DISSERTATION REPORT

Market Understanding of Endoscopic Ultrasound

Table of contents

Research background and objectives

Research background	• The global ultrasound endoscope market is expanding at a quicker rate than the endoscope market as a whole • Global MNC is interested in learning more about the flexible endoscope market, particularly optical endoscopes with ultrasound (EUS), as well as customer dynamics when it comes to purchasing (ultrasound) endoscopic systems

Business objective	• Provide insights on:
	  • Current unmet needs and customer expectations of flexible endoscope systems, especially ultrasound endoscopes
	  • Purchase dynamics like process followed, key decision makers, factors considered, etc.

Research objectives	• To assess the challenges and expectations with current ultrasound endoscopes used in endoscopic ultrasound (EUS) • To explore key innovations expected in the area of endoscopy and EUS in particular • To evaluate customer perceptions of key competitors in this space • To understand the purchase process for flexible endoscope systems and EUS systems • To determine the key decision makers involved in the purchase of flexible endoscope systems and EUS systems • To identify the factors driving purchase of flexible endoscope systems and EUS systems
Target geography	USA, UK, Germany, China, and Japan

Research methodology and sample plan

Methodology overview

A 60-mins (qualitative) and 45-mins (competitive intelligence) web assisted **in-depth-interview (IDI)** using a comprehensive discussion guide

Sample achieved

Target Group*		USA	UK	Germany	Japan	China	Total
Head of Department (HODs)	Head of Gastroenterology Department	2	3	2	2	2	**11**
	Head of Pulmonology Department	2	1	2	2	2	**9**
Clinicians	Gastroenterologists / Endoscopists, Gastrointestinal / Endoscopic Surgeon	2	2	2	2	2	**10**
	Pulmonologists / Interventional Pulmonologist	2	2	2	2	2	**10**
Purchasers	Purchase Heads/Directors	4	4	4	4	4	**20**
Competitive intelligence	Ex-employees of Olympus/ Fujifilm /Pentax	2	2	2	-	-	**6**
	Per country	**14**	**14**	**14**	**12**	**12**	**66**
	Total						**66**

*Total E(B)US Users: 32 (Clinicians=22 and Purchasers=10)
Total E(B)US Intenders: 28 (Clinicians=18 and Purchasers=10)

Respondent criteria: Qualitative

- All respondents must purchase/use/perform procedures with flexible endoscopes (not necessarily limited to endoscopic ultrasound)
- Have 5+ years of total experience and 2+ years of experience at current facility
- All respondents must be involved in purchase decision-making process of (ultrasound) endoscopes
- Have knowledge about current landscape and trends in (ultrasound) endoscopes market
- US: Hospitals with 250+ beds, ASCs, OBLs; China: Level 3 Hospitals; Other Countries: Hospitals with 250+ beds

Respondent criteria: Competitive Intelligence

- All respondents have worked as Business Unit Head/Marketing Manager/Sales Manager managing portfolio of flexible endoscopes/echoendoscopes
- Have 2+ years of total experience managing a portfolio of flexible endoscopes/echoendoscopes
- Have worked for 1+ years at Olympus/Fujifilm/Pentax managing a portfolio of flexible endoscopes/echoendoscopes
- Have knowledge about current landscape and trends in flexible endoscopes/echoendoscopes

Section 1: Current Practice

Current EUS practice and future outlook – gastroenterology

Gastros/Gastro Surgeons and HODs (User)

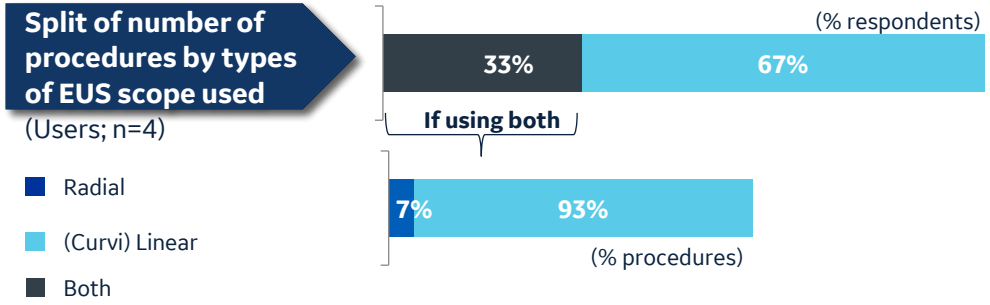
Gastros/Gastro Surgeons perform ~30-50 EUS procedures per month. They expect an increase in EUS procedures, mainly due to increased patient volume for biopsy/aspiration

Current EBUS practice

Number of EUS procedures done personally/month
(Users; n=4)

30 - 50

Split of number of procedures by types of EUS scope used
(Users; n=4)



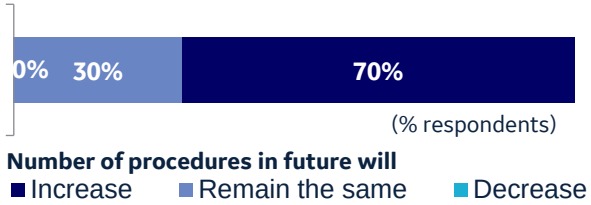
- **~75% expect procedure splits to change, with increase in (curvi) linear usage** due to ability to perform both diagnosis and biopsy at the same time
- **~25% expect procedure splits to remain the same**

(Users; n=11)

> *"We expect the volume to continue to increase because there is always new techniques being 'invented'. For example, portal pressure measurements with EUS that is new but that is important, liver biopsies, fiducial placements all these things were not being done 5 years ago, they are new. So, I think the base technology is so good that people are coming out with new techniques, so I have not seen a plateau yet of the volumes."* – ***Gastroenterologist, EUS User, US***

Future outlook (next 2 years) for EUS procedures

Changes in number of EUS procedures over the next 2 years
(Users; n=11)



Reasons for increase in EUS procedures over the next 2 years
(Users; n=11)

	Mentions
• **Increased volume of patients for potential biopsy/aspiration** of pancreatic lesions, gallstones removal, etc.	5
• **Increase in usage of EUS for cancer diagnosis/staging**, especially for lesions that are difficult to access or missed by CT	2
• **Increased number of manufacturers** entering EUS market space	2
• **Innovations** such as EUS-guided portal pressure measurements or pancreatic fiducial placements (radiographically visible markers are inserted in the target lesions)	2

> *"As I mentioned removal of gallstones, potential biopsy of pancreatic lesions or aspiration of pancreatic lesions, with EUS pathological procedures such as GYN lesions, ovarian cysts etc or retroperitoneal lesions can be done. All these things could be done with the echoendoscope guidance. It will increase the width and breadth of potential therapeutic endoscopic procedures."* – ***Gastroenterologist, EUS User, US***

High mentions Medium mentions Low mentions

n=11

Current EBUS practice and future outlook – pulmonology

Pulmos/Interv. Pulmos and HODs (User)

Pulmonologists perform ~15-25 EBUS procedures per month. All expect an increase, due to increased need for cancer staging, especially for difficult to reach lesions and those that get missed by other imaging modalities

Current EBUS practice

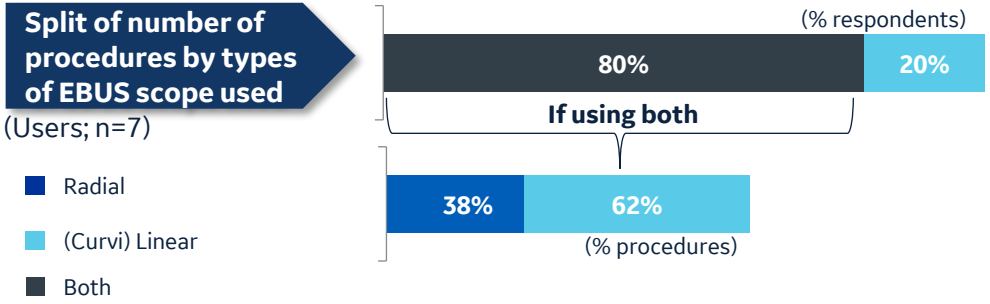
Number of EBUS procedures done personally/month

(Users; n=7)

15 - 25

Split of number of procedures by types of EBUS scope used

(Users; n=7)



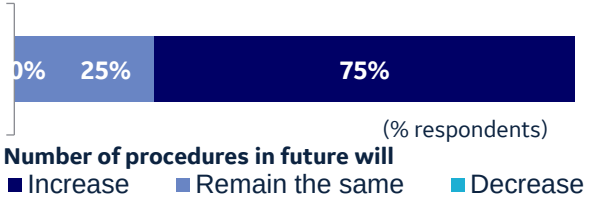
- **~ 66% expect procedure splits to change, with higher radial usage** due to comparatively better visualization, especially for peripheral lesions (due to 360º view)
- **~ 33% expect procedure splits to remain the same**

(Users; n=11)

Future outlook (next 2 years) for EBUS procedures

Changes in number of EBUS procedures over the next 2 years

(Users; n=11)



Reasons for increase in EBUS procedures over the next 2 years

(Users; n=11)

	Mentions
• **Increase in usage of EBUS for cancer diagnosis and staging** , especially for difficult to access lesions (such as mediastinal lymph nodes, peripheral lesions) which tend to get missed with CT	6
• **Increase in usage of EBUS for lesions that are difficult to access** (e.g., peripheral lung lesions)	3
• **Increased volume of patients for potential biopsy/aspiration**	3
• **Introduction of navigational bronchoscopy**	2
• **Avoiding invasive biopsies**	2

"I think more so for the peripheral lung nodules that I want to say a little bit better. As a visualization, what I think is a better accuracy in terms of looking around for radial. I think it looks at the other surrounding structures and it might get a little bit better. That's why I like it a little bit the 360º image." - ***Interventional Pulmonologist, EBUS User, US***

"The recent studies showed that if the CT scans don't show a lot of mediastinal lymph nodes staging using EBUS is recommended. The radial echoendoscopes certain have got a lot more potential to go up because it has 360-degree visualization, and we get bull's eye view as to where it is supposed to be target. Traditionally, we always go for CT guided biopsy." **– *Interventional Pulmonologist, EBUS User, UK***

High mentions Medium mentions Low mentions

n=11

Reasons to prefer E(B)US over traditional optical endoscopes

Clinicians/HODs (Users)

Single procedure for diagnosis and biopsy and better cancer staging are the key factors driving E(B)US usage over traditional endoscopes

	Overall (n=22)	US (n=4)	UK (n=6)	DE (n=4)	CN (n=4)	JP (n=4)
Ability to diagnose and perform biopsy simultaneously (Single procedure for diagnosis and biopsy vs. multiple procedures with traditional endoscopes)	9	3	3	--	1	2
Better staging of cancer, because extra luminal swellings, mucosal texture changes, and nodules can be detected better with echoendoscopes (vs. regular endoscopes)	9	2	2	3	1	1
Better visualization of the anatomy behind folds (precise location and size of deep-seated lesions/tumours)	8	1	--	3	1	3
Easier biopsy with less possibility of artery puncture/bleeding (better visualization of artery microstructure using ultrasound)	5	--	1	2	1	1
Precise and targeted sampling of soft tissues	4	1	2	1	--	--

"So, let's say if you have a pancreatic mass and you take some samples from it, Almost like more than 90% of the cases right away if you use an on-site cytology. So, you can tell the patient right away that okay you had this pancreatic mass. Most likely it looks like cancer, and you can start the treatment quickly. Previously, these patients would undergo like a laparoscopy or some surgical intervention to get in the tissue. Then there was a prolonged recovery, and the biopsies would take few days for the results to come back and by the time they get started on their treatment, everything got delayed."
– Gastroenterology HOD, EUS User, US

"Because the traditional optical endoscopes does not reach the places, we want it to go and therefore EBUS helps in the diagnosis immensely and more importantly it helps us stage the lung cancer. For example, we always need to know whether the patient is fit for surgery and determine that whether the cancer has spread or not within the chest and for that purpose, EBUS can tell us exactly where the lymph glands are, whether they are enlarged or not and if they are enlarged, it allows us to biopsy real time. You cannot do any of those for the bronchoscope." - ***Interventional Pulmonologist, EBUS User, US***

High mentions Medium mentions Low mentions

n=22

Drivers for adoption of an E(B)US system

Clinicians/HODs (Intenders)

Increased patient volume for cancer evaluation, better image quality and quicker diagnosis are the key drivers of the adoption of E(B)US

	Overall (n=18)	US (n=4)	UK (n=2)	DE (n=4)	CN (n=4)	JP (n=4)
Increased patient volume for cancer diagnosis (evaluation of lesion/cysts/tumor for pancreatic, biliary and lung cancers)	11	2	2	3	3	1
E(B)US offers better image/video quality in terms of **clarity and resolution** compared to traditional endoscopes	10	3	2	2	1	2
Reduction in diagnosis time (diagnosis and biopsy can be done simultaneously)	9	2	2	2	2	1
Increase in patient volume for cancer staging	8	2	2	1	2	1
Availability of **training courses** or **online resources**, can **help** clinicians perceive the advantages of E(B)US and **be more confident in** the **technology**	7	2	1	1	--	3
Increase in **E(B)US promotion** at academic conferences	6	3	1	--	1	1

"It would probably save time on some of these cancer diagnoses where we get patients in sooner and keep the ball rolling on getting a treatment plan in place for patients with malignancy. The time factor would also relate to lesions that were not sure if it is cancer or not. So, it might be submucosal lesions we are finding in the stomach and referring them out for EUS, getting the patient in a timely fashion, getting an answer sooner instead of sending a mail." – ***Gastroenterologist, EUS Intender, US***

"The key drivers would basically be accuracy and efficiency and both diagnosis and therapy rather than having to do 2 procedures that we can get in 1, it would save a lot of time and effort. Also, if the examination where we take a cell sample from the lymph node were to increase, then it's possible to invest in the EBUS system." – ***Pulmonologist, EBUS Intender, Japan***

High mentions Medium mentions Low mentions

n=18

Barriers for adoption of an E(B)US system

Clinicians/HODs (Intenders)

High upfront costs and high patient volume to recover initial investment are the barriers to adopt E(B)US

	Overall	US	UK	DE	CN	JP
	(n=18)	*(n=4)*	*(n=2)*	*(n=4)*	*(n=4)*	*(n=4)*
High upfront cost	11	3	2	1	4	1
High procedure volume is **required to recover** the **investment**/initial costs	8	3	2	--	1	2
High maintenance/service costs	7	2	2	--	1	2
Accuracy of E(B)US is operator dependent (trained clinical staff required)	7	2	2	1	1	1
Current flexible endoscopes are enough to perform majority of the procedures	3	--	1	--	1	1
Reimbursement concerns (unaware if E(B)US is covered under insurance)	2	--	1	--	--	1

> *"Price is the main issue. I am sure echoendoscopes are much pricier than gastroscopes. We will need prior 1 year approval when doing this to submit or request, then pass to committee, allocate the finance and do some budgeting, revenue evaluation. If after approval comes to our department, we will pass to procurement department, specify the model etc, or do some bidding. Of course, each equipment costs at least in millions (RMB), so we have to be careful and follow the SOP. If we insist, we want a specific brand, our facility may have to fund partially."* **– *Gastroenterology HOD, EUS Intender, China***

> *"Well, when we're talking about adopting (new) equipment/devices, I think profitability must always be included. For example, we would estimate how many patients will come to get examined in a year and calculate our estimated profits from that. In addition, we would also consider it based on the department head's strong aspirations and motivations."* – **Pulmonology HOD, EUS Intender, Japan**

High mentions Medium mentions Low mentions

n=18

Section 2: Unmet Needs

Challenges with currently used E(B)US

Clinicians/HODs (Users)

Limited angulation of distal scope tip, high cost of maintenance/repair, sub-optimal characterization of lesions and large diameter of the echoendoscope are the key challenges with E(B)US

Challenge (Unaided+Aided)	Explanation	Mentions					
		Overall (n=22)	*US (n=4)*	*UK (n=6)*	*DE (n=4)*	*CN (n=4)*	*JP (n=4)*
Limited angulation of distal scope tip (Aided)	• Due to limited angulation, there is inefficient **visualization of the target site;** e.g., areas like the entrance of the stomach or the duodenum are difficult to get a good view of • Difficult to **visualize lesions, tumors, or lymph nodes** due to limited angulation	**11**	2	3	3	2	1
High cost of maintenance/repair (Unaided + Aided)	• **High incidence of scope damage coupled with high repair costs**, add up to a **significant maintenance burden** • **Limited durability** also adds up to high maintenance cost *(Pentax, n=1)*	**10**	1	2	2	1	4
Sub-optimal characterization of lesions (Aided)	• In certain cases, it is difficult to **interpret the type of lesion** and **characterize it accurately**; clinicians expect an improvement in the **resolution and focus** • Sub-optimal illumination can sometimes result in **missing blood vessels,** which can cause internal bleeding • **Ultrasound artifacts** make characterization of lesions more difficult	**9**	–	2	2	4	1
Large diameter of the echoendoscope (Unaided + Aided)	• As the diameter of an echoendoscope is comparatively bigger than an endoscope, it is **difficult to penetrate further into the anatomic site** like lungs	**8**	2	3	1	–	2
Improper/inefficient depth perception (Aided)	• Due to sub-optimal optics depth perception is a challenge, especially with smaller lesions	**8**	3	1	1	1	2
Sub-optimal cleaning or improper reprocessing of scope (Aided)	• Cleaning an endoscope is **cumbersome and often leads to damage**, **sub-optimal infection control, or quality degradation** of the scope	**7**	2	1	1	1	2
Fragile scope lens/ probe (Unaided)	• The **echoendoscope lens/ultrasound probe is fragile,** and prone to **damage especially during reprocessing**	**2**	–	1	1	–	–

Other unaided mentions: Steep learning curve (n=2), Inefficient suction port (n=1), Smudging of scope (n=1)

Other aided mentions: Long reprocessing turnaround time (n=7), Restricted field of view leading to improper adenoma detection (n=6), Lack of triangulation and spatial orientation (n=6), Lack of AI/ML algorithms to help with better polyp detection (n=6), Lack of training to support staff leading to improper handling of scopes (n=6)

High impact Medium impact Low impact

High mentions Medium mentions Low mentions

n=22

Challenges with currently used gastroscope/bronchoscope

Clinicians/ HODs (Intenders)

Sub-optimal characterization of lesions and sub-optimal cleaning or improper reprocessing, are the key challenges with gastroscope/bronchoscope

Challenge (Unaided+Aided)	Explanation	Mentions					
		Overall (n=18)	US (n=4)	UK (n=2)	DE (n=4)	CN (n=4)	JP (n=4)

Sub-optimal characterization of lesions (Aided)	• Due to **sub-optimal illumination** it is difficult to
	  • **Accurately characterize masses like lymph nodes and tumors**
	  • **Locate and mark small peripheral lesions for biopsy**
		9	2	2	1	3	1

Sub-optimal cleaning/reprocessing of scope and long reprocessing TAT (Unaided + Aided)	• **Reprocessing the scope is cumbersome** and the scope is **prone to damage** • Inefficient cleaning can **degrade the quality of the lens,** resulting in **sub-par image quality** • **Long** reprocessing **turnaround time** • Sub-optimal cleaning may lead to **inefficient infection control**	8	2	2	1	2	1
High cost of maintenance/repair (Aided)	• **High incidence of scope damage coupled with high repair costs**, add up to a **significant costly maintenance burden**	7	2	1	1	2	1
Diameter of the endoscope (Unaided + Aided)	• Large diameter of the scope makes it difficult to **penetrate further into the anatomic site**	6	1	1	1	1	2
Restricted field of view (Unaided + Aided)	• Due to restricted field of view, there is a **high chance to miss a mass which may lead to incorrect diagnosis**	5	-	1	-	3	1
Fragile scopes (Unaided)	• Endoscopes are **fragile**, hence **prone to damage**, which in turn impacts the **procedure volume**	2	-	2	-	-	-

Other unaided mentions: Difficult to maneuver (n=2), Delay in delivery of replacement scope (within warranty, (n=2), Limited flexibility of the scope (n=2)

Other aided mentions: Lack of triangulation and spatial orientation (n=4), Improper/inefficient depth perception (n=4), Limited angulation of distal scope tip (n=4), Difficulty in visualizing mucosa behind folds (n=4), Lack of AI/ML algorithms to help with better polyp detection (n=4), Low reliability of flexible endoscopes (n=4)

High impact Medium impact Low impact

High mentions Medium mentions Low mentions

n=18

Section 3: Brand Usage and Perceptions

Echoendoscope brand satisfaction and brand likes

Clinicians/HODs & Purchasers (Users)

The high satisfaction for Olympus is driven by the superior image quality, maneuverability/flexibility and brand familiarity because of training during the fellowship

	OLYMPUS (n=22)	PENTAX (n=12)	FUJIFILM (n=8)
Brand likes			
Brand Satisfaction	**5.8/7**	**5.6/7**	**5.0/7**
Image quality	• The new Olympus **video processors** yield **better image quality** 6 • Optimal **image color and saturation** • Excellent **image clarity** of lesions	• Good **image resolution** and **quality of ultrasound image** 2	• Good **image resolution** 1
Maneuverability /flexibility	• Echoendoscopes are **thin and flexible, hence easy to maneuver** 3 • **Good integration capabilities with EHR**	-	• Echoendoscopes are **thin;** hence, they enable **access to difficult to reach anatomy** 2
Brand familiarity	• Clinicians are **trained on the Olympus device** during **fellowship;** hence there is high brand familiarity which translates into ease of usage 3	-	-
Upfront cost	-	• **Competitive cost (vs Olympus)** 2	• **Competitive cost (vs Olympus)** 1
Satisfaction with training	**5.0/7**	**4.5/7**	**4.3/7**
Clinician training and support	• Good training workshops provided via **Olympus Academy** 1	-	• **Good training support** provided **during device installation** 1
Satisfaction with maintenance support	**5.2/7**	**4.0/7**	**5.7/7**
Maintenance and service support	• **Prompt revert** to technical queries 3	• **Quick repair turnaround time** 2	• **Prompt and reliable service support** 1

Note: The counts for number of echoendoscope is higher than sample, since some respondents have more than one brand of echoendoscope

Echoendoscope brand dislikes and areas of improvement

Clinicians/HODs & Purchasers (Users)

The key brand dislike for Olympus is the high upfront cost and maintenance/service cost; the Pentax echoendoscope is perceived by some as thick and rigid

	OLYMPUS (n=22)	PENTAX (n=12)	FUJIFILM (n=8)
Brand dislikes			
Image quality	-	-	• **High image saturation** which may sometimes be mistaken as internal bleeding (1)
Upfront cost	• **High upfront cost** of the device (5)	-	-
Maneuverability /flexibility	-	• Echoendoscopes are **thick and rigid**, hence they lead to **more patient discomfort** (2) • Scopes are **fragile and less sturdy**	-
Clinician training and support	• **Training for support staff is not proactive** (3) • **Infrequent visits** from the **sales representative** during the early phase of **equipment installation**	• **Inadequate training provided** to clinicians and support staff (2)	• **Inadequate training** provided to the **new clinicians and support staff** (1)
Maintenance and service support	• **High cost of repair** (4) • **High turnaround time** for **device repair and replacement**	• **High cost of repair** (1)	-
Brand areas of improvement			
NOTE: Cook Medical needles are perceived better than other brands because they have better penetrability	• Incorporate **artificial intelligence** to help with a **better and quicker diagnosis** • In some **cancers where the anatomy/site is difficult to access**, there is a need for **thinner and flexible echoscopes** • **Improve user interface** for some complicated functionalities • Need for **regular visits from the sales representative** to understand **physicians' unmet needs** and keep them **updated about the current innovations in echoendoscopes** • **Provide simulation-based training** to practice cases and ensure quick learning for new physicians		

Note: The counts for number of echoendoscope is higher than sample, since some respondents have more than one brand of echoendoscope

High mentions Medium mentions Low mentions

n=32

Gastroscope/ bronchoscope brand satisfaction and brand likes

Clinicians/HODs & Purchasers (Intenders)

The high satisfaction for Olympus is driven by the superior image quality and ease of use/handling, while for Pentax and Fujifilm it is due to competitive cost

	OLYMPUS (n=39)	PENTAX (n=16)	FUJIFILM (n=16)
Brand likes			
Brand Satisfaction	**6.2/7**	**4.5/7**	**6.2/7**
Image quality	• Good **image quality,** especially of new generation devices in terms of **resolution, focus, balance of color, saturation, and TXI** (Texture and Color Enhancement Imaging) 11 • **NBI mode** is superior as compared to other brands • Good quality and **durable device**	• Good **image quality in terms of resolution** 2	• Good image quality in terms **of color, brightness, and resolution** 3
Maneuverability /flexibility	• **Superior ergonomics** of the scope 9 • Endoscopes are flexible/ easy to maneuver	-	-
Device reliability	-	-	• Minimal breakdowns hence **reliable device** 2
Brand familiarity	• High **brand familiarity due to being trained on the Olympus device** during **fellowship** 4	-	-
Upfront cost	-	• **Competitive cost (vs Olympus)** 4	• **Competitive cost (vs Olympus)** 5
Satisfaction with training	**5.6/7**	**4.0/7**	**4.3/7**
Clinician training and support	-	-	• **Good training support** provided **during device installation** 1
Satisfaction with maintenance support	**5.9/7**	**4.5/7**	**5.5/7**
Maintenance and service support	• **Prompt revert to technical queries** 3	• **Prompt and reliable customer service** 3 • Quick **repair turnaround time**	• **Prompt revert to technical queries** 2
Sales representatives	• Olympus representatives interact with the clinicians **once every month** to assist them with problems associated with device usage 1	• Representatives are **professional in conduct** 1	-

n=50

Gastroscope/ bronchoscope brand dislikes and areas of improvement

Clinicians/HODs & Purchasers (Intenders)

The key brand dislikes for Olympus include high upfront cost and high repair turnaround time

	OLYMPUS (n=39)	PENTAX (n=16)	FUJIFILM (n=16)
Brand dislikes			
Image quality	• Sub-optimal **image magnification** 1	-	• Sub-optimal **image clarity** 1
Upfront cost	• **Expensive/ high upfront cost** of the device 7	-	-
Maneuverability /flexibility	• **Limited maneuverability** of the endoscope 2	• **Limited maneuverability** of endoscopes 3	-
Clinician training and support	• **Training provided is technical,** there is a need for **regular simulation-based training and seminars** for clinicians 2	• **Inadequate training** provided to the **new clinicians and support staff** 2	-
Maintenance and service support	• **High turnaround time** for device repair 5	• **High replacement turnaround time** for damaged devices in warranty 5	• **High replacement turnaround time** for damaged devices in warranty 2
Sales representatives	• Not all sales representatives have a **professional attitude** 3	-	• **Limited presence in Germany** leads to delay in service 1
Areas of improvement			
Overall area of improvement	• Incorporate **artificial intelligence** to help with a better and quicker diagnosis • Provide more **efficient suction channels** as the ones currently used are inefficient • **Despite anti-fog there is fogging and smudging of lens,** hence there is a scope of improvement in the quality of lens • Develop more **clinical trial data** on its efficiency • **Develop thinner scopes** with better distal tip flexibility • Work on improving **video resolution**		

High mentions Medium mentions Low mentions

Note: The counts for number of echoendoscope is higher than sample, since some respondents have more than one brand of echoendoscope

n=50

Section 4: Purchase Considerations

Purchase process of a new flexible endoscope/E(B)US

Purchasers (User, Intender)

Clinicians (Gastroenterologists/Pulmonologists) and HODs are key purchase initiators/champions
Sales representatives and user recommendation/testimonials are key sources of information during purchasing

	USA *(n=4)*	UK *(n=4)*	Germany *(n=4)*	China *(n=4)*	Japan *(n=4)*
Purchase triggers	• **Equipment nearing end of life**	• **Equipment nearing end of life** • High maintenance/ reprocessing cost	• **Equipment nearing end of life** • Upgrade to new technology	• **Equipment nearing end of life**	• **Equipment nearing end of life** • Upgrade to new technology • Clinician request/interest/complaints
Purchase initiators	• Clinicians (Gastroenterologists /Pulmonologists)			• HOD - Gastroenterology/ Pulmonology	• Clinicians (Gastroenterologists /Pulmonologists)
Purchase follow up/ discussion	• The initiator(s) identifies the need gathers information to make a case in front of **VAC (value analysis committee)*** • VAC post-evaluation will decide if they want to go ahead with the purchase or not	• In case of a new purchase, the **Purchasing/ Procurement Head** would step in to assess the vendors and help the clinicians build a business case	• The initiators make a business case outlining why there is a need for new equipment which is then evaluated by the **Purchasing/Procurement Head**	• The request initiated by the initiator is assessed by the **Equipment Department Head** to check if there is really a requirement and thus decide to move ahead for approval to the final decision maker or not	• The initiator(s) identifies the need and gathers information to make a case in front **Procurement Department;** which then evaluates the request and looks at the annual budget before making a decision
Resources used to research	• **Sales representative**	• **Sales representative**	• **Colleague recommendation / Testimonials from users at other facilities** • Group Purchasing Organization (GPO) • Online resources • Professional societies/conferences	• **Colleague recommendation / Testimonials from users at other facilities** • **Professional societies/conferences** • Online resources	• **Sales representative** • Colleague recommendation / Testimonials from users at other facilities
Purchase method	• **Direct purchase/No competitive bidding** • **Group Purchasing Organizations (GPOs)**	• **NHS Supply Chain**	• **Direct purchase/No competitive bidding** • **Government-driven quotation/tender process**	• **Government-driven quotation/tender process** • Hospital-specific quotation/tender process	• **Direct purchase/No competitive bidding** • **Hospital-specific quotation/tender process**
Time taken**	• 6 months	• 4 to 6 months	• 6 to 9 months	• 3 to 6 months	
Preferred payment model	• CAPEX				

**consisting of physicians, representatives from the infection control, maintenance, and reprocessing department*

***from need initiation to final purchase*

n=20

Key purchase factors for flexible endoscopes/E(B)US (Unaided)

Image quality, ease of use and competitive upfront cost are key drivers influencing purchase decisions for flexible endoscopes/E(B)US

	Unaided	Mentions		
		Overall (n=60)	*Clinicians/HODs (n=40)*	*Purchasers (n=20)*
Technical factors	**Image quality** • Good image quality in terms of **resolution**, **video clarity, focus, saturation** and availability of contrast enhancement option to help with better diagnosis	**22**	14	8
Technical factors	**Ease of use** • Adequate scope **flexibility/ maneuverability** to accurately **target area of interest** • **Better scope ergonomics** for easier handling	**18**	12	6
Technical factors	**Sturdy scopes that are easy to clean and reprocess** • The scope lens/ultrasound probe should be **sturdy and not prone to damage** when cleaning and reprocessing	**13**	7	6
Non-technical factors	**Competitive upfront cost** • Stakeholders prefer a device with **competitive upfront cost, but would not compromise on quality**	**21**	11	10
Non-technical factors	**Prompt and reliable service** • **Inclusions in the service/maintenance contract**, **and prompt technical support** from the vendors	**15**	8	7
Non-technical factors	**Maintenance cost and repair turnaround time** • **Low cost of repair** with quick **repair turnaround time** for endoscopes	**14**	7	7
Non-technical factors	**Training** • **Regular training** with **continuous medical education** for clinicians • **Robust training on device** reprocessing during early phase of device installation for support staff	**7**	3	4

> *"I would say image quality is number 1. So, we make sure the image quality is good. I would also analyze the ability of the scope to accept different devices like EUS needles, and stents. Ease of use I think that is got to be there too and then ergonomically how these processors are designed. I have done this for long enough now like the ones early on, the screen can move, but it could not get to face heights, it is bending over. Now they are getting better with the ability to move the displaced screen to rotate things, but I think ease of use needs because it is always there as well."-* ***Gastroenterology Department Head, US***

> *"Image quality, device footprint, cost and durability of the equipment, and inclusions in the maintenance agreement are important purchase factors. Ability to integrate with existing systems, so whether that information can get uploaded through software to our electronic medical record and with that is going to be data security consideration. So, I would say those are the items that probably would be at the top of the list. Any innovative or safety feature that maybe through the use of this new device, clinical studies, white paper and things like that which shows support for this new equipment over what's currently out there."* ***- Purchasing/Procurement Head, EBUS User, US***

Other unaided mentions: *Device ROI (n=3), compatibility with other components (n=3), ability to incorporate AI (n=2), brand reputation (n=2), scope diameter (n=2), needle size(n=1), durability of the device(n=1), device footprint(n=1)*

Unaided: Unprompted responses mentioned by the respondent

**Probe points not specified for purchasers*

High mentions Medium mentions Low mentions

n=60

Key purchase factors for flexible endoscopes/E(B)US (Aided)

Maneuverability of the scope, range of tip angulation/field of view, after sales service and maintenance cost and total cost of ownership are key purchase factors

	Aided	Mentions		
		Overall (n=60)	Clinicians/HODs (n=40)	Purchasers (n=20)
Technical factors	**Maneuverability of the scope** *Stakeholders look for flexible and thin scopes*	36	27	9
	Range of tip angulation/field of view	23	23	_ *
	Simple, intuitive user-interface of video processor	18	13	5
	Real-time tissue elastography	13	13	_ *
Non-technical factors	**After sales service and maintenance cost** *Maintenance agreement: guarantee offered for consumables, cost of repair, and repair turnaround time are analyzed before making a purchase*	29	19	10
	Total cost of ownership	26	18	8
	Prompt and reliable after-sales service	25	15	10
	Training and education	21	15	6

Other aided mentions: *Clinician choice/preference (n=12), brand reputation (n=12), high-resolution b-mode (n=9), Contrast-enhancement option (n=9), ergonomically designed scope grip (n=9),*

**Probe points not shown to purchasers*

> *"The durability of the equipment and the stability. The technical support on-site as well as the support in case of possible equipment damage. The conditions of the purchase and maintenance contract. The availability of rental equipment. Especially in areas like ours where you have three endo-sonography units. If one fails, a quick replacement with a rental device is needed to keep the operation going. My order of importance is: maneuverability, fast and reliable customer service, training and education, intuitive user interface, financial aspects, cost of customer service, and maintenance."* ***- Gastroenterologist/Endoscopist, EUS User, Germany***

> *"It must be top-quality technology. It must be a valued system. The service must be guaranteed. Overall, the package should be very attractive in terms of price. The most important thing is technology. Then comes the handling of the endoscope. The third most important thing is the customer service, operating costs and medical consumables that are offered. This must be compatible. It is always good to get the right consumables from one company. If you use other needles, the risk of damage to the working channel increases."* ***- Pulmonology HOD, EBUS User, Germany***

> *"User-friendliness, hygienic aspects, price, ease of repair, and image quality, in order to present the diagnosis correctly. That one would have to come first. Training and continuing education are basic requirements. Order: image quality, doctor's preference. Then customer service, training, cost, purchase, and maintenance. Unimportant for me are brand reputation and relationship with the sales team."* ***- Purchasing/Procurement head, EBUS Intender, Germany***

Aided: Prompted responses selected from a list of options shown

High mentions Medium mentions Low mentions

n=60

Impact of cost of maintenance/service contracts on purchase decision

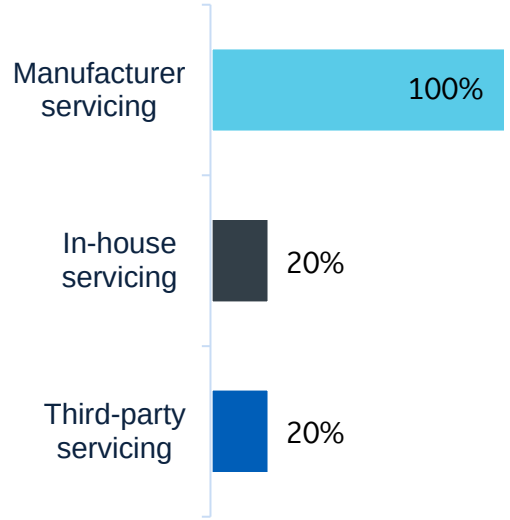
Overall, there is an impact of cost of maintenance/service on purchase decision because high cost of maintenance leads to an overall high total cost of ownership

86% Stakeholders consider maintenance/ service contract to have an impact on purchase decision

Reasons for impact of maintenance contract on purchase decision

- **Maintenance cost along with the upfront cost** is taken into consideration during purchase
  - Since the **maintenance cost is high (vs. upfront cost) it has an impact on the total cost of ownership** which in turn impacts the purchase decision
- Preference is given to a vendor who **provides maintenance services in their contract** versus a vendor who has a lower upfront price

Maintenance/service of flexible endoscopes/E(B)US



- For maintenance/ service all depend on the manufacturer
- Additionally in the US 3rd party servicing has opted especially for older equipment.
- Further in case of minor repairs hospitals in US, Germany and Japan cite using the in-house repair

> *"It has a total impact. This is a big cost component of the total cost. If you have an offer for 50,000 and for 40,000 euros, it does not mean that you take the one for 40,000 euros. The other supplier may be expensive in terms of equipment but may have much cheaper consumables or maintenance costs. You always have to consider this together. It often makes the final decision"*
> - ***Purchasing/Procurement Head, E(B)US User, Germany***

> *"EUS devices are serviced as far as possible, and otherwise you need to consult with medical devices department. For normal flexible endoscopes we have a service contract which is adjusted every three years. This is simply more comfortable because otherwise the defective part is removed, then you have a cost suggestion, which needs to be checked and approved, and this is a back and forth"*
> – ***Purchasing/Procurement Head, E(B)US User, Germany***

n=20

Recommendations to provide better maintenance/ service contracts

Quick availability of a loaner, reduced maintenance cost, and remote support for troubleshooting are the key recommendations

Recommendations	Explanation	Mentions
Quicker loaner availability	• Provide **quick turnaround time** for loaner • Manufacturers should simultaneously **provide a loaner set** at the same time as a **replacement pick-up for the damaged scope**	4
Lower maintenance/service cost	• Stakeholders want manufacturers to provide **discounts and offer a more competitive maintenance cost**, since maintenance cost for flexible endoscopes/E(B)US is **high**	3
Remote support for troubleshooting	• Manufacturers can provide **remote technical support in case of software breakdown**	3
Quick device repair	• Currently, the **turnaround time for device repair is quite high**, stakeholders want a quick repair turnaround time	2
Reprocessing staff training	• **Reprocessing training for support staff** will **minimize device damage** and lead to effectively lower maintenance cost	1

> *"I think a big part of it is a quick turnaround. So if we have one that needs to be serviced or replaced, then we would first get that replacement before we give back the one that needs to be repaired or be replaced. I push back on that sometimes and that's been a real problem. I would say that within the contract, it should be just an automatic replacement after so many repairs. So if it is been repaired twice, it's time for us to just give a new one. Just replace it, put in something. That type of thing. "- **Purchasing/Procurement Head, EUS Intender, US***

> *"I hope the cost can be reduced, of course, this is to complement each other (seller and purchaser). Also, training should be provided for operational training. This will reduce obstruction and breakdown during use. It's a give and take scenario. "- **Equipment Department Head, EUS User, China***

High mentions Medium mentions Low mentions

n=20

Impact of training on purchase decision

Clinicians/HODs and Purchasers (User, Intender)

Training is included in the purchase contract; however, it is not considered to have a strong impact on purchase decisions, since device controls/features do not vary much across brands

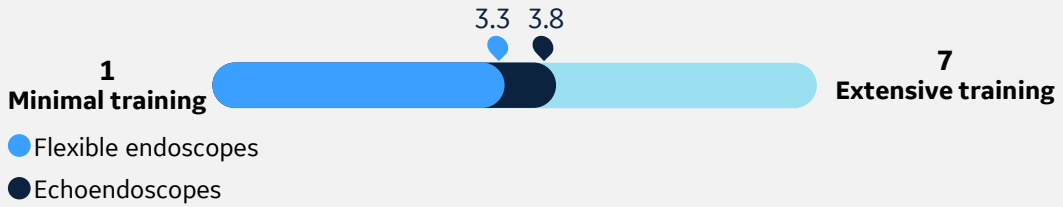
12% Stakeholders consider training to have an impact on purchase decision

90% Stakeholders mention that training is included in the purchase contract

Impact of training on purchase decision

- Although training does not have a high impact on the decision, there is a **preference for vendors that provide practical training/demonstration**
- Training is **not a primary consideration**; it is just an additional clause in the contract

Level of training required when switching brands



- Clinicians expect **minimal training** when switching brands
- Given the **years of experience performing endoscopy** and since **most** of the **features/controls are the same across brands** the learning curve is not considered steep (high among Olympus users). Hence, extensive clinical training is not expected when switching brands

Types of training provided

Training is a part of the service contract and is provided basis **facility needs**

Clinician training:

- Training is provided to **clinicians on device and feature usage**
- While performing procedures in the endoscopy room, sales representatives are present during the initial training period
- **Support staff/ physician assistants:**
- On installation, support staff, and physician assistants are trained on **device setup, maintenance, and troubleshooting**

Reprocessing staff:

- Training is provided on **reprocessing, cleaning, and sterilization of scope**
- If necessary, training is provided to **new support staff** basis requirement

NOTE: Stakeholders prefer continuous training (at least twice a year) to ensure the new clinicians/ support staff are trained

> *"I wonder. The wording might be a little improper but it's more like an "extra" or "bonus". I mean, it's fine if they were to include it in the contract, but it's not too essential or high on the priority list. That's why I think that while it matters little if it's included in the contract or not but it does have its merit if it is included."*
> ***- Purchasing/Procurement Head, E(B)US User, Japan***

High mentions Medium mentions Low mentions

n=20

Training expectations with E(B)US

Clinicians expect manufacturers to provide in person training, online courses and provide funding for training conducted by physicians' societies

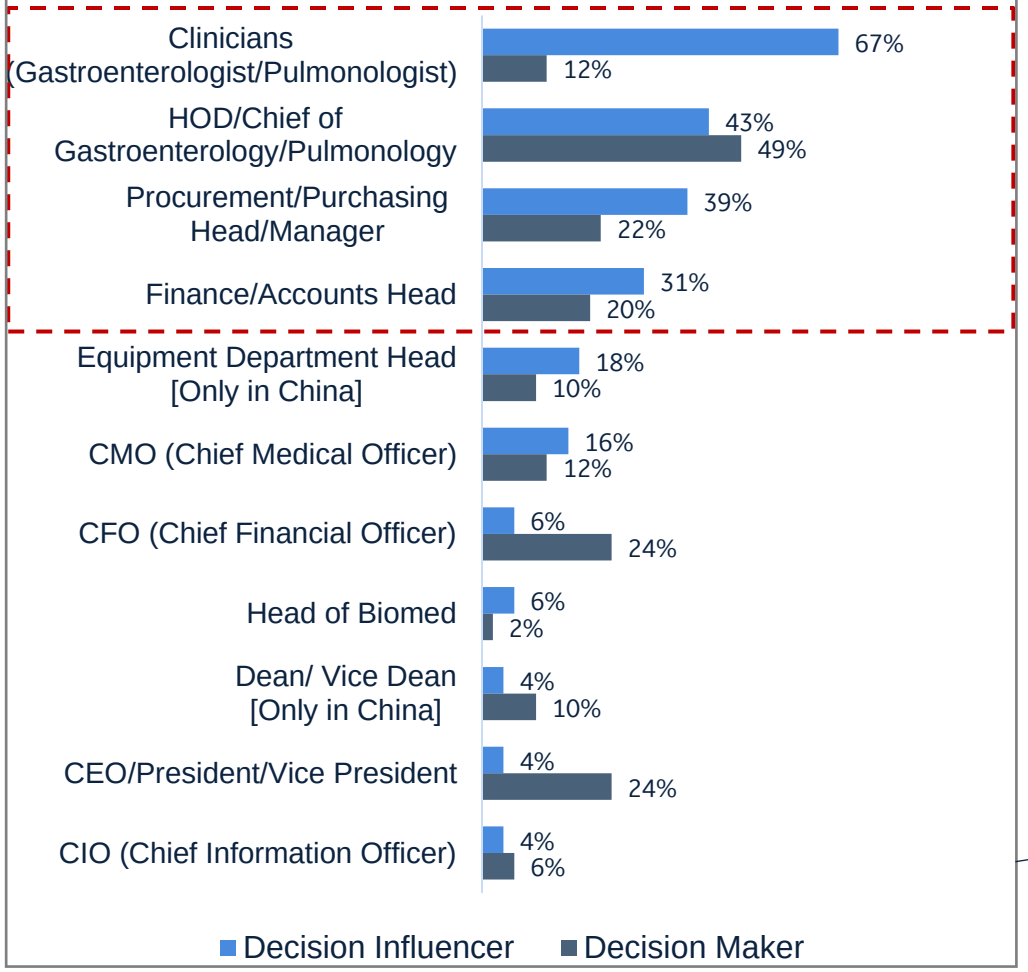
	Physicians	Physician Assistants/ Support staff
When should training be provided	• Training should be provided during **device installation** • 2-3 days of **comprehensive training** should be provided when a **new technology** is introduced • Due to high physician turnover frequent on-site training should be provided to **new physicians**	• Training should be provided during **device installation** • Regular training should be provided to support staff on **reprocessing** to prevent frequent damages • **New physician assistants** should receive training on how to handle the device
Expected periodicity of training	• **Biannually**	• **Triennially**
Who should deliver the training	• **Sales representatives from manufacturers** should provide training on various intricacies associated with **using the device** • **EUS experts/ experienced physicians** should train on the **skills to perform a procedure**	• **Sales representatives from manufacturers** should provide training on **device handling and reprocessing**
What training should be provided	**Training currently provided:** • Training is provided on device and feature usage • Sales representative is present during the initial procedures to answer questions if needed Additionally, clinicians expect: **Funding for training conducted by physician societies:** • Regular and robust training courses are provided by physician societies such as the **European Respiratory Society and Chinese Medical Association; physicians** expect manufacturers to finance such courses **Continuous medical education:** • Organize **medical conferences where** experts speak about newer techniques and innovations in the area **Online courses:** • Online courses like the one provided by Olympus Academy on **technical skills** and **device usage,** should be offered by other manufacturers **Virtual simulations** • Manufacturers should provide **virtual models** to practice cases and ensure quick learning for **new physicians**	**Device usage:** • There is a need to train the support staff on **how to use, reprocess, and handle the device** • **Clinician training is the focus, while support staff training are limited**, more robust training should be provided for reprocessing and handling of scopes **Reprocessing of scopes:** • Train support staff on **optimal handling and reprocessing of scopes to prevent breakages** as and reduce maintenance costs

n=22

Key stakeholders involved in purchase decisions

HODs, Procurement/ Purchasing Head/Manager and Finance/Accounts Head are the key stakeholders involved in the purchase

OVERALL



KEY STAKEHOLDERS

Clinicians/HODs

- Clinicians/HODs identify the need for the device and define its technical specifications
- They gather information to make a case in front of VAC (value analysis committee)
- HODs play a key role in the final decision making

Procurement/Purchasing Head/Manager

- Identify and assess products basis facility budgets and recommend the most cost-effective option or a device with maximum return on investment fitting the facility requirement
- Review competitive bids and carry out negotiations with vendors
- Build business case along with clinicians
- Procurement/Purchasing Head/Manager are key decision-makers in Germany

Finance/Accounts Head

- Approve budget for the device and finalize both upfront cost and maintenance cost

NOTE:

- In China, Equipment Department Head is the key decision influencer whereas Dean/Vice Dean is the key decision-maker

> *"I think it's a complex question. It's not easy. It depends upon the hospital's arrangements as well. Obviously, there is advice from the clinician, there is a purchase committee and budget committee and there is an equipment. There is a different department who recruits the equipment as well. So after certain levels, we don't get involved with business aspects of it."*
> ***- Gastroenterologist/Endoscopist, EUS User, UK***

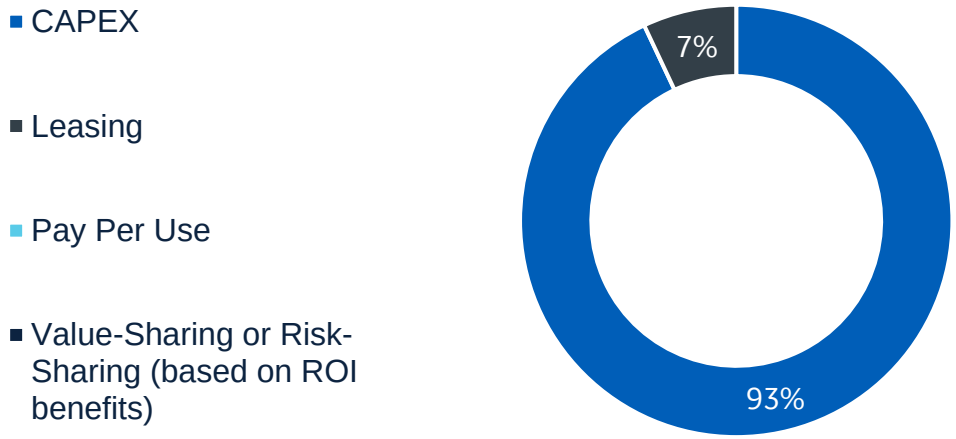
> *"The first is, of course, the HOD. The Accounts Head would come next, followed by the President/Director. As a result, the opinion of individuals who are really handling the equipment will ultimately have the biggest influence. We wouldn't continue the discussion if the person who would operate the equipment doesn't truly aspire to it or if he or she doesn't consent."*
> ***- Pulmonology Department Head, EUS/EBUS Intender, JP***

n=60

Preferred Payment Model for flexible endoscopes/E(B)US

CAPEX is the preferred payment model for flexible endoscopes/E(B)US

Preferred Payment Model



Payment Model Preference

- Almost all prefer CAPEX
  - CAPEX is preferred for equipment with a longer average lifespan (~5 years or more)
  - It is perceived to be a comparatively cost-effective option
  - It also enables the hospital to own the equipment, which is not the case with leasing (which is preferred only when the facility is short of capital)
- Stakeholders are skeptical of Pay Per Use and Value-Sharing models for scopes since they are not very sure how these will be tracked or calculated

> *"Leasing is currently not an option for us because we fund the purchase of these devices with subsidies, and our pot of subsidies is currently well filled. We were in a very good position this year and last year because we saved the years before. At the moment we are at CAPEX. We buy the device and finished. Leasing has the advantage, now, that interest rates were very low and at almost zero for a long time, leasing has a leasing factor behind it, and at our bank, the credit for a million euros was cheaper than any leasing offer. Pay per use and value-sharing stand out in the billing afterwards. We would need a good concept to think about it, but then there surely is a lot of administrative work."*
> –***Purchasing/Procurement Head, EUS User, DE***

> *"Generally for equipment, our philosophy is if the technology is stable and is going to be stable for let's say the next 5 to 10 years, it's not constantly changing, we generally are going to purchase that equipment through capital equipment. Hence if it's technology that's currently changing like our smartphones. Where that technology changes literally year to year. In that case, we would choose a different contracting model because we would not want to spend X number of dollars on something that a year or two from now it's already obsolete. So that's generally kind of our philosophy on what type of contracting model is it."*
> –***Purchasing/Procurement Head, EUS User, US***

n=20

Section 5: Future outlook

Key innovations in flexible endoscopes that will be impactful in future

Clinicians/HODs & Purchasers (User, Intender)

Fusion EUS imaging/electromagnetic navigational bronchoscopy followed by single-use endoscopes and incorporation of AI/ML are the key innovations that will have the most impact

In order of overall mentions

Key innovation	Impact on endoscopy practice	Mentions					
		Overall (n=60)	US (n=12)	UK (n=12)	DE (n=12)	CN (n=12)	JP (n=12)
Fusion EUS imaging / Electromagnetic navigational bronchoscopy (Unaided + Aided)	• Combining EUS with CT/MRI offers better visualization of lesions/tumors aiding diagnosis (especially early-stage cancers)	35	10	9	6	8	2
Single-use flexible endoscope (Unaided + Aided)	• Enables better handling of sudden spikes in patient volume (especially in ER/ICUs) • Helps avoid laborious process of sterilization and reprocessing (better infection control); however, costs and equipment quality are the concerns	27	10	5	7	4	1
Incorporation of AI/ML in flexible endoscopy (Unaided + Aided)	• AI/ML can help in better detection and characterization of polyps/lesions, adenoma, early carcinomas, and dysplastic changes, which tend to get missed • Application of AI can be further extended by combining endoscopy with CT/MRI images	22	4	7	6	4	1
Forward viewing EUS (Unaided + Aided)	• It provides direct view (instead of oblique view with conventional EUS), which leads to better precision during biopsy, thereby avoiding accidental artery puncture	18	3	5	4	6	--
Capsule endoscopy (Unaided + Aided)	• Non-invasive diagnosis of the complete GI tract (including colon) without procedure hassle (patient just has to swallow a pill) • Improved reach – access to narrow lumens that scopes cannot get into • However, biopsy is not possible	11	5	3	1	1	1
Robot-assisted endoscopy (Unaided)	• Robot assisted endoscopy will improve precision because of higher degrees of freedom	4	2	--	--	--	2
Availability of thinner (echo)endoscopes (Unaided)	• Thinner (echo)endoscopes will help reach difficult anatomy (narrow lumens) along with improving patient comfort for the procedure	4	--	--	1	--	3

Other Innovations: Narrow band imaging (NBI) provides better visualization and helps to differentiate between sub-mucosal surface and microvascular structures

High mentions Medium mentions Low mentions

n=60

TEJASWINI BATHALA

IIHMR-U/02/2020-22/0232

MBA IN PHARMACEUTICAL MANAGEMENT

BATCH 2020-22

IIHMR UNIVERSITY, JAIPUR