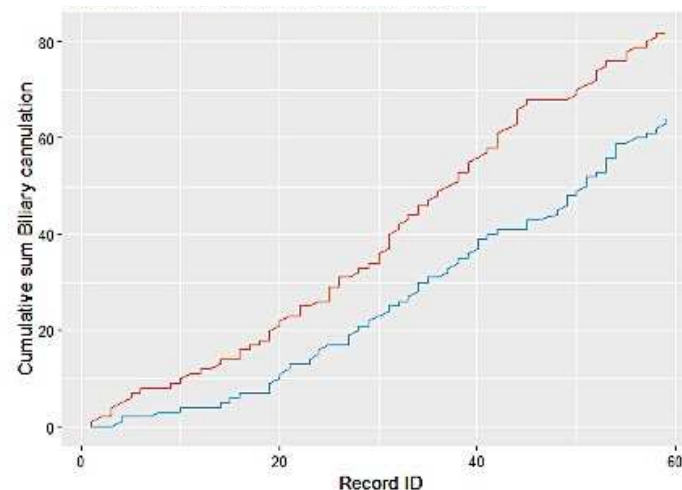
*Native biliary cannulation success rate* (SG=52%, CG=42%,  $p<0.001$ )

*Biliary cannulation time* (SG=3(6)min, CG=5(8)min,  $p<0.001$ )

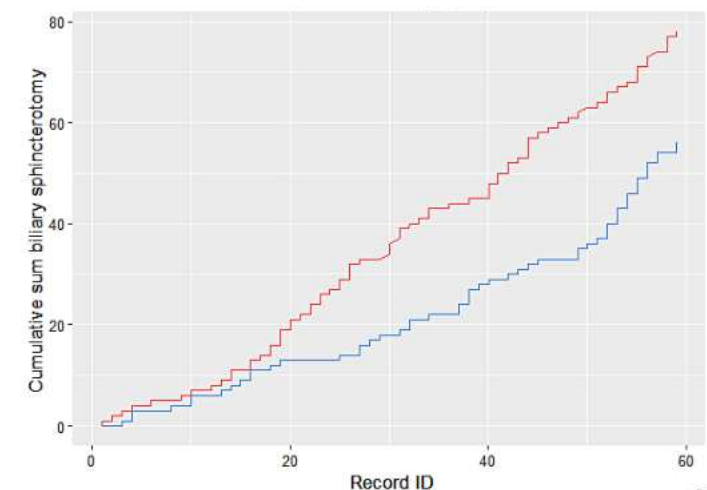
*Overall competence*



*Biliary cannulation*



*Biliary sphincterotomy*



Study group  
— Study group  
— Control group

*AE: no significant differences*

6. Where should ERCP be performed?





Is there a relation between  
endoscopists' and centers'  
**volume** and ERCP **outcomes**?

*The impact of ERCP volume per center and endoscopist on ERCP outcomes: a systematic review and a meta-analysis*

Gastrointestinal Endoscopy, 2023 Sep; 98(3):306-315.e14

Presentation as free-paper session in Prevention and Treatment of ERCP related adverse events in ESGE 2023

S. Campos, A. Papaefthymiou, T. Florou, A. Facciorusso, M. Arvanitakis, J. Devière, P. Gkolfakis

**Aim:** systematic review and meta-analysis

**Primary outcome:** impact of endoscopists' and centers' **volume** on ERCP **success**

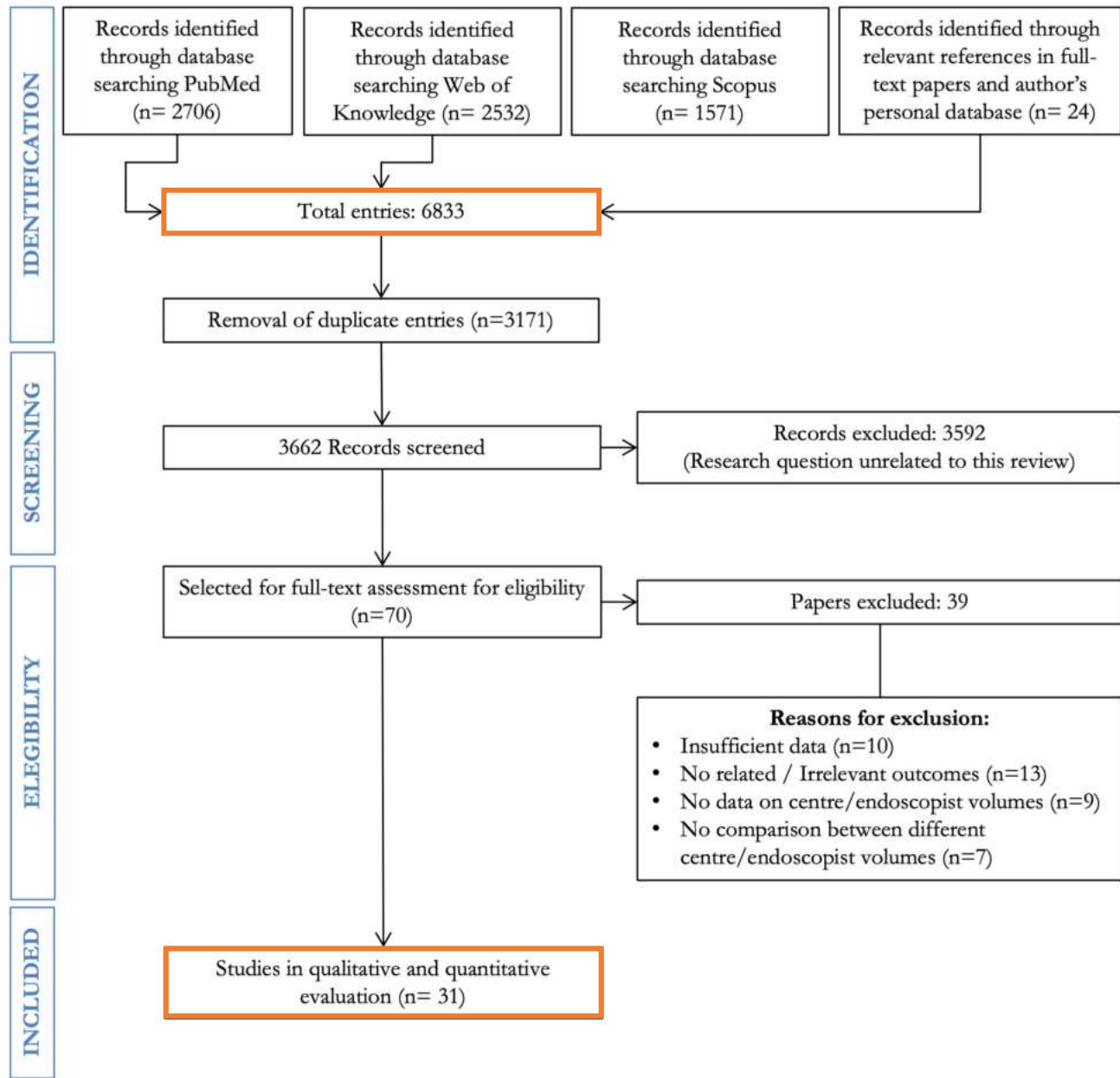
**Secondary outcomes:** overall and specific **AEs** rates

*The impact of ERCP volume per center and endoscopist on ERCP outcomes: a systematic review and a meta-analysis*

Gastrointestinal Endoscopy, 2023 Sep; 98(3):306-315.e14

Presentation as free-paper session in Prevention and Treatment of ERCP related adverse events in ESGE 2023

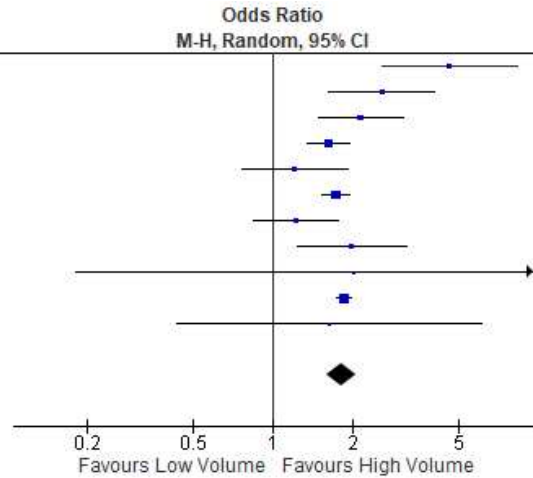
S. Campos, A. Papaefthymiou, T. Florou, A. Facciorusso, M. Arvanitakis, J. Devière, P. Gkolfakis



# Procedure success

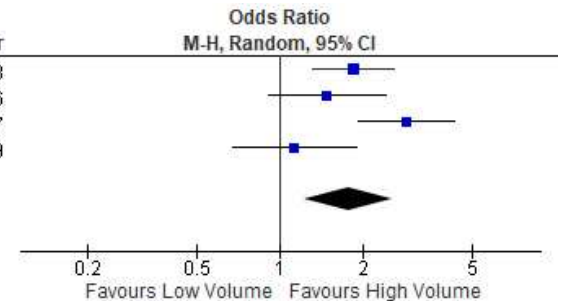
## Endoscopists

| Study or Subgroup   | High Volume |              | Low Volume |              | Weight        | Odds Ratio          |                     | Year |
|---|-------------|--------------|------------|--------------|---------------|---------------------|---------------------|------|
|   | Events      | Total        | Events     | Total        |               | M-H, Random, 95% CI |                     |      |
| Freeman 1996  | 1144        | 1158         | 1125       | 1189         | 4.1%          | 4.65                | [2.59, 8.34]        | 1996 |
| Freeman 2001  | 637         | 660          | 1192       | 1303         | 6.0%          | 2.58                | [1.63, 4.08]        | 2001 |
| Vitte 2007  | 919         | 971          | 644        | 722          | 8.4%          | 2.14                | [1.49, 3.08]        | 2007 |
| Kapral 2008   | 2126        | 2447         | 976        | 1215         | 16.5%         | 1.62                | [1.35, 1.95]        | 2008 |
| Wang 2009   | 1948        | 2015         | 649        | 676          | 6.1%          | 1.21                | [0.77, 1.91]        | 2009 |
| Cotè 2013   | 7574        | 8030         | 6777       | 7484         | 20.3%         | 1.73                | [1.53, 1.96]        | 2013 |
| Voiosu 2018   | 957         | 1021         | 760        | 822          | 8.5%          | 1.22                | [0.85, 1.75]        | 2018 |
| Mariani 2019  | 1114        | 1197         | 169        | 194          | 5.7%          | 1.99                | [1.23, 3.19]        | 2019 |
| Han 2019  | 68          | 69           | 67         | 69           | 0.3%          | 2.03                | [0.18, 22.92]       | 2019 |
| Harvey 2020   | 38896       | 41492        | 11380      | 12790        | 23.1%         | 1.86                | [1.73, 1.99]        | 2020 |
| Caglar 2020   | 49          | 59           | 12         | 16           | 0.9%          | 1.63                | [0.44, 6.12]        | 2020 |
| <b>Total (95% CI)</b>   |             | <b>59119</b> |            | <b>26480</b> | <b>100.0%</b> | <b>1.81</b>         | <b>[1.59, 2.06]</b> |      |
| Total events  | 55432       |              | 23751      |              |               |                     |                     |      |
| Heterogeneity: Tau <sup>2</sup> = 0.02; Chi <sup>2</sup> = 23.26, df = 10 (P = 0.010); I <sup>2</sup> = 57% |             |              |            |              |               |                     |                     |      |
| Test for overall effect: Z = 8.95 (P < 0.00001)   |             |              |            |              |               |                     |                     |      |



**> 81% if by HV endoscopists**  
**> 77% in HV centers**

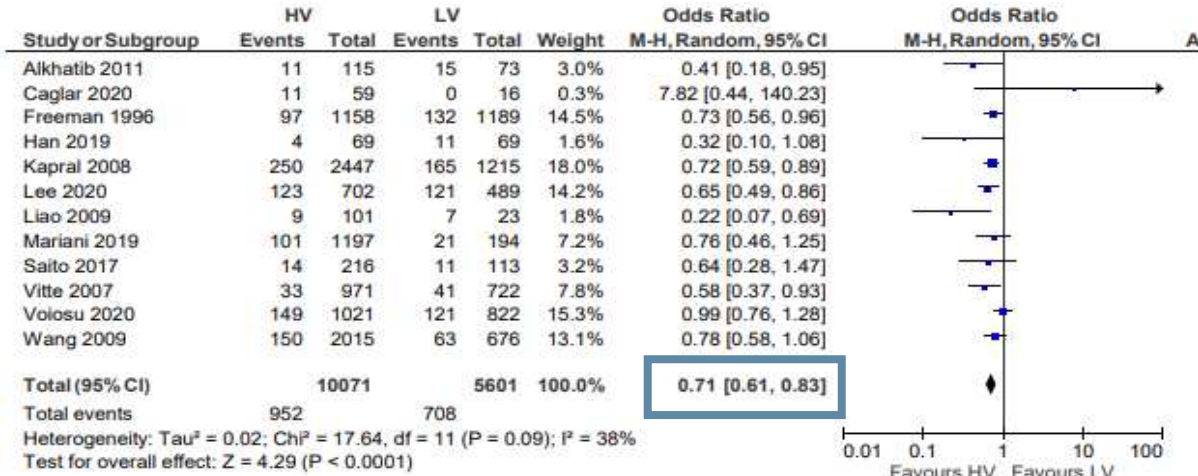
| Study or Subgroup  | High Volume |             | Low Volume |             | Weight        | Odds Ratio          |                     | Year |
|--|-------------|-------------|------------|-------------|---------------|---------------------|---------------------|------|
|  | Events      | Total       | Events     | Total       |               | M-H, Random, 95% CI |                     |      |
| Loperfido 1998   | 1636        | 1703        | 991        | 1066        | 28.9%         | 1.85                | [1.32, 2.59]        | 1998 |
| Masci 2006   | 344         | 389         | 160        | 191         | 22.8%         | 1.48                | [0.90, 2.43]        | 2006 |
| Vitte 2007   | 779         | 812         | 826        | 927         | 26.2%         | 2.89                | [1.93, 4.33]        | 2007 |
| Mariani 2019   | 1136        | 1185        | 452        | 474         | 22.1%         | 1.13                | [0.67, 1.89]        | 2019 |
| <b>Total (95% CI)</b>  |             | <b>4089</b> |            | <b>2658</b> | <b>100.0%</b> | <b>1.77</b>         | <b>[1.22, 2.57]</b> |      |
| Total events   | 3895        |             | 2429       |             |               |                     |                     |      |
| Heterogeneity: Tau <sup>2</sup> = 0.10; Chi <sup>2</sup> = 8.99, df = 3 (P = 0.03); I <sup>2</sup> = 67% |             |             |            |             |               |                     |                     |      |
| Test for overall effect: Z = 3.00 (P = 0.003)  |             |             |            |             |               |                     |                     |      |



## Centers

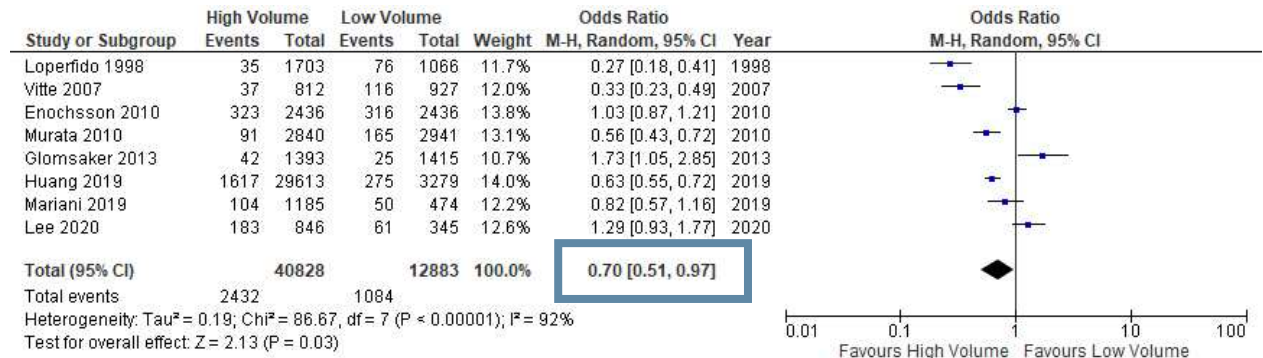
# Procedure overall adverse events

## Endoscopists



**< 29% if by HV endoscopists**  
**< 30% in HV centers**

## Centers



The impact of ERCP volume per center and endoscopist on ERCP outcomes: a systematic review and a meta-analysis

Gastrointestinal Endoscopy, 2023 Sep; 98(3):306-315.e14

Presentation as free-paper session in Prevention and Treatment of ERCP related adverse events in ESGE 2023

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# Specific adverse events

**BLEEDING:** < 33% if HV endoscopists [OR=0.67(95%CI,0.48-0.95),I<sup>2</sup>=37%]

No differences based on center volume [OR=0.68(95% CI,0.24-1.90),I<sup>2</sup>=89%]

PEP, CHOLANGITIS, PERFORATION: **no** statistical differences



*Black Mould, Michaël Borremans*

*The impact of ERCP volume per center and endoscopist on ERCP outcomes: a systematic review and a meta-analysis*

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In the current context of increasing healthcare expenses and limited resources, promotion of **cost-effective** care becomes essential for healthcare provision...

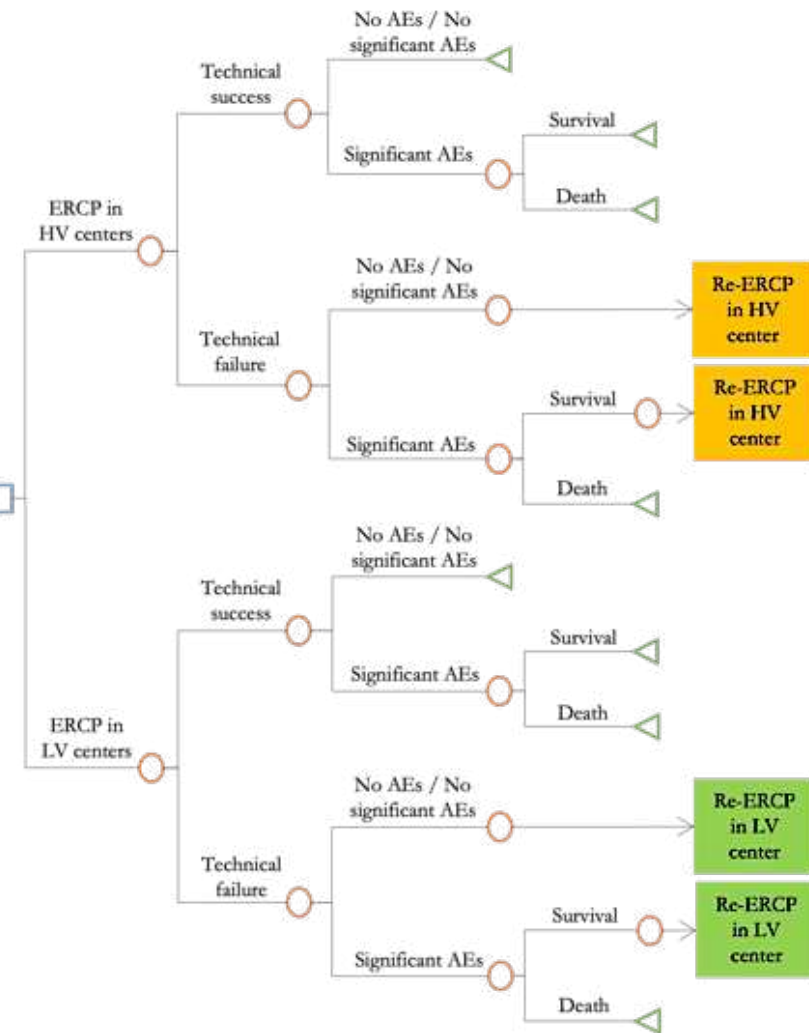
**Aim:** cost-effectiveness analysis

**Hypothesis:** HV centers perform ERCP with higher quality at lower costs than LV centers

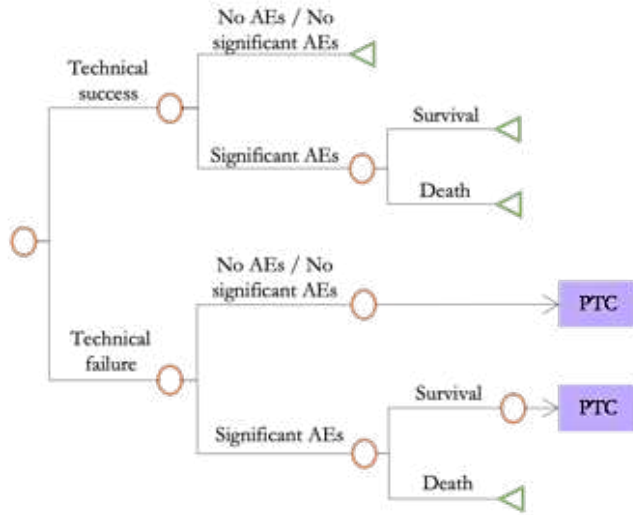


# Conceptual model

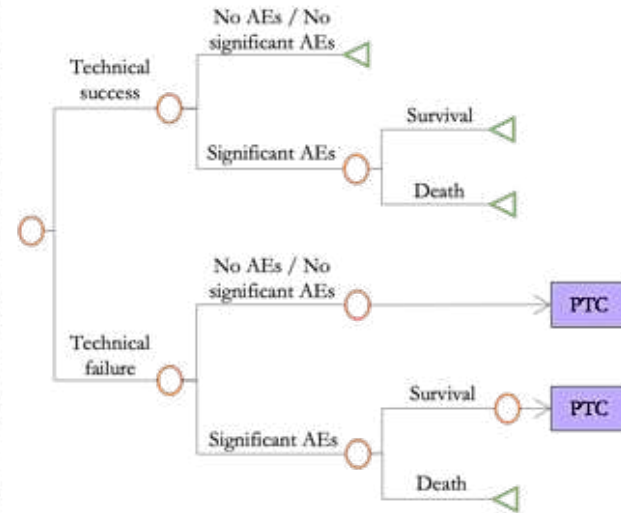
## Patients with indication for ERCP



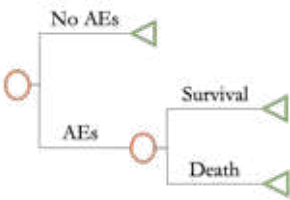
## Re-ERCP in HV center



## Re-ERCP in LV center

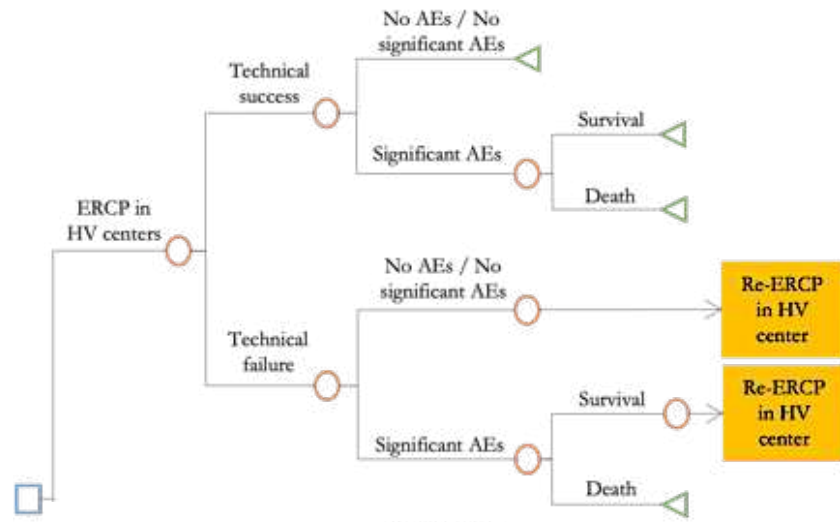


## PTC in HV center

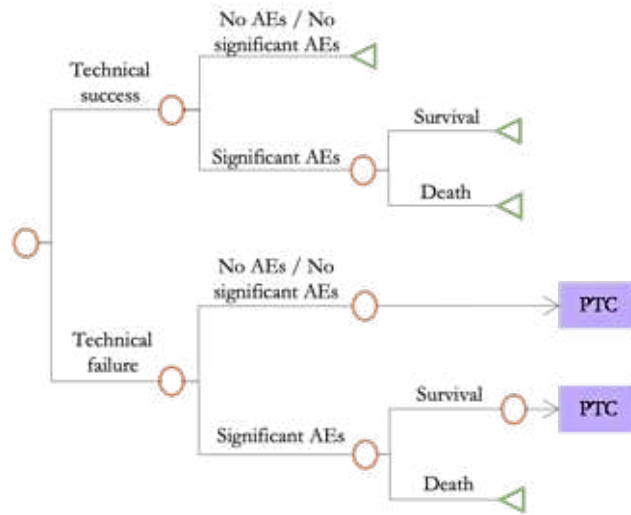


# Conceptual model

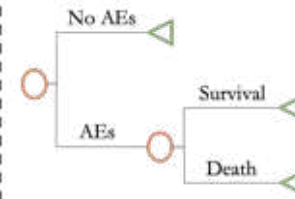
*Patients with indication for ERCP*



*Re-ERCP in HV center*



*PTC in HV center*



# Baseline case



| Assumption   | QALYs         | Average cost per ERCP | ICER           |
|--|---------------|-----------------------|----------------|
| <b>REFERENCE</b> scenario (current):<br>ERCPS in HV and LV centers | 0.0763        | 3,859€                | -151,270€/year |
| <b>HYPOTHETICAL</b> scenario:<br>ERCPS only in HV centers          | <b>0.0819</b> | <b>3,014€</b>         | *              |

\*HV: < repeated ERCP following failures and < significant AE

# Baseline case

| Assumption   | QALYs         | Average cost per ERCP | ICER           |
|--|---------------|-----------------------|----------------|
| <b>REFERENCE</b> scenario (current):<br>ERCPS in HV and LV centers | 0.0763        | 3,859€                |                |
| <b>HYPOTHETICAL</b> scenario:<br>ERCPS only in HV centers          | <b>0.0819</b> | <b>3,014€*</b>        | -151,270€/year |

\*HV: < repeated ERCP following failures and < significant AE



L'homme qui mesure les nuages, Jan Fabre

## *One-way sensitivity analysis*

The model most sensitive to changes in:

**Transportation costs** (109.34%)\*

**Probab. significant AE** after successful ERCP in LV (42.12%)

*\*Centralization not cost-effective if transportation costs > 3,655€*

*Two-way sensitivity analysis*

Current ERCP distribution only cost-effective if **LV centers:**

**higher success** ( $\geq 92.4\%$ )

and **much lower significant AEs** ( $\leq 0.5\%$  vs  $6.7\%$ )

I just need  
the main ideas



## In sum:

As digestive endoscopy becomes increasingly specialized, the imperative to deliver effective care becomes more pronounced:

- specialized training
- sustainable expertise

I just need  
the main ideas



In sum:

**European curricula for ERCP & EUS training**

are positive initiatives.



I just need  
the main ideas



## In sum:

To excel in ERCP/EUS, trainees should combine technical endoscopic skills and **non-technical** skills:

- Personality (honesty, team-player, self-awareness, work ethics)
- Cognitive (decision-making ability, clinical judgement)

I just need  
the main ideas



In sum:

**Gaps in European ERCP/EUS training programs**  
to meet recommendations.

I just need  
the main ideas



In sum:

### Boškoski-Costamagna ERCP Trainer:

- Realistic
- Useful didactic tool
- Improve overall technical competence

I just need  
the main ideas



In sum:

**HV (endoscopists) and centers** perform ERCP:

- Higher success
- Lower AE
- Lower costs

**ERCP centralization** might be cost-effective.



Future perspectives?



# Future perspectives:

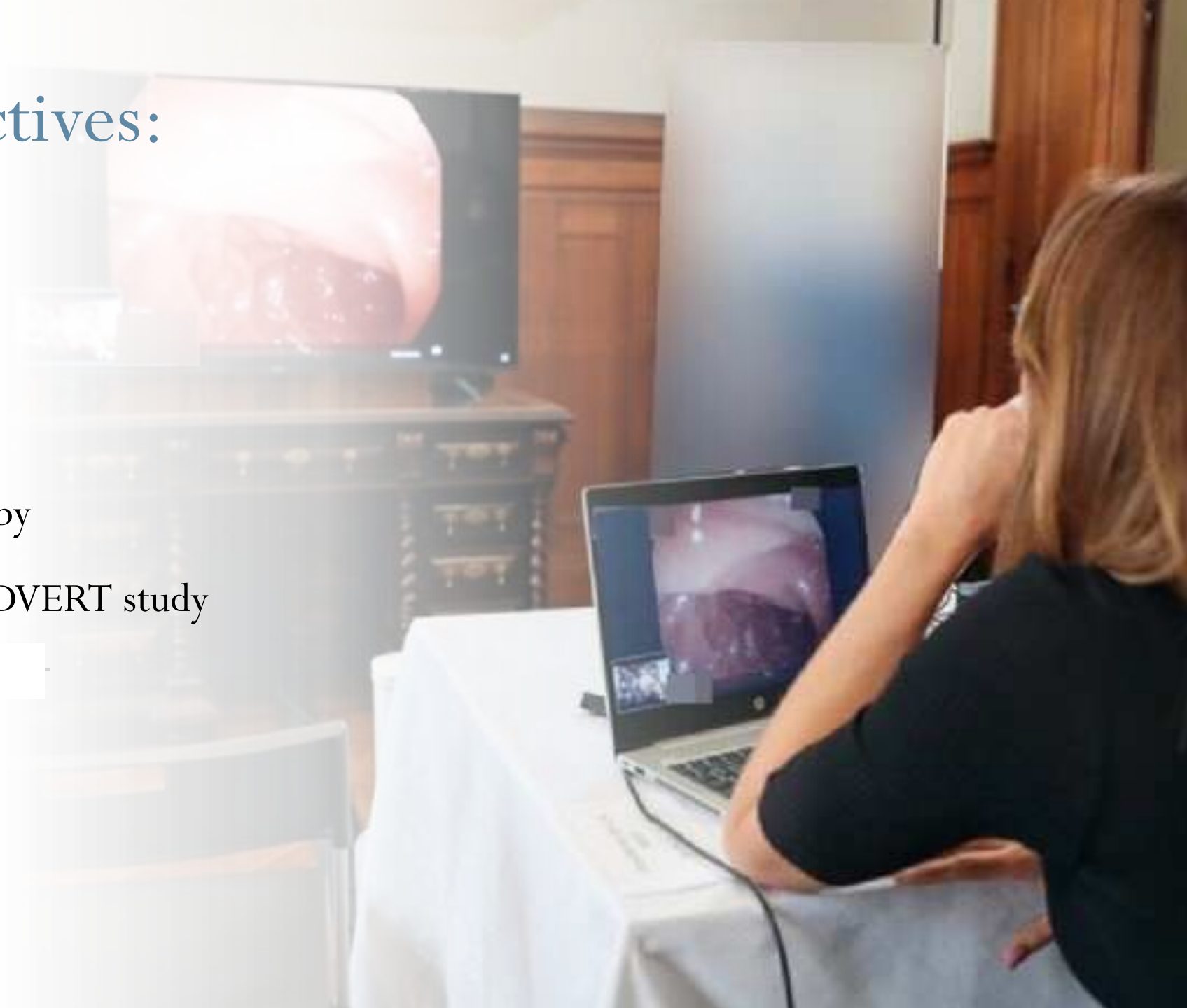
## 1. **Assessing ERCP in Belgium:**

Center Volume Impact on Performance,  
Costs, and Carbon Footprint

# Future perspectives:

2. ADVancing ERCP Skills by

**Tele-mentoring:** the ADVERT study



# Future perspectives:

3. Validation of a simple clinical **predictive risk score** of ERCP-related AEs in a training setting: TIERS score

*ERCP indication*

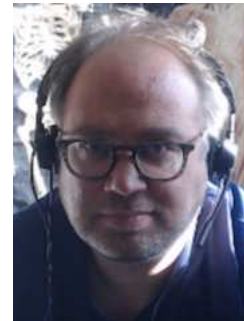
*Bilirubin level*

*Previous ERCP failure*

*Native papilla*











*C'est le mystère qui éclaire la connaissance*



*Ceci n'est pas une pipe.*