



Research gaps in IUS in IBD

From evidence to unmet needs in clinical practice and trials

Mariangela Allocca

IRCCS Hospital San Raffaele and University
Vita-Salute San Raffaele Milan, Italy

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Workshop organised in collaboration with



Intestinal Ultrasound
Group of the United
States and Canada

Disclosure

Dr. Mariangela Allocca received consulting fees from Nikkiso Europe, Mundipharma, Janssen, Abbvie, Ferring, Galapagos, Lilly, Alfasigma, Sandoz and Pfizer

Where are we—and what is missing?

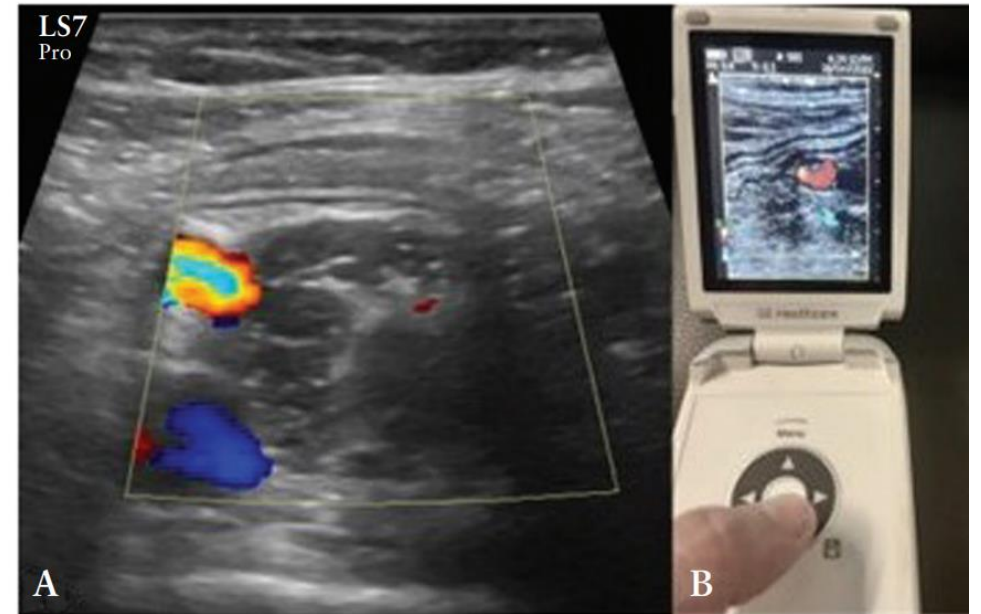
Current evidence

- Assessment of disease activity and severity
- Ultrasound scoring systems for IBD
- Ultrasound response and remission — Transmural healing

Unmet needs

- Lack of standardization
- Limited validation
- Heterogeneous endpoint definitions

Intestinal ultrasound is changing the current approach to managing patients with IBD



First outpatient visit:

Luisa, 48 years old

Ileal CD for 20 yrs

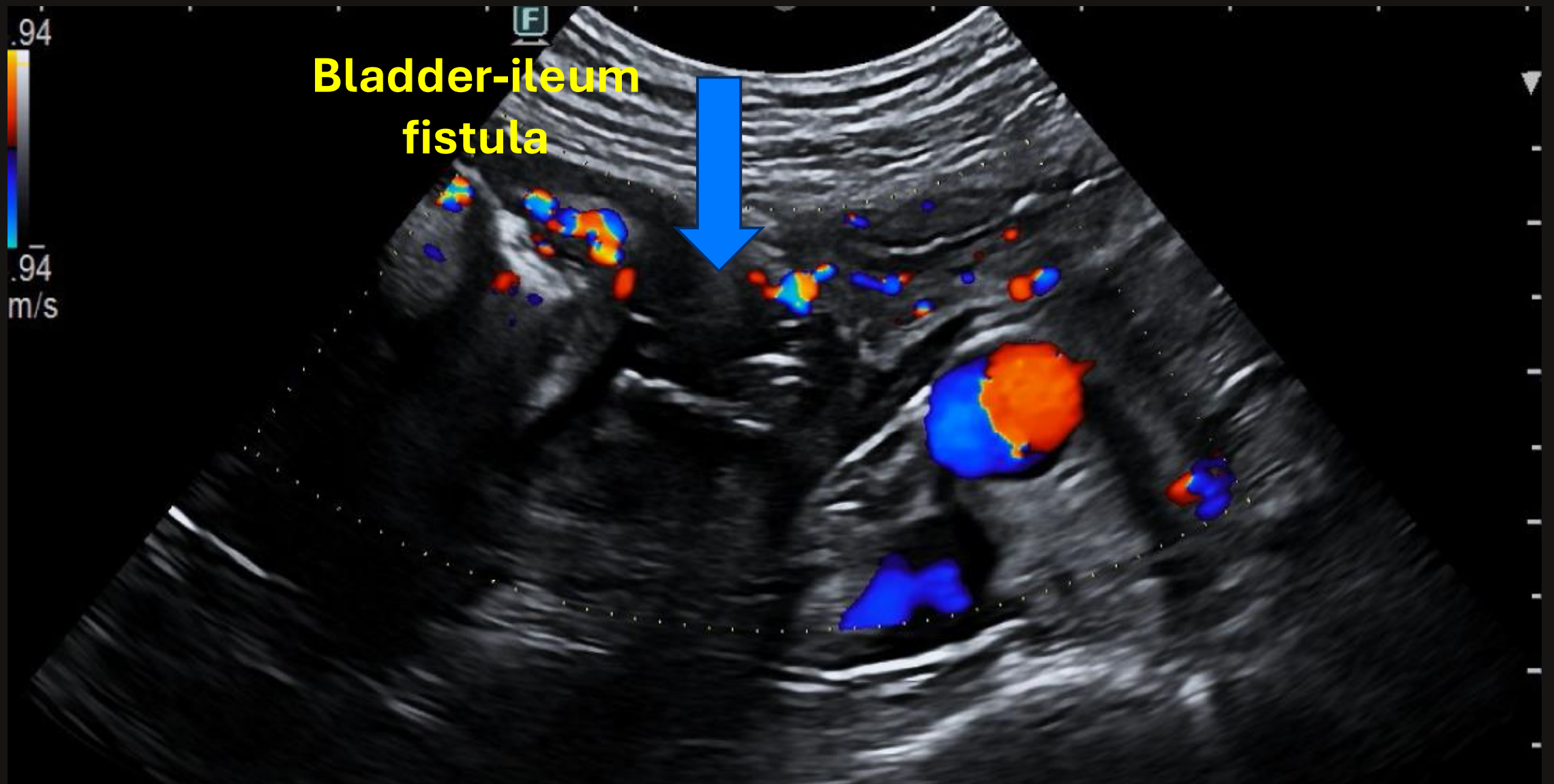
Mesalazine 4 g/day 🙄

Abdominal pain in the
right iliac fossa

CRP 7.5 mg/L

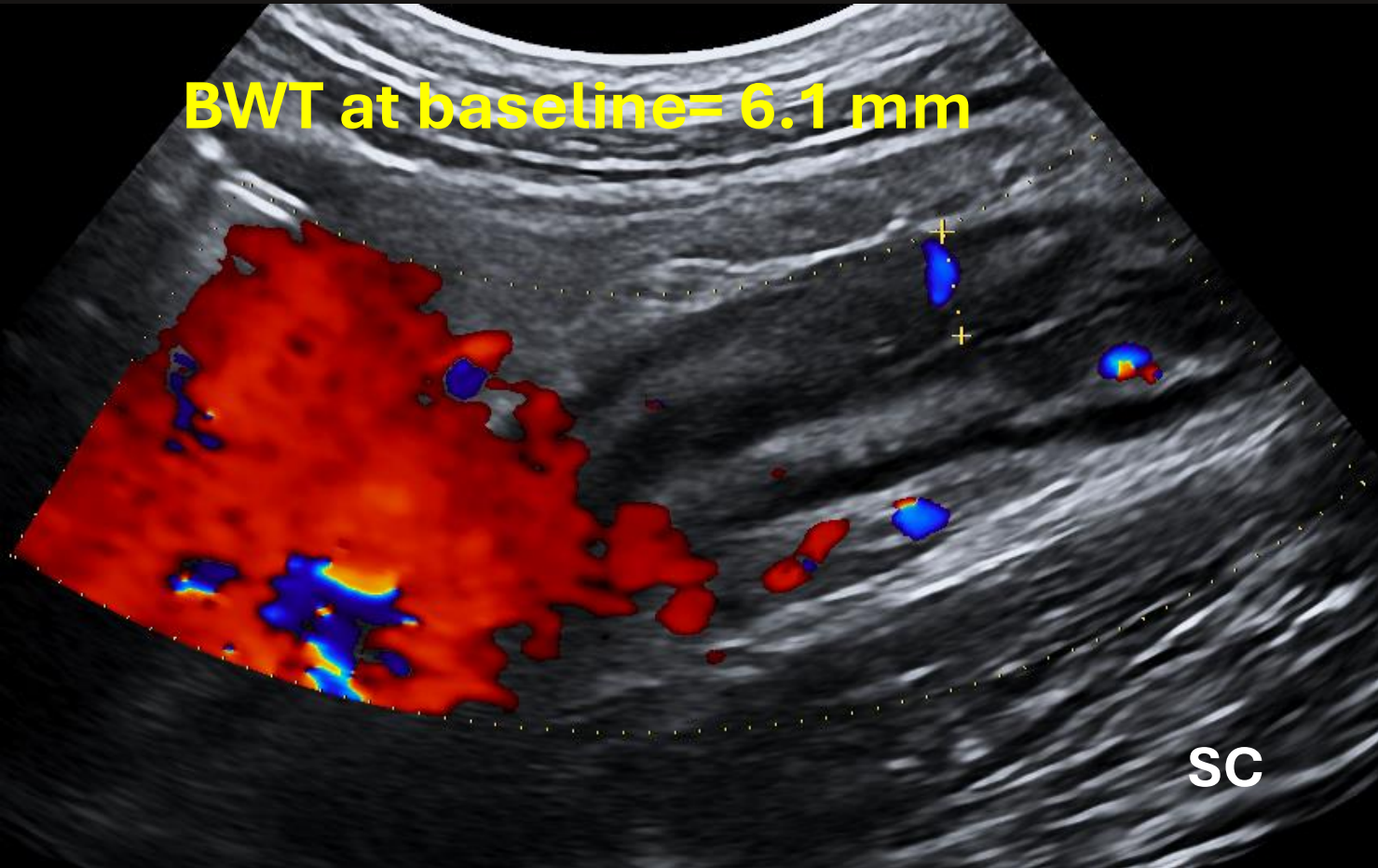
FC 263 mcg/g



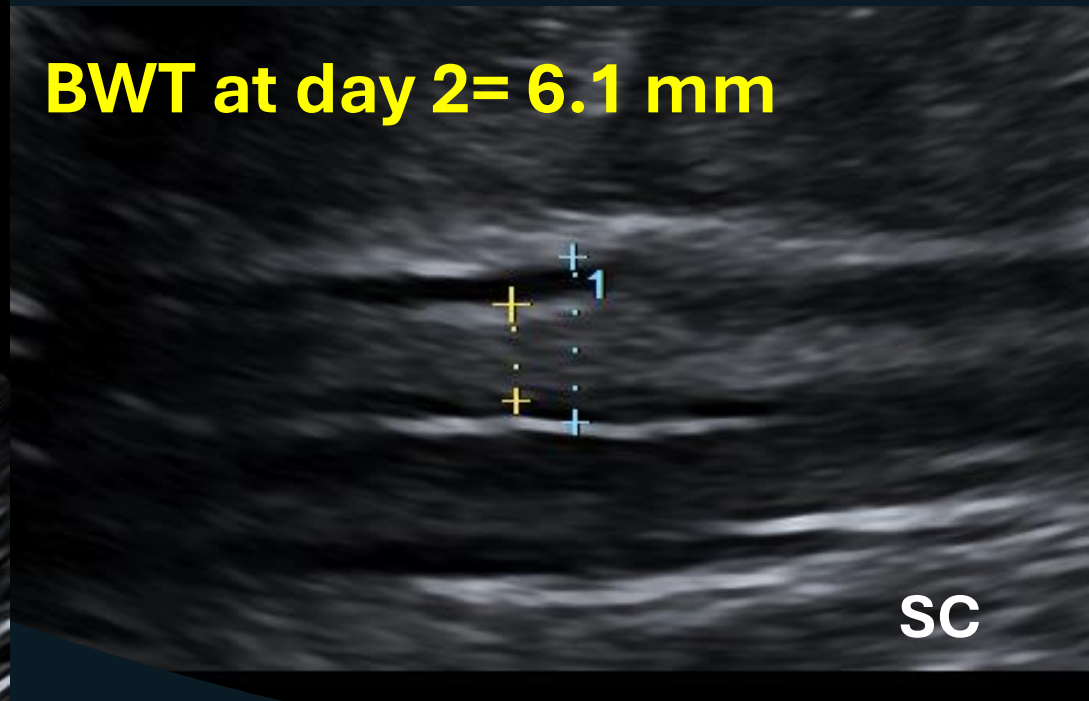
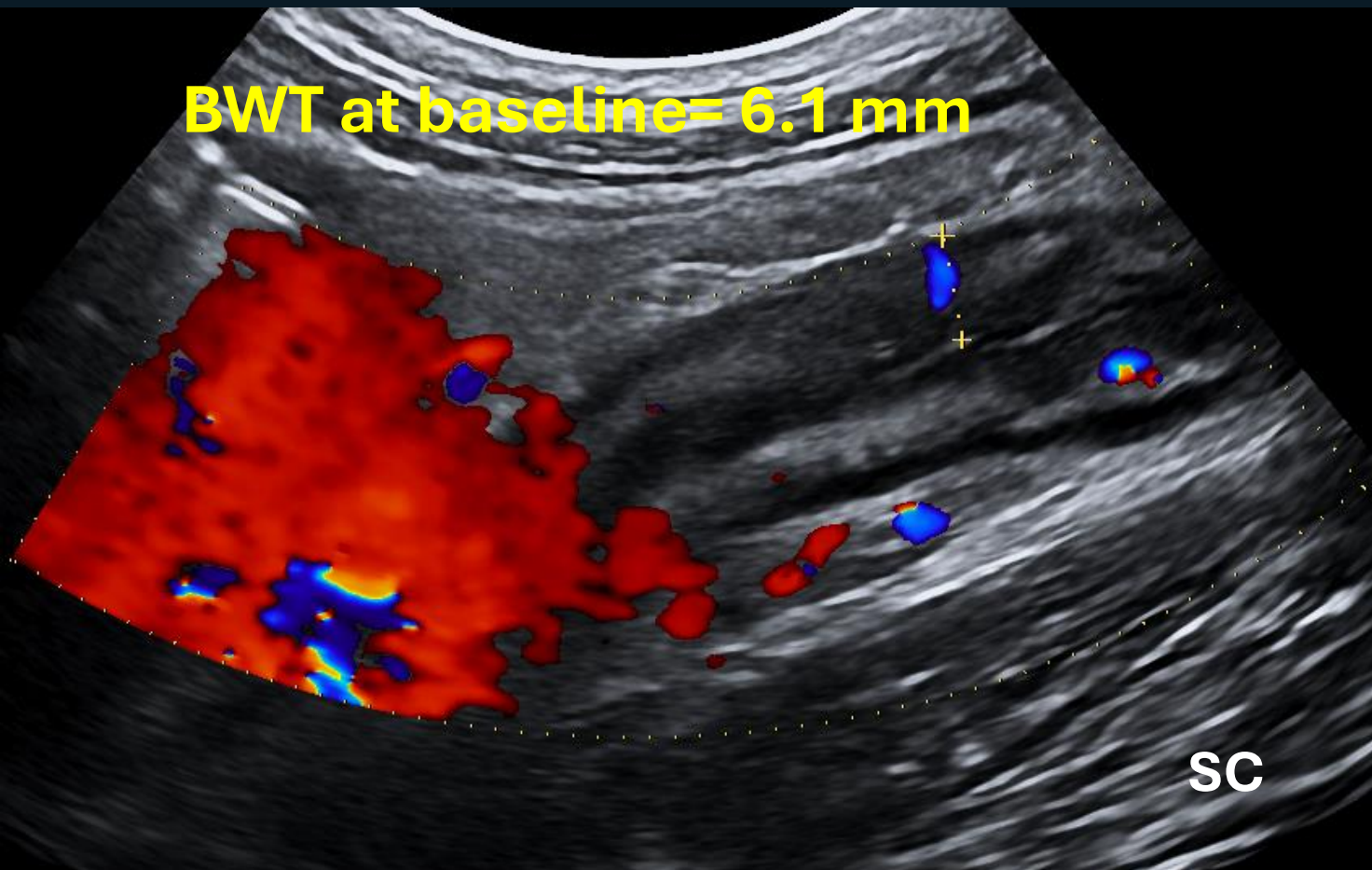


Real-time detection of complications

Francesca 22 yrs. Left UC for 1 year
Acute flare-up. Admitted to hospital
Started iv steroids

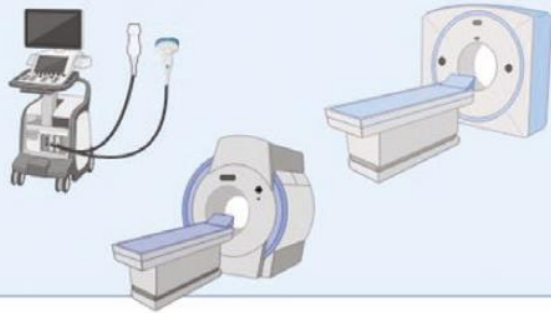


Early prediction of treatment response



Moderate to excellent accuracy of imaging techniques in assessing IBD activity and severity

Assessment of activity and severity of inflammatory bowel disease in cross-sectional imaging techniques: a systematic review



6496 publications screened



179 papers (1990 – 2023) included



10988 IBD patients included



Activity investigated in 100% of the included studies
Severity investigated in < 60% of the included studies

Intestinal ultrasound

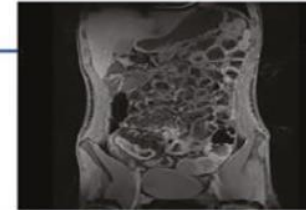
- Bowel wall thickness
- Color Doppler signal
- Hypo-echogenic bowel wall



Pooled sensitivity 62 – 95.2%, pooled specificity 61.5 – 100%,
pooled accuracy 69 – 95%

Magnetic resonance

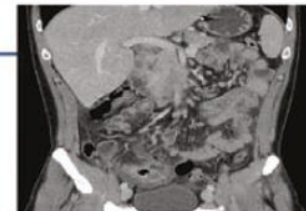
- Bowel wall thickness
- Mural hyper-enhancement
- Mucosal ulcers
- Parietal edema



Pooled sensitivity 64 – 100%, pooled specificity 58.8 – 100%,
pooled accuracy 63.2 – 98%

Computed tomography

- Bowel wall thickness (BWT)
- Mural hyper-enhancement
- Parietal edema



Pooled sensitivity 63.3 – 100%, pooled specificity 59.1 – 100%,
pooled accuracy 81 – 96%

What works

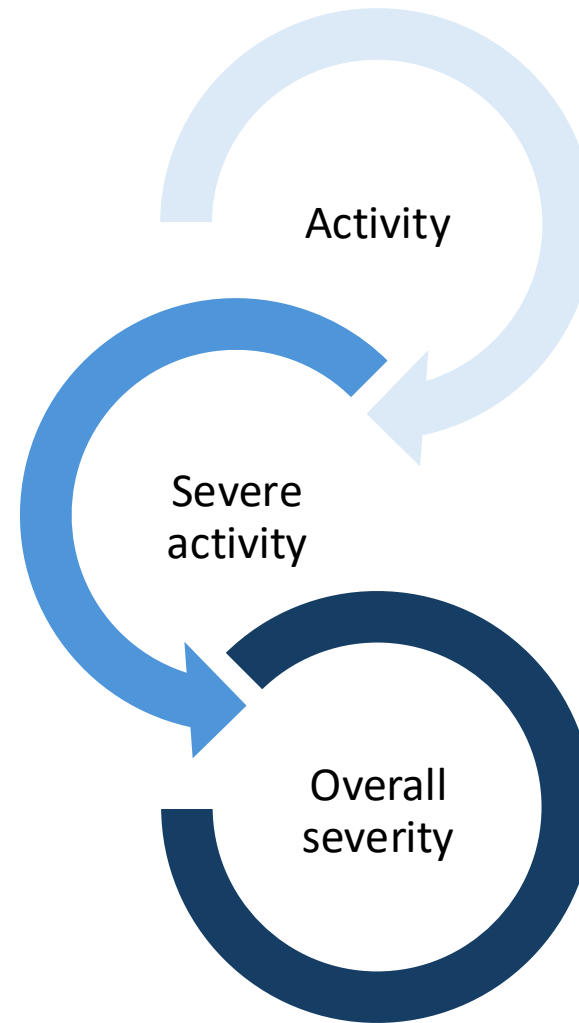
- High reproducibility and predictive value of activity:
 - BWT + CDS
- Combined parameters → ↑ accuracy
- Several activity scores validated
- Good accuracy in ileum and in colon

What doesn't: Key limitations

- Low sensitivity in proximal small bowel (20–30%)
- Very mild/mild disease often missed
- Severity poorly defined (<60% of studies), not standardized definition

Proposed definition of Severity

- **severe activity:**
severe acute
inflammation
- **overall severity:**
activity +
complications



IUS scoring systems in IBD: What to use?

Inflammatory Bowel Diseases, 2025, **31**, 3194–3212

<https://doi.org/10.1093/ibd/izaf183>

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Review Article - Clinical



Systematic Review of Available Intestinal Ultrasound Scores for Inflammatory Bowel Disease and Update on Validation Studies

Tommaso Innocenti, MD^{1,2,3},^{ID}, Carmen Rocco, MD^{2,4}, Luca Scarallo, MD^{5,6},^{ID},
Paolo Lionetti, MD, PhD^{5,6}, Andrea Galli, MD, PhD², Gabriele Dragoni, MD, PhD^{1,2,*},^{ID}

✓ 23 scores, 15 for CD, 6 for UC

➤ Sensitivity: 68–100% | Specificity: 57–100% | Accuracy: 72–91%

• **Most Relevant Parameters:** BWT, CDS, BWS and iFAT

Key challenges and clinical implications

N. 23

Development phase

MUC^a
BUSS
Arienti *et al.*
UC-IUS
Civitelli index
Drews *et al.*
UICD
SPAUSS
Lenze *et al.*
UCS
US MaRIA
KUC-UC
Neye *et al.*
Simple Ultrasound Score
IBUS-SAS
Paredes *et al.*
US Score
Pascu *et al.*
Simple US
US-LI
SUS-CD
Zhou *et al.*

N. 13

Validation phase [1-2 external cohorts]

KUC-UC
SPAUSS
UCS
US Score

N. 8

Validation phase [> 2 external cohorts]

BUSS
Civitelli index
Hata index^b
IBUS-SAS
MUC
Simple US
SUS-CD
UC-IUS

N. 5

Prognostic value

MUC
BUSS
Civitelli index
KUC-UC
IBUS-SAS

N. 2

Responsiveness

MUC
BUSS

***Heterogeneous data collection and
lack of consensus***

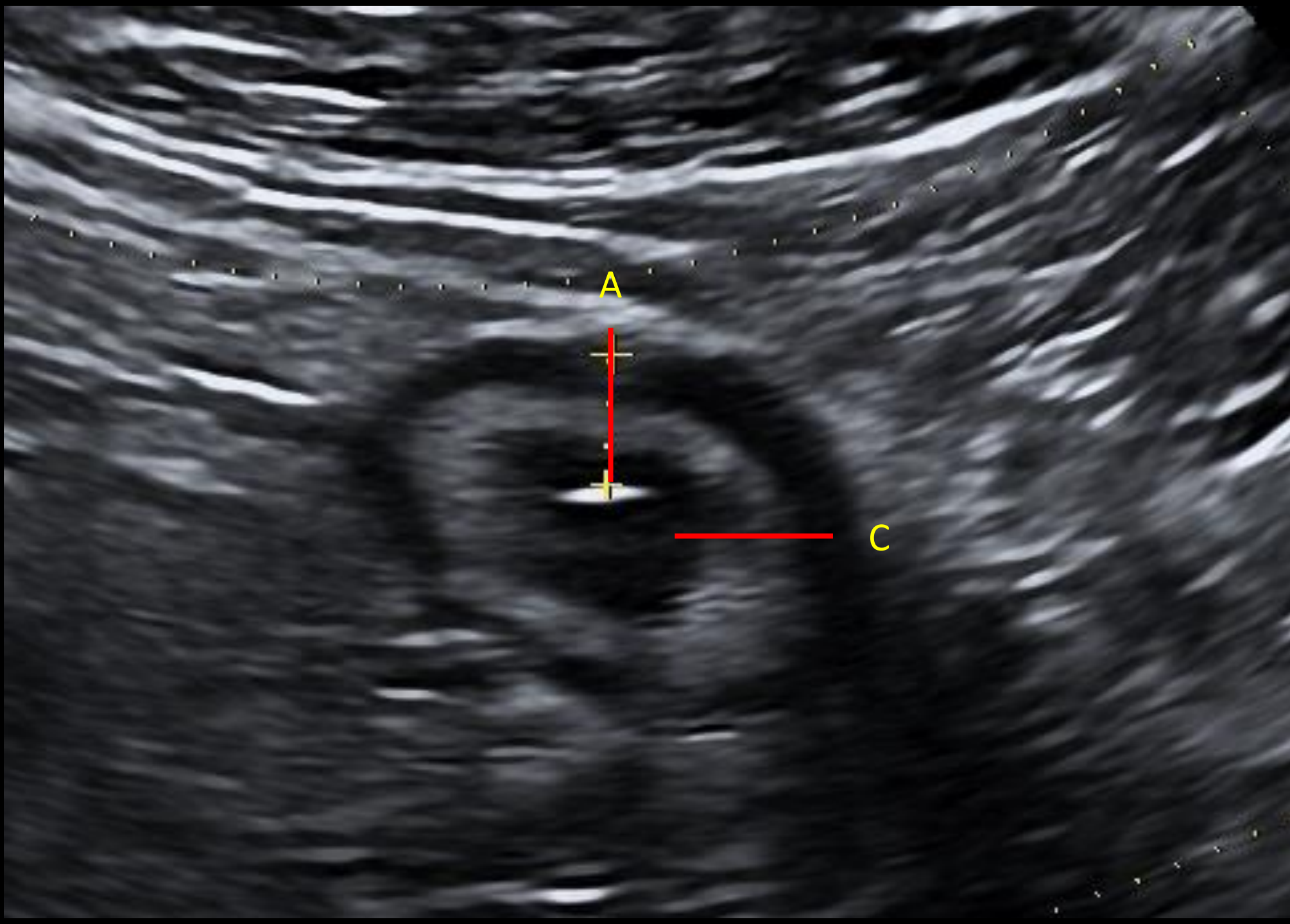
BWT

A

B



BWT



F

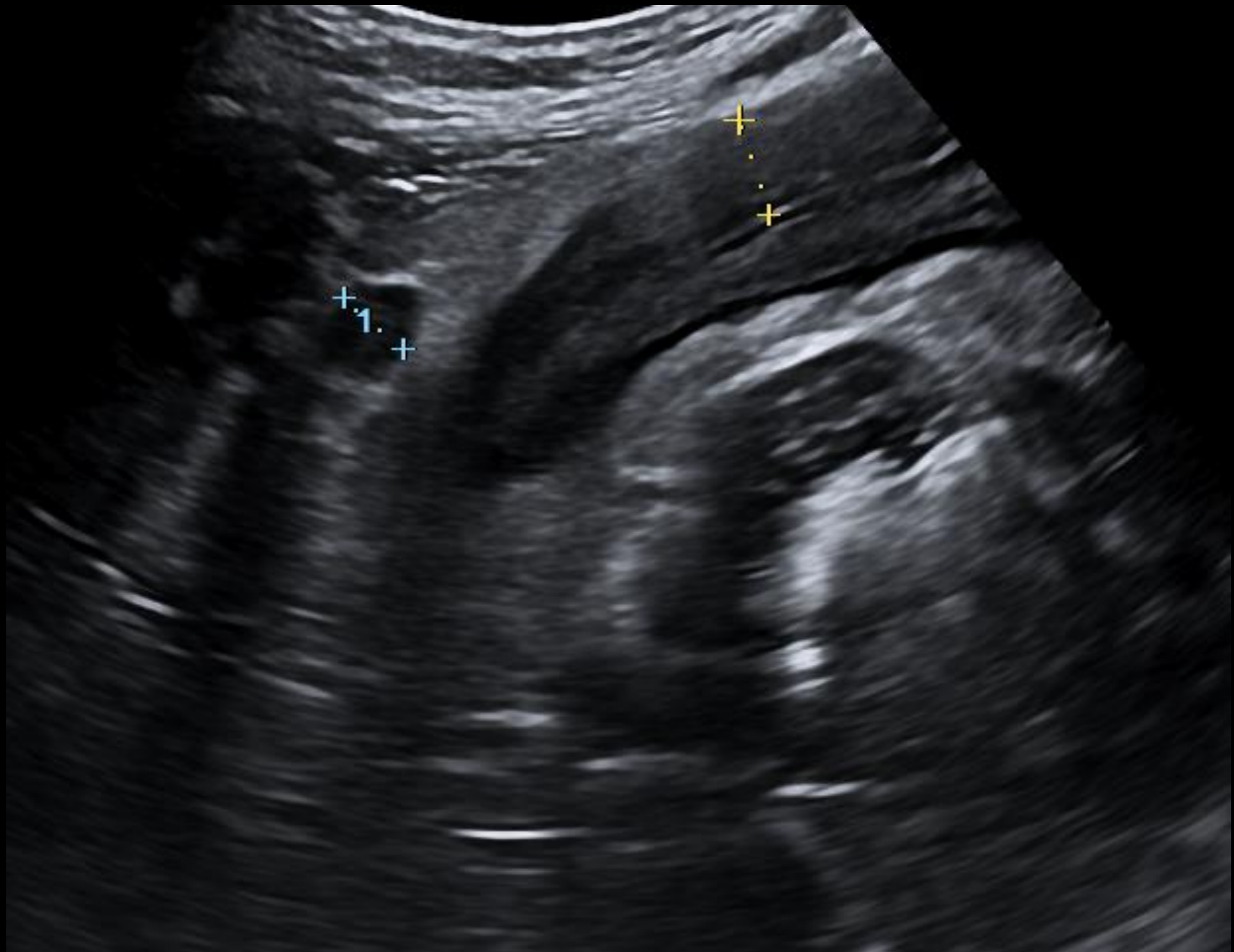
CDS



BWS

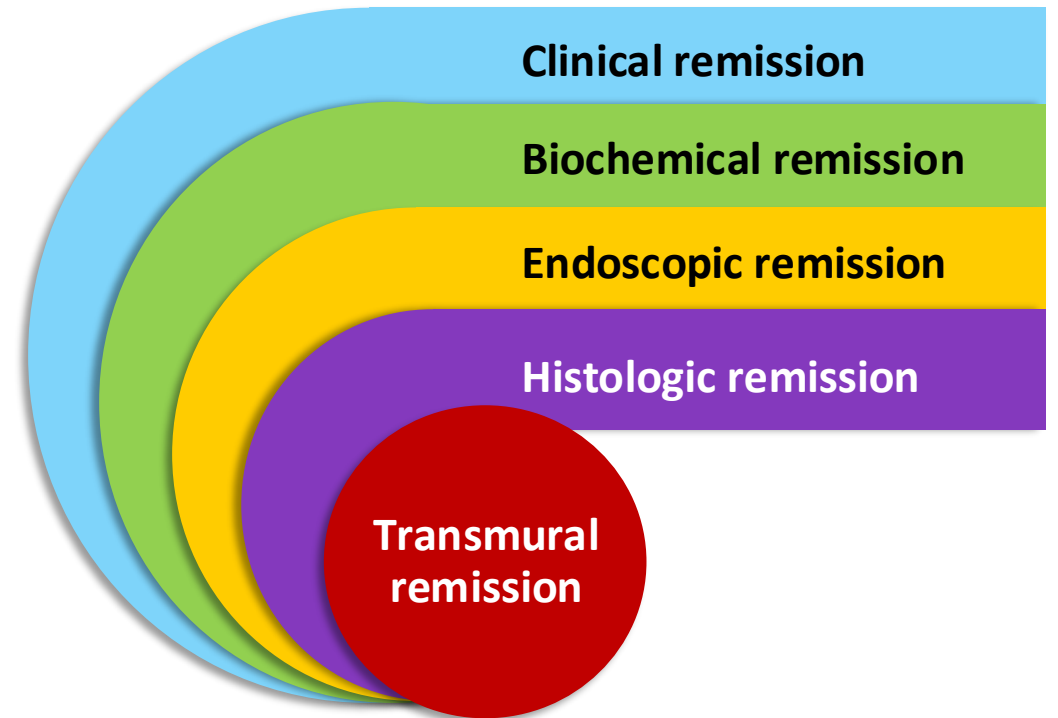


iFAT

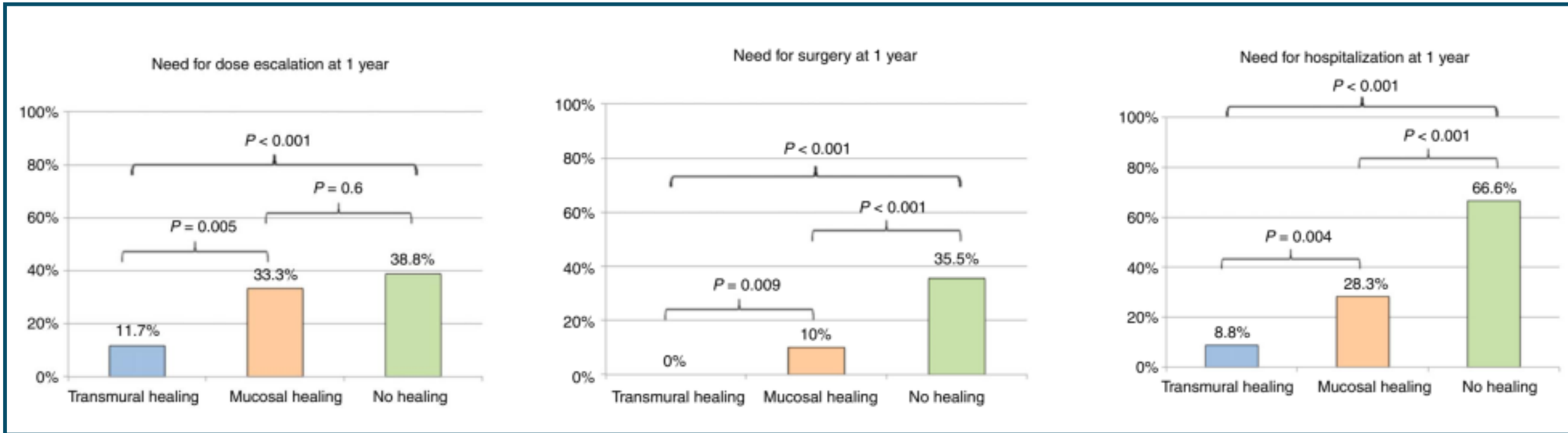


The concept of remission is constantly evolving over time

- Need for objective evidence of remission
- Increasing availability of more effective therapies
- Aiming to change disease course



Transmural healing predicts better outcomes in Crohn's disease



Transmural healing, defined as BWT \leq 3 mm + mucosal healing (SES-CD \leq 2)

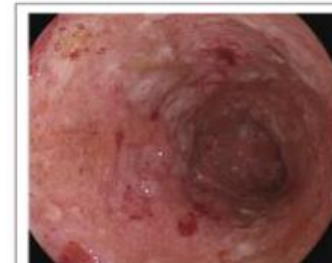
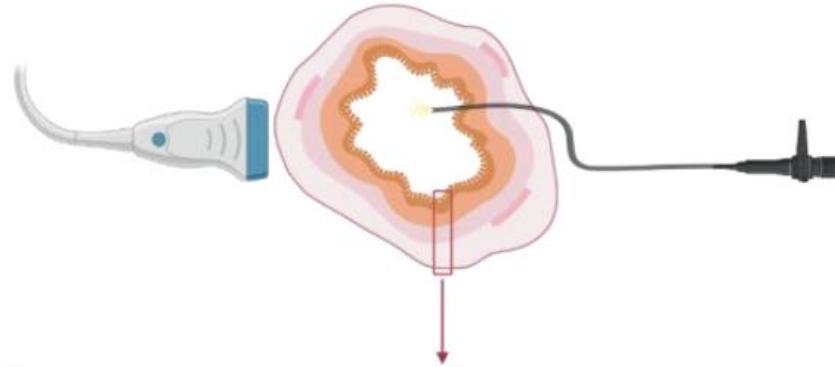
Mucosal healing, defined as a SES-CD \leq 2

UC: More Than a Mucosal Disease

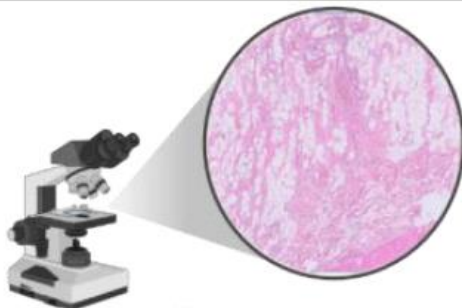


US image of sigmoid of acute severe colitis

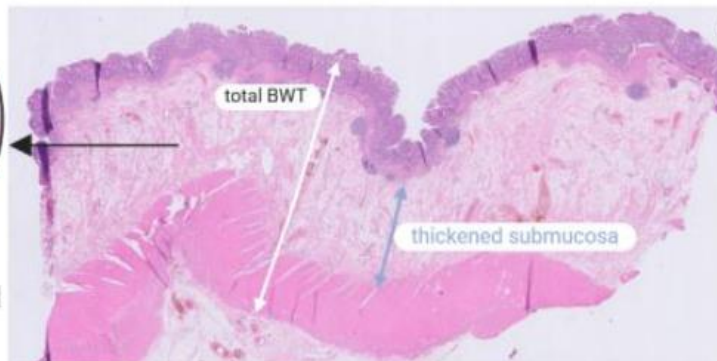
- thickened submucosa
- loss of haustrations
- mesenteric fibrofatty proliferation
- Loss of bowel wall stratification



Acute severe ulcerative colitis: Mayo 3 score



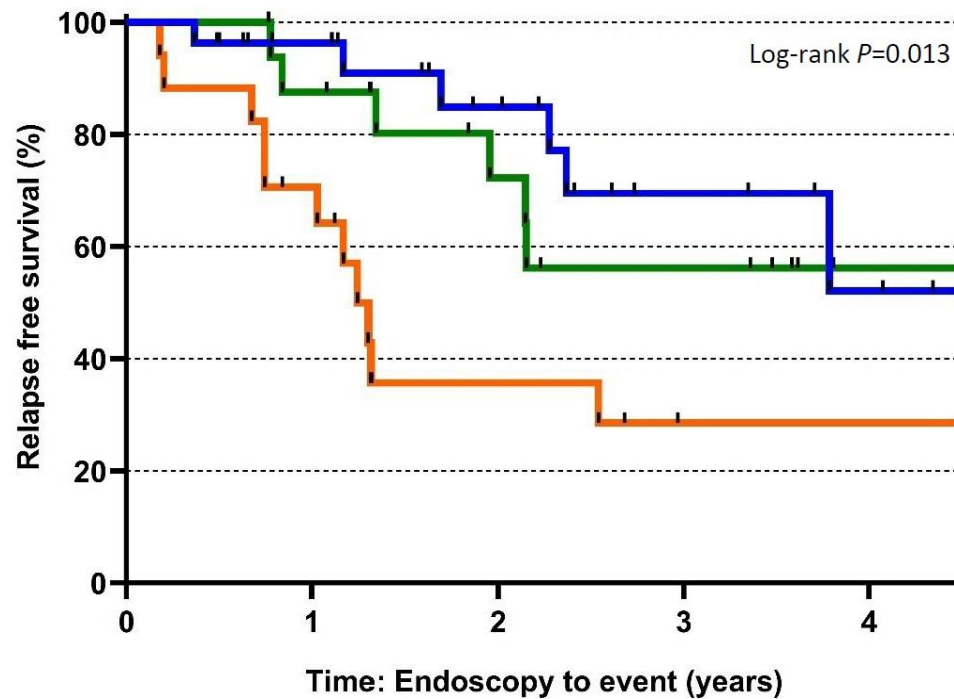
Submucosal fibrosis and increased fat cell deposition



Histopathological aspects

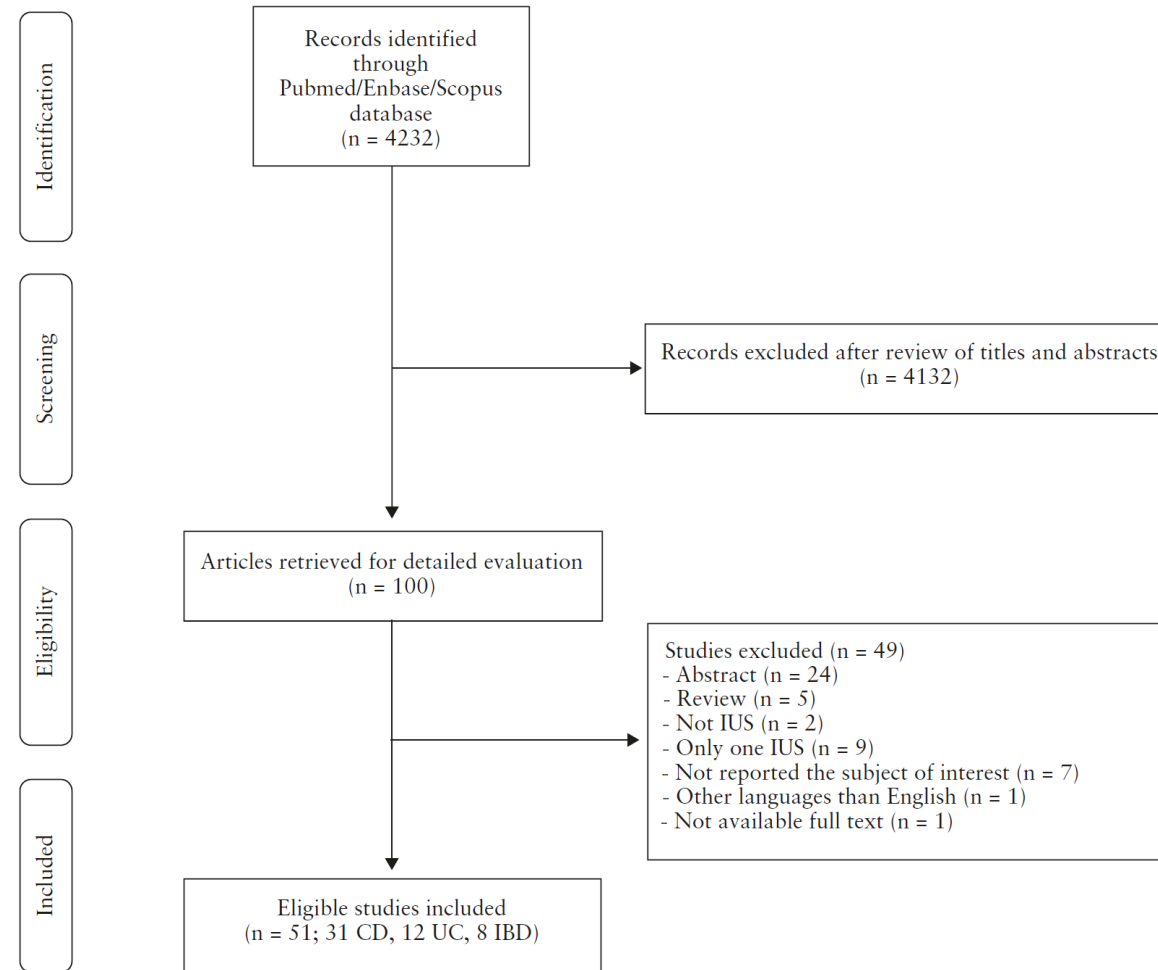
- thickened muscularis mucosae
- submucosal fibrosis
- muscular remodelling and fibrotic shifts in UC

Trasmural healing improves long-terms outcomes compared to mucosal healing in ulcerative colitis

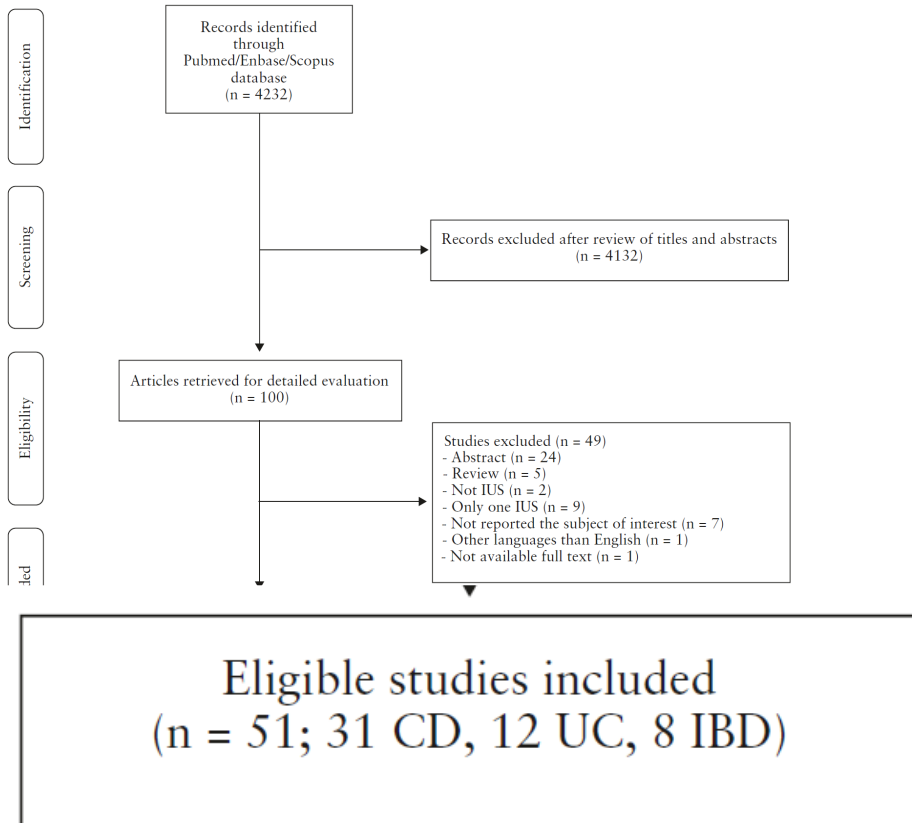


—+—	MES 0 with TH	27	22	14	7	4
—+—	MES 1 with TH	17	15	10	7	2
—+—	MES 1 without TH	17	12	6	3	3

Ultrasound Response and Remission in IBD: Heterogeneity in Definitions



Ultrasound Response and Remission in IBD: Heterogeneity in Definitions



3541 IBD patients

Intestinal ultrasound response definitions	Intestinal ultrasound remission definitions
Decrease in bowel wall thickness ranging from 0.5 to 2.5 mm from baseline ^{8,18,24,28,30,32,38,46,59}	Bowel wall thickness ≤ 3 mm ^{10,18,20,21,24-26,28,29,33,35,36,38,40,59,61}
Decrease in bowel wall thickness of 25% from baseline ^{9,16,60}	Color Doppler signal = 0-1 ^{18,21,24,28,38,59}
Decrease in color Doppler signals of 1 grade from baseline ^{8,16,18,24,28,37,38,59}	Simplified: normalization of bowel wall thickness and color Doppler signal ⁶⁰
Ultrasonographic activity scores for CD: <ul style="list-style-type: none"> • IBUS-SAS, International Bowel Ultrasound Segmental Activity Score $< 25$³⁹ • BUSS, Bowel Ultrasound Score ≤ 1.2 points from baseline⁴¹ 	Extended: normalization of bowel wall thickness and at least two additional parameters among color Doppler signal, bowel wall stratification, and absence of inflammatory fat ⁶⁰
Ultrasonographic activity scores for UC: <ul style="list-style-type: none"> • MUC, Milan Ultrasound Criteria ≤ 2 points from baseline⁵¹ 	Complete: normalization of all four parameters ⁶⁰
CEUS, contrast-enhanced ultrasound: reduction in mural enhancement $\geq 20\%$ from baseline ²⁴	Ultrasonographic activity scores for CD: <ul style="list-style-type: none"> • IBUS-SAS, International Bowel Ultrasound Segmental Activity Score $\leq 32.5$³⁹ • BUSS, Bowel Ultrasound Score $\leq 3.52$⁴¹
	Ultrasonographic activity scores for UC: <ul style="list-style-type: none"> • MUC, Milan Ultrasound Criteria ≤ 6.2 (for MES = 0-1)⁵¹ • MUC, Milan Ultrasound Criteria ≤ 4.3 (for MES = 0)⁵¹
	CEUS, contrast-enhanced ultrasound: percentage of increase of enhancement $< 46\%$ ²¹

Moving toward standardization: international consensus

Journal of Crohn's and Colitis, 2025, **19(9)**, jjaf170


<https://doi.org/10.1093/ecco-jcc/jjaf170>

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Original Article



International consensus on the use of intestinal ultrasound in inflammatory bowel disease trials

Mariangela Allocca^{*.1, }, Vipul Jairath^{2, }, Bruce E. Sands³, David T. Rubin⁴, Bénédicte Caron⁵,
Valérie Laurent⁶, Kerri Novak^{7, }, Remo Panaccione^{8, }, Peter Bossuyt^{9, }, David H. Bruining¹⁰,
Axel Dignass¹¹, Iris Dotan^{12,13}, Joel Fletcher^{14, }, Mathurin Fumery^{15, }, Federica Furfaro¹,
Jonas Halfvarson^{16, }, Ailsa Hart¹⁷, Taku Kobayashi^{18, }, Noa Krugliak Cleveland⁴, Torsten
Kucharzik^{19,20}, Andrea Laghi²¹, Peter L. Lakatos^{22,23, }, Rupert W. Leong^{24, }, Edward V. Loftus^{25, },
Edouard Louis²⁶, Fernando Magro²⁷, Pablo A. Olivera^{28,29}, Shaji Sebastian^{30, }, Britta Siegmund^{31, },
Stephan R. Vavricka^{32, }, Stephanie R. Wilson³³, Jaap Stoker^{34, }, Jordi Rimola^{35, },
Laurent Peyrin-Biroulet⁵, Silvio Danese^{1, }

Methods

- Panel of 35 international gastroenterologists and radiologists
- Delphi methodology
- $\geq 75\%$ agreement

Results

- Consensus was reached on 150 statements:
 - 30 on general IBD
 - 43 on luminal CD
 - 51 on perianal CD
 - 26 on UC

Approved ultrasonographic parameters to assess the response in IBD

- **BWT**
- **CDS**
- **BWS**
- **Thickening of submucosal layer**
- **iFAT**
- **Length of disease**

Approved definitions and time points for ultrasound response

- **Definition 1:** Reduction in BWT from baseline $\geq 25\%$
- **Definition 2:** Reduction of at least 25% in BWT AND a decrease of at least one grade or category in CDS or BWS or iFAT

Time points:

- 4-8 weeks for the colon
- 12 weeks for the ileum

Approved definitions and time points for transmural remission

- **Definition 1:** Normalization of BWT to ≤ 3 mm
- **Definition 2:** Normalization of BWT plus additional ultrasonographic parameters

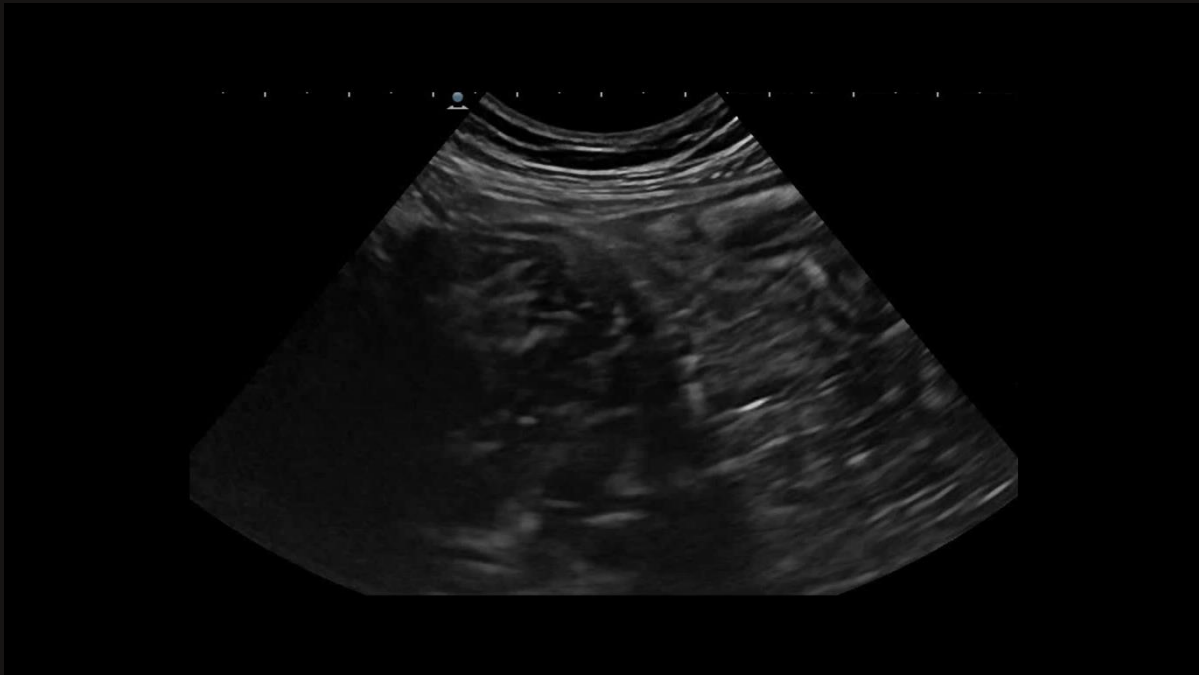
Time points:

- 12, 24, 48-52 weeks

Summary

- IUS enables real-time, non-invasive monitoring in IBD
- It accurately assesses disease activity, severity, and complications
- However, lack of standardization and heterogeneous definitions limit its implementation in clinical practice and its use in clinical trials
- Large multicenter studies and international consensus are essential to validate scores and standardize endpoints

Indeed IUS is ready—we just need to make it standardized





I.R.C.C.S. Ospedale
San Raffaele



Thank you