

L'échographie abdominale réalisée par l'urgentiste dans le diagnostic des douleurs abdominales.

R. GIRERD

Urgences SMUR UHCD

CHU de la Réunion – Site Sud

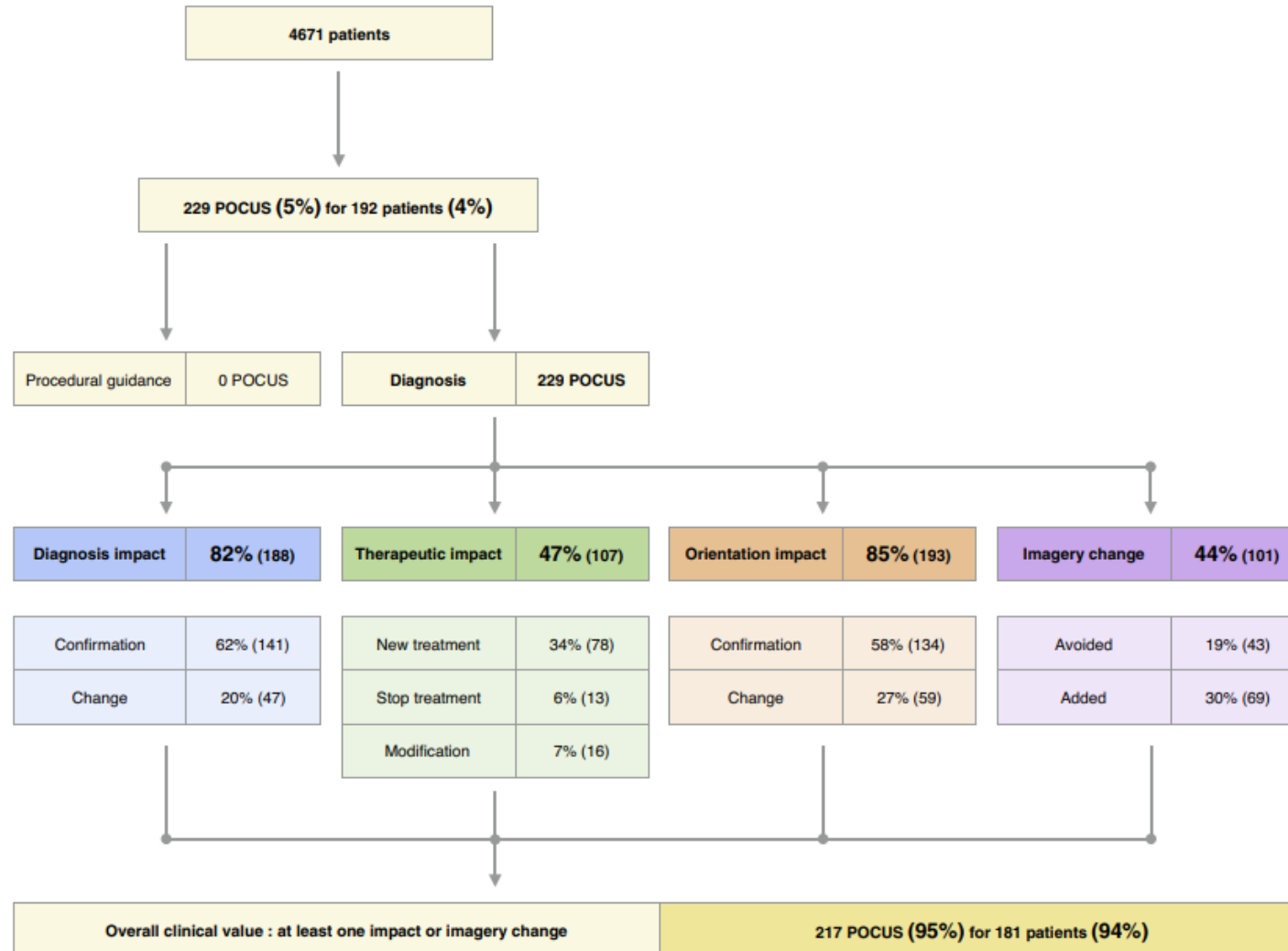


Plan

- Compétences d'un urgentiste
- Trauma versus non trauma
- Adulte et enfant
- Actualités et à venir

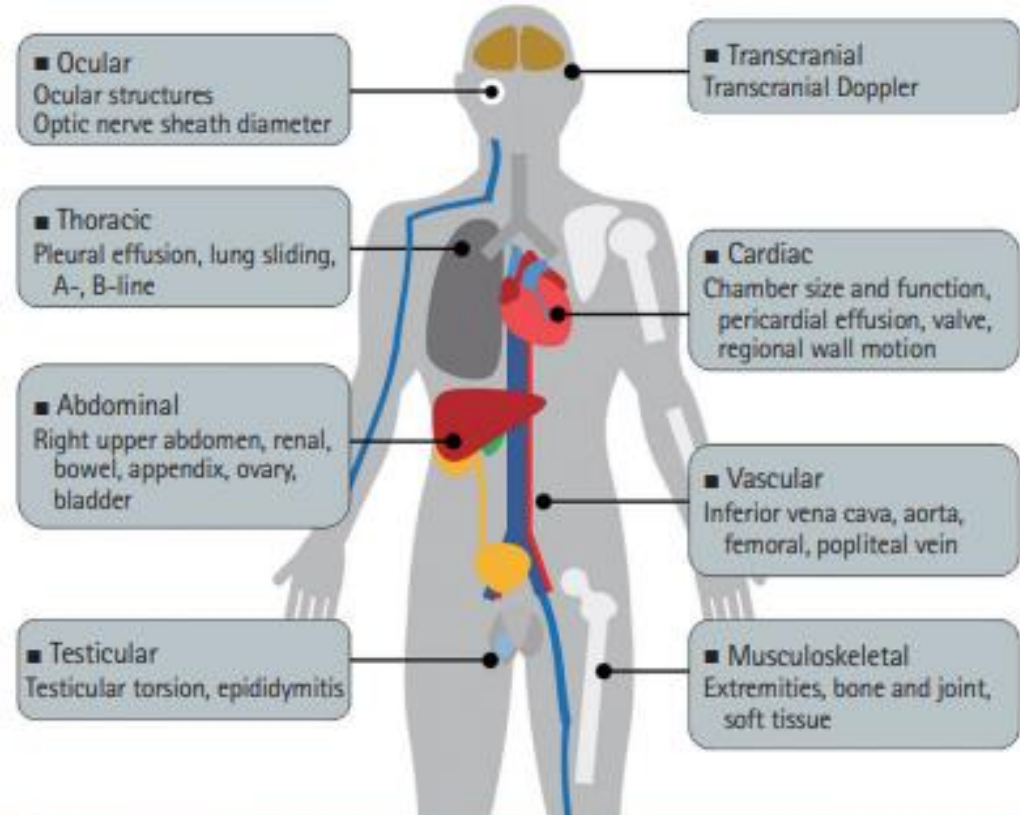
Conflits d'intérêts : aucun

L'échographie par l'urgentiste





Assessing organ systems



Applications in various clinical scenarios

- Emergency care
- Critical care
- Pediatric care
- Cardiopulmonary arrest
- Chest pain
- Dyspnea
- Shock
- Trauma
- Ultrasound-guided procedure**
 Peripheral and central line placement, arterial catheterization, aspiration or drainage of fluid
 (thoracentesis, paracentesis, pericardiocentesis, arthrocentesis)

Les compétences en ECMU

2016

**Premier niveau de compétence pour l'échographie clinique
en médecine d'urgence.**

Recommandations de la Société française de médecine d'urgence par
consensus formalisé.

TEXTE COURT

Les compétences en ECMU

2018

Deuxième niveau de compétence pour l'échographie clinique en médecine d'urgence. Recommandations de la Société française de médecine d'urgence par consensus formalisé

Second Level of Clinical Sonography in Emergency Medicine. French Society of Emergency Medicine (SFMU) Guidelines by Formal Consensus



M. Martinez · J. Duchenne · X. Bobbia · S. Brunet · P. Fournier · P. Miroux · C. Perrier · P. Pès · A. Chauvin · P.-G. Claret · les membres de la commission des référentiels de la SFMU

recommandations (adulte)

2016

- Il faut que l'urgentiste soit capable de détecter un **épanchement péritonéal de moyenne à grande abondance**
- Il faut que l'urgentiste soit capable de détecter une **dilatation des cavités pyélocalicielles**
- Il faut que l'urgentiste soit capable de détecter une **dilatation vésicale**
- Il faut que l'urgentiste soit capable de détecter un **cathéter de Foley intravésical**
- Il faut que l'urgentiste soit capable de détecter un **anévrisme de l'aorte abdominale**

Les recommandations (enfant)

2016

- Il faut que l'urgentiste soit capable de détecter **une dilatation des cavités pyélocalicielles en pédiatrie**
- Il faut que l'urgentiste soit capable **d'intégrer l'échographie dans un algorithme de prise en charge du traumatisé grave en pédiatrie**
- Il faut que l'urgentiste soit capable de réaliser un **échorepérage pour la mise en place d'un cathéter sus-pubien en pédiatrie**

recommandations (adulte)

2018

- Il est proposé que l'urgentiste soit capable d'identifier **une lithiase vésiculaire**
- Il est proposé que l'urgentiste soit capable d'identifier **une cholécystite aiguë lithiasique**
- Il est proposé que l'urgentiste identifie **des lithiases urinaires en dehors du méat urétéral**
- Il faut que l'urgentiste soit capable **d'identifier, à partir de sept semaines d'aménorrhée, en réalisant une échographie transpariétale, un sac gestationnel ou un embryon, le mesurer dans son grand axe et identifier une activité cardiaque**
- ~~un intestin inflammatoire aigu, dilatation de la voie biliaire principale ; appendicite aiguë ; identifier une torsion testiculaire~~

Les recommandations (enfant)

2018

- Il est proposé que l'urgentiste soit capable **d'identifier une invagination intestinale par échographie en pédiatrie**
- Il est proposé que l'urgentiste soit capable d'exclure une **dilatation rénale chez les enfants de plus de trois mois consultant pour un premier épisode de pyélonéphrite aiguë**
- ~~identifier une torsion testiculaire par échographie en pédiatrie~~
- ~~identifier une sténose du pylore par échographie en pédiatrie~~
- ~~identifier une appendicite aiguë en pédiatrie~~

Et ailleurs...



CAEP | ACMU

 American College of
Emergency Physicians®

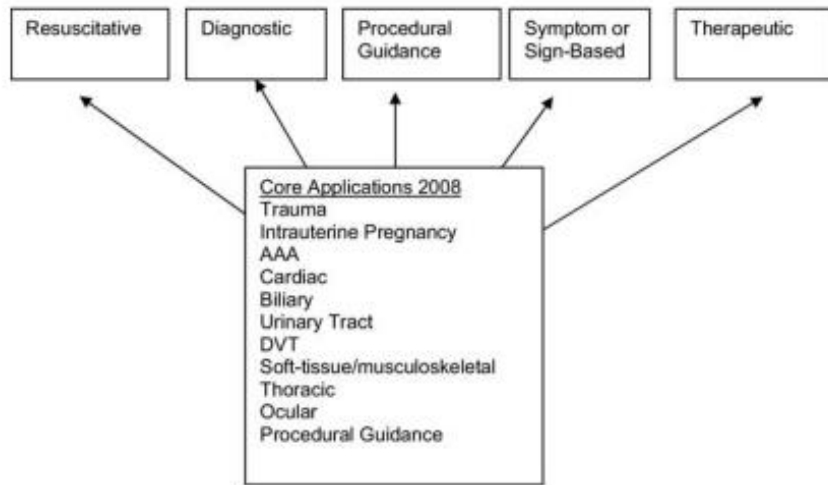


Figure 1. ACEP 2008 emergency ultrasound guidelines scope of practice.



	TABLEAU 3	Modules d'échographie ciblée de la formation «POCUS»	
--	------------------	---	--

1. Echographie de base des urgences
2. Echographie musculosquelettique
3. Echographie vasculaire
4. Echographie vasculaire périphérique (y compris pose de voie veineuse superficielle)
5. Ponction vasculaire échoguidée
6. Echographie interventionnelle pour le traitement de la douleur
7. Echographie pédiatrique de base (pour les enfants à partir de la 5^e semaine de vie)
8. Echographie en soins intensifs neurologiques
9. Echographie des urgences pédiatriques
10. Anesthésie locorégionale
11. Echographie pulmonaire
12. Echocardiographie transœsophagienne
13. Echocardiographie transthoracique
14. Echocardiographie transthoracique pédiatrique (à partir de 5 semaines de vie)

Et la pédiatrie ?

Marin et al. *Crit Ultrasound J* (2016) 8:16
DOI 10.1186/s13089-016-0049-5

 Critical Ultrasound Journal



REVIEW

Open Access

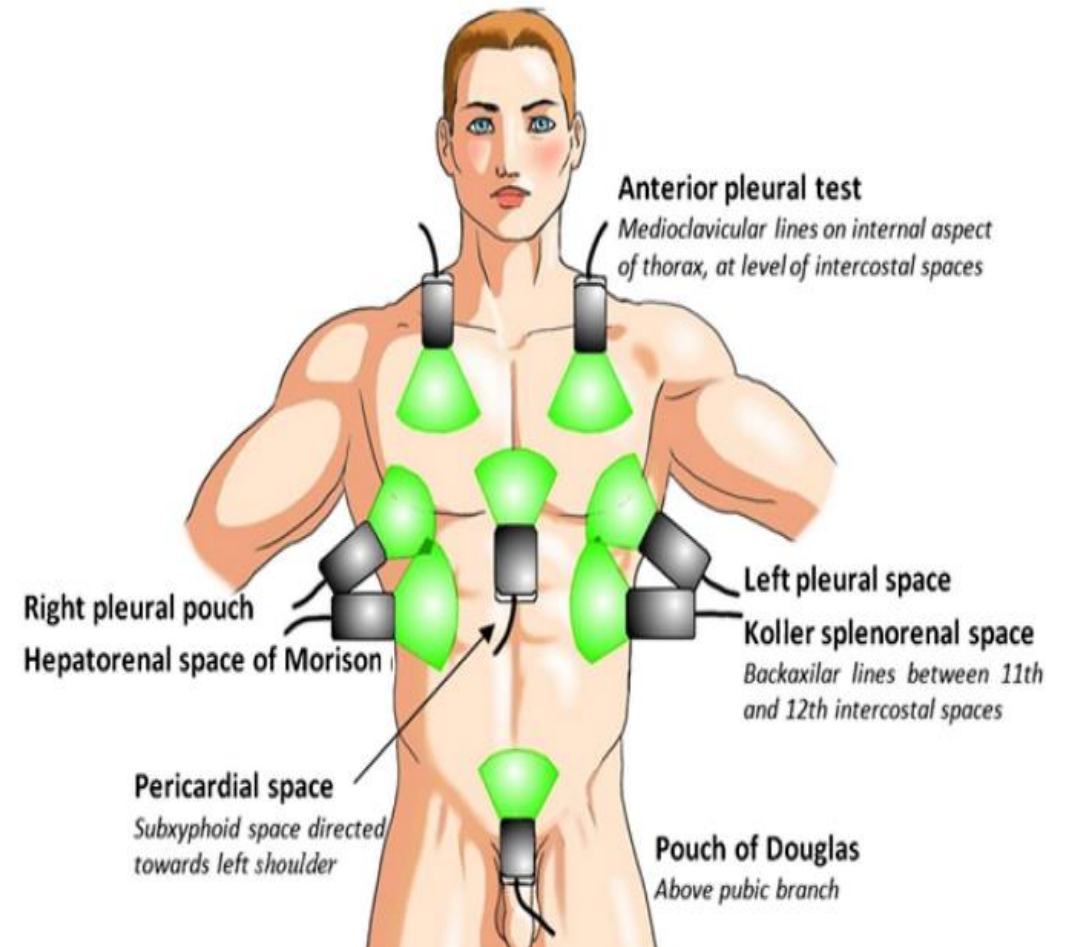


Pediatric emergency medicine point-of-care ultrasound: summary of the evidence

Jennifer R. Marin^{1*}, Alyssa M. Abo², Alexander C. Arroyo³, Stephanie J. Doniger⁴, Jason W. Fischer⁵, Rachel Rempell⁶, Brandi Gary⁷, James F. Holmes⁸, David O. Kessler⁹, Samuel H. F. Lam¹⁰, Marla C. Levine¹¹, Jason A. Levy⁶, Alice Murray¹², Lorraine Ng⁹, Vicki E. Noble¹³, Daniela Ramirez-Schrempp¹⁴, David C. Riley¹⁵, Turandot Saul¹⁶, Vaishali Shah¹⁷, Adam B. Sivitz¹⁸, Ee Tein Tay¹⁹, David Teng²⁰, Lindsey Chaudoin⁹, James W. Tsung¹⁹, Rebecca L. Vieira⁶, Yaffa M. Vitberg²¹ and Resa E. Lewiss²²

Les recommandations

- Il faut que l'urgentiste soit capable de détecter un épanchement péritonéal de moyenne à grande abondance
- Précision diagnostique, guider la prise en charge et l'orientation du patient
- Des preuves encore à fournir...



Les faux positifs

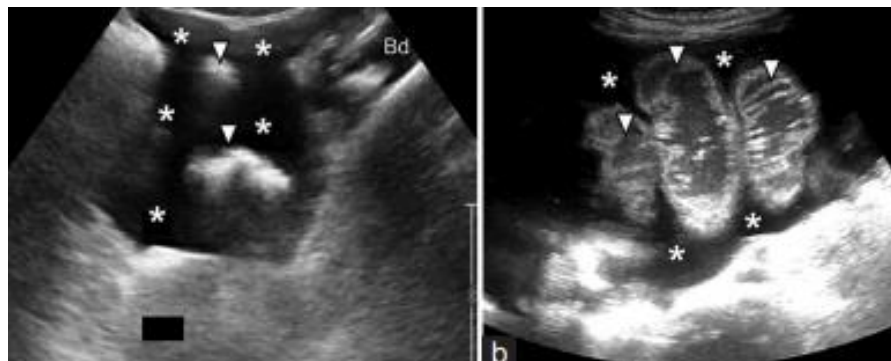
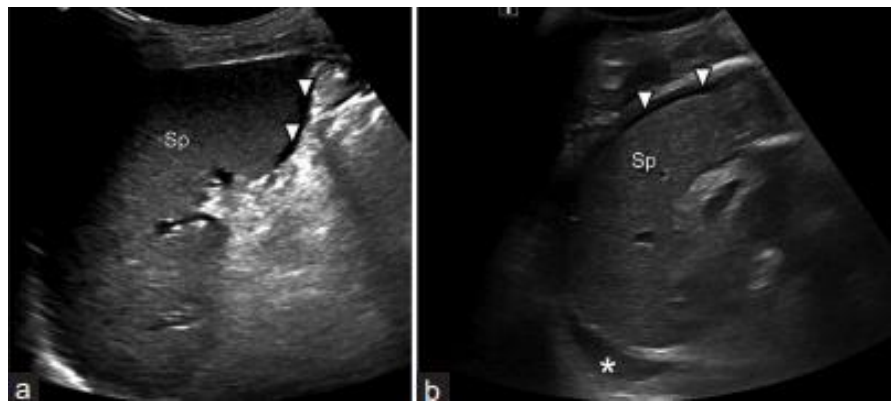
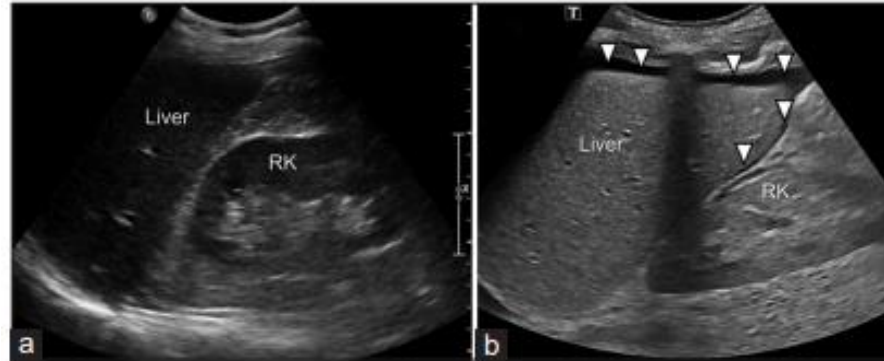


Table 1: Main false positives and false negatives

FAST/e-FAST protocol

False positives

- Pericarditis
- Pleural effusion from a nontrauma condition
- Ascites
- Peritoneal dialysate
- Ventriculoperitoneal shunt outflow
- Bladder rupture
- Ovarian hyperstimulation
- Ovarian cyst rupture
- Massive intravascular volume resuscitation (intravascular-to-intraperitoneal fluid transudation)

False negatives

- Superficial soft tissue emphysema
- Obese patients
- Isolated extraperitoneal injuries*

Early management of severe abdominal trauma

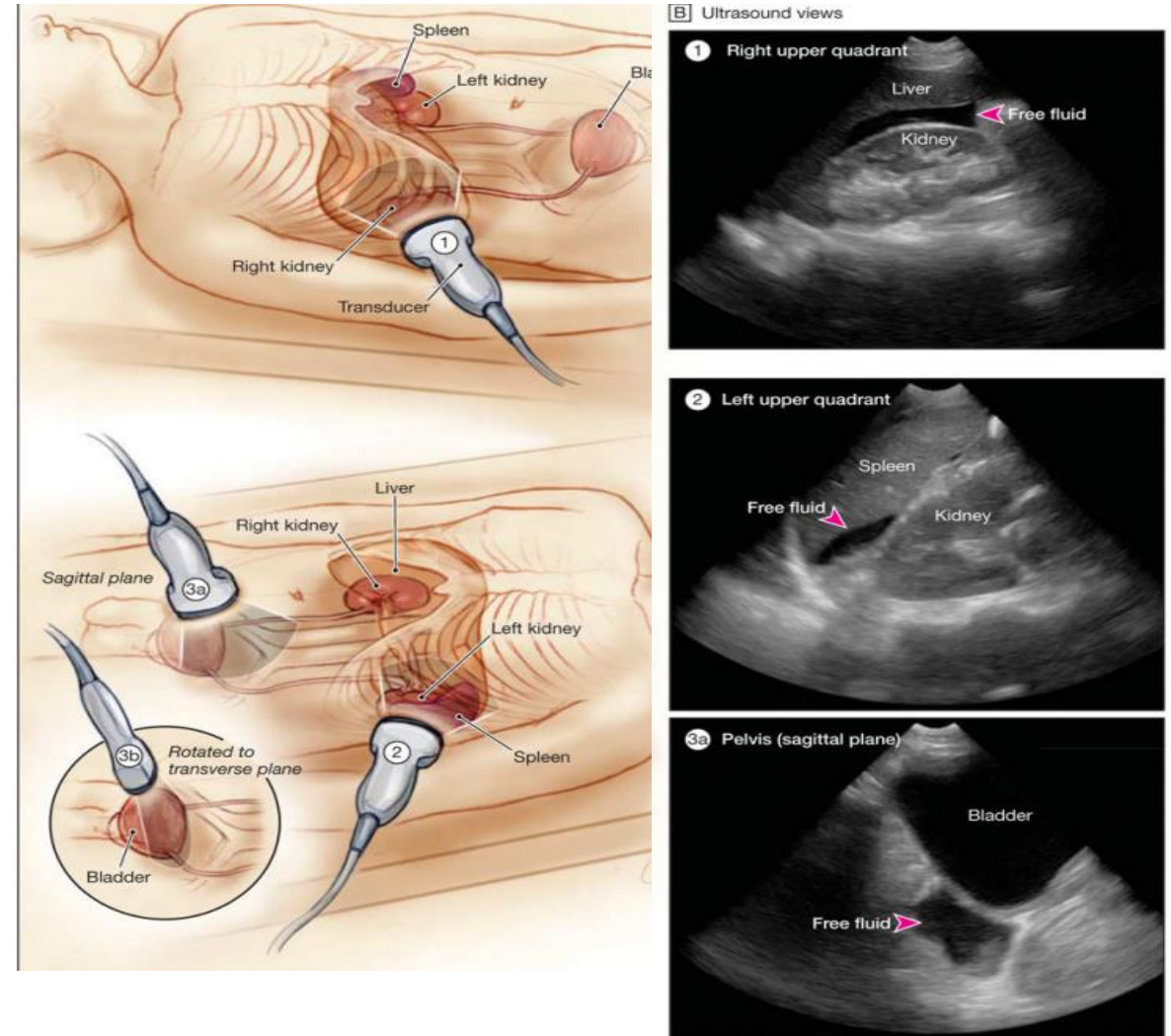


Stratégie diagnostique



Question 1: What is the diagnostic performance of clinical signs to suggest abdominal injury in trauma patients?

R1 – In patients after severe trauma, clinical signs are insufficient to rule in or rule out abdominal injury.
(GRADE 1), STRONG AGREEMENT



Stratégie diagnostique



Question 2: Suspecting abdominal trauma, what is the diagnostic performance of prehospital FAST (Focused Abdominal Sonography for Trauma) to rule in abdominal injury and guide the prehospital triage of the patient?

R2.1 – When suspecting abdominal trauma, it is probably recommended to perform a prehospital FAST to rule in intra-abdominal free fluid.

(GRADE 2+), STRONG AGREEMENT

No recommendation: After studying the available literature, the experts are not in the position to provide a recommendation in favour or against the use of prehospital FAST to guide the prehospital triage of patients with suspected severe abdominal trauma.

*P. Bouzat et al. Anaesth Crit Care
Pain Med 39 (2020) 269–277*

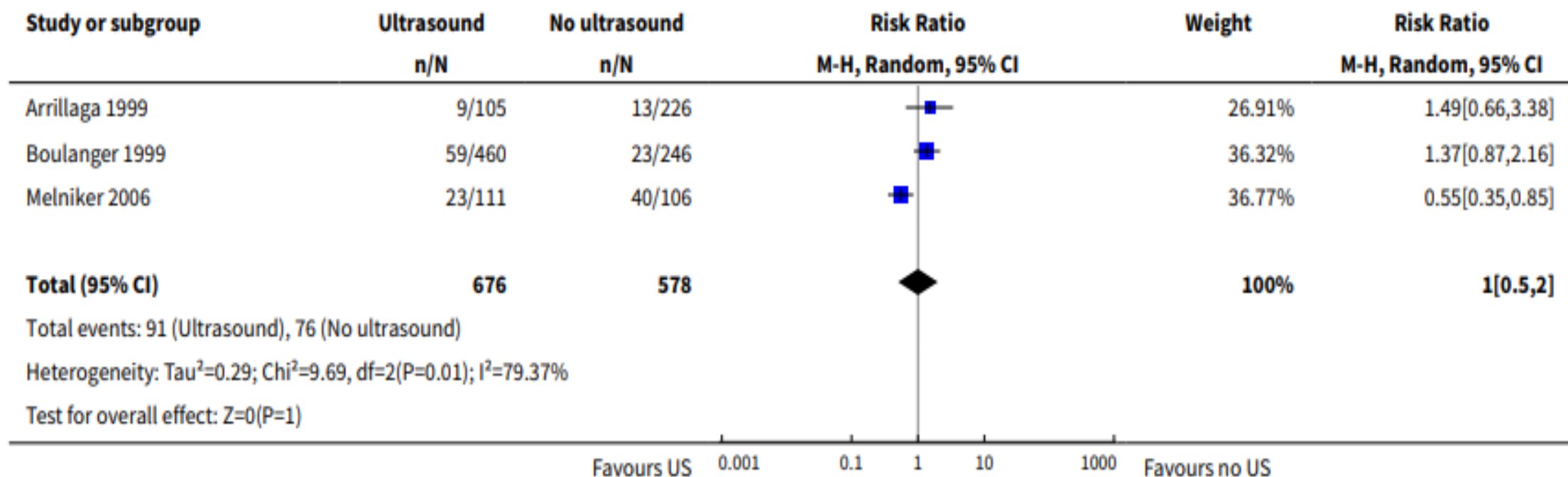
Peu d'études évaluent l'utilité de la FAST en pré-hospitalier

Performance diagnostic pré-hospitalière < intra-hospitalière

Deux limites majeures :

- **un résultat négatif**
- **un hématome rétropéritonéal**

Analysis 1.1. Comparison 1 Mortality, Outcome 1 Relative risk of mortality.



Et chez les enfants ?



Point-of-care ultrasonography for diagnosing thoracoabdominal injuries in patients with blunt trauma

In patients with suspected blunt thoracoabdominal trauma, positive POCS findings are helpful for guiding treatment decisions. However, with regard to abdominal trauma, **a negative POCS exam does not rule out injuries and must be verified by a reference test such as CT**. This is of particular importance in paediatric trauma, where the sensitivity of POCS is poor.

Furthermore, in a virtual population of 1000 children, based on the observed median prevalence (pretest probability) of thoracoabdominal trauma of 31%, **POCUS would miss 118 children with injuries and falsely suggest the presence of injuries in another 62 children.**

Et chez les enfants ?



Point-of-care ultrasonography for diagnosing thoracoabdominal injuries in patients with blunt trauma

Adulte : Sensibilité 78% Spécificité 97%

Enfants : Sensibilité 63% Spécificité 91%

Abdomen : Sensibilité 68% Spécificité 95%

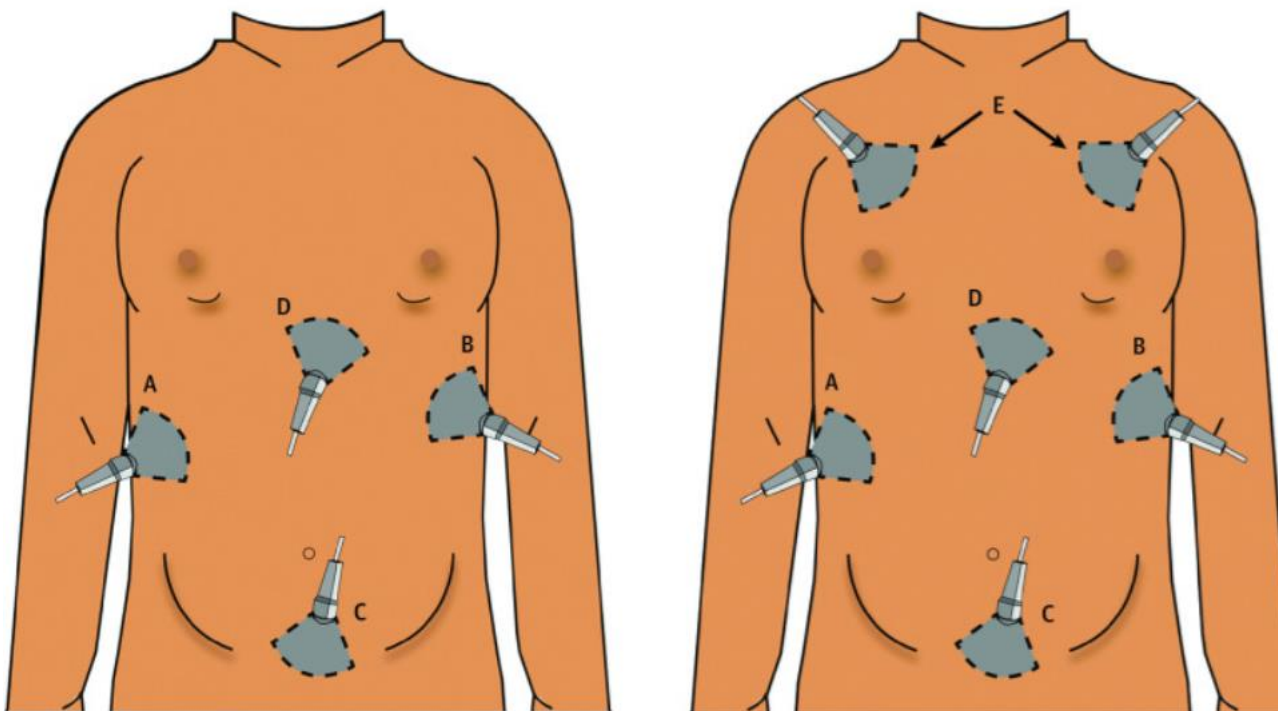
Thorax : Sensibilité 96% Spécificité 99%

Recommendations chez enfants ?

US Applications		
System	POCUS Applications Assumed Mastered in PEM Fellowship*	PEM POCUS Fellowship Applications
Cardiovascular	Identify non-traumatic pericardial effusion Identify traumatic pericardial effusion Identify cardiac standstill Evaluate cardiac function	Assess IVC for volume status Identify tamponade physiology Chamber size and comparison
Lung	Identify hemothorax Identify pleural fluid/effusion Identify pneumothorax Identify lung consolidation Identify pulmonary edema	Identify findings in bronchiolitis
Soft Tissue/ Musculoskeletal	Identify abscess Identify cellulitis Identify soft tissue foreign body	Identify joint effusion Identify adenitis Identify long bone fractures
Abdomen	Identify free peritoneal fluid in trauma Identify intussusception	Identify appendicitis Identify pyloric stenosis Identify cholelithiasis Assessment for cholecystitis
Renal/Genitourinary	Assess bladder volume Identify intrauterine pregnancy	Identify hydronephrosis Identify ectopic pregnancy
Ocular		Evaluate the optic nerve
Procedural Skills	Abscess incision and drainage Central line placement Peripheral intravenous access Soft tissue foreign body localization/removal Pericardiocentesis	Perform US guided nerve blocks US guided arthrocentesis US guided arterial line placement

Development of a Consensus-Based Definition of Focused Assessment With Sonography for Trauma in Children

Aaron E. Kornblith, MD; Newton Addo, BS; Monica Plasencia, MTM; Ashkon Shaahinfar, MD, MPH; Margaret Lin-Martore, MD; Naina Sabbineni; Delia Gold, MD; Lily Bellman, MD; Ron Berant, MD; Kelly R. Bergmann, DO, MS; Timothy E. Brenkert, MD; Aaron Chen, MD; Erika Constantine, MD; J. Kate Deanehan, MD; Almaz Dessie, MD; Marsha Elkhunovich, MD; Jason Fischer, MD, MSc; Cynthia A. Gravel, MD; Sig Kharasch, MD; Charisse W. Kwan, MD; Samuel H. F. Lam, MD, MPH; Jeffrey T. Neal, MD; Kathryn H. Pade, MD; Rachel Rempell, MD; Allan E. Shefrin, MD; Adam Sivitz, MD; Peter J. Snelling, MBBS; Mark O. Tessaro, MD; William White, MD



Box. Definitions and Hybrid Summary Statements for FAST and E-FAST for Children With Injury

Definitions

FAST is a noninvasive, limited, POCUS study used in patients after abdominal or chest trauma to detect intraperitoneal, pericardial, or pleural free fluid.

E-FAST is a noninvasive, limited, POCUS study used in patients after abdominal or chest trauma to detect intraperitoneal, pericardial, or pleural free fluid and includes a thoracic examination for pneumothorax.

Completeness

1. A complete negative study result must include an adequate evaluation of all anatomic views. In contrast, a positive study result must consist of a thorough evaluation of each anatomic region, with at least 1 view demonstrating abdominal, thoracic, or pericardial free fluid (pathology).
 - a. FAST: right upper-quadrant abdominal view, left upper-quadrant abdominal view, transverse and sagittal suprapubic view, and pericardial view.
 - b. E-FAST: FAST and lung or thoracic view.
2. There are specific views and anatomic landmarks that are necessary to ensure an accurate interpretation. Some anatomic landmarks are not as important as others to provide an adequate study and accurate interpretation. Key anatomic landmarks are required to mark a study as complete. Diagnostic performance suffers when specific anatomic landmarks are missed, and an incomplete study could preclude an assessment for pathology.

view or landmark within a view indicates the presence of intraperitoneal, pericardial, or intrathoracic free fluid. A FAST study may be considered positive for free fluid even if the operator has not visualized one or more landmarks in each anatomic region.

- a. Free fluid will appear on ultrasonography as an anechoic region within the intraperitoneal, intrathoracic, or pericardial spaces. Fluid appearance may become hyperechoic or heterogeneous with coagulation.
 - b. Trace free fluid in the pelvis may be considered a positive study.
 - c. The cardiac view is used to identify the presence of pericardial effusion and cardiac activity. The subxiphoid or parasternal views are adequate for interpretation of the pericardial window. Multiple cardiac views may increase the likelihood of identifying pericardial effusion.
 - d. Pneumothorax evaluation should rule out clinically significant pneumothoraces. The position of free air accumulation and accurate interpretation of pneumothorax are affected by patient positioning.
2. Negative FAST or E-FAST result: a study can be considered negative for free fluid if the study has adequate completeness and quality and if no free fluid can be seen at any landmarks.
 3. Limitations: a limitation of FAST is that a small volume of free fluid may be difficult to visualize, especially in young children or those with larger body habitus.

Stratégie diagnostique

R2.2 – When suspecting abdominal trauma, we recommend to perform a FAST on admission to the hospital to: (i) rule in or out free intra-abdominal fluid; (ii) rule out more than 500 ml of free fluid if the exam is negative.

(GRADE 1+), STRONG AGREEMENT

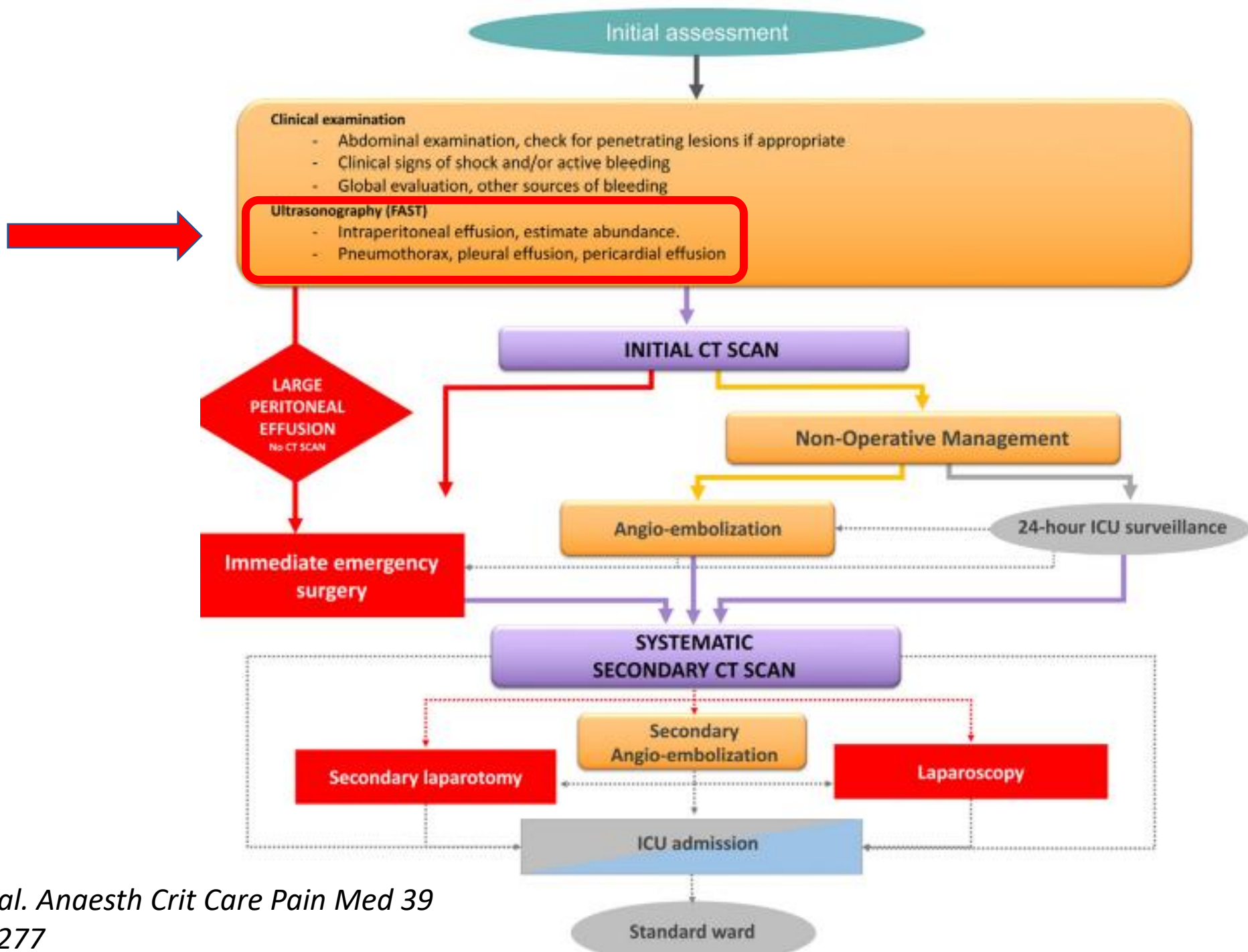
R2.3 – When suspecting abdominal trauma, we do not recommend to perform a FAST on admission to the hospital to: (i) rule out a specific intra-abdominal injury; (ii) rule out the presence of a retroperitoneal haematoma.

(GRADE 1–), STRONG AGREEMENT

FAST in-hospital :

Se : 74% [95% CI: 65%–81%]

Sp : 96% [95% CI: 94%–98%]



What's next ?

CURRICULUM

E-FAST Ultrasound Training Curriculum for Prehospital Emergency Medical Service (EMS) Clinicians

Clever M. Nguyen, BS*, Krista Hartmann, BS, EMT-A*, Craig Goodmurphy, PhD^ and Avram Flamm, DO, EMT-P, FACEP, FAEMS*+**

*Pennsylvania State University College of Medicine, Hershey, PA

^Pennsylvania State University College of Medicine, Department of Radiology, Hershey, PA

†WellSpan Health, Department of Emergency Medicine, York, PA

**WellSpan EMS, York, PA

Correspondence should be addressed to Avram Flamm, DO, EMT-P, FACEP, FAEMS at aflamm@wellspan.org

Submitted: July 6, 2023; Accepted: November 19, 2023; Electronically Published: January 31, 2024; <https://doi.org/10.21980/J8S060>

Copyright: © 2024 Nguyen, et al. This is an open access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY 4.0) License. See: <http://creativecommons.org/licenses/by/4.0/>

ABSTRACT:

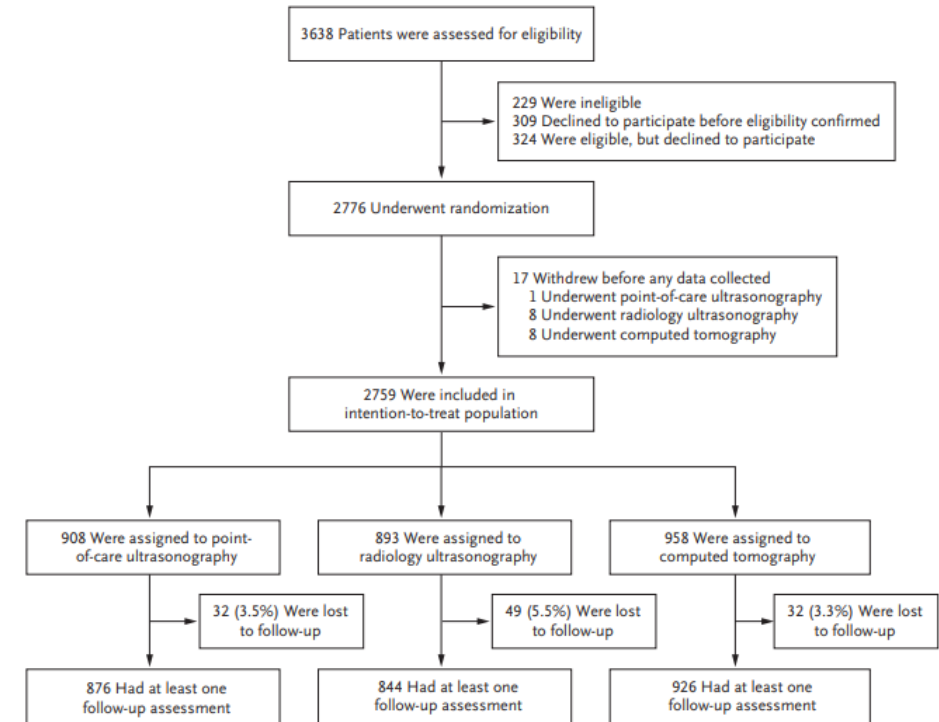
Audience and Type of Curriculum: Audience and type of curriculum: This hybrid, asynchronous curriculum is designed for prehospital clinician colleagues, including but not limited to emergency medical technicians (EMT), advanced EMTs (AEMT), EMT-paramedics (EMT-P), critical care EMT-Ps (CCEMTP), critical care transport nurses (CCTN), and certified flight registered nurses (CFRN) to learn and practice ultrasound fundamentals in the setting of a standardized extended focused assessment with sonography in trauma (E-FAST) exam.

Ultrasonography versus Computed Tomography for Suspected Nephrolithiasis

R. Smith-Bindman, C. Aubin, J. Bailitz, R.N. Bengiamin, C.A. Camargo, Jr., J. Corbo, A.J. Dean, R.B. Goldstein, R.T. Griffey, G.D. Jay, T.L. Kang, D.R. Kriesel, O. J. Ma, M. Mallin, W. Manson, J. Melnikow, D.L. Miglioretti, S.K. Miller, L.D. Mills, J.R. Miner, M. Moghadassi, V.E. Noble, G.M. Press, M.L. Stoller, V.E. Valencia, J. Wang, R.C. Wang, and S.R. Cummings

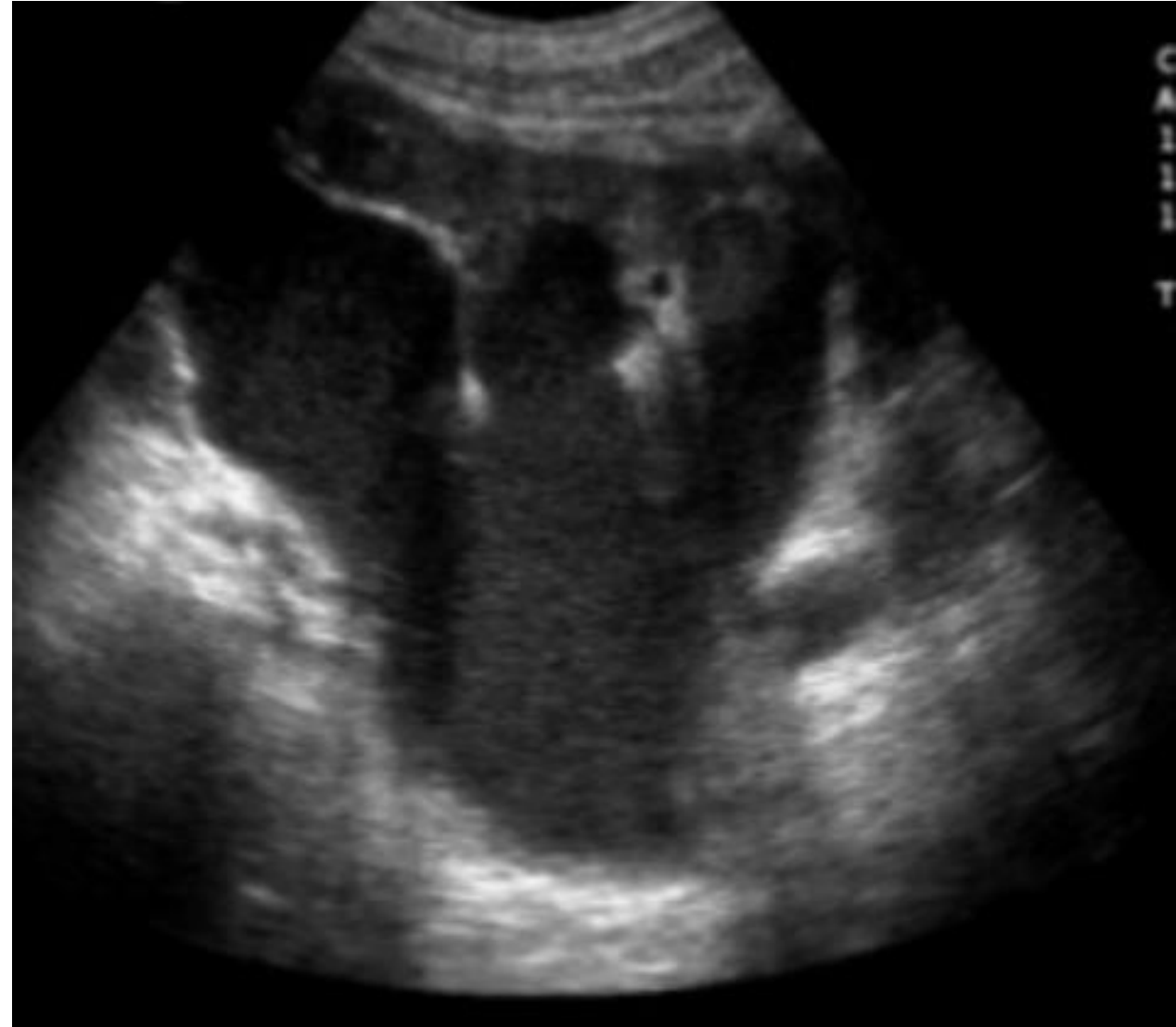
- Il faut que l'urgentiste soit capable de détecter une **dilatation des cavités pyélocalicielles / une dilatation vésicale**

Outcome	Point-of-Care Ultrasonography (N=908)	Radiology Ultrasonography (N=893)	Computed Tomography (N=958)	P Value
Accuracy for diagnosis of nephrolithiasis				
Sensitivity — % (95% CI)	85 (80–89)	84 (79–89)	86 (82–90)	0.74
Specificity — % (95% CI)	50 (45–54)	53 (49–57)	53 (49–58)	0.38



Les recommandations

- Il faut que l'urgentiste soit capable de détecter une **dilatation des cavités pyélocalicielles / une dilatation vésicale**

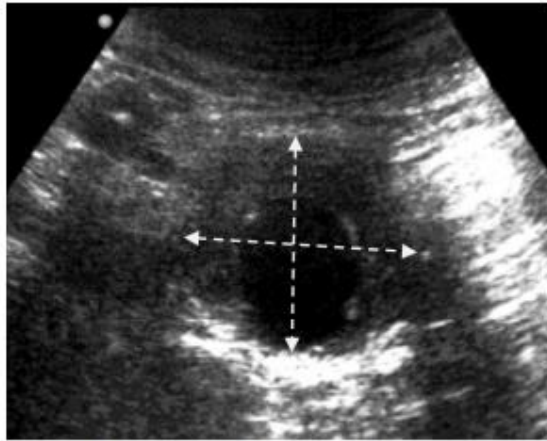


L'anévrisme de l'aorte abdominale

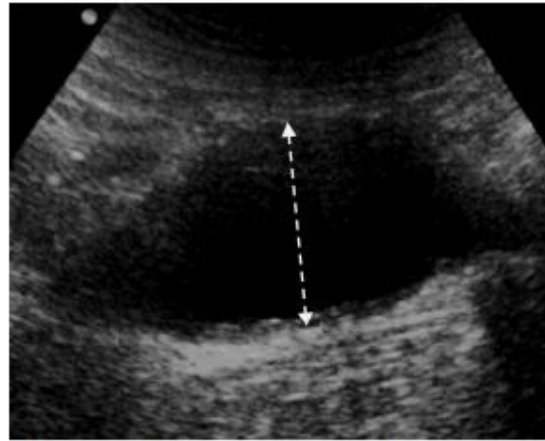
EVIDENCE-BASED DIAGNOSTICS

Systematic Review: Emergency Department Bedside Ultrasonography for Diagnosing Suspected Abdominal Aortic Aneurysm

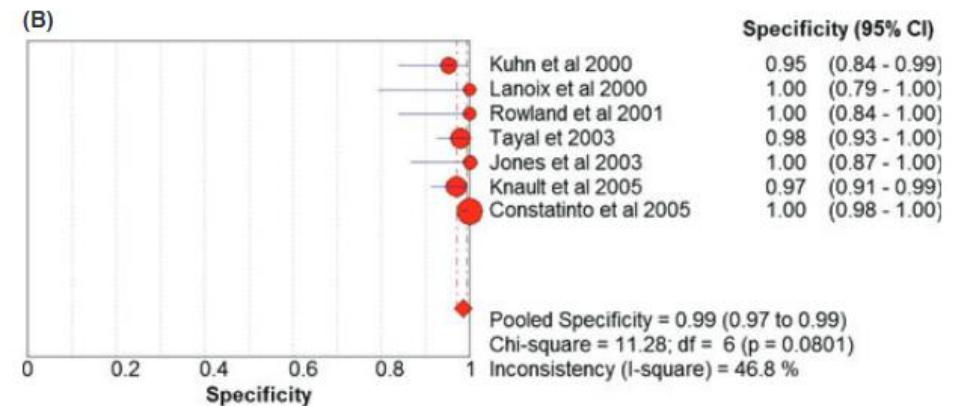
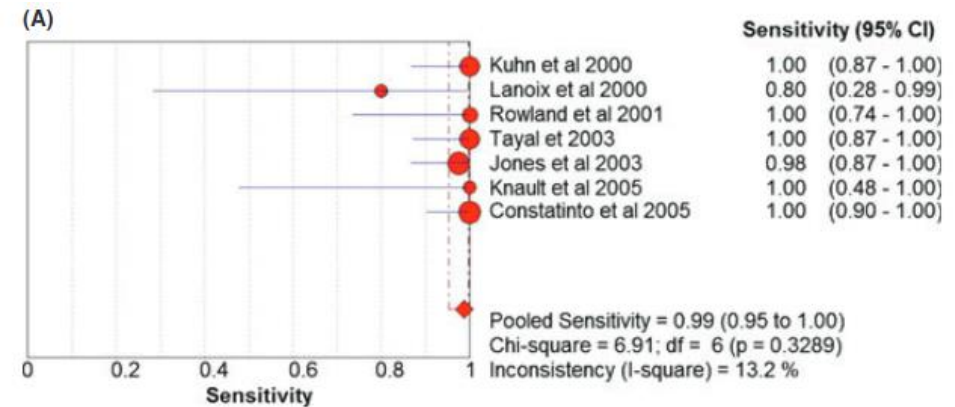
Elizabeth Rubano, MD, Ninfa Mehta, MD, William Caputo, MD, Lorenzo Paladino, MD, and Richard Sinert, DO



5a : Coupe transversale d'un AAA



5b : Coupe longitudinale d'un AAA

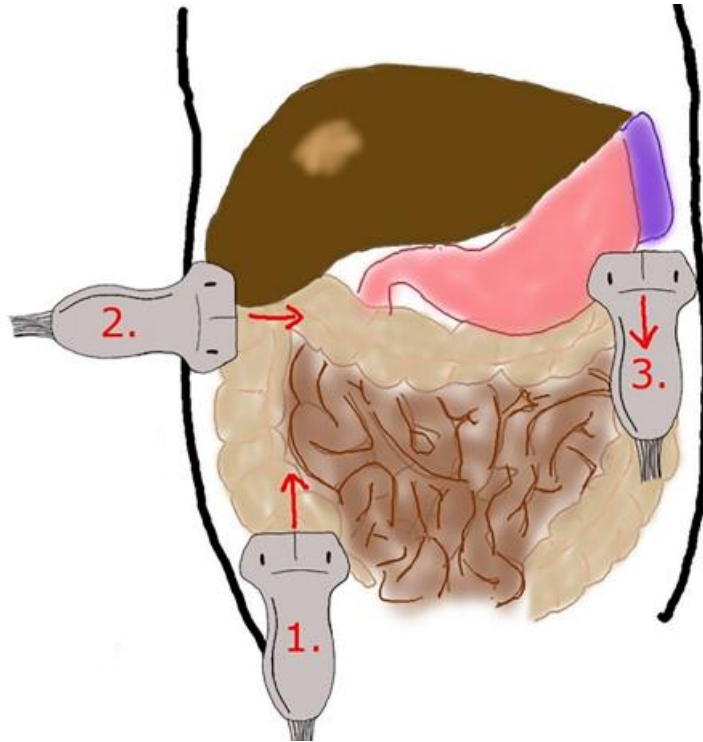


L'invagination intestinale aigue

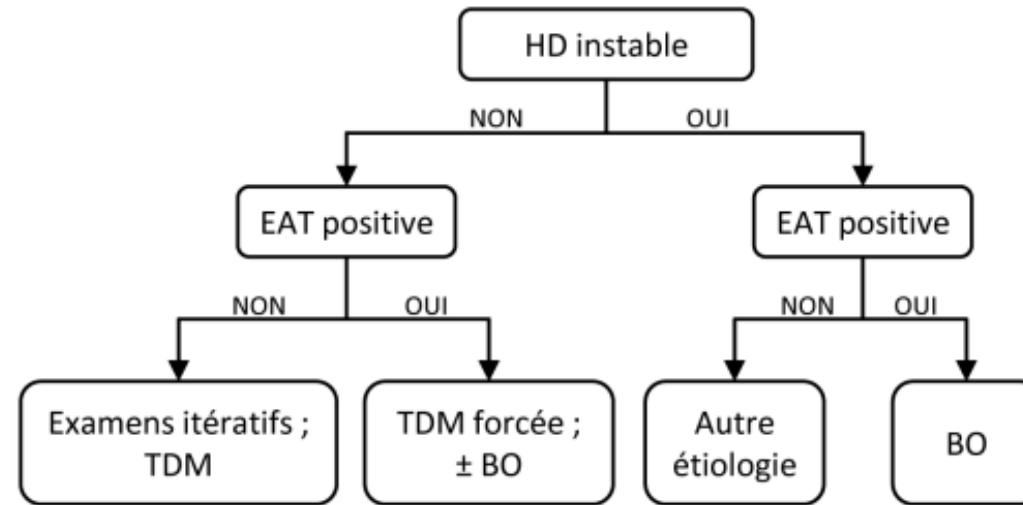
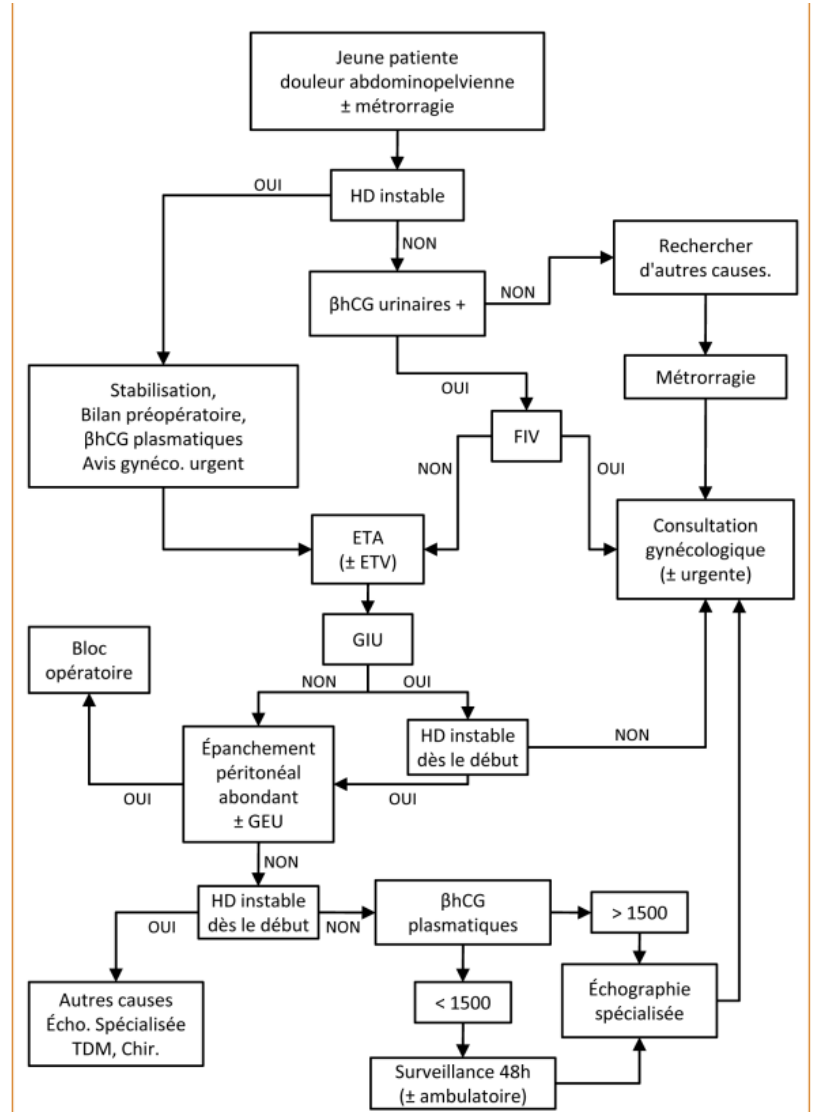
Diagnostic Accuracy of Point-of-Care Ultrasound for Intussusception in Children Presenting to the Emergency Department: A Systematic Review and Meta-analysis

Margaret Lin-Martore, MD*
Aaron E. Kornblith, MD*
Michael A. Kohn, MD, MPP^{†‡}
Michael Gottlieb, MD[§]

*University of California, San Francisco, Department of Emergency Medicine and
Pediatrics, San Francisco, California
[†]Stanford University, Department of Emergency Medicine, Stanford, California
[‡]University of California, San Francisco, Department of Epidemiology & Biostatistics, San
Francisco, California
[§]Rush University Medical Center, Department of Emergency Medicine, Chicago, Illinois



Une échographie contextualisée... pour des réponses précises !



En conclusion

- Recommandations formelles / compétences propres
- Formations
- Niveaux de preuves à établir (préhospitalier, pédiatrie)
- Une échographie de l'urgence, par l'urgentiste et pour l'urgentiste

