IBUS Assessment of Technical Skills (ATS)

Domain 1: Ultrasound equipment and preparation

1. Patient position and abdominal exposure

Demonstrate proper techniques for exposing the abdomen and positioning patients according to their needs and medical conditions.

Level	Criterion
1 **Unacceptable**	Abdomen poorly exposed and patient misaligned; ability to fully visualize ≥ 2 segments is compromised.
2 **Poor**	Abdomen partially exposed and patient sub-optimally positioned; ability to fully visualize of ≥ 1 segment is compromised, hindering full evaluation.
3 **Adequate**	Abdomen sufficiently exposed and patient sub-optimally positioned; all segments are visible, but ability to fully visualize 1 segment is compromised.
4 **Good**	Abdomen clearly exposed and patient well positioned; all segments are visible, but ability to fully visualize 1 segment is compromised.
5 **Exemplary**	Abdomen fully exposed and patient perfectly positioned; all segments are fully visible without being compromised.

2. Machine care and hygiene

a. Demonstrates appropriate techniques for maintaining the ultrasound machine and probes in a clean and functional condition before, during, and after the examination, including proper disinfection procedures and equipment handling to prevent damage.

b. Ensure adherence to appropriate hygiene standards, including proper hand hygiene and well-maintained nails. For optimal performance, wristwatches, jewelry, and long sleeves should be avoided.

Level	Criterion
1 **Unacceptable**	Ignores hygiene protocols, leaves equipment soiled; no disinfection – risking machine damage and demonstrating inappropriate hygiene standards
2 **Poor**	Inconsistent cleaning; misses key disinfection steps; careless equipment handling; insufficient hygiene standards.
3 **Adequate**	Follows basic protocols; equipment left clean, but thorough steps may be rushed or omitted; meets minimum hygiene standards.
4 **Good**	Consistently performs full cleaning and disinfection; equipment is ready for next use; adheres to appropriate hygiene standards (e.g., hand hygiene, short nails, no jewelry/long sleeves).
5 **Exemplary**	Performs pre- and post-exam inspections, deep cleaning, and precise handling; leaves equipment fully clean, next-user–ready condition; exceeds hygiene standards.

3. Preset and probe selection(s)
Control navigation and ultrasound machine menu controls for image acquisition.
An appropriate probe for the detailed and documented exam is a mid-high frequency probe that at least covers the 5-8MHz frequency range

Level	Criterion
1 **Unacceptable**	Chooses an inappropriate probe/preset or cannot operate basic controls; produces no usable image and fails to document bowel segment(s).
2 **Poor**	Chooses an inappropriate initial probe/preset or struggles significantly (> 2 min) with basic controls; yields poor image quality that hinders the exam.
3 **Adequate**	Chooses the appropriate probe/preset; locates essential controls (≤ 2 min); produces a fair but suboptimal image.
4 **Good**	Chooses the appropriate probe/preset and essential controls (≤ 0.5 min); achieves clear, good quality images across most segments using only those controls.
5 **Exemplary**	Chooses the appropriate probe/preset instantly and operates all controls without hesitation; captures high quality, diagnostic frames for every segment.

4. Probe holding
Demonstrates ergonomic grip, appropriate pressure, and correct cranial/caudal & left/right orientation while ensuring patient comfort.

Level	Criterion
1 **Unacceptable**	Inappropriate and/or unstable probe grip; pressure is either too light or too heavy, causing patient discomfort; orientation is repeatedly incorrect.
2 **Poor**	Inappropriate probe grip: pressure is too light or too heavy, compromising patient comfort; orientation is occasionally incorrect.
3 **Adequate**	Appropriate probe grip; sufficient pressure; orientation is accurate or quickly corrected.
4 **Good**	Appropriate probe grip and compression pressure, though minor improvements (e.g., displacing bowel gas) are possible; orientation is consistently correct.
5 **Exemplary**	Appropriate probe grip and compression pressure ideal to minimize artifact and clearly demonstrate bowel segment(s); orientation is consistently correct.

5. Probe maneuvering
Implement image centering techniques effectively to position the ultrasound probe accurately over target structures for optimal image quality through the use of rotating, sweeping, sliding, rocking, fanning/tilting, etc.

Level	Criterion
1 **Unacceptable**	Probe movements are irregular; cannot center or follow the bowel; produces no usable images
2 **Poor**	Probe movements are irregular; inconsistent centering; visualization is poor with frequent poor images
3 **Adequate**	Probe movements are regular, demonstrates basic techniques to center and follow the bowel most of the time; obtains adequate images.
4 **Good**	Probe movements are regular, employs a full range of maneuvers to center the bowel; produces adequate images of all segments with only occasional minor delays.
5 **Exemplary**	Probe movements are regular, employs full range of maneuvers and dynamically uses all probe movements to track and center all loops; consistently captures optimal images of every bowel segment.

Domain 2: Image optimization

6. Depth
Adjust depth appropriately to visualize the varying depths of the bowel and extra-intestinal structures of interest.

Level	Criterion
1 **Unacceptable**	No depth control: images are too deep or too shallow, causing bowel segments to be cut off or become too small for assessment.
2 **Poor**	Sporadic or incorrect depth control; ≥ 2 segments are cut-off or too small for assessment, due to depth errors.
3 **Adequate**	Adjusts depth to include all segments in the field; however, ≥ 2 segments are not optimally framed with excess depth of > 3 cm below the posterior bowel wall.
4 **Good**	Continuously adjusts depth for most loops; only 1–2 segments fall outside the ideal margin of 1-2 cm below the posterior bowel wall
5 **Exemplary**	Continuously refines depth so every loop sits approximately 1–2 cm below the posterior bowel wall

7. Gain
Adjust gain settings to optimize brightness/contrast balance to enhance image clarity while minimizing artifacts.

Level	Criterion
1 **Unacceptable**	No gain adjustment; image is consistently too dark or too bright.
2 **Poor**	Inconsistent gain adjustment; attempts gain adjustments sporadically or incorrectly; image is consistently too dark or too bright.
3 **Adequate**	Sets an appropriate overall gain with no need for adjustments OR performs occasional adjustments and image is still too bright or dark in ≥ 2 segments.
4 **Good**	Sets an appropriate overall gain and performs only occasional adjustments as needed. Image is too bright or dark in ≤ 1 segment.
5 **Exemplary**	Sets an appropriate overall gain and continuously and precisely adjusts gain for all segments. No image is too bright or too dark.

8. Focus
Adjust focus appropriately (autofocus = 3) to the structure of interest during scanning.

Level	Criterion
1 **Unacceptable**	Focus is ≥ 3 cm off target in ≥ 3 segments, no focus adjustment attempted.
2 **Poor**	Focus is ≥ 2 cm off target in ≥ 2 segments; minimal or incorrect adjustments; autofocus, if available, not used.
3 **Adequate**	Activates autofocus/full-focus mode or manually sets focus ≥ 1 cm off target in ≥ 2 segments.
4 **Good**	Manually adjusts focus to the bowel of interest for most views; focus is suboptimal in 1 segment
5 **Exemplary**	Consistently ensures focus to the bowel of interest for all views via precise manual adjustments.

9. Freeze (and scroll)
Demonstrate utilizing the freeze ± scroll function to identify the optimal still image.

Level	Criterion
1 **Unacceptable**	No freeze or random freeze; no scroll; unacceptable images in ≤ 3 segments.
2 **Poor**	Mostly inappropriate freeze timing; no effective scroll; unacceptable images in ≥ 2 segments.
3 **Adequate**	Appropriate freeze timing; minimal or inconsistent scroll; suboptimal images in ≥ 1 segment.
4 **Good**	Appropriate freeze timing; occasional scrolling (if used) to improve frame selection; captures clear images in all segments.
5 **Exemplary**	Appropriate freeze timing; systematic scrolling (if used) to select the best frame and captures clear images in all segments.

10. Color Doppler Imaging
a. Utilizing optimal settings for scale (±5-7 cm/s) (essential)
b. Box size (> 1 cm surrounding the bowel) (essential)
c. Appropriate color Doppler gain settings (just below noise level) (essential)
d. Minimizing breathing and movement artefacts (desirable)
e. Sufficient assessment time (≥ 3 s) (desirable)

Level	Criterion
1 **Unacceptable**	0–1 essential parameter correct.
2 **Poor**	2 essential parameters correct.
3 **Adequate**	3 essential parameters correct .
4 **Good**	3 essential + 1 desirable parameters correct .
5 **Exemplary**	All parameters correct.

Domain 3: Systematic examination

11. Anatomical landmarks

Must be deliberately shown for ≥ 1 sec
a. Right iliac vessels/psoas muscles for TI, (essentiel)
b. Left iliac vessels/psoas muscles for SC, (essentiel)
c. Stomach/liver for TC, (essentiel)
d. Spleen for splenic flexure, (desirable)
e. Liver for hepatic flexure, (desirable)
f. Boundaries of the entire abdominal cavity, including the bladder/iliac crest bones, pelvic, and lateral abdominal walls, (desirable)

Level	Criterion
1 **Unacceptable**	No landmarks identified, or all attempts are incorrect.
2 **Poor**	1-2 essential landmarks correctly identified.
3 **Adequate**	3 essential landmarks correctly identified.
4 **Good**	3 essential and 1–2 desirable landmarks correctly identified.
5 **Exemplary**	≥6 landmarks identified.

12. Systematic bowel examination

a. Demonstrate a systematic scan to cover all large & small bowel segments (4+2)*
b. Start with EITHER SC/(rectum) and scan in the oral direction to (N)TI, OR start with (N)TI and scan in the anal direction to SC/(rectum)
c. Perform a sweep of the abdomen to look for small bowel pathology
**1. SC, 2. DC, 3. TC, 4. AC/CEC, 5. TI/NTI, 6. Proximal small bowel sweep, (transvesical rectum & appendix is optional)*

Level	Criterion
1 **Unacceptable**	Scans ≤3 core segments; no consistent anatomical order, performs random sweeps without purposeful progression.
2 **Poor**	Scans 4–5 core segments; misses 1 entirely (no attempt) or inconsistent order disregarding anatomical progression.
3 **Adequate**	Scans 5–6 core segments, with uncertainty about 1 segment; order is occasionally unclear but follows anatomical progression.
4 **Good**	Scans all 6 core segments in a clear anatomical order, incomplete proximal small bowel sweep is performed, does not perform optional pelvic (transvesical) rectal view or appendix attempt.
5 **Exemplary**	Scans all 6 core segments, includes a full proximal small bowel sweep, and additionally performs an optional pelvic (transvesical) rectal view or appendix attempt (if no prior appendectomy).

13. Scan plane control
Demonstrate maneuverability between anatomical scan planes (axial/sagittal) and bowel scan planes (cross-section vs. longitudinal).

Level	Criterion
1 **Unacceptable**	Cannot establish correct scan planes; images remain oblique for most segments.
2 **Poor**	Attempts correct scan planes, but transitions often fail; images remain oblique for most segments.
3 **Adequate**	Achieves correct scan planes in ≥ 3 core segments; transitions are difficult and some fail. Some images are slightly oblique.
4 **Good**	Achieves correct scan planes in ≥ 4 core segments; transitions are smooth; no oblique image; both bowel scan planes demonstrated in ≥ 4 segments.
5 **Exemplary**	Achieves all correct scan planes in all core segments; transitions are smooth with consistent precise alignment; optimal true axial/sagittal or cross-sectional/longitudinal images are demonstrated in all segments.

14. Entire segment
Demonstrate scanning through the entire segment (> 80 % of the segment covered) at an adequate scanning speed (1–4 cm/s) in a consistent direction.

Level	Criterion
1 **Unacceptable**	No movement across the segment or erratic, uncontrolled back-and-forth (< 0.5 cm/s or > 10 cm/s).; ≤ 1 segment shown entirely.
2 **Poor**	Attempts a full segment sweep/slide but is erratic—too fast (> 4 cm/s) or too slow (< 1 cm/s)—with many back-and-forth movements; only 2–3 entire segments shown.
3 **Adequate**	Generally, moves along the segment but with variable speed (outside the 1–4 cm/s range) or inconsistent direction; 4–5 segments shown in entirety.
4 **Good**	Smooth scan in one direction at an adequate speed (1–4 cm/s); 5 segments shown in entirety.
5 **Exemplary**	Flawless, deliberate sweep/slide at an adequate speed (1–4 cm/s); all 6 segments fully shown.

15. Identify bowel segments

Find and differentiate between the stomach, the large and small bowel, and the transition between the terminal ileum and the cecum (based on anatomical location, haustral pattern, small bowel folds, peristalsis, content, and diameter).

Level	Criterion
1 Unacceptable	Frequent major errors: confuses small and large bowel or misidentifies major segments; ≤ 2 correct identifications.
2 Poor	1 or 2 significant errors on specific segments or at the TI – cecum transition; identifies only 3–5 segments correctly.
3 Adequate	Minor errors or hesitation on one segment; correctly identifies/labels 5–6 segments/transitions.
4 Good	Correctly labels all six core segments but fails to identify or label the TI–cecum transition.
5 Exemplary	Completely error-free; labels all six core segments and the TI–cecum transition without hesitation.

Domain 4: Exam documentation

16. Annotation

Annotate all stored images and cine loops.
Score is given based upon total numbers of actually saved images/cine loops.

Level	Criterion
1 Unacceptable	0–29% of saved images/cine loops annotated or annotations are mostly wrong.
2 Poor	30–59% of images/cine loops annotated; annotations may be wrong.
3 Adequate	60–79% of images/cine loops annotated; annotations are mostly correct.
4 Good	80–95% of images/cine loops; rare minor mistakes.
5 Exemplary	96–100% of images/cine loops annotated correctly.

17. Image selection and storage
Select and store representative still images and cine loops for core segments (minimum 5 core segment stills + 3 research cine loops + 2 research stills with measurements).

Level	Criterion
1 **Unacceptable**	Documents **0-29 %** of expected OR those images/loops stored are unclear or unrepresentative.
2 **Poor**	Documents **30-59 %** of expected. Images/loops may be poorly framed or less representative.
3 **Adequate**	Documents **60-79 %** of expected with mostly representative images/loops.
4 **Good**	Documents **80-95 %** of expected and all images/loops are representative.
5 **Exemplary**	Documents **96-100 %** of expected**.** Every stored image/loop is clear, accurately framed, and representative.

18. Research data acquisition
Acquires:
a. 1 cine loop cross-section (entire segment)
b. 1 cine loop longitudinal (entire segment)
c. 1 cine loop with color Doppler signal (in cross-section)
d. 2 BWT measurements in cross-section with > 90 degrees apart
e. 2 BWT measurements in longitudinal with > 1 cm apart

Level	Criterion
1 **Unacceptable**	Completes **0–1** element or shows major issues across all elements.
2 **Poor**	Completes **2** elements or demonstrates major issues across all elements.
3 **Adequate**	Completes **3** elements or shows some issues across most elements.
4 **Good**	Completes **4** elements with only minor issues across some elements.
5 **Exemplary**	Completes all **5** elements completely and accurately.

19. Structured report
After the scan, generate a structured report with accurate descriptions, measurements, and a summary of findings

Level	Criterion
1 Unacceptable	No coherent structure: findings poorly or not described; measurements absent; no summary.
2 Poor	Poor structure; significant omissions or inaccuracies in descriptions; most measurements missing or incorrect; no clear summary.
3 Adequate	Adequate structure: main findings described; some measurements or grading included; summary clarity or completeness is suboptimal.
4 Good	Clear structure: most findings and measurements/grading accurately reported; minor omissions; summary is mostly clear.
5 Exemplary	Clear structure; complete and accurate descriptions of all findings and required measurements; concise, informative, clear summary.

20. Confidence and Limitations
Document the scan quality, completeness, and any limitations that may impact the final interpretation/conclusion.

Level	Criterion
1 Unacceptable	No mention of scan quality or limitations; confidence is clearly mismatched to image quality; unrealistic conclusions; no suggestions for further testing.
2 Poor	Mentions limitations or scan quality only vaguely; confidence does not match to quality; follow-up suggestions are absent or inappropriate.
3 Adequate	Notes obvious limitations; confidence generally - matches scan quality; may suggest further testing, but not clearly aligned with limitations.
4 Good	Clearly documents significant limitations and scan completeness; confidence – consistently matches scan quality; suggests further testing or management when appropriate.
5 Exemplary	Precisely documents all limitations and their impact; confidence is perfectly matched to scan quality; specific, justified recommendations for further evaluation when appropriate.

Optional section:

21. Post-resection anastomosis

Visualize, assess, and report the post-resection anastomosis, using a multidimensional evaluation:
a. Bowel wall thickness (BWT), (essential)
b. Doppler signal (vascularity), (essential)
c. Surrounding structures (e.g., mesentery, lymph nodes), (essential)
d. Pre-stenotic dilatation (if present), (desirable)
e. Peristalsis (motility), (desirable)

Level	Criterion
1 Unacceptable	Fails to locate or visualize the anastomosis; **0** features evaluated.
2 Poor	Finds the general region intermittently; unable to clearly image the anastomosis; **1** essential feature evaluated.
3 Adequate	Clearly visualizes the anastomosis; basic inspection performed; evaluates all 3 essential features; may attempt desirable features.
4 Good	Reliably images the anastomosis; documents BWT and Doppler; evaluates all 3 essential features plus 1 desirable feature; minor errors possible.
5 Exemplary	Expertly visualizes and documents all features without errors.