



Rijnstate

Echografie; hoe deskundig moet je zijn?

Douwe Rijpsma

Frank Bosch

Rijnstate. Voorop in zorg voor jou.

(Potentiële) belangenverstremgeling	Geen
Voor bijeenkomst mogelijk relevante relaties met bedrijven	•Geen
<ul style="list-style-type: none"> •Sponsoring of onderzoeksgeld •Honorarium of andere (financiële) vergoedingen •Aandeelhouder •Andere relatie 	<ul style="list-style-type: none"> •Geen •Geen •Geen •Geen



Point-of-care Echografie vs. Systematische Echografie



Lindgaard K 2017
Speets AM 2007
Sorensen B 2019



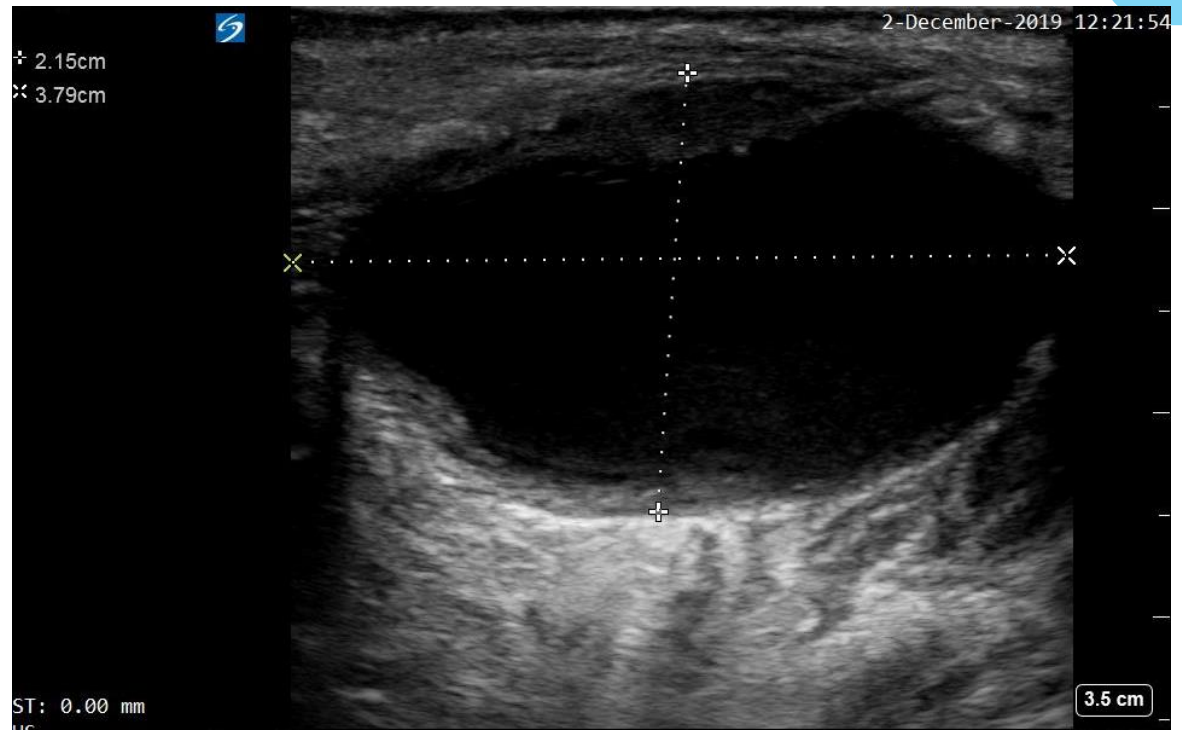
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Is dit een abces?



Is dit een abces?



Tayal VS 2017
Sivitz AB 2010
Lin MJ 2018

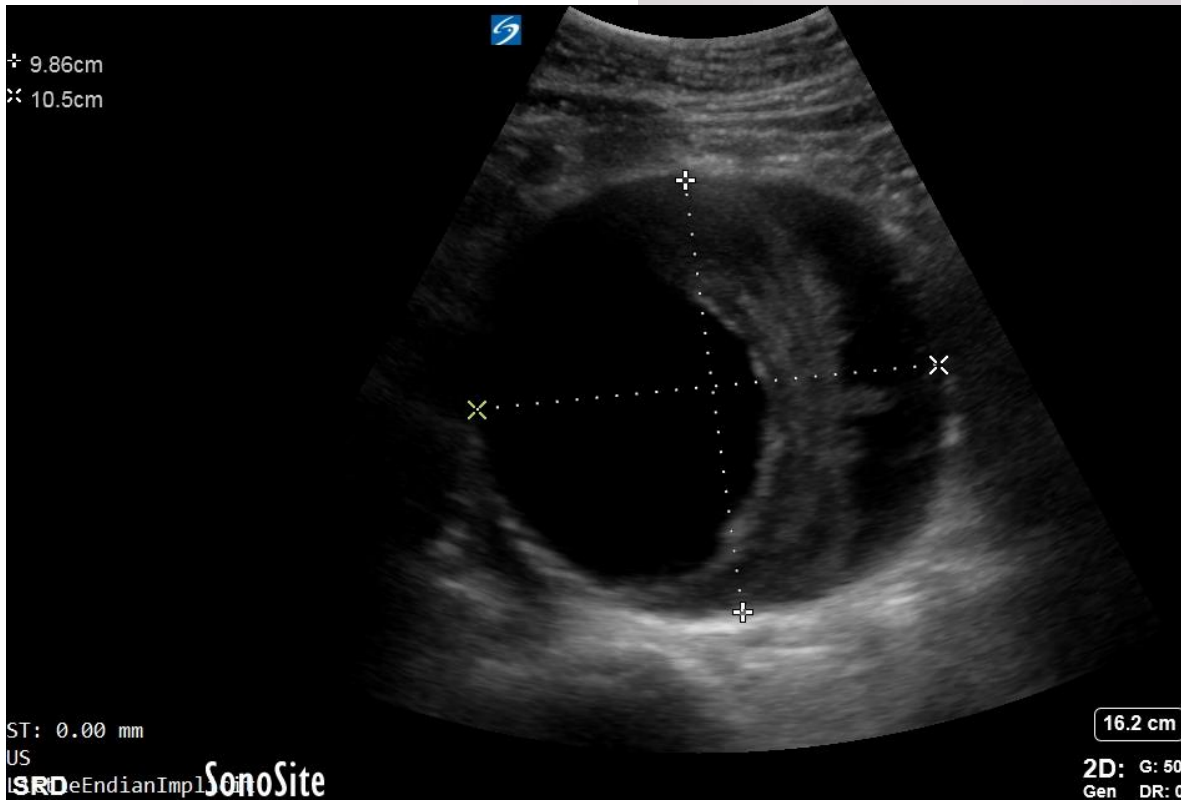


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Is deze buikpijn ernstig?



Is deze buikpijn ernstig?



Bravo-Merino L 2019
Siso-Almirall A 2017

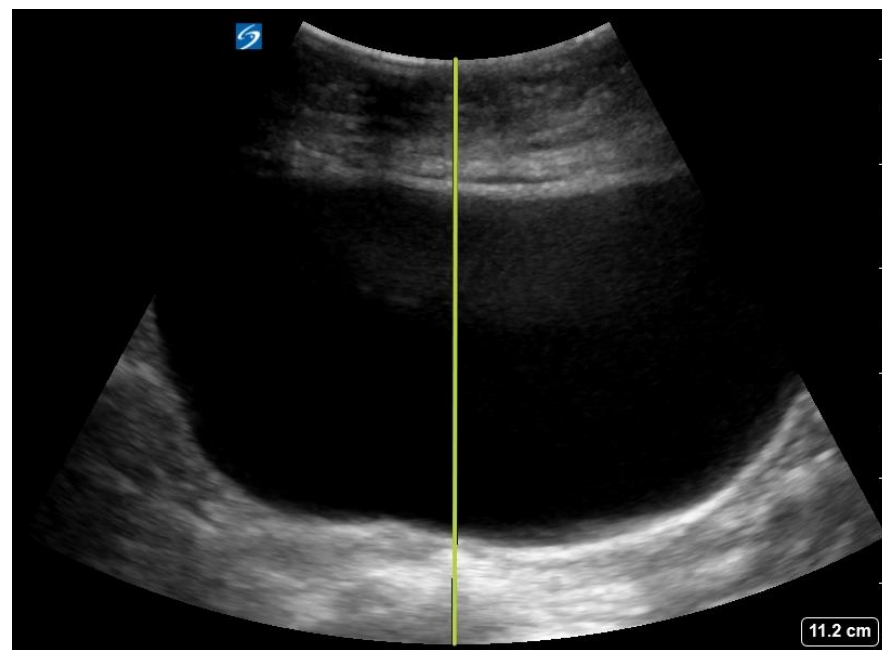


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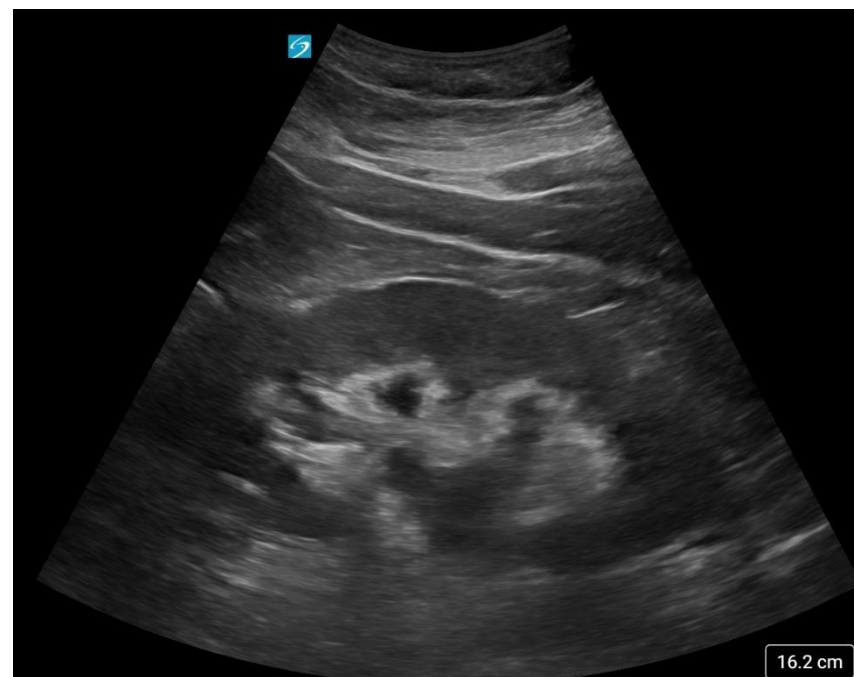
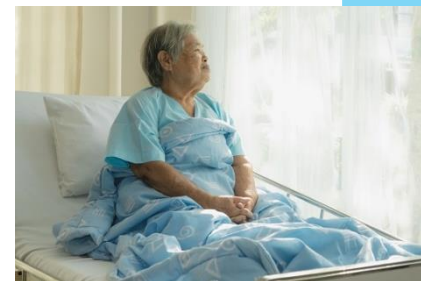
Heeft deze patiënt een blaasretentie?



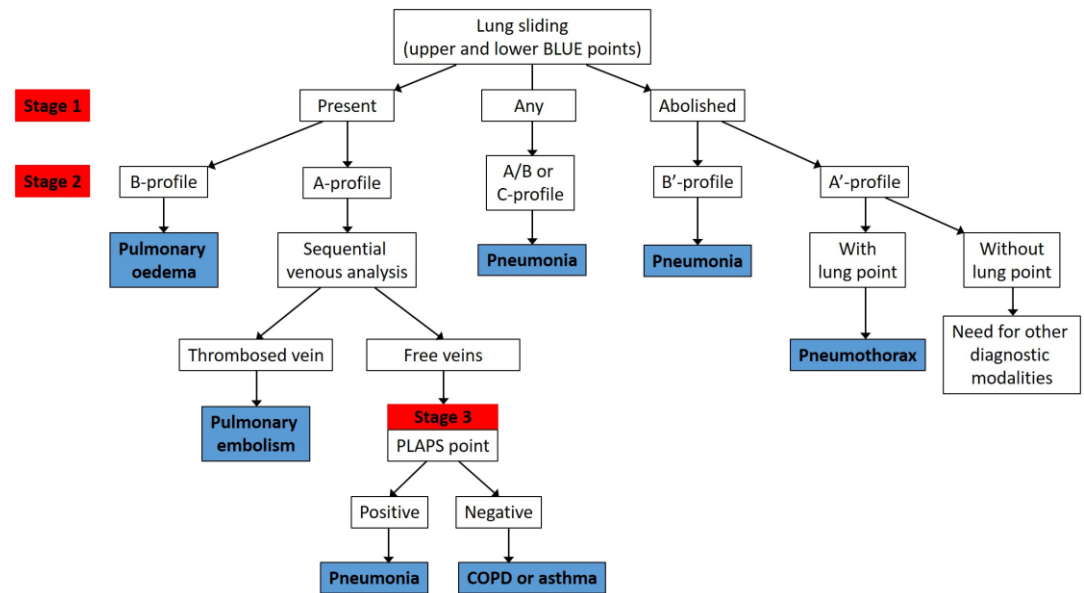
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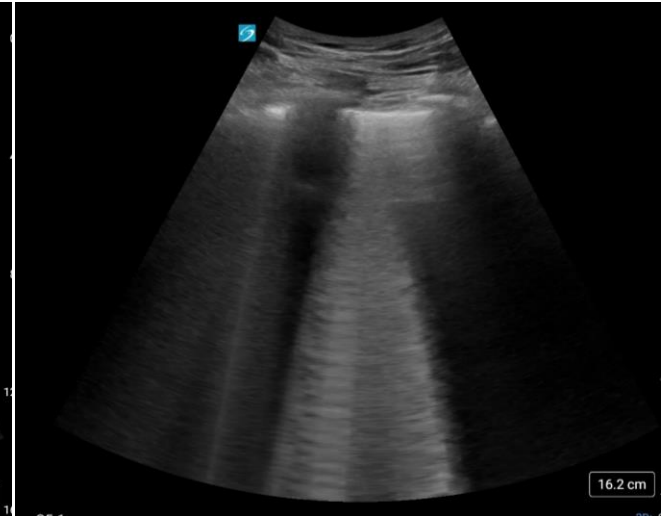
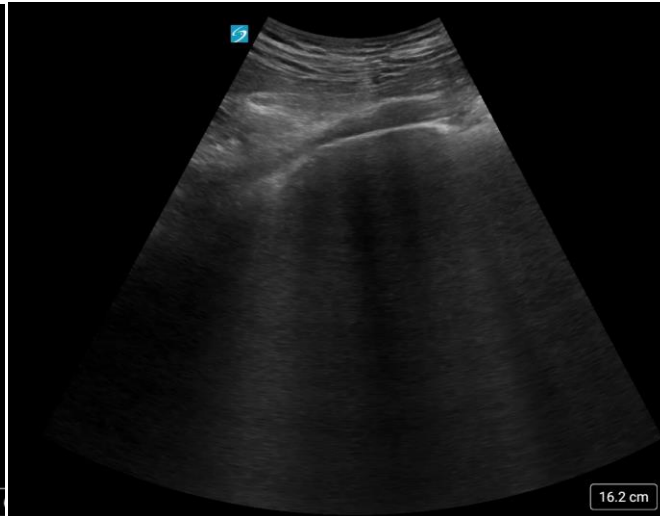
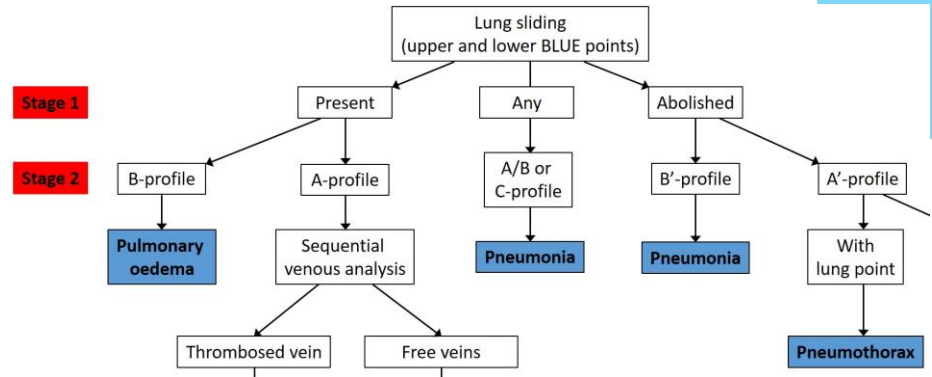
Is deze benauwde patiënt overvuld?



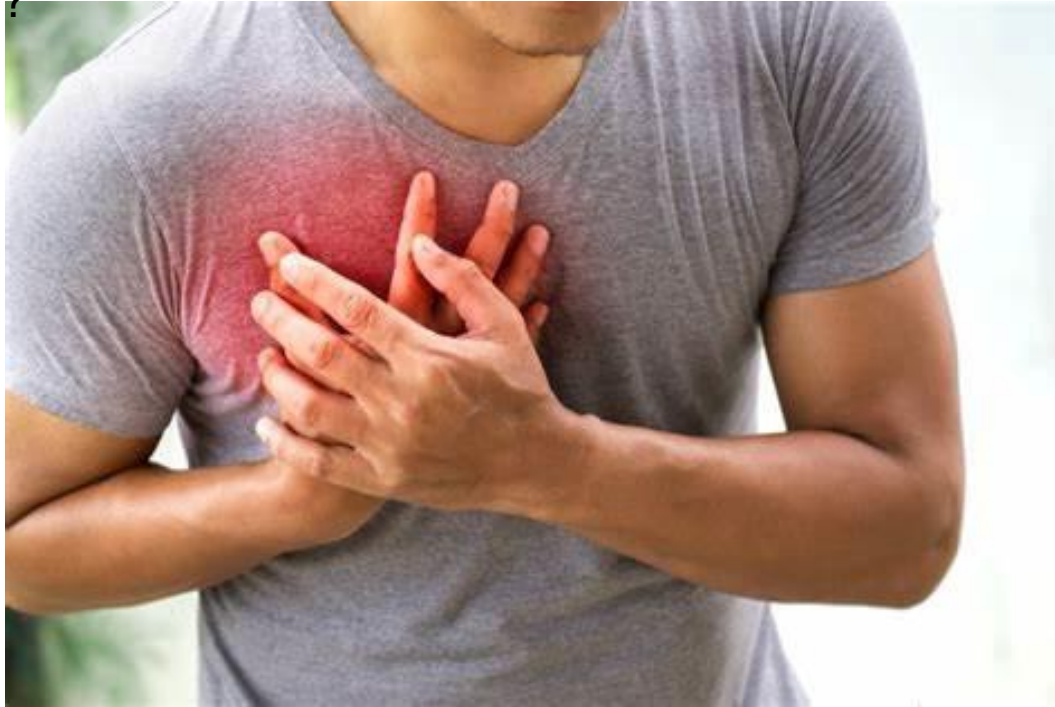
Lichtenstein D 2011
Sorensen B 2019



Is deze benauwde patiënt overvuld?



Is het gebroken?

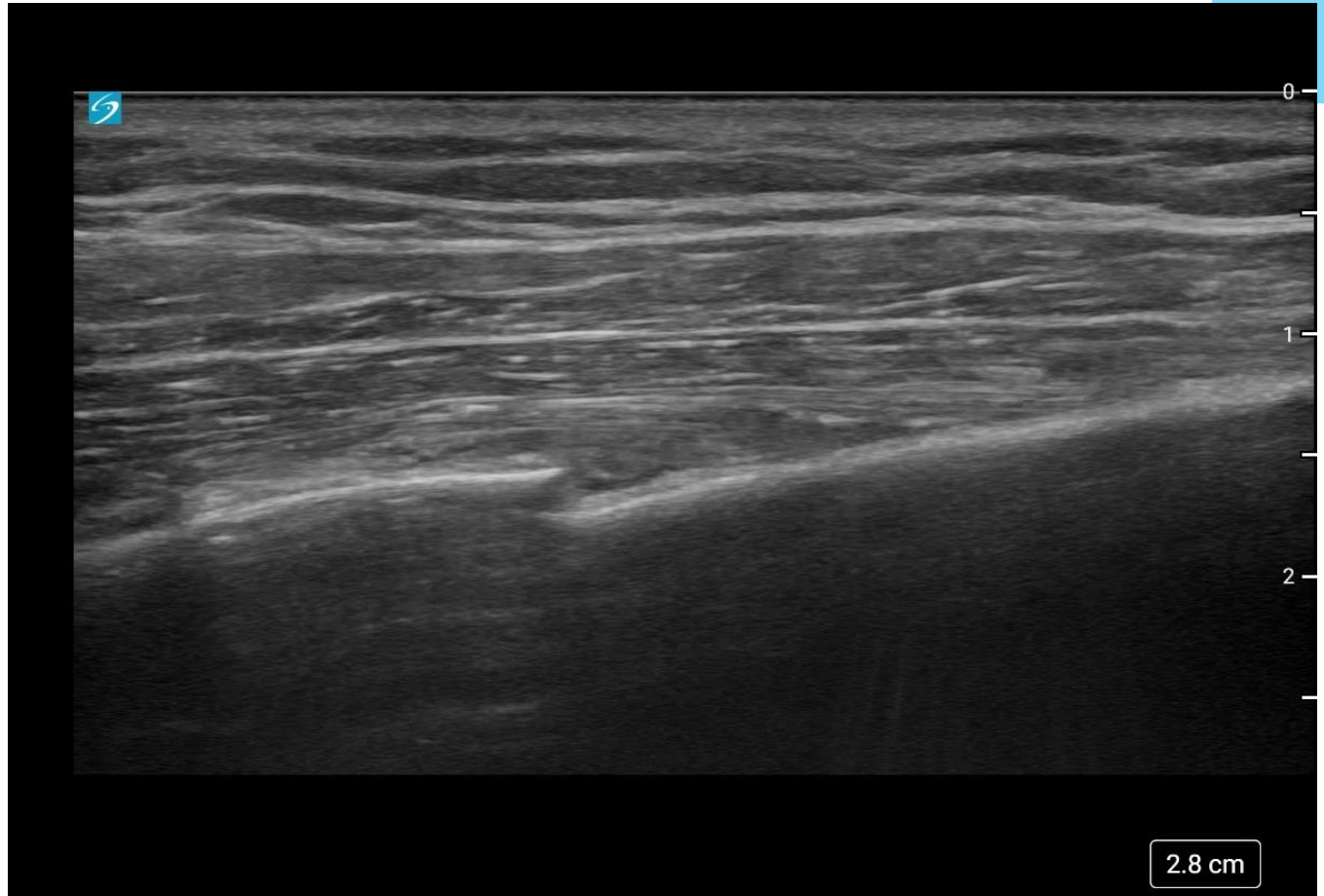
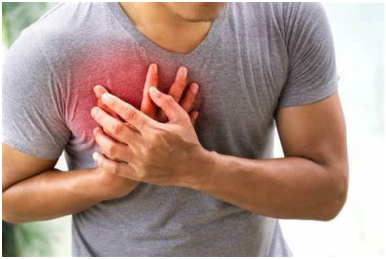


Crombach A 2020
Chartier 2016
Kozaci N 2015



Rijnstate

Is het gebroken?



Crombach A 2020
Chartier 2016
Kozaci N 2015



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POCUS FOR BEGINNERS

The best procedures for point-of-care ultrasound (POCUS) beginners are impactful for the patient, easy to perform (require a small number of quickly obtained views), simple to interpret (limited diagnostic endpoints), and low liability for patient and physician.

Tissue/system	Learn this first	Then proceed to	Transducer type
Skin and soft tissue	Cellulitis vs. abscess	Lumps and bumps	High frequency
Musculoskeletal	Knee effusions	Needle guidance	High frequency
Pelvis and obstetrics	Bladder obstruction	Intrauterine pregnancy labor and delivery	Low frequency
Abdomen	Abdominal ascites	Hydronephrosis	Low frequency
Chest	Pleural effusion	Pulmonary edema	Low frequency

Shen-Wagner J 2020



POINT-OF-CARE ULTRASOUND USES

POCUS uses	Scope of use	Example questions
Physical exam extension	Focused	"Is this palpable mass a cystic or solid structure?" "Is the baby in the cephalic or breech presentation?"
Procedural	Focused	"Where is the best location to insert a needle?" "Where is the foreign body?"
Diagnostic	Focused	"Are there stones in the gallbladder?" "Is there a pregnancy in the uterus?"
Multi-organ scans	Extended	"Is the patient's hypotension due to sepsis, heart failure, or acute blood loss?" "What is causing the patient's dyspnea?"

Shen-Wagner J 2020



Apparatuur



$n \rightarrow \infty \left\{ \frac{n+1}{n} \right\} \{x_n\} \subset \mathbb{R}$
 $\{y_n\} \neq 0 \iff y_n \neq 0$
 $N \rightarrow \mathbb{R} x: \rho$
 $\sqrt{5}^n \left\{ \frac{1}{n} \right\} A_y$
 $\left\{ 1 + \frac{1}{n} \right\} x_n + y_n$
 $f(x) \iff \exists \eta \in [0, 1]: \forall x, x' \in X$
 $\left\{ \frac{1}{n} \right\} = \left\{ \frac{1}{n+1} \right\}$
 $\epsilon \in [0, 1]$

$\lim_{n \rightarrow \infty} \sqrt[n]{A} = 1$
 $\lim_{n \rightarrow \infty} \frac{n^2 - x}{3}$
 $\lim_{n \rightarrow \infty} \left(1 + \frac{\pi}{n} \right)^n$
 $\lim_{n \rightarrow \infty} \sqrt[n]{4^{n+1}}$
 $\lim_{n \rightarrow \infty} \sqrt[n]{4^n \cdot \cos 2n}$
 $\lim_{n \rightarrow \infty} \frac{(n^2 + n - 1)^5}{(n^2 - 2n + 3)^5} x: \rho$
 $\lim_{n \rightarrow \infty} \sqrt[n]{0+0+0} \leq \sqrt[n]{+13^n}$
 $\lim_{n \rightarrow \infty} \sqrt[n]{4^n \cdot 13^n} = 13$
 $\lim_{n \rightarrow \infty} \sqrt[n]{13^n} = 13$

$\forall n \in \mathbb{N}, \text{ to } \left\{ \frac{x_n}{y_n} \right\} \stackrel{\text{df}}{=} \left\{ \frac{x_n}{y_n} \right\}; x_n + \frac{3n-4}{n^2-2n+x}$
 $n \in \mathbb{N}, A > 0, \implies \lim_{n \rightarrow \infty} \sqrt[n]{A} = 1$
 $\forall n \in \mathbb{N} x_n \leq y_n < z_n$
 $\text{lokal. max}; \{x_n\}: x_n = \frac{1}{n}; \{y_n\} = \dots$
 $\lim_{n \rightarrow \infty} \min$ lok. min

$\{x_n\} + \{y_n\} \stackrel{\text{df}}{=} \{x_n + y_n\}; 13$
 $\{x_n\} \cdot \{y_n\} \stackrel{\text{df}}{=} \{x_n \cdot y_n\}; 13$
 $x_n \leq y_n \leq z_n$
 $\downarrow n \rightarrow \infty$ $\downarrow n \rightarrow \infty$
 g



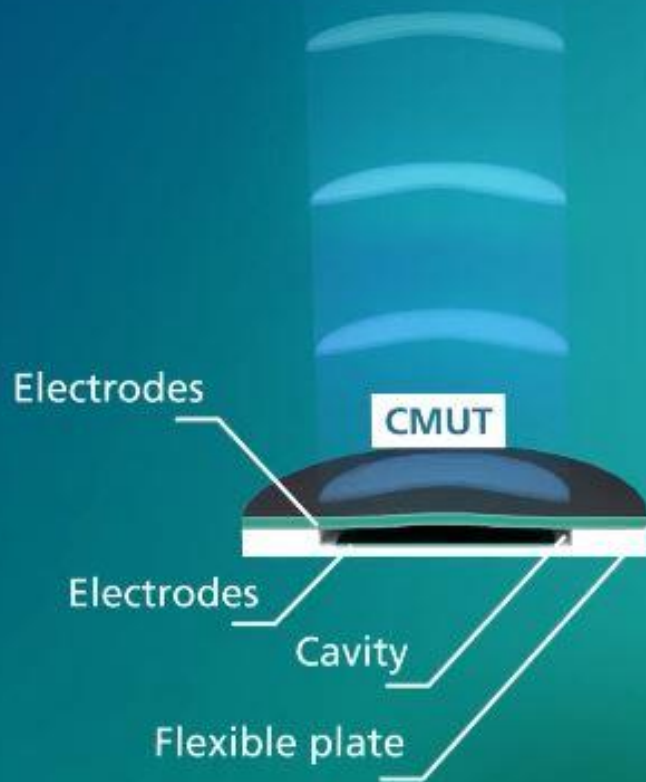
Ultrasound in je hand



Vscan Air™
Digital Tools



MICROMACHINED ULTRASOUND TRANSDUCER



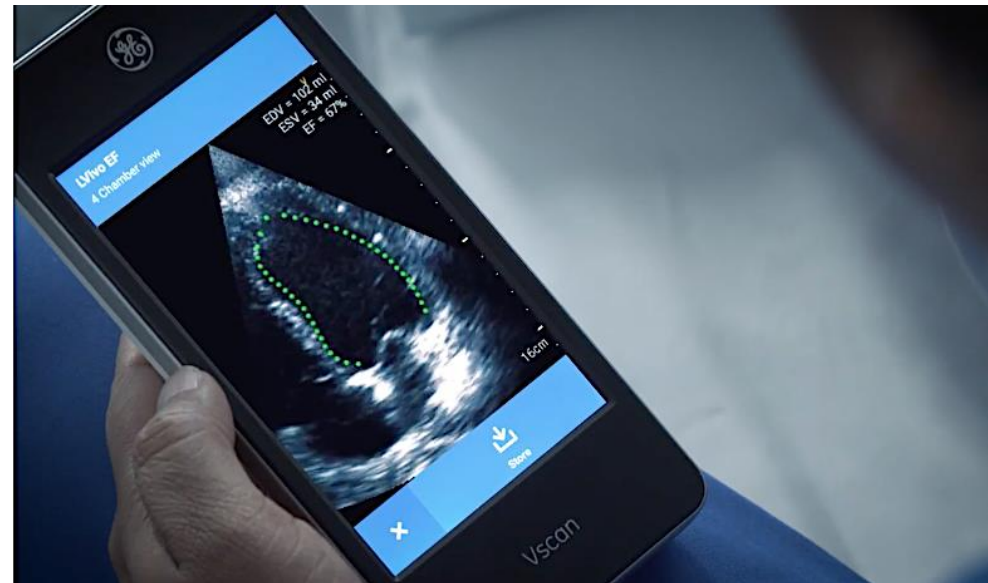
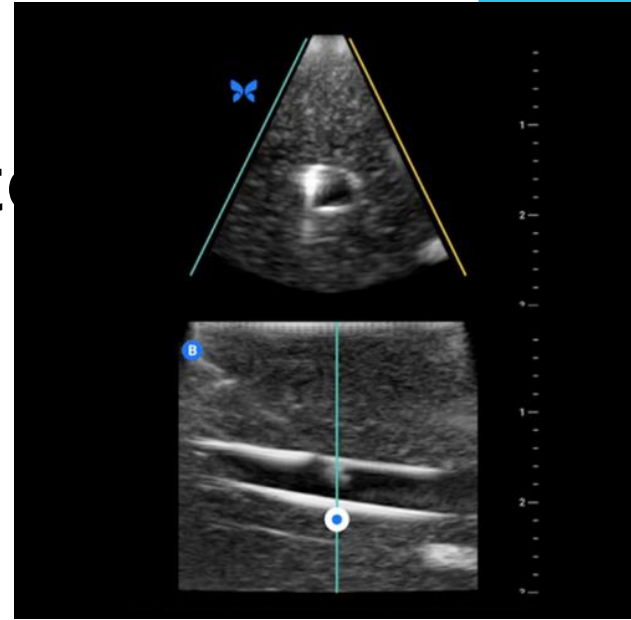
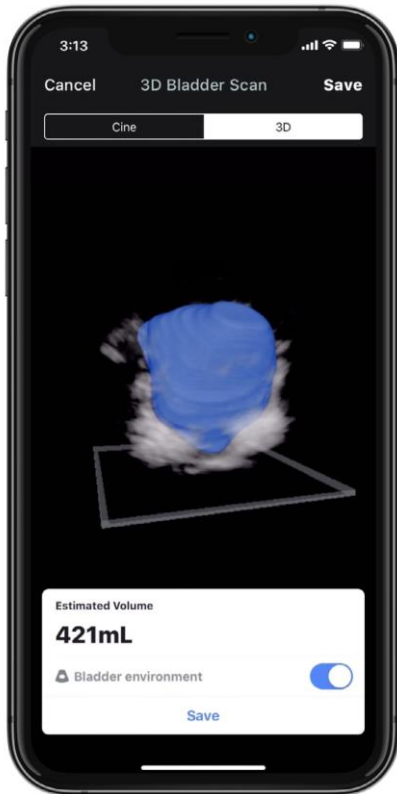
CMUTs consist of a flexible membrane which can be put into motion electrostatically.

Voordelen



- 1 probe, verschillende profielen
 - Abdominaal
 - Cardiaal
 - Long
 - Blaas
 - Etc

A.I. Onderste



For reference

0 A4C

Guiding

Grading

Labeling

EN

KOSMOS

63%

96%

1.1 MI

0.5 TIS

2.0 MHz

Depth 66% Gain

TGC TRIO

1 sec

2

5

10

15

16

• RV • IVS • LV

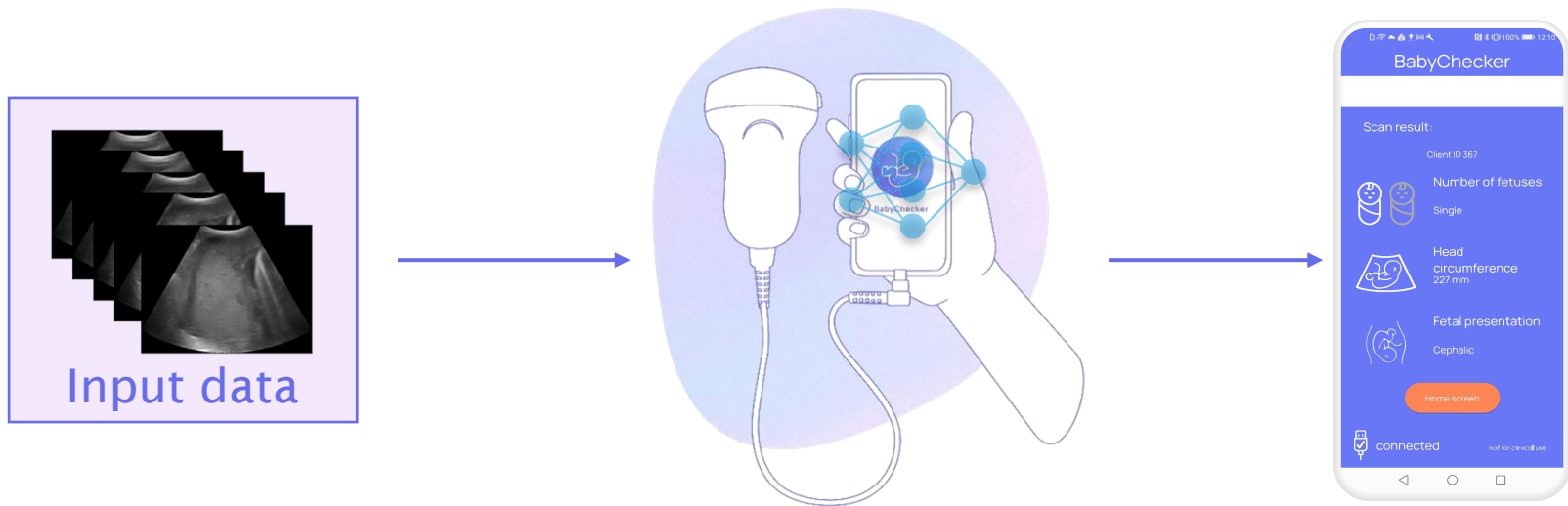
• TV • MV

• RA • IAS • LA

OBSTETRIC SWEEP PROTOCOL



AUTOMATIC DETECTION OF RISK FACTORS IN PREGNANCY



Number of fetuses

Gestational age estimation

Fetal presentation

Placenta localization

Thomas van den Heuvel, 2019, Automated low cost ultrasound: improving antenatal care in resource-limited settings



a



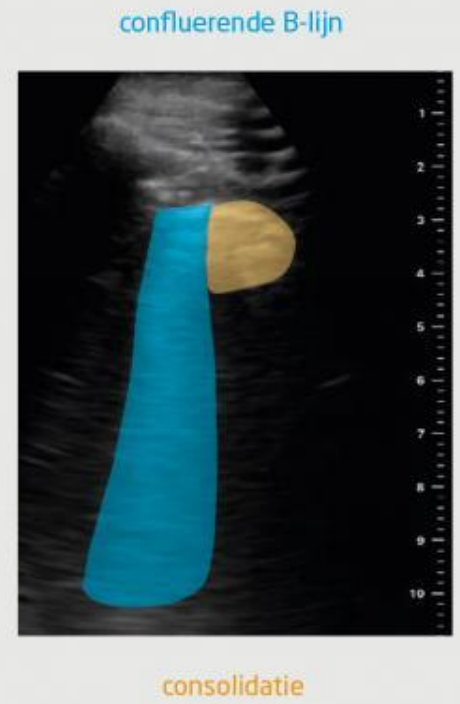
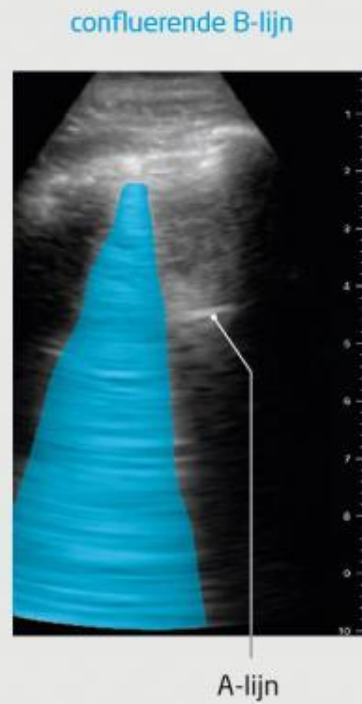
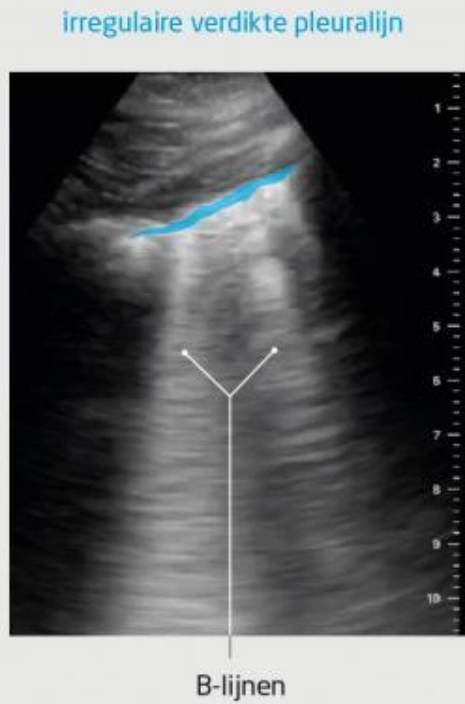
b



c



d



irreguliere verdikte pleuralijn

confluerende B-lijn

confluerende B-lijn

pleuralijn

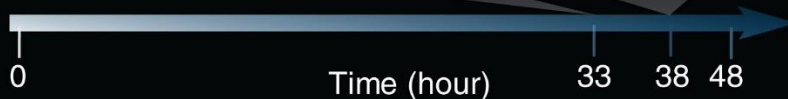
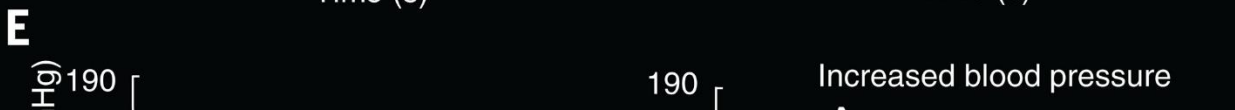
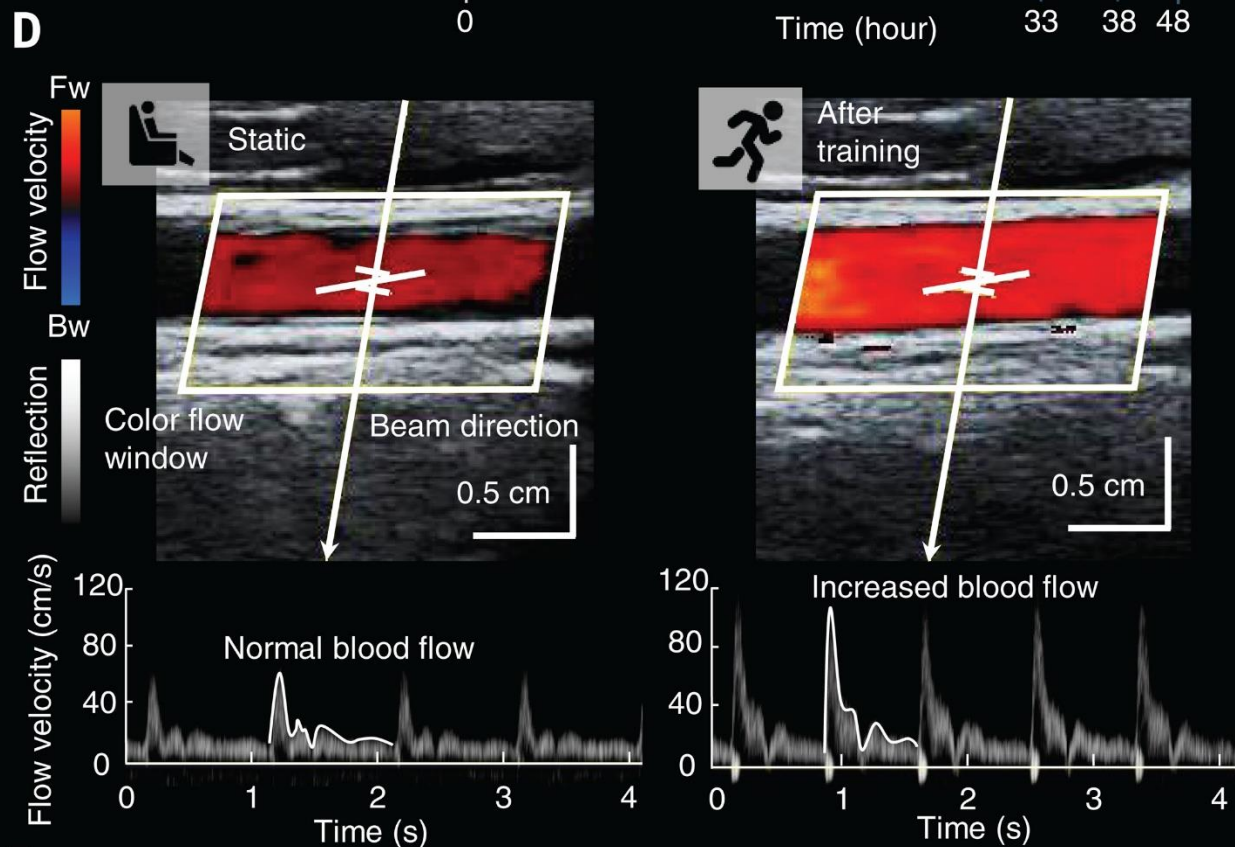
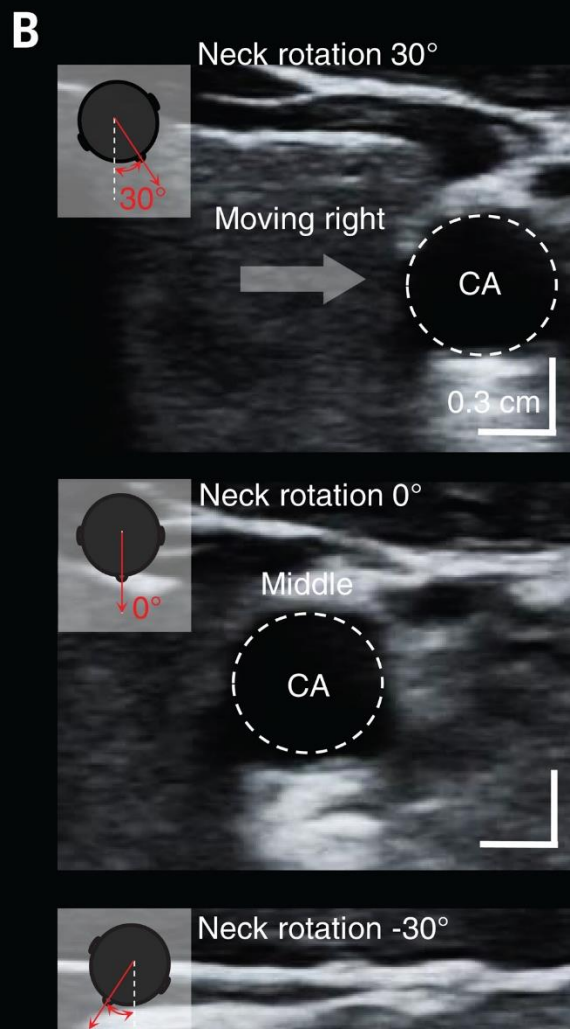
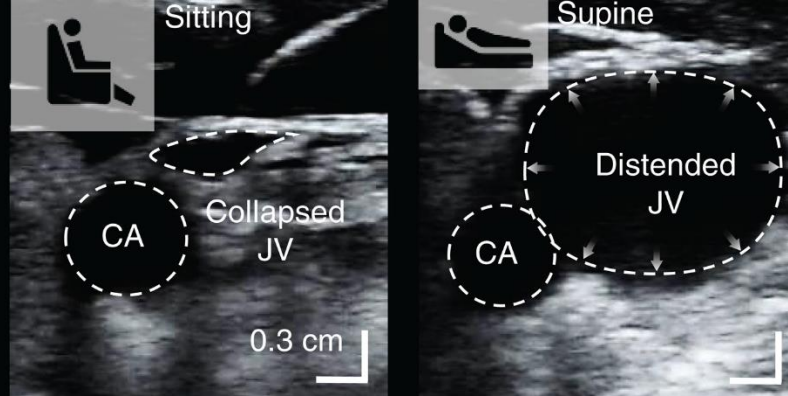
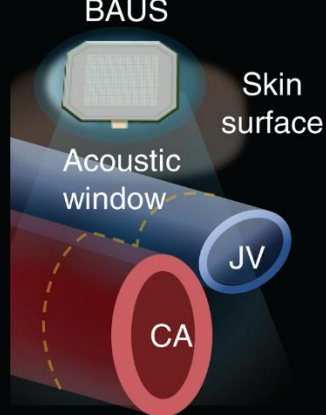
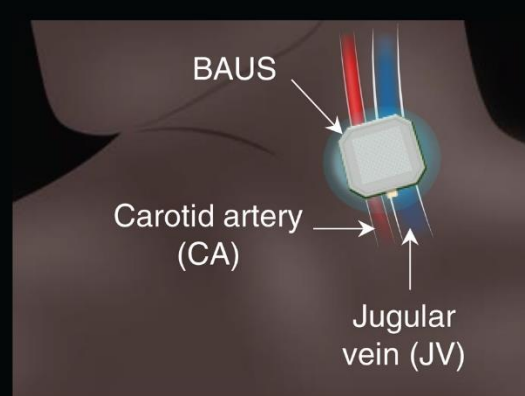
A-lijn

ribschaduw

B-lijnen

A-lijn

consolidatie





Conclusie

- Echografie onder de knie krijgen vereist inspanning en tijd, maar heeft dan meer nut voor de patiënt dan het aanleren en hanteren van de stethoscoop
- Ja/Nee vragen zijn na beperkte training te beantwoorden
- De ontwikkeling van kleine devices gekoppeld aan een smartphone is een revolutie! A.I. en CMUT technology gaan een grote kwaliteitsverbetering mogelijk maken







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