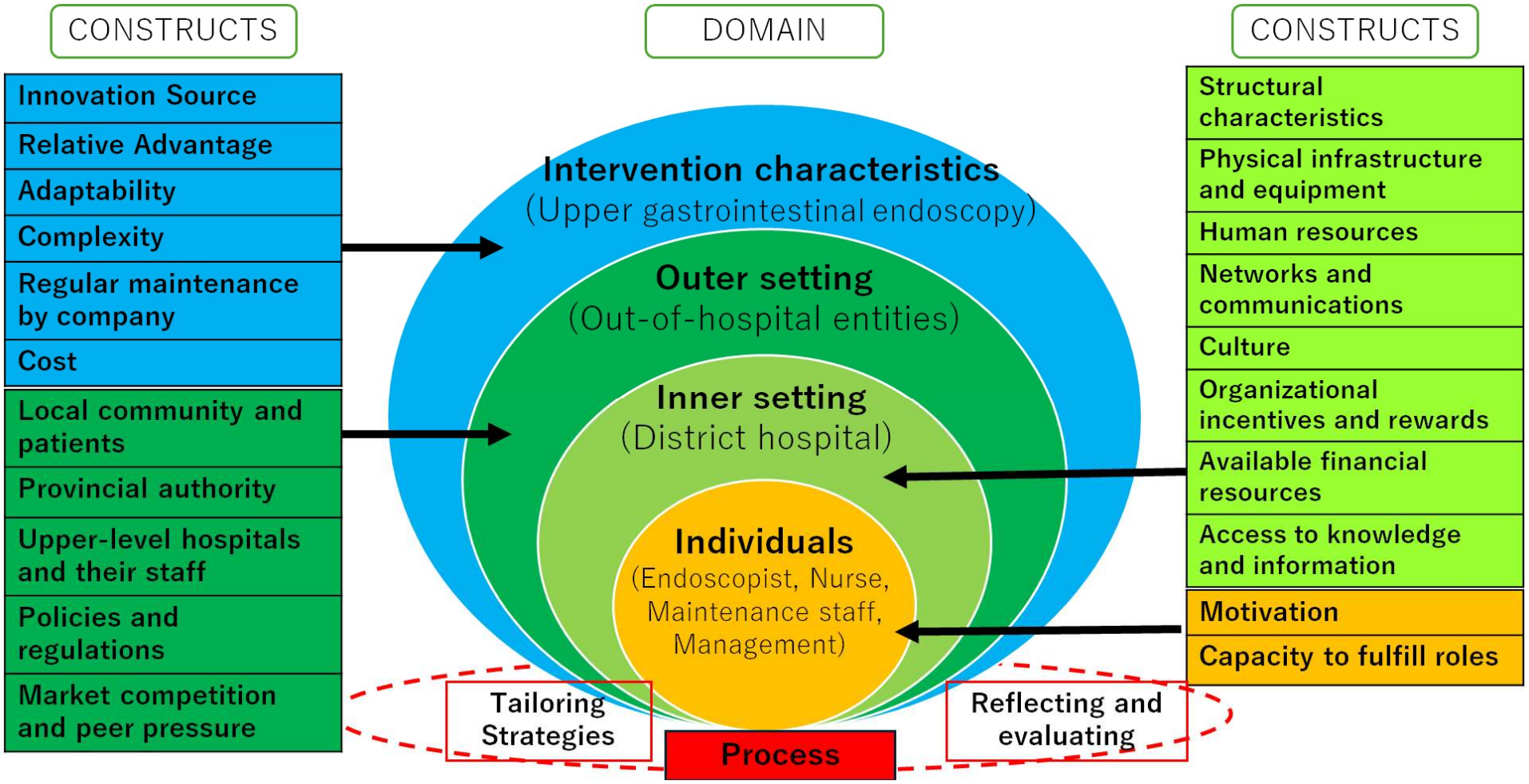

Supplementary Figure S1. Consolidated Framework for Implementation Research (CFIR).

Supplementary Table S1. Pre-collected Data

	Province 1		Province 2	
	Hospital A	Hospital B	Hospital C	Hospital D
Population in 2019*	214,914	315,711	121,254	107,846
Number of beds	300	370	260	270
Number of upper gastrointestinal endoscopy cases in 2023	2,956	523	150	40**
Number of endoscopists	2	3	1	1
Number of endoscopy nurses	2	2	1	1
Number of endoscopy technicians	1	1	1 (Nurse)****	1 (Nurse)****
GI endoscopy stations (monitors)	2	1	2	1
Number of endoscopes	3	2	3	1
Year established***	2007	2011	2018	2023
Number of operating days per week***	5.5	5	n.a.	1
Average number of patients per day***	15–20	2–10	5–6	2–3

The table includes some data from the interviews.
* National Statistics Office of Vietnam, 2019. ** October 2023–October 2024.
*** Data from interviews. **** Endoscopy nurses take on technician tasks.

Supplementary Table S2. Facilitating and hindering factors of upper gastrointestinal endoscopy implementation at district hospitals in Vietnam

Theme	Description	CFIR constructs (domain)	Factors linked with the recommended policies
Facilitating factors			
1) Staff confidence in the diagnostic efficacy of upper gastrointestinal endoscopy	Staff recognize the diagnostic efficacy of upper gastrointestinal endoscopy.	Relative advantage (Intervention characteristics).	4) Raising awareness of upper gastrointestinal endoscopy services.
2) Supportive national health policy	Health insurance coverage for endoscopic services ensures affordable access for patients; professional certifications are established.	Cost (Intervention characteristics); Policies and regulations (Outer setting).	
3) Favorable environment for the device, including access to monitoring and maintenance services	Monitoring and maintenance services are provided by manufacturers/agencies.	Regular maintenance by companies (Intervention characteristics).	
4) Partnerships with upper-level hospitals	Referral of complex cases, diagnoses, and bleeding cases; training for certification of endoscopic specialists.	Upper-level hospitals and their staff (Outer setting).	2) Facilitating participation in upper gastrointestinal endoscopy training; 3) Establishing accessible professional networks.
5) Motivated and committed human resources	Staff motivated to pursue continuous training and higher skills for improved endoscopic services; Staff having a sense of mission as public facilities and attachment to their workplace.	Culture (Inner setting); Motivation (Individuals).	2) Facilitating participation in upper gastrointestinal endoscopy training; 3) Establishing accessible professional networks.

Hindering factors			
1) Limited service delivery capacity	Lack of pathological diagnostic capacity in hospitals; Limited capacity for emergency interventions for bleeding cases and other treatments.	Structural characteristics (Inner setting); Capacity to fulfill roles (Individuals).	1) Mobilizing and redistributing financial resources for PHC-level hospitals; 2) Facilitating participation in upper gastrointestinal endoscopy training.
2) Non-standardized endoscope reprocessing	Different reprocessing processes among the four hospitals.	Adaptability/Complexity (Intervention characteristics).	5) Promoting adherence to national guidelines.
3) Limited physical infrastructure	Suspension of service delivery in the event of device breakdown; Lack of rooms and equipment; shortage of consumables; Outdated endoscopy models that have been in use for a long time; Lack of pathological capacity.	Local community and patients (Outer setting); Physical infrastructure and equipment /Structural characteristics (Inner setting).	1) Mobilizing and redistributing financial resources for PHC-level hospitals.
4) Limited human resources in terms of number, skills, and training	Inability to provide stable services delivery due to staff shortages; Understaffing; Multitasking; Shortage of substitute staff; Limited training opportunities.	Local community and patients (Outer setting); Human resources/access to knowledge and information (Inner setting); Tailoring Strategies (Implementation process).	1) Mobilizing and redistributing financial resources for PHC-level hospitals; 2) Facilitating participation in upper gastrointestinal endoscopy training.
5) Lack of professional networks for seeking technical advice	Lack of official networks for seeking technical advice.	Upper-level hospitals and their staff (Outer setting).	3) Establishing accessible professional networks.
6) Constrained budgets	Lack of budget for new devices; Reusing single-use consumables; Low-quality disinfectants and water for reprocessing; Basic salaries covering only minimum daily expenses.	Cost (Intervention characteristics); Provincial authority (Outer setting); Physical infrastructure and equipment; Organizational incentives and rewards (Inner setting).	1) Mobilizing and redistributing financial resources for PHC-level hospitals.

7) Low awareness of alignment between national guidelines and in-house guidelines among staff	Low awareness of national guidelines; Absence of in-house guidelines.	Policies and regulations (Outer setting).	5) Promoting adherence to national guidelines.
8) Low awareness of upper gastrointestinal endoscopy services among local communities and clinicians	Limited awareness of endoscopy services among local residents; Low volume of endoscopy examinations prescribed by internal clinical doctors; Staff perception of a need to raise awareness among the local population and internal staff.	Local community and patients (Outer setting); Networks and communications (Inner setting); Tailoring strategies (Implementation process).	4) Raising awareness of upper gastrointestinal endoscopy services.