



● *Original Contribution*

**WFUMB POSITION PAPER. LEARNING GASTROINTESTINAL ULTRASOUND:
THEORY AND PRACTICE**

NATHAN S. S. ATKINSON,* ROBERT V. BRYANT,^{†‡} YI DONG,[§] CHRISTIAN MAASER,^{||}
 TORSTEN KUCHARZIK,[¶] GIOVANNI MACONI,[#] ANIL K. ASTHANA,** MICHAEL BLAIVAS,^{††}
 ADRIAN GOUDIE,^{‡‡} ODD HELGE GILJA,^{§§|||} CHRISTIAN NOLSØE,^{¶¶} DIETER NÜRNBERG,^{##}
 and CHRISTOPH F. DIETRICH***

*Translational Gastroenterology Unit, Oxford University Hospitals NHS Foundation Trust, Oxford, UK; [†]School of Medicine, University of Adelaide, Adelaide, South Australia; [‡]Department of Gastroenterology and Hepatology, Royal Adelaide Hospital, Adelaide, South Australia; [§]Department of Ultrasound, Zhongshan Hospital, Fudan University, Shanghai, China; ^{||}Ambulanzzentrum Gastroenterologie, Klinikum Lüneburg, Lüneburg, Germany; [¶]Städtisches Klinikum Lüneburg gGmbH, Department of Gastroenterology, Lüneburg, Germany; [#]Gastrointestinal Unit, Department of Biomedical and Clinical Sciences, L. Sacco University Hospital, Milan, Italy; **Department of Gastroenterology and Hepatology, The Alfred Hospital, Monash University, Melbourne, Victoria, Australia; ^{††}University of South Carolina School of Medicine, Department of Medicine, Department of Emergency Medicine, Piedmont Hospital Newnan, Georgia, USA; ^{‡‡}Emergency Department, Fiona Stanley Hospital, Perth, Australia; ^{§§}National Centre for Ultrasound in Gastroenterology, Haukeland University Hospital, Bergen, Norway; ^{|||}Department of Clinical Medicine, University of Bergen, Bergen, Norway; ^{¶¶}Copenhagen Academy for Medical Education and Simulation (CAMES), Ultrasound Section, Department of Gastroenterology, Division of Surgery, Herlev Hospital, University of Copenhagen, Denmark; ^{##}Medizinische Hochschule Brandenburg, Germany; and ***Med. Klinik 2, Caritas-Krankenhaus, Bad Mergentheim, Germany

Abstract—Gastrointestinal ultrasound (GIUS) is an ultrasound application that has been practiced for more than 30 years. Recently, GIUS has enjoyed a resurgence of interest, and there is now strong evidence of its utility and accuracy as a diagnostic tool for multiple indications. The method of learning GIUS is not standardised and may incorporate mentorship, didactic teaching and e-learning. Simulation, using either low- or high-fidelity models, can also play a key role in practicing and honing novice GIUS skills. A course for training as well as establishing and evaluating competency in GIUS is proposed in the manuscript, based on established learning theory practice. We describe the broad utility of GIUS in clinical medicine, including a review of the literature and existing meta-analyses. Further, the manuscript calls for agreement on international standards regarding education, training and indications. (E-mail: christoph.dietrich@ckbm.de) © 2016 World Federation for Ultrasound in Medicine & Biology.

Key Words: Ultrasound, Intestinal, Inflammatory bowel disease, Learning curve, Point-of-care ultrasound.

INTRODUCTION

Gastrointestinal ultrasound (GIUS) is not a new technique. The capacity of GIUS to distinguish layers of the bowel wall and detect pathologic changes correlating with disease was first described more than 3 decades ago (Holt and Samuel 1979; Sonnenberg et al. 1982). Technological advances in sonographic imaging and increasing experience in GIUS have broadened its application to diagnosis and monitoring of a range of intestinal disorders in clinical practice, in particular inflammatory bowel disease (IBD) (Dietrich 2009;

Nylund et al. 2010). Systematic review and meta-analysis data show equivalence in sensitivity and specificity between GIUS and magnetic resonance imaging (MRI), and in many instances computed tomography, in the evaluation of IBD (Dong et al. 2014; Horsthuis et al. 2008; Panes et al. 2011).

GIUS holds many advantages over other imaging modalities in that it is relatively inexpensive, the equipment is widely available and it lacks ionizing radiation. Yet, despite the performance and advantages of GIUS, its incorporation into routine gastroenterology practice is internationally inconsistent (Asthana et al. 2015). In many countries, GIUS has been trumped by conventional cross-sectional imaging, which is favoured for reasons of standardised and reproducible protocols, capacity for retrieval and re-evaluation of archived images and a superior “time to

Address correspondence to: Christoph F. Dietrich, Med. Klinik 2, Caritas-Krankenhaus Bad Mergentheim, Umlandstr. 7, D-97980 Bad Mergentheim, Germany. E-mail: christoph.dietrich@ckbm.de

remuneration” ratio. GIUS is often branded as “operator dependent” and of value only in the hands of the most esteemed experts. However, application of this rationale seems poorly founded, as the performance and interpretation of all diagnostic tests is without exception “operator dependent.” This criticism is perhaps more reflective of the lack of international consensus regarding standardisation of technique, interpretation, performance or training standards of GIUS than of the test itself.

The use of ultrasound by clinicians is expanding in many realms of medicine. Point-of-care ultrasound or “echoscopy,” using convenient portable devices, embraces focused training of operators to answer specific, clinically pertinent questions (Barreiros et al. 2014; Dietrich et al. 2015a; Wastl et al. 2015). In many specialities, including rheumatology, anaesthetics, pulmonology, palliative care, emergency medicine and surgical specialties, there has been increasing utilisation of limited ultrasound procedures performed by clinicians, without the necessity for formal radiology training (Royse et al. 2012). In part, this represents a culture change, acknowledging that pattern recognition and expertise within a limited remit of ultrasonographic skills applied to specific clinical contexts, can provide acceptable diagnostic accuracy without the necessity for “full diagnostic level of knowledge and expertise” in ultrasonography (Royse et al. 2012). This paradigm is yet to be acknowledged by many societal guidelines, which conceptually consider GIUS to be an advanced technique under the broader schema of “abdominal ultrasound,” placing it beyond the reach of clinicians (Royal College of Radiologists 2012; Dietrich 2012; Dietrich and Rudd 2013). It also represents a shift from fear of false reassurance and missed findings of significance, to a recognition that appropriate use of GIUS improves diagnostic accuracy over clinical examination alone (Royse et al. 2012). In this context we consider the key components of learning to perform GIUS as a restricted remit of sonographic competence for the gastroenterology specialist and trainee.

THE ROLE FOR GASTROINTESTINAL ULTRASOUND IN GASTROENTEROLOGY CLINICAL PRACTICE

Indications for GIUS in gastroenterology are summarised in Table 1. GIUS has a broad role in the recognition, diagnosis and monitoring of multiple gastroenterological disease entities. In many settings, GIUS can be viewed as an “extension of the examining hand,” adding diagnostic sensitivity with minimal additional cost, time or patient inconvenience.

In particular, GIUS can play a valuable role in the management of IBD. In a “treat to target” era, wherein objective measures of disease activity are used to guide

Table 1. Indications for GIUS in gastroenterology

General gastroenterology
<ul style="list-style-type: none"> • Identification of diverticulosis and diverticulitis • Evaluation of colitis, in particular <ul style="list-style-type: none"> ○ Tuberculous, neutropenic and penicillin-induced segmental haemorrhagic colitis • Identification of bowel obstruction • Diagnosis of appendicitis • Identification of acute and chronic mesenteric ischaemia • Confirmation of normal bowel in irritable bowel syndrome • Detection of rare diseases including <ul style="list-style-type: none"> ○ Meckels’ diverticulum, intussusception, angioedema, mucosal bleeding ○ Whipples and Coeliac disease ○ Radiation induced enteritis ○ Lymphoma and rare tumours • Exclusion of alternative intra-abdominal diagnoses
Inflammatory bowel disease
<ul style="list-style-type: none"> • Pre-screening before invasive testing • Primary diagnosis of IBD • Detection of complications <ul style="list-style-type: none"> ○ Strictureing and fistulating disease • Monitoring of IBD disease activity <ul style="list-style-type: none"> ○ Assessment of luminal disease activity ○ Detection of complications including abscesses and fistulae ○ Assessment of response to therapy ○ Treatment de-escalation strategies ○ Monitoring prestenotic dilation ○ Evaluation of post-operative disease recurrence • Evaluation of disease extent <ul style="list-style-type: none"> ○ Extent of colitis ○ Extent of small bowel disease • Diagnosis and assessment of extra-intestinal disease • Perianal disease diagnosis and monitoring with transperineal US <ul style="list-style-type: none"> ○ Anal fistula mapping and guidance of perianal abscess drainage with TRUS • Evaluation of IBD in pregnant patients • Cancer staging <ul style="list-style-type: none"> ○ Local staging of anal cancer with TRUS ○ Inguinal lymph node evaluation with high resolution ultrasound as a supplement to staging
GI tract functional assessment

GI = gastrointestinal; IBD = inflammatory bowel disease; GIUS = gastrointestinal ultrasound; TRUS = transrectal ultrasound; US = ultrasound.

subsequent treatment decisions, patients with IBD are subject to frequent investigations (Peyrin-Biroulet et al. 2015). In this setting, cross-sectional imaging and endoscopic investigations may be associated with harm in terms of risk of complications and ionising radiation, not to mention patient discomfort. GIUS is thus becoming increasingly appealing, particularly when employed at the bedside. Furthermore, as the cost of healthcare mounts, the health economic rationale of GIUS in place of more expensive imaging techniques is resounding.

GIUS has a high sensitivity and specificity in the diagnosis of Crohn’s disease (CD), and the detection of its complications including stenotic lesions and penetrating lesions of fistula or abscess formation (Hirche et al. 2004, 2002) (Table 2).

Meta-analysis data demonstrates GIUS is accurate in detecting active CD (area under the curve = 0.94;

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