BASE10 PROTOCOL

IVICA ZDRAVKOVIĆ

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Brza sonografska evaluacija pacijenta u urgentnoj medicini

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Basic Assessment with Sonography in Emergency Medicine

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Basic Assessment with Sonography in Emergency Medicine

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PDF Book

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UVOD

U savremenoj kliničkoj praksi lekara u hitnim i dežurnim službama, kao i lekara na terenu, vremenski prozor za donošenje vitalnih odluka često je izuzetno mali. Racionalizacija ultrazvučnih pregleda bolesnika "na licu mesta" (Point-Of-Care-UltraSound, POCUS) zahteva strukturisani, jedinstveni i maksimalno skraćeni protokol, koji eliminiše suvišna lutanja i fokusira se isključivo na životno ugrožavajuća stanja. Klasični POCUS protokoli, iako izuzetno temeljni, često zahtevaju premeštanje nestabilnih pacijenata, okretanje bolesnika, ili preveliki broj skeniranih zona, što usporava donošenje životno važnih odluka. Odgovor na ovaj klinički izazov predstavlja **BASE10** protokol - brza, racionalizovana i visoko efikasna metodologija dizajnirana specifično za lekare u hitnim i dežurnim službama.

BASE10 protokol je dobio ime prema akronimu izvedenom iz "***B****asic* ***A****ssessment with* ***S****onography in* ***E****mergency (situations)"* . To je brzi ehosonografski pregled pacijenta sa hitnim stanjem. Broj 10 označava deset pozicija, odnosno prostora koje posmatramo. To je jedinstven, didaktički zaokružen sistem, protokol za urgentnu medicinu koji integriše principe ***eFAST***, ***RUSH***, ***BLUE*** i ***FATE*** protokola. Njime se grubo evaluira stanje kardiorespiratornog sistema, pronalazi se upadljiva akutna

INTRODUCTION

In the modern clinical practice of physicians in emergency and on-call services, as well as field physicians, the time window for making life-critical decisions is often extremely narrow. The rationalization of bedside patient ultrasound examinations (Point-Of-Care Ultrasound, POCUS) requires a structured, unified, and maximally condensed protocol that eliminates unnecessary detours and focuses exclusively on life-threatening conditions. Classical POCUS protocols, although extremely thorough, often require moving unstable patients, turning the patient, or scanning an excessive number of zones, which slows down the making of vital decisions. The response to this clinical challenge is the **BASE10 protocol** - a rapid, streamlined, and highly efficient methodology designed specifically for emergency and on-call physicians.

The **BASE10 protocol** derives its name from the acronym **B**asic **A**ssessment with **S**onography in **E**mergency (situations). It is a rapid echosonographic examination of a patient with an emergency condition. The number 10 denotes ten positions, i.e., spaces that we examine. It is a unique, didactically rounded system, a protocol for emergency medicine that integrates the principles of the ***eFAST***, ***RUSH***, ***BLUE***, and ***FATE*** protocols. It roughly evaluates the state of the cardiorespiratory system, identifies prominent acute abdominal

abdominalna patologija, pregledaju se urotrakt i mala karlica i dopunski se posmatraju eventualne muskuloskeletne povrede i duboka venska tromboza. Cilj protokola je sveobuhvatna procena vitalno ugroženog pacijenta za samo nekoliko minuta, bez pomeranja bolesnika.

pathology, examines the urinary tract and pelvis, and additionally inspects potential musculoskeletal injuries and deep vein thrombosis. The goal of the protocol is a comprehensive assessment of a critically ill patient in just a few minutes, without moving the patient.

Fizika ultrazvuka, sonde i tehnika skeniranja

Zvučni talasi koji se koriste u dijagnostičkom ultrazvuku imaju frekvenciju preko 2MHz. Poređenja radi, ljudsko uho detektuje frekvencije zvuka između 20Hz i 20.000Hz. Svaka ultrazvučna sonda sadrži piezoelektrične kristale koji vibriraju kada su izloženi električnoj struji, stvarajući frekvenciju (zvuk) koja je znatno iznad raspona sluha ljudskog uha. Proizvedeni zvučni talasi se zatim prostiru kroz tkivo prenoseći vibracije kroz molekule. Pomenuti zvučni talasi imaju karakteristike sinusnih talasa i imaju sledeće karakteristike:

1. talasna dužina (**λ**), koja je razmak između dva vrha sinusoide talasa (dubina prodora ultrazvučnog talasa je direktno proporcionalna talasnoj dužini);

2. frekvencija (**f**), broj ciklusa (talasnih dužina) koji se stvaraju u toku jedne sekunde meri se u hertzima - Hz (što je direktno

Ultrasound Physics, Probes, and Scanning Technique

Sound waves used in diagnostic ultrasound have frequencies exceeding 2 MHz. By comparison, the human ear detects sound frequencies between 20 Hz and 20,000 Hz. Each ultrasound probe contains piezoelectric crystals that vibrate when exposed to an electric current, generating a frequency (sound) well above the range of human hearing. The generated sound waves then propagate through tissue by transmitting vibrations through molecules. These sound waves exhibit sinusoidal characteristics and possess the following properties:

1. Wavelength (λ): The distance between two wave peaks (the depth of penetration of an ultrasound wave is directly proportional to its wavelength).

2. Frequency (f): The number of cycles (wavelengths) generated per second, measured in Hertz - Hz (directly dependent on the type of

zavisno od vrste piezoelektričnih kristala u sondi), što je veća frekvencija, to je bolja rezolucija slike (slika sadrži više detalja), ali penetracija u tkivo je manja (plitka);

3. brzina širenja talasa (**V**), za'visi od gustine tkiva. Pošto je brzina kojom se talas širi (V) relativno konstantna kada je reč o mekim tkivima i iznosi oko 1540 m/s, jasno je da su u ovom slučaju promenljive samo talasna dužina i frekvencija.

Odnos ovih karakteristika može se opisati preko matematička jednačina: **V=λf**. Da bi „V" bio konstantan, porast „λ" mora biti praćen smanjenjem „f" i obrnuto. Drugim rečima, frekvencija i talasna dužina su obrnuto proporcionalni:

$$\lambda = V/f$$

Ova činjenica je od velike važnosti pri izboru sonde koja ima određenu vrstu kristala u sebi i stvara određeni tip ultrazvučnog talasa. Ako lekar koji obavlja test koristi sondu sa većom frekvencom, ona će imati manju talasnu dužinu, što zauzvrat znači da će imati bolju rezoluciju slike, ali manju penetraciju u tkivo (plitka vizuelizacija tkiva).

Generalno imamo tri glavna tipa sondi na osnovu vrste ultrazvučnih talasa koje emituju kroz tkivo: sektorske, konveksne i linearne sonde. Pored ove tri, postoje i posebne ultrazvučne sonde poput

piezoelectric crystals in the probe). The higher the frequency, the better the image resolution (more detail), but tissue penetration is lower (shallower).

3. Propagation velocity (V): Depends on tissue density. Since the propagation speed (V) is relatively constant in soft tissues, averaging approximately 1540 m/s, it is evident that only wavelength and frequency are variable in this context.

The relationship between these characteristics can be described by the mathematical equation: **V=λf.** For "V" to remain constant, an increase in "λ" must be accompanied by a decrease in "f", and vice versa. In other words, frequency and wavelength are inversely proportional:

$$\lambda = V/f$$

This fact is of great importance when selecting a probe containing a specific type of crystal that generates a specific type of ultrasound wave. If the physician performing the examination uses a higher-frequency probe, it will have a shorter wavelength, which in turn means better image resolution but lower tissue penetration (shallower tissue visualization).

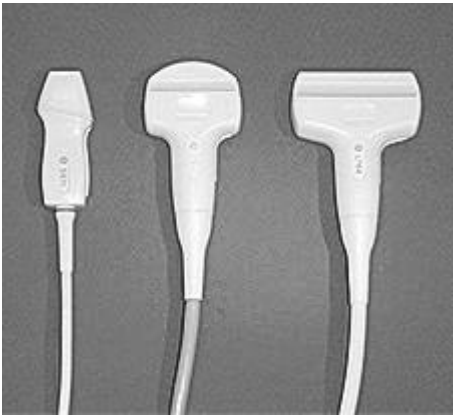
Generally, there are three main types of probes based on the type of ultrasound waves they emit into tissue: phased array (sector), convex, and linear probes. In

sondi koje se koriste u transvaginalnom ultrazvuku, rektalnomi ultrazvuku, itd. Ultrazvučne sonde nisu samo odašiljači ultrazvučnih talasa, već su takođe i prijemnici koji apsorbuju reflektovani (odbijeni) ultrazvučni talas, čineći tako svaki ultrazvučni aparat i emiterom i prijemnikom.

Sonde više frekvencije imaju bolju rezoluciju i manju penetraciju, pa se koriste za vizuelizaciju mekog tkiva ispod kože i organe blizu kože. Ove sonde se nazivaju linearne sonde i imaju frekvencu između 7,5 i 10 MHz (savremene multifrekventne sonde se kreću od 2 do 12 MHz). Za dublje skeniranje (na primer organa trbuha) koriste se sonde koje imaju frekvence oko 3,5MHz. One se nazivaju konveksne sonde i njih koristimo u BASE10 protokolu (videti dalje).

addition to these three, there are specialized ultrasound probes such as those used in transvaginal ultrasound, transrectal ultrasound, etc. Ultrasound probes are not only emitters of ultrasound waves but also receivers that absorb the reflected (echoed) ultrasound waves, making every ultrasound machine both an emitter and a receiver.

Higher-frequency probes provide better resolution with lower penetration, making them suitable for visualizing soft tissue beneath the skin and organs close to the skin surface. These probes are called linear probes and typically operate at frequencies between 7.5 and 10 MHz (modern multifrequency probes range from 2 to 12 MHz). For deeper scanning (e.g., abdominal organs), probes with frequencies around 3.5 MHz are used. These are called convex probes, and they are utilized in the BASE10 protocol (see below).



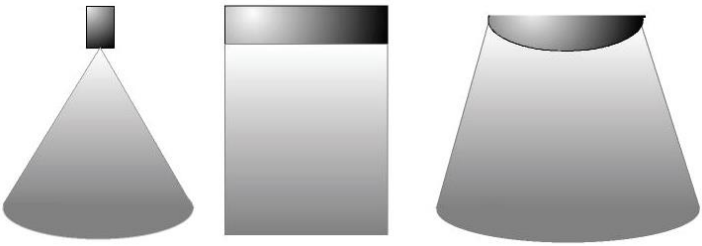
Sa leva na desno: sektorska, konveksna i linearna sonda.
From left to right: sector, convex, and linear probes.

Svaka sonda ima oznaku sa strane, koja pomaže lekaru da se orijentiše. UZ aparati obično na monitoru imaju zelenu tačku, ili drugi marker koji takođe pomaže lekaru da se orijentiše. U većini slučajeva pomeranje sonde ka desnoj strani pacijentovog tela prikazuje anatomske strukture sa te strane tela i obrnuto. Za lekare početnike koristimo metod orjentacije sonde pomoću prsta: ako sondu postavimo ispred monitora i dodirnemo njen levi ugao, to se vidi na levoj strani ekrana ii sonda je ispravno orjentisana. Ovo je deo praktične obuke.

Kada opisujemo sliku na ekranu, upoređujemo različite stepene svetlosti, opisujući stvari kao, **hiperehogene** (svetlije), **hipoehogene** (tamnije), ili **anehogene** (potpuno tamne). Izrazi kao što su **izoehogeni** (istog nivoa osvetljenja) i **heteroehogeni** (tkivo koje nema isti nivo svetlost u svim oblastima) se takođe često koriste.

Each probe has a side marker that helps the physician with orientation. Ultrasound machines typically display a green dot or another marker on the monitor to further assist with orientation. In most cases, moving the probe toward the right side of the patient's body displays anatomical structures from that side of the body, and vice versa. For beginner physicians, we use the finger orientation method: if we place the probe in front of the monitor and touch its left corner, it will appear on the left side of the screen, indicating that the probe is correctly oriented. This is part of practical training.

When describing the image on the screen, we compare different degrees of brightness, describing structures as **hyperechoic** (brighter), **hypoechoic** (darker), or **anechoic** (completely dark). Terms such as **isoechoic** (having the same level of brightness) and **heteroechoic** (tissue that does not have uniform brightness across all areas) are also frequently used.



Shematski prikaz snopa talasa koje šalju u tkivo sektorska, linearna i konveksna sonda
Schematic representation of the wave beams emitted into tissue by sector, linear, and convex probes.

Ultrazvučno skeniranje se može izvesti u više režima (moda):

A-mod (amplitudni režim) - obuhvata emitovanje pojedinačnih ultrazvučnih talasa koji se registruju na prijemniku i na ekranu se formira slika koja pokazuje dubinu. Danas se ova metoda praktično ne koristi u dijagnostičke svrhe.

B-mod (režim osvetljenja, „brightness“) - predstavlja skeniranje površine, koja se zatim prikazuje na ekranu kao dvodimenzionalna slika. Ovo je danas najčešća metoda ultrazvučnog snimanja. Nju ćemo najviše koristiti u BASE10 protokolu.

M-mod (režim kretanja, „movement“) - mod skeniranja u kom se u kratkom vremenskom intervalu smenjuju A i B mod, kako bi se napravio analogni zapis pokretanja struktura koje posmatramo. U BASE10 protokolu M-mod možemo da koristimo kod UZ pluća ("barcode sign" kod pneumotoraksa) ili kod merenja MAPSE i TAPSE (subksifoidni pregled srca), ali uglavnom zbog potrebe brzog obavljanja pregleda, veči deo skeniranja obavljamo u B-modu.

D-mod (Dopler režim) j- merenje povećanja ili smanjenje frekvencije zbog Doplerovog efekta, što daje informacije o protoku krvi ili druhij tečnosti kroz skenirane organe. Postoje osnovni, klasični Dopker

Ultrasound scanning can be performed in several modes:

A-mode (amplitude mode): Involves emitting individual ultrasound waves registered by the receiver to form an image on the screen showing depth. Today, this method is practically no longer used for diagnostic purposes.

B-mode (brightness mode): Represents surface scanning displayed on the screen as a two-dimensional image. This is currently the most common ultrasound imaging method and the one we will use most extensively in the **BASE10 protocol**.

M-mode (motion mode): A scanning mode in which A-mode and B-mode alternate over short time intervals to create an analog recording of the motion of observed structures. In the BASE10 protocol, we can use M-mode for lung ultrasound ("barcode sign" in pneumothorax) or when measuring MAPSE and TAPSE (subxiphoid cardiac view); however, due to the need for rapid examinations, the vast majority of scanning is performed in B-mode.

D-mode (Doppler mode): Measures frequency increases or decreases due to the Doppler effect, providing information about blood flow or other fluids through the scanned organs. Standard classical Doppler methods exist alongside Pulsed Wave (PW), Continuous Wave (CW), Power

metod skeniranja, ali i Pulse wave metod (PW), Continous wave (CW), Power doppler itd. U našem BASE10 protokolu dopler dijagnostika nije obavezna - iako je dobrodošla ako lekar ume da je upotrebi.

Doppler, etc. In our BASE 10 protocol, Doppler diagnostics are not mandatory - though they are welcome if the physician is proficient in their use.

Interakcija ultrazvučnih talasa sa tkivom
Interaction of Ultrasound Waves with Tissue

1. Slabljenje (atenuacija)

Predstavlja postepeni gubitak snage prodora kada ultrazvučni talas prolazi kroz tkivo, posledično i nejasnu ili tamniju sliku na monitoru.

2. Odbijanje (refleksija)

Ultrazvučni talasi se odbijaju od površine tkiva kroz koju prolaze. Upravo ovaj fenomen i omogućava ehosonografiju. Refleksija zavisi od akustičke impedance skeniranog tkiva, što je u direktnoj korelaciji sa gustinom tkiva i brzinom kojom se ultrazvučni talasi šire kroz njega. Što je tkivo gušće, veća je impedanca ako je talasna brzina konstantna.

3. Refrakcija

Kada ultrazvučni talas dođe u kontakt sa tkivom različite akustičke impedance, neki delovi ultrazvučnih talasa se ne reflektuju, oni se samo usporavaju, a ovaj fenomen se posmatra kao refrakcija (isto kao i refrakcija

1. Attenuation

Represents the gradual loss of penetration power as an ultrasound wave passes through tissue, consequently resulting in an unclear or darker image on the monitor.

2. Reflection

Ultrasound waves reflect off the surface of the tissue through which they pass. It is precisely this phenomenon that makes echosonography possible. Reflection depends on the acoustic impedance of the scanned tissue, which is directly correlated with tissue density and the speed at which ultrasound waves propagate through it. The denser the tissue, the higher the impedance if the wave velocity is constant.

3. Refraction

When an ultrasound wave comes into contact with tissue of different acoustic impedance, some parts of the ultrasound waves are not reflected; they are merely slowed

svetlosti).

4. Difrakcija

Raspršivanje snopa ultrazvuka direktno je proporcionalno udaljenost od izvora ultrazvučnih talasa.

down, and this phenomenon is observed as refraction (just like the refraction of light).

4. Diffraction / Scattering

Scattering of the ultrasound beam is directly proportional to the distance from the source of the ultrasound waves.

Artefakti - Ultrasound Artifacts

Artefakti su nepravilnosti na slici koja je primljena ultrazvučnim skeniranjem zbog fizičkih procesa koji utiču na emitovani talas ultrazvuka.

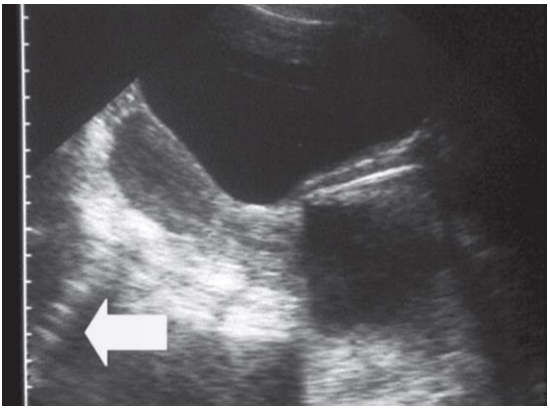
Artifacts are irregularities in the image obtained by ultrasound scanning due to physical processes that affect the emitted ultrasound wave.

1. Reverberacija

Reverberacija se posmatra kao niz paralelnih linija postavljenih na jednakoj udaljenosti jedna od druge. To je uzrokovano višestrukim odbijanjem ultrazvučnih talasa između dva tkiva.

1. Reverberation

Reverberation is observed as a series of parallel lines spaced at equal distances from one another. It is caused by multiple reflections of ultrasound waves between two tissues.



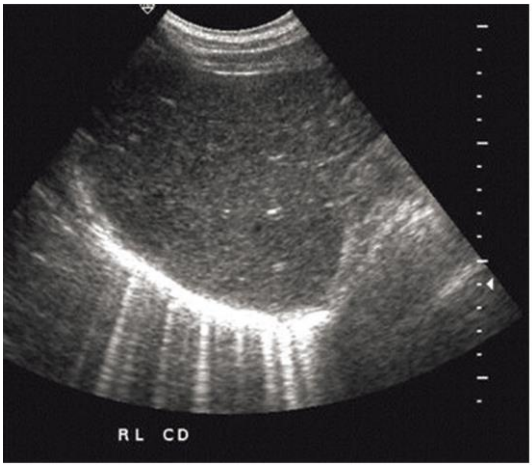
Reverberacija / Reverberation

2. „Ring down“ fenomen

Mali kristali holesterola ili mikro-mehurići gasa rezoniraju sa ultrazvučnim talasom, a zatim emituju nove talase.

2. "Ring-down" phenomenon

Small cholesterol crystals or gas microbubbles resonate with the ultrasound wave and subsequently emit new waves.



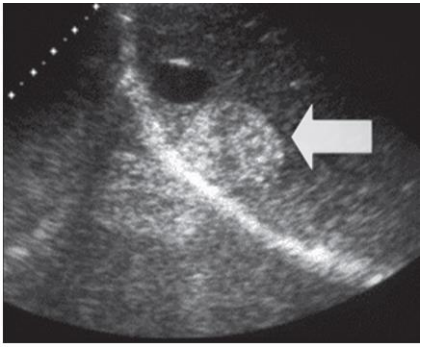
Ring down

3. Fenomen ogledala

Velike površine poput dijafragme mogu reflektovati ultrazvučne talase na takav način da se pojavljuju slike „kao u ogledalu“ sa druge strane tkiva koje reflektuje ultrazvučne talase.

3. Mirror-image artifact

Large surfaces such as the diaphragm can reflect ultrasound waves in such a way that "mirror-image" structures appear on the other side of the reflecting tissue.



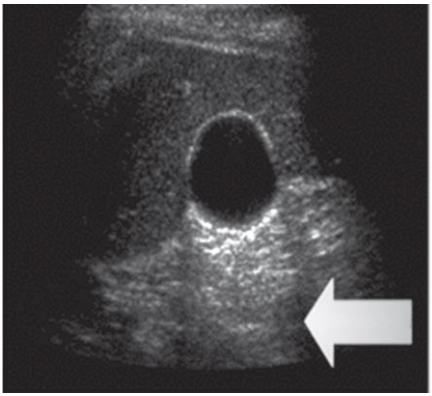
Fenomen ogledala / Mirroring

4. Pojačanje signala - „enhancement“ (augmentacija)

Obično u obliku hiperehogenog "svetlog fara" koji se pojavljuje iza šupljeg organa ispunjenog tečnošću

4. Acoustic enhancement (enhancement / augmentation)

Usually in the form of a hyperechoic "bright headlight" appearing behind a fluid-filled hollow organ.



Pojačanje signala / Augmentation

5. Prigušenje (slabljenje signala) - „atenuation“

Obično se pojavljuje iza hiperehogenih formacija, kao što su žučna kesa ili bubrežni kamen - takozvana "akustička senka".

5. Acoustic attenuation (signal attenuation)

Usually appears behind hyperechoic structures, such as gallstones or kidney stones - the so-called "acoustic shadow."

Atenuacija / Attenuation

DRŽANJE SONDE I OSNOVNE MANIPLACIJE SONDOM
PROBE HANDLING AND BASIC PROBE MANIPULATIONS

Iako je držanje sonde i pomeranje sonde veština koja se najefikasnije uči praktično uz instruktora, daćemo ovde neka osnovna uputstva:

1. Držite sondu kao što biste držali olovku.
2. Možete nasloniti ruku na telo pacijenta, ali nije obavezno.
3. U osnovi postoje tri pokreta koja možemo izvesti sondom: klizanje (*sliding*), naginjanje (*tilting*), rotiranje (rotation). Bočno tiltobanje se ponekad tove i "rocking".

IIzbegavate pravljenje više pokreta istovremeno (na primer: ako klizate, nemojte rotirati, ako naginjete sondu, ne klizite). Takvo kretanje može dovesti do zabune i otežava identifikaciju anatomskih struktura.

Although holding and moving the probe is a skill most effectively learned practically with an instructor, we provide some basic instructions here:

1. Hold the probe as you would hold a pen.
2. You may rest your hand on the patient's body, but it is not mandatory.
3. Essentially, there are three basic movements we can perform with the probe: **sliding, tilting**, and **rotation**. Lateral tilting is sometimes also referred to as "**rocking**."

Avoid making multiple movements simultaneously (for example: if you are sliding, do not rotate; if you are tilting the probe, do not slide). Such combined movement can lead to confusion and makes the identification of anatomical structures more difficult.

Pravilan način držanja sonde - Proper Probe Grip

U BASE10 protokolu, ali i generalno u ehosonografiji, veoma je važna upotreba naginjanja, rotacije i klizanja kao malih pokreta koji dozvoljavaju da sondu držimo praktično na istoj poziciji, ali da skeniramo veću regiju. Zlatno pravilo je: što manje okreta - to se više vidi. Odlika iskusnijih ehosonografista je da imaju mirnu ruku i STRPLJENJE.

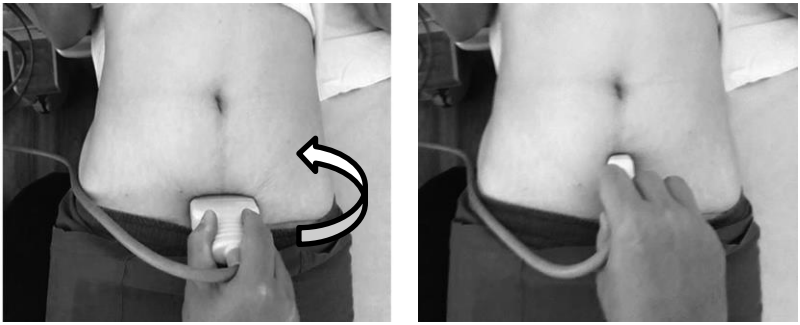
Evo primera racionalnog minimalnog pomeranja sonde: u subksifoidnoj poziciji sonda je u skoro horizontalnom položaju radi posmatranja srca. Kada je nagnemo napred i postavimo pod pravim uglom u odnosu na kožu, dobijamo epigastrični presek u nivou panreasa. Dopunskim blagim nagibom i minimalnim klizanjem na dole pregledamo abdominalnu aortu. Tako sa veoma malo pomeranja, uz adekvatno adaptiranje položaja sonde pregledamo više organa u praktično istoj poziciji.

Dok izvodimo skeniranje, moramo uvek da znamo da li regiju pregledamo u transverznom ili u longitudinalnom skanu (posmatrabo u odnosu na uzdužnu osu pacijenta). Okretanje sonde iz jedne u drugu pooziviju je u našoj školi ultrazvuka praktično uvek u smeru obrnutom od kazaljnii na satu:

In the BASE10 protocol - and in echosonography generally - the use of tilting, rotation, and sliding as micro-movements is essential, allowing us to keep the probe in virtually the same position while scanning a broader region. The golden rule is: the fewer the turns, the more you see. A hallmark of experienced echosonographers is a steady hand and PATIENCE.

Here is an example of rational, minimal probe movement: in the subxiphoid position, the probe is held in a nearly horizontal position to view the heart. When we tilt it forward and place it perpendicular to the skin, we obtain an epigastric cross-section at the level of the pancreas. With an additional gentle tilt and minimal downward sliding, we examine the abdominal aorta. Thus, with very little movement and adequate adjustment of probe positioning, we can examine multiple organs from practically the same spot.

While performing the scan, we must always know whether we are examining the region in a transverse or longitudinal scan (evaluated relative to the patient's longitudinal axis). In our ultrasound school, rotating the probe from one position to the other is practically always performed in a counterclockwise direction:



Pravilan način rotiranja sonde iz transverzalnog u longitudinalni presek
Proper method of rotating the probe from a transverse to a longitudinal scan

Tehnički zahtevi za izvođenja pregleda
Technical Requirements for Performing the Examination

Potrebna oprema

Za izvođenje protokola koristi se konveksna sonda (uz opciju upotrebe linearne sonde za 9. i 10. poziciju). Pregled se u potpunosti oslanja na kvalitativnu dijagnostiku – nisu potrebni dopleri, složeni softveri, niti specifična merenja.

Protokol ne zahteva skupe i glomazne ultrazvučne aparate. Može se nesmetano izvoditi na najjednostavnijim uređajima, uključujući džepne wireless sonde, sonde povezane kablom sa tabletima, kao i standardne prenosive laptop ultrazvučne sisteme.

Required Equipment

To perform the protocol, a convex probe is used (with the option of using a linear probe for the 9th and 10th positions).

The examination relies entirely on qualitative diagnostics—no Doppler modes, complex software, or specific measurements are required.

The protocol does not require expensive or bulky ultrasound machines. It can be seamlessly performed on the simplest devices, including pocket-sized wireless probes, cable-connected tablet probes, and standard portable laptop ultrasound systems.

BASE10 PREGLED
BASE10 EXAMINATION

Pozicija pacijenta

Celokupan pregled se obavlja sa pacijentom u ležećem položaju (supinacija). Nema potrebe za okretanjem niti pomeranjem vitalno ugroženog, slabo pokretnog pacijenta.

Patient Position

The entire examination is performed with the patient in a supine position. There is no need to turn or move a vitally compromised, poorly mobile patient.

Deset pozicija sonde - Ten Probe Positions

Pregled je podeljen u tri logičke celine radi lakšeg pamćenja:

A) Prve četiri pozicije

Sonda na grudnom košu, procena stanja plućnog intersticijuma, otkrivanje pneumotoraksa, evaluacija globalne i segmentne kontraktilnost miokarda u korelaciji sa elektrokardiografskim promenama, evaluacija izgleda srčanih komora kod sumnje na plućnu emboliju, pregled perikarda.

B) Sledeće četiri pozicije

Sonda nad abdomenom i malom karlicom:

1. Subksifoidno/epigastrično:

Evaluacija rada i izgleda srca iz drugog ugla, posmatranje donje šuplje vene - IVC, isključivanje aneurizme abdominalne aorte - AAA, kao i posmatranje pankreasa.

The examination is divided into three logical sections for easier memorization:

A) First Four Positions

Probe on the chest, assessment of the pulmonary interstitium, detection of pneumothorax, evaluation of global and segmental myocardial contractility in correlation with EKG changes, evaluation of cardiac chamber appearance in suspected pulmonary embolism, and examination of the pericardium.

B) Next Four Positions

Probe over the abdomen and pelvis:

1.Subxiphoid / Epigastric:

Evaluation of cardiac function and appearance from another angle, observation of the inferior vena cava (IVC), ruling out abdominal aortic aneurysm (AAA), and visualization of the pancreas.

2. Subkostalno desno:

RUQ (***R**ight **U**pper **Q**uadrant*): evaluacija Morisonovog špaga, desnog pleuralnog recezusa, jetre, žučne kese i desnog bubrega

3. Subkostalno levo

LUQ (***L**eft **U**pper **Q**uadrant*): evaluacija Kolerovog špaga, levog pleuralnog recezusa, slezine i levog bubrega

4. Suprapubično:

Posmatranje perivezikalnog ascita, intravezikalnih masa, prostate i Prustovog špaga kod muškarca, materice, jajnika i Daglasovog špaga kod žena; sliding-evaluacija crevne peristaltike i apendicita.

C) Poslednje dve pozicije

Linearna sonda, opcioni dopunski pregled za verifikaciju duboke venske tromboze (DVT) i ciljanu dijagnostiku muskuloskeletnih trauma (MSK).

2. Right Subcostal:

RUQ (***R**ight **U**pper **Q**uadrant*): evaluation of Morison's pouch, the right pleural recessus, liver, gallbladder, and right kidney.

3. Left Subcostal:

LUQ (***L**eft **U**pper **Q**uadrant*): evaluation of Koller's pouch, the left pleural recessus, spleen, and left kidney.

4. Suprapubic:

Observation of perivesical ascites, intravesical masses, prostate, and rectovesical pouch (Pouch of Douglas / Prust's pouch in men); uterus, ovaries, and rectouterine pouch (Douglas pouch in women); sliding evaluation of bowel peristalsis and appendicitis.

C) Last Two Positions

Linear probe, optional supplementary examination for the verification of deep vein thrombosis (DVT) and targeted musculoskeletal trauma diagnostics (MSK).

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Prve četiri pozicije: Sonda nad grudnim košem
First Four Positions: Probe on the Chest

Klasični protokoli za ultrazvuk pluća pored kreveta (Bedside Lung Ultrasound Examination – BLUE), tradicionalno propisuju detaljan pregled čak **12 različitih zona** (po 6 na svakom hemitoraksu). Iako ova sveobuhvatna metoda pruža izuzetnu panoramsku sliku, u uslovima rada u dežurnim službama i urgentnim centrima – gde lekari često moraju da donesu odluku u roku od nekoliko minuta – opsežno skeniranje velikog broja zona može značajno da uspori trijažu i zbrinjavanje vitalno ugroženog pacijenta.

Postavlja se ključno pitanje: Kako i zašto možemo prilično bezbedno da smanjimo broj tačaka na samo 4 osnovne pozicije, a da i dalje budemo prilično sigurni da nismo propustili tešku plućnu patologiju? Odgovor leži u patofiziologiji hitnih stanja, distribuciji najčešćih po život opasnih oboljenja i tehničkim karakteristikama ultrazvučnog pregleda izvedenog konveksnom sondom u longitudinalnoj (uzdužnoj) ravni**.**

Akutna stanja koja ugrožavaju život pacijenta, poput akutnog kardiogenog edema pluća, akutnog respiratornog distres sindroma (ARDS), masivne pneumonije sa konsolidacijom ili tenzionog pneumotoraksa - manifestuju se specifičnim distribucijama**:**

Classic bedside lung ultrasound protocols (Bedside Lung Ultrasound Examination – BLUE) traditionally prescribe a detailed examination of as many as **12 different zones** (6 on each hemithorax). Although this comprehensive method provides an exceptional panoramic view, in emergency department and urgent care settings—where physicians often must make decisions within minutes—extensive scanning of a large number of zones can significantly slow down triage and the management of vitally compromised patients.

The key question arises: How and why can we safely reduce the number of points to just 4 basic positions while still remaining quite confident that we haven't missed severe pulmonary pathology? The answer lies in the pathophysiology of emergency conditions, the distribution of the most life-threatening diseases, and the technical characteristics of ultrasound examination performed with a convex probe in the longitudinal (vertical) plane.

Acute life-threatening conditions - such as acute cardiogenic pulmonary edema, acute respiratory distress syndrome (ARDS), massive pneumonia with consolidation, or tension

1. Stanja koja dovode do intersticijalnog sindroma (poput kardiogenog edema ili teških bilateralnih pneumonija) difuznog su karaktera. Kada se patologija pojavi, ona zahvata velike anatomske regije, što znači da će se B-linije verifikovati i u gornjim i u prednjim zonama (pozicije 1 i 2 - videti dalje).

2. Tečnost u pleuri, kao i eksudativni i transudatuvni intersticijalni procesi se usled gravitacije najbolje vide u posteriornim i bazalnim delovima pluća, odnosno pleure. Modifikovane posterolateralne (PLAPS) tačke (pozicije 3 i 4), koje lociramo visoko na srednjoj ili zadnjoj aksilarnoj liniji bez okretanja pacijenta, omogućavaju uvid u donje režnjeve pluća, gde se najčešće dešavaju intersticijalni sindrom, konsolidacije i hepatizacija pluća i veći pleuralni izlivi.

3. Pneumotoraks se prostire ka višim tačkama grudnog koša u ležećem položaju (anteriorno i apikalno), gde ga prve dve pozicije lako detektuju.

Zbog svega navedenog, upotrebom 4 pozicije za pregled pluća i pleure imamo dobar uvid u kritičnu patologiju i eliminišemo korake koji usporavaju pregled i poostavljanje dijagnoze.

pneumothorax—manifest with specific distributions:

1. Conditions leading to interstitial syndrome (such as cardiogenic edema or severe bilateral pneumonia) are diffuse in nature. When pathology appears, it affects large anatomical regions, meaning that B-lines will be verified in both upper and anterior zones (positions 1 and 2 - see below).

2. Pleural fluid, as well as exudative and transudative interstitial processes, are best visualized in the posterior and basal parts of the lungs and pleura due to gravity. Modified posterolateral alveolar and pleural syndrome (PLAPS) points (positions 3 and 4), located high on the mid-axillary or posterior axillary line without turning the patient, provide insight into the lower lung lobes, where interstitial syndrome, consolidations, lung hepatization, and major pleural effusions most commonly occur.

3. Pneumothorax extends toward the upper points of the chest in the supine position (anteriorly and apically), where the first two positions easily detect it.

Because of all the above, using 4 positions for lung and pleura examination provides good insight into critical pathology and eliminates steps that slow down the examination and diagnosis.
The examination in the BASE 10

Pregled u BASE10 protokolu obavljamo konveksnom sondom, usmerenom longitudinalno, popreko u odnosu na međurebarne prostore. lako se pregled pluća može obaviti i linearnom sondom, koristimo niskofrekventnu konveksnu sondu zbog dublje penetracije talasa u tkivo.

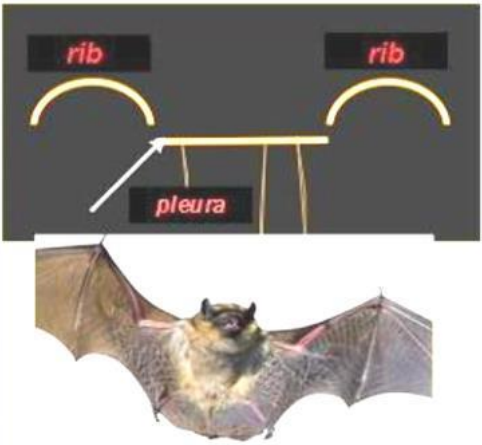
Postavljanjem sonde preko dva rebra i međurebarnig prostora dobijamo klasični "**znak slepog miša"** (bat sign)**:**

- **Rebra** se vide kao "krila" slepog miša sa svojim akustičnim senkama.
- **Pleuralna linija** predstavlja "telo" slepog miša.

protocol is performed using a convex probe, oriented longitudinally, transverse to the intercostal spaces. Although lung examination can also be performed with a linear probe, we use the low-frequency convex probe due to deeper wave penetration into tissue.

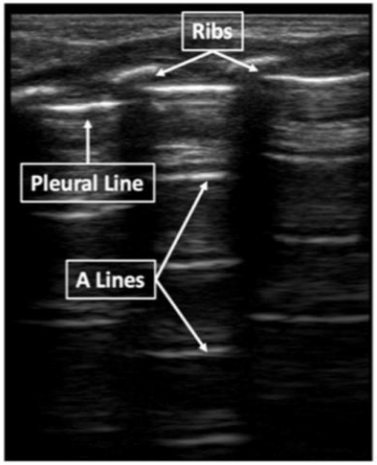
By placing the probe across two ribs and the intercostal space, we obtain the classic "**bat sign**":

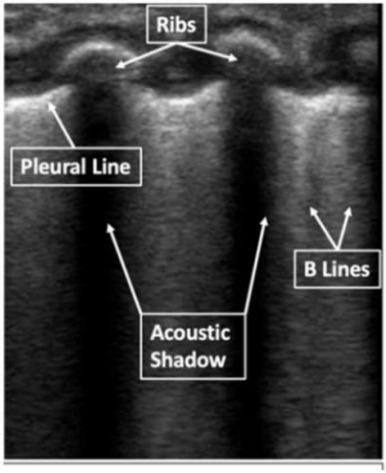
- **Ribs** are seen as the "wings" of the bat with their acoustic shadows.
- The **pleural line** represents the "body" of the bat.



Skeniranje se fokusira na uočavanje uobičajenih A-linija (normalno reverberacijsko ponavljanje pleuralnog signala), pleuralnog klizanja ("*lung sliding*", pomeranje listova pleure, koje je odsutno kod pneumotoraksa), prisustva ili odsustva B-linija (vertikalnih linija koje nadole presecaju A-linije i dopiru do dna monitora), ili raslojavanja pleure (izliv, krv). Osim toga, možemo da uočimo i takozvane "C-linije", koje su više zone nego linije, posledice kontenzacije, skarifikacije ili kalcifikacije plućnog tkiva.

Scanning focuses on observing normal A-lines (normal reverberation repetition of the pleural signal), lung sliding (movement of the pleural layers, which is absent in pneumothorax), the presence or absence of B-lines (vertical lines that cut downward across the A-lines and reach the bottom of the monitor), or pleural stratification (effusion, blood). In addition, we can also observe so-called "C-lines," which are zones rather than lines, resulting from consolidation, scarification, or calcification of the lung tissue.





Normalan nalaz u plućima opisujemo kao "**A-profil**". Drugi najčešći nalaz je "**B-profil**", odnosno uočavanje B-linija. Njihova karakteristika je da su pokretne sa disanjem, da sežu do dna ekrana i da presecaju horizontalne A-linije. U ranijoj literaturi nazivane su i "*lung rockets*", za razliku od tzv. "*lung comets*" – koje polaze od pleure, ali su kraće, obično sežu do prve A-linije i

A normal lung finding is described as an "A-profile." The second most frequent finding is the "B-profile," which involves the observation of B-lines. Their characteristic features are that they move with respiration, extend to the bottom of the screen, and cross horizontal A-lines. In earlier literature, they were also called "*lung rockets*," as opposed to so-called "*lung comets*"- which originate from

posledica su pleuralnih adhezija ili mikrobuloznih promena.

Kada u jednom međurebarnom prostoru vidimo najmanje tri B-linije ili jednu izraženu, debelu B-liniju, govorimo o tzv. B-profilu. To je ultrazvučni ekvivalent intersticijalnog sindroma.

B-profil može da bude:

1. "**Vlažan**" → transudat (kardijalni edem pluća) ili eksudat (pneumonija, ARDS, upale)

2. "**Suv**" → fibroza pluća, bez tečne komponente, ali sa trajnim strukturnim promenama tkiva.

Nepoznavanje ove fibrozne etiologije intersicijalnig sindroma (B-profila) može da nas dovede u kliničku zamku. Pacijent sa hroničnom fibrozom pluća može razviti akutnu upalu. Nakon lečenja, simptomi se povuku, laboratorijske analize se normalizuju (CRP, SE, leukociti), ali B-profil na ultrazvuku ostaje. Ako ne razumemo da je to posledica fibroze, postoji opasnost da pacijenta nepotrebno "prelečimo".

Zato je važno zapamtiti: ***B-profil ne znači uvek aktivan, vlažan proces – nekada označava i trajne, suve, fibrozne promene!***

Kada su u pitanju pneumotoraks, pleuralni izlivi i/ili krv u pleuri, kao i njihova detaljna evaluacija (M-mod kod pneumotoraksa, procena količine izliva prema predloženim formulama i sl.) - ovo su delovi UZ

the pleura but are shorter, usually extending only to the first A-line, and are the consequence of pleural adhesions or micro-bullous changes.

When we see at least three B-lines or one prominent, thick B-line in a single intercostal space, we refer to it as a B-profile. This is the ultrasound equivalent of interstitial syndrome.

A B-profile can be:

1. "**Wet**" → transudate (cardiac pulmonary edema) or exudate (pneumonia, ARDS, inflammation).

2. "**Dry**" → pulmonary fibrosis, without a liquid component, but with permanent structural tissue changes.

Failing to recognize this fibrotic etiology of interstitial syndrome (the B-profile) can lead us into a clinical trap. A patient with chronic pulmonary fibrosis may develop acute inflammation. After treatment, symptoms subside, laboratory findings normalize (CRP, ESR, leukocytes), but the B-profile on ultrasound remains. If we do not understand that this is the result of fibrosis, there is a risk of unnecessarily "overtreating" the patient.

Therefore, it is important to remember: ***B-profile does not always mean an active, wet process - sometimes it indicates permanent, dry, fibrotic changes!***

Regarding pneumothorax, pleural effusions, and/or blood in the pleura, as well as their detailed evaluation (M-

dijagnostike pluća koji prevazilaze obim i potrebe BASE10 protokola. O njima se možete informisati iz drugih izvora i u pitanju su znanja i veštine koja se lako nadovežu kada se savlada početni BASE10 kurs.

mode for pneumothorax, estimating the amount of effusion according to proposed formulas, and the like)—these are parts of lung ultrasound diagnostics that exceed the scope and needs of the BASE10 protocol. You can learn about them from other sources, and they represent knowledge and skills that are easily built upon once the initial BASE10 course is mastered.

Ograničenja ultrazvučnog pregleda pluća (i par komentara o pregledu srca u BASE10 protokolu)

Limitations of Lung Ultrasound Examination *(and a few comments on cardiac examination in the BASE 10 protocol)*

Kao odgovorni lekari, moramo biti svesni dijagnostičkih ograničenja ove metode. Ultrazvuk pluća **nije rendgen, niti skener (CT)** i ima svoje jasne limite:

- **Nemogućnost detekcije centralnih lezija:** Promene koje se nalaze duboko u centru plućnog krila, odnosno u hilusima, ostaju potpuno nevidljive za ultrazvuk.
- **Diferencijacija fokalne patologije:** Konveksnom sondom možemo da registrujemo subpleuralne konsolidacije, takozvane **C-linije** (koje ukazuju na tkivnu leziju, pneumoniju, infarkt...) i znake tzv. hepatizacije pluća. Ipak, ultrazvukom **ne možemo** pouzdano reći da li pacijent ima primarni karcinom pluća, specifičnu ili nespecifičnu infiltraciju – za takve dijagnoze neophodni su CT toraksa i

As responsible physicians, we must be aware of the diagnostic limitations of this method. Lung ultrasound is **neither an X-ray nor a computed tomography (CT) scanner**, and it has clear limits:

- Inability to detect central lesions: Changes located deep within the center of the lung, i.e., in the hila, remain completely invisible to ultrasound.
- Differentiation of focal pathology: With a convex probe, we can register subpleural consolidations, so-called C-lines (indicating tissue lesion, pneumonia, infarction...) and signs of lung hepatization. However, ultrasound cannot reliably tell us whether a patient has primary lung carcinoma, specific infiltration, or non-specific

histopatološki pregled.

Prve četiri tačke BASE 10 protokola fokusirane su na grudni koš i omogućavaju brzu diferencijaciju između akutne srčane insuficijencije, masivne plućne embolije, pneumotoraksa i intersticijalnog sindroma različite etiologije (transudat vs. eksudat, ARDS). Pacijent se sve vreme nalazi u ležećem (*supinacionom*) položaju.

- **Pozicija 1 (Desno gore – prednja strana):**Sondu postavljamo u nad desni hemitoraks.
- **Pozicija 2 (Levo gore – prednja strana + srce):** Sonda se postavlja nad levim hemitoraksom. Pored procene plućnog parenhima gornjeg režnja levog plućnog krila, ovaj prozor se koristi za ciljani ehokardiografski pregled. Pronalazimo PSAX - parasternal small-axis (kratku osovinu) srca, i u tom ehokardiografskom prozoru posmatramo: globalnu i segmentnu kontraktilnost leve komore, eventualne znake plućne embolije (D-oblik leve komore koju potiskuje uvećana desna komora), proveravamo da li u perikardu postoji slobodna tečnost (izliv, krv) ili u najtežem kliničkom scenariju, postoji li tamponada srca.

BASE10 protokol namerno izbegava posmatranje srca u PLAX prozoru, jer iz iskustva znamo da mlađe kolege, kada se susretnu sa PLAX pozicijom i brojnim ehokardiološkim merenjima koja se tu obavljaju, doživljavaju strah, razočarenje i

infiltration—such diagnoses require a chest CT and histopathological examination.

The first four points of the BASE 10 protocol are focused on the chest and allow for rapid differentiation between acute heart failure, massive pulmonary embolism, pneumothorax, and interstitial syndrome of varying etiology (transudate vs. exudate, ARDS). The patient remains in the supine position throughout the examination.

- **Position 1 (Right Upper – Anterior)**: We place the probe over the right hemithorax.
- **Position 2 (Left Upper – Anterior + Heart):** The probe is placed over the left hemithorax. In addition to assessing the pulmonary parenchyma of the upper lobe of the left lung, this window is used for a targeted echocardiographic examination. We find the PSAX – parasternal short-axis view of the heart, and within this echocardiographic window, we observe: global and segmental left ventricular contractility, potential signs of pulmonary embolism (D-shape of the left ventricle compressed by an enlarged right ventricle), we check whether free fluid (effusion, blood) exists in the pericardium, or in the most severe clinical scenario, whether cardiac tamponade is present.

The BASE 10 protocol deliberately avoids observing the heart in the PLAX window because experience

često odustaju od učenja i primene ehosonografije u redovnom radu. Zato je od "basic FATE" protokola BASE10 protokol "pozajmio" samo dva ehokardiokrafska prozora: PSAX i subksifoidni prozor.

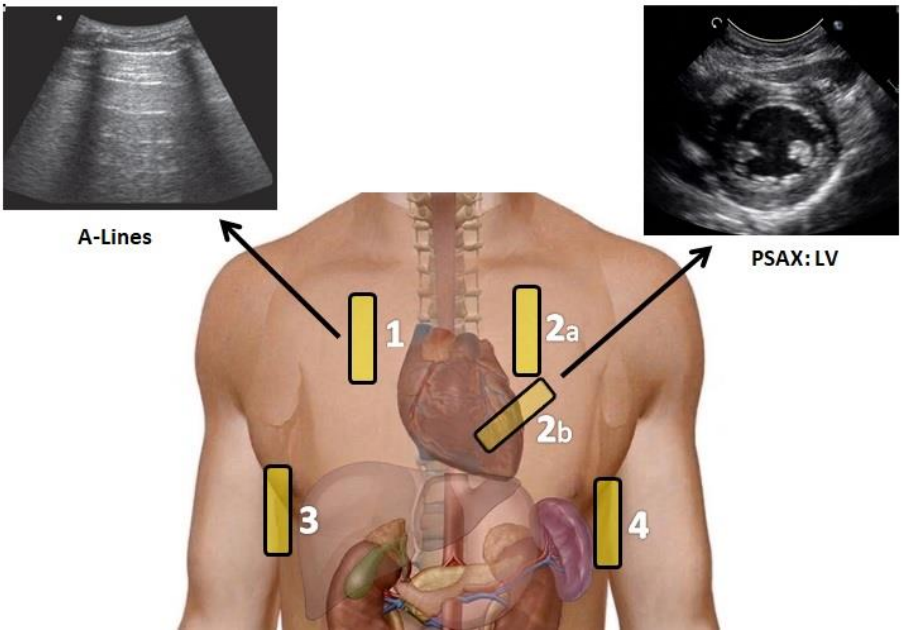
Smatramo da su oni u uslovima urgentnih stanja dovoljni za mlađe lekare da prikupe osnovne informacije os stanju srca pacijenta. Svakako, na naprednom nivou sugeriše se dalje savladavanje FATE protokola, odnsosno proširenje bazičnih znanja i veština koja nudo naš protokol.

- **Pozicije 3 i 4 (Modifikovani PLAPS / Posterolateral alveo-pulmonal space):** Ovo je blago modifikovani pristup interkostalnim prostorima na srednjoj i zadnjoj aksiilarnoj liniji, gde vizuelizujemo posterolateralno tkivo i **donje režnjeve levog i desnog plućnog krila**.

shows that younger colleagues, when encountering the PLAX position and numerous echocardiographic measurements performed there, experience anxiety, disappointment, and often give up on learning and applying echosonography in routine work. Therefore, the BASE 10 protocol "borrowed" only two echocardiographic windows from the "basic FATE" protocol: the PSAX and subxiphoid windows.

We consider them sufficient in emergency conditions for younger colleagues to gather basic information about the patient's cardiac status. Certainly, at an advanced level, further mastery of the FATE protocol is suggested—meaning the expansion of basic knowledge and skills offered by our protocol.

- **Positions 3 and 4 (Modified PLAPS/ Posterolateral Alveo-pulmonary Space):** This is a slightly modified approach to the intercostal spaces on the mid-axillary and posterior axillary lines, where we visualize the posterolateral tissue and lower lobes of the left and right lungs.



Četiri pozicije sonde nad grudnim košem
(pozicija 2 modifikovana radi vizualizacije leve komore (LV) u PSAX prozoru)
Four probe positions on the chest
(position 2 modified for the visualization of the left ventricle (LV) in the PSAX view)

Dopunska evaluacija pleure i pluća u okviru BASE10 protokola obavlja se pregledom desnog i levog plućnog recezusa u desnom i levom subkostalnom prozoru (eventualno i intekostalno levo, jer se tako slezina i levi pleuralni recezus ponekad i lakše vizualizuju). Ovo su **pozicije 6 i 7** (videti dalje).

Dopunska evaluaciija srca obavlja se pregledom u subksifoidnom prozoru (**pozicija 5**) - pogledati u nastavku teksta. Najčešće i najbitnije patološke nalaze možete pogledati u kratkom "Atlasu" na kraju priručnika.

Supplementary evaluation of the pleura and lungs within the BASE10 protocol is performed by examining the right and left pleural recesses in the right and left subcostal windows (occasionally also intercostally on the left, as the spleen and left pleural recess are sometimes more easily visualized this way). These are **positions 6 and 7** (see below).

Additional evaluation of the heart is performed by examining the subxiphoid window (**position 5**) - see further in the text. The most common and essential pathological findings can be viewed in the brief "Atlas" at the end of the manual.

Druge četiri pozicije: Sonda nad abdomenom
Other Four Positions: Probe Over the Abdomen

Po završetku pregleda u prve četiri pozicije, pregled se nastavlja sledećim redosledom:

- **Pozicija 5 -** Subskifoidno,. uz nagib sonde tako da snop zraka "gađa" srce, a kasnije se tiltovanjem sonda ispravlja i polako ponera na dole, pa se u istom aktu pregledaju i pankreas, VCI i abdominalna aorta

- **Pozicija 6** - Subkostalno desno, radi pregleda RUQ ("right upper quadrant") - desnog gornjeg kvadranta abdomena.

- **Pozicija 7** - Subkostalno levo (ponekad i interkostalno levo, na srednoj ili zadnjoj aksilarnoj liniji) - radi pregleda LUQ ("left upper quadrant") - levog gornjeg kvadranta abdomena.

- **Pozicija 8** - Suprapubično, radi pregleda male karlice i donjeg dela abdomena.

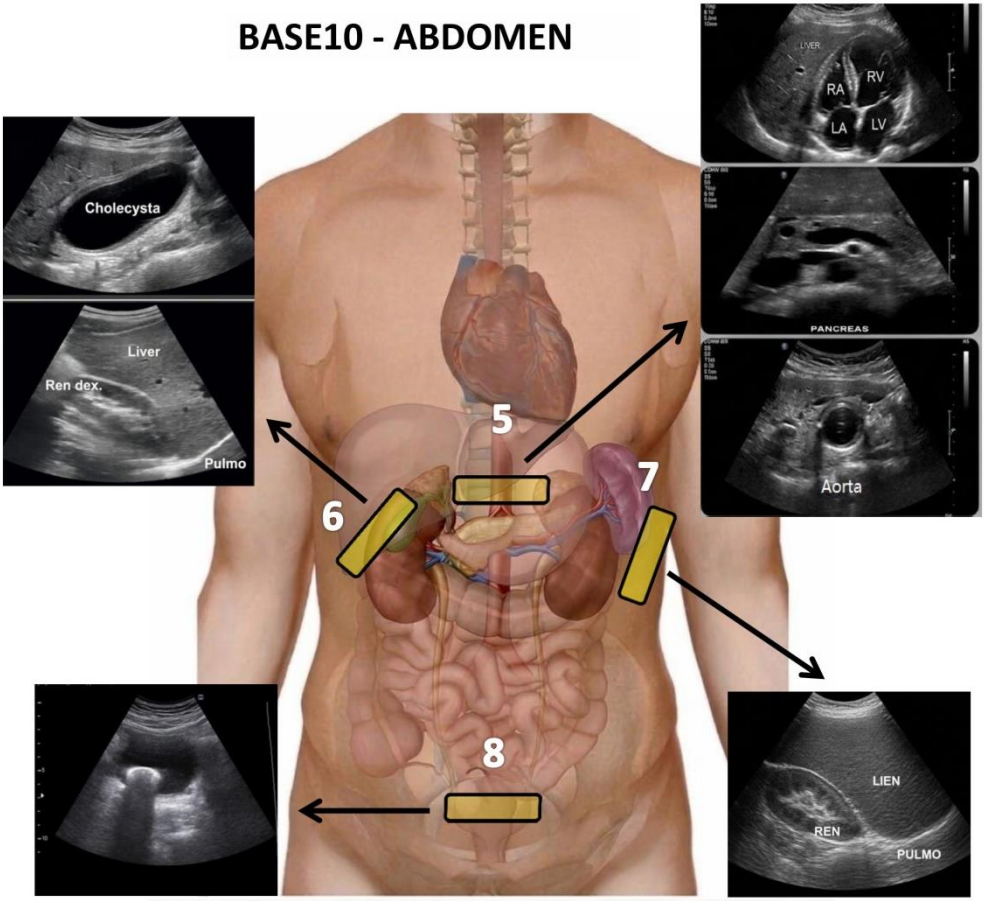
Upon completing the examination in the first four positions, the procedure continues in the following order:

- **Position 5** - Subxiphoid, with the probe angled so that the ultrasound beam "targets" the heart. Later, by tilting the probe back to a straight position and slowly moving it downward, the pancreas, IVC, and abdominal aorta are examined in the same act.

- **Position 6** - Right subcostal, for the examination of the RUQ ("right upper quadrant") of the abdomen.

- **Position 7** - Left subcostal (occasionally also intercostally on the left, along the mid-axillary or posterior axillary line) - for the examination of the LUQ ("left upper quadrant") of the abdomen.

- **Position 8** - Suprapubic, for the examination of the lesser pelvis and lower abdomen.



Prikaz osnovnih abdominalni pozicija sonde u BASE10 protokolu.
Važno je ne zaboraviti da se kod svih ovih pozicija sonda dopunski nagiba, rotira i adaptira položajem tako da se vizualizuju traženi organi i anatomske strukture.

Overview of the basic abdominal probe positions in the BASE 10 protocol.
It is important not to forget that across all these positions, the probe is additionally tilted, rotated, and adjusted in position to visualize the required organs and anatomical structures.

PETA POZICIJA - FIFTH POSITION

Ovo je klasičan ehokardiografski prozor, ali i epigastrična pozicija u kojoj čemo gledati pankreas, donju šuplju venu i abdominalnu aortu. Još jednom da se podsetimo: BASE10 protokol se bavi KVALITATIVNIM procenama ("odokativna", odnosno "eyeballing" metoda), a ne KVANTITATIVNIM opisima (merenja). Zato nam je bitno da okvirno znamo dimenzije ehostruktura i organa koje su relativno fiksne i sa kojima možemo vizuelno da upoređujemo ehostrukture koje posmatramo.

Na primer: normalna širina leve pretkomore je do 4cm, maksimalna širina desne pretkomore je do 5cm, leva komora u dijastoli treba da bude široka do oko 5,5cm. Dužina leve komore je oko 7-8cm. Širina korena i ascendentne aorte je do 3 do 4cm, abdominalna aorta je do normalno promera do 3cm, dok je iza nje često uočljiv pršljen pormeraoko 5-6cm, pa i spinalni kanal promera do oko 2,5cm.

Da sve bude još jednostavnije - posmatrajte strukture koje ispitujete upoređujući ih sa bočnom skalom (centimetarskim lenjirom), koja je prisutna na praktično svim monitorima.

Da nastavimo sa posmatranjem srca: gledamo odnos veličina komora i pretkomora, grubo procenjujemo veličinu leve komore i debljinu septuma. Posmatramoo

This is a classic echocardiographic window, but also the epigastric position in which we will examine the pancreas, the inferior vena cava, and the abdominal aorta. Let us remind ourselves once more: the BASE10 protocol deals with QUALITATIVE assessments ("rough", i.e., "eyeballing" method) rather than QUANTITATIVE descriptions (measurements). Therefore, it is important for us to roughly know the dimensions of echo structures and organs that are relatively fixed and with which we can visually compare the echo structures we are observing.

For example: the normal width of the left atrium is up to 4cm, the maximum width of the right atrium is up to 5cm, and the left ventricle in diastole should be up to about 5.5cm wide. The length of the left ventricle is about 7–8cm. The width of the aortic root and ascending aorta is up to 3 to 4cm, the normal diameter of the abdominal aorta is up to 3cm, while behind it, a vertebra with a diameter of about 5-6cm is often noticeable, as well as the spinal canal with a diameter of up to about 2,5 cm.

To make everything even simpler—observe the structures you are examining by comparing them with the side scale (centimeter ruler), which is present on practically all monitors.

takozvani "crux cordis", koga čine interventrikularni i interatrijalni septim i trikuspidalna i mitralna valvula. Određujemo indeks sferičnosti leve komore - odnos dužine i širine trebalo da bude 2 prema 1, ili veći, a što je taj odnos bliži odnosu 1:1, odnosno što je šubljina bliša sverićnom obliku, to je srce bolesnije.

Procenjujemo ima lu kardiomiopatije (CMP) u smislu diatacije leve komore, ili hipetrofije zidova i septima. Čim leva komora počinje da dobija sferični izgled - radi se o uvećanju njeng enddijastolnog promera. Taj odokativni indeks sferičnosti često je i bitniji od preciznog merenja do u milimetar.

Evaluiramo globalnu kinetiku zidova leve komore i evaluiramo njenu ejekcionu frakciju (EF) preko pomeranja mitralnog anulusa gore-dole (MAPSE, mitral anulus plane systolic excursion, trebalo bi da bude preko 10mm). Slično možemo da uradimo i sa TAPSE (tricuspid anulus plane systolic excursion), koji je normalno preko 15mm i govori o snazi desne komore.

Procena EF LK može da se obavi na mnogo načiina, a jedan je i preko FAC (fraction area change), odnosa površine LK u dijastoli i sistoli. Ovaj odnos bi kod normalne EF od oko 65% trebao da bude 2:1, dok je kod donje prihvatljive EF od oko 50-55% taj odnos 1,5 prema 1. Njega najbolje evaluiramo u 2b poziciji, ali

To continue with the observation of the heart: we look at the size ratio of the chambers and atria, roughly estimate the size of the left ventricle and the thickness of the septum. We observe the so-called "crux cordis", which is formed by the interventricular and interatrial septum and the tricuspid and mitral valves.

We determine the sphericity index of the left ventricle - the ratio of length to width should be 2 to 1 or greater, and the closer this ratio is to 1:1, i.e., the closer the cavity is to a spherical shape, the sicker the heart is.

We assess whether there is cardiomyopathy (CMP) in terms of left ventricular dilatation or hypertrophy of the walls and septum. As soon as the left ventricle begins to acquire a spherical appearance, it indicates an enlargement of its end-diastolic diameter. That qualitative sphericity index is often even more important than precise millimeter measurements.

We evaluate the global kinetics of the left ventricular walls and evaluate its ejection fraction (EF) via the up-and-down movement of the mitral annulus (MAPSE, mitral annulus plane systolic excursion, which should be over 10 mm). We can do something similar with TAPSE (tricuspid annulus plane systolic excursion), which is normally over 15 mm and indicates the strength of the right ventricle.

možemo i u subskifoidnom prozoru.

Ovde ćemo se vratiti korak unazad i objasniti korist i domet posmatranja srca u drugoj poziciji. Znamo da u toj poziciji osim parenhima levog plućnog krila posmatrama i srce u tzv. PSAX prozoru. Tu se najbolje uočava prisustvo eventualne regionalne hipokinezije ili akinezije zidova, u direktnoj korelaciji sa promenama u EKG odvodima: Podsetimo se te korelacije EHO i EKG nalaza

- **Lateralni zid:** Hipokinezija korespondira sa promenama u lateralnim odvodima (D1, aVL).
- **Donji zid / Inferiorni segment**: Hipokinezija korespondira sa promenama u donjim odvodima (D2, D3, aVF).
- **Anteriorni / anteroseptalni zid**: Hipokinezija korespondira sa promenama u prekordijalnim odvodima (V2–V4, Wellens-ov znak i slične ishemijske alteracije).

PSAX je optimalni ehografski prozor za vizualizaciju izliva lociranog ispred, ispod i oko leve komore. Ako uočimo tečnost između perikarda i miokarda tu, odmah je tražimo i u subksifoidnom prozoru. (Napomena: u subksifoidnom prozoru često se vidi pseudoizliv iznad desne more, između nje i jetre. Radi se u najvećem broju slučajeva o majsnom jastučetu.)

Upoređivanjem debljine eventualnog izliva sa okolnim strukturama takođe

Estimation of LV EF can be done in many ways, one of which is via FAC (fractional area change), the ratio of LV area in diastole and systole. This ratio should be 2:1 at a normal EF of about 65%, while at a lower acceptable EF of about 50–55%, this ratio is 1.5 to 1. We evaluate this best in the 2b position, but we can also do it in the subxiphoid window.

Here we will take a step back and explain the utility and scope of observing the heart in the second position. We know that in this position, besides the parenchyma of the left lung, we also observe the heart in the so-called PSAX window. This is where the presence of eventual regional hypokinesia or akinesia of the walls is best observed, in direct correlation with changes in ECG leads: Let us recall this correlation between ECHO and ECG findings:

- **Lateral wall:** Hypokinesia corresponds to changes in the lateral leads (D1, aVL).
- **Inferior wall / inferior segment:** Hypokinesia corresponds to changes in the inferior leads (D2, D3, aVF).
- **Anterior / anteroseptal wall:** Hypokinesia corresponds to changes in the precordial leads (V2–V4, Wellens' sign, and similar ischemic alterations).

PSAX is the optimal echographic window for visualizing effusion located in front of, below, and around the left ventricle. If we notice

možemo da je odredimo prilično sigurno i bez posebnog merenja. Najgrublje, ako znamo da su septum i zadnji zid normalno debljine oko 1cm, onda i izliv slične debljine nije strašan. Ako je on dvostruke debljine, već je vreme za konsultaciju kardiologa, a ako je puno veći, pacijent je veoma ugrožen...

Kada ujedinimo sve ove informacije, dobijamo prilično jasnu sliku o stanju srca pacijenta:

- Da li je očuvana globalna sistolna finkcija komora
- Da li postoji dilatativna ili hipertrofična kardiomiopatija
- Da li postoji očuvan indeks sferičnosti
- Kakav je odnos veličina leve i desne komore, kakve su dimenzije srčanih šupljina, kolika je ascendentna aorta...
- Ima li znakova plućne embolije (u korelaciji sa S1Q3T3 EKG znakom, povišenim D-dimerom i simptomima dispneje i sl.)
- Postoji li dilatacija pretkomora ili komora praćena upadljivim auskultatornim šumovima, što govori u prilog grubim valvulopatijama
- Postoje li u srčanim šupljinama mase (tromb, miksom i sl.)
- Kakva je EF LK, kao i EF DK
- Kakvo je stanje perikarda

Jasno je da BASE10 protokol sa samo dve pozicije (2 i 5) u kojima posmatra srce daje prilično sličnu količinu informacija kao i Basic FATE

fluid between the pericardium and the myocardium here, we immediately look for it in the subxiphoid window as well. (Note: in the subxiphoid window, a pseudo-effusion above the right ventricle, between it and the liver, is often seen. In most cases, this is a fat pad.)

By comparing the thickness of any potential effusion with surrounding structures, we can also determine it quite reliably without special measurement. Roughly speaking, if we know that the septum and posterior wall are normally about 1 cm thick, then an effusion of similar thickness is not alarming. If it is twice as thick, it is already time to consult a cardiologist, and if it is much larger, the patient is in severe jeopardy...

When we combine all this information, we get a fairly clear picture of the patient's cardiac status:

- Whether global systolic ventricular function is preserved
- Whether dilated or hypertrophic cardiomyopathy is present
- Whether a preserved sphericity index exists
- What the size ratio of the left and right ventricles is, what the dimensions of the heart chambers are, what the ascending aorta measures...
- Are there signs of pulmonary embolism (in correlation with the S1Q3T3 ECG sign, elevated D-dimer, symptoms of dyspnea, etc.)

protokol. Deo ove ehokardiografske dijagnostike uključen je i u RUSH protokol, koga, eto, učimo indirektno preko BASE10 protokola. Naravno, toplo preporučujemo da po završetku obuke za POCUS u urgentnim stanjima kolege svoja znanja prošire i na osnovni i napredni FATE protokol - gde će naučiti upotrebu apikalnog 4c prozora i PLAX prozora, određivanje EF na druge načine, preciznija merenja, određivanje E/A odnosa koji je bitan za dijastologiju i rano otkrivanje HFpEF, itd.

Nagibanjem i dovođenjem sonde u vertikalni položaj, pregled u petoj poziciji nastavljamo pregledom pankreasa, aorte i donje šulje veme. Kod pankreasa su nam bitni njegova ehogenost, kvalitet (homogenost) parehima, kao oi njegove dimentije (glava, telo, rep). Detekcija edematoznog "crnog" pankreasa i peripankreatičnih kolekcija (izliv i/ili limfonodusi u hilusu jetre) govore o akutnom pankreatitisu ili postojanju malignih stanja. Pankreatitis se naknadno može evaluirati i UZ pregledom pleure levo (ili ponekad desno) bazalno, gde neretko pronalazimo karakterističan izliv. Naravno - ukoliko posumnjamo na pankreatitis, dopunska laboratorijska obrada i napredni imidžing su najbitniji u potvrdi dijagnoze.

Malim zakretanjem sonde praktično u istoj poziciji posmatramo i donju šuplju venu (vena cava inferior, VCI), koja bi trebalo da nije promera preko 2cm i da uredno respiratorno

- Is there dilatation of the atria or ventricles accompanied by conspicuous auscultatory murmurs, indicating gross valvulopathy
- Are there masses in the heart chambers (thrombus, myxoma, etc.)
- What the LV EF is, as well as the RV EF
- What the state of the pericardium is

It is clear that the BASE10 protocol, with only two positions (2 and 5) in which it observes the heart, provides a fairly similar amount of information as the Basic FATE protocol. Part of this echocardiographic diagnostics is also included in the RUSH protocol, which we, well, learn indirectly via the BASE10 protocol. Of course, we warmly recommend that upon completing the POCUS training in emergency conditions, colleagues broaden their knowledge to the basic and advanced FATE protocols—where they will learn the use of the apical 4c window and the PLAX window, determining EF in other ways, more precise measurements, determining the E/A ratio which is important for diastology and early detection of HFpEF, etc.

By tilting and bringing the probe into a vertical position, we continue the examination in the fifth position by examining the pancreas, aorta, and inferior vena cava. For the pancreas, its echogenicity, the quality (homogeneity) of the parenchyma, as well as its dimensions (head, body, tail) are important to us. Detection of an edematous "black"

"kolabira" najmanje 50%, ili više. Merenje promera i i posmatranje respiratornih varijacija VCI bitno je kod procene statusa hidriranosti i centralnog venskog pritiska.

Konačno, silaskom ili nagibanjem sonde malo niže, usmeravajući snop prema abdominalnoj aorti, posmatramoo u transtverznom i lobgitudinalnom skanu da li postoji aneurizma, proširenje lumena preko 3cm. Aneurizmu opisujemo kao sakularnu ili fuziformnu, i eventualno pratimo da li se nastavlja na ilijačne arterije...

pancreas and peripancreatic collections (effusion and/or lymph nodes in the hepatic hilum) indicate acute pancreatitis or the presence of malignant conditions. Pancreatitis can subsequently also be evaluated by a US examination of the left (or sometimes right) basal pleura, where we not infrequently find a characteristic effusion. Of course—if we suspect pancreatitis, additional laboratory workup and advanced imaging are most important in confirming the diagnosis.

By slightly rotating the probe in practically the same position, we also observe the inferior vena cava (vena cava inferior, IVC), which should ideally have a diameter of no more than 2 cm and properly "collapse" by at least 50% or more during respiration. Measuring the diameter and observing the respiratory variations of the IVC is important when assessing hydration status and central venous pressure.
Finally, by descending or tilting the probe slightly lower, directing the beam toward the abdominal aorta, we observe in transverse and longitudinal scans whether there is an aneurysm, i.e., a lumen dilation exceeding 3 cm. We describe the aneurysm as saccular or fusiform, and optionally track whether it extends into the iliac arteries...

ŠESTA POZICIJA - SIXTH POSITION

Sonda se postavlja desno subkostalno, ređe interkostalno. U ovom "RUQ" prostoru ciljevi pregleda i ključni nalazi su:

- Procena morfologije jetre (pre svega fokalne promene, ruptura, TU mase i sl...)
- Detekcija slobodne tečnosti u Morisonovom špagu ili subdijafragmlno, iznad jetre
- Status žučne kese (prisustvo kalkuloze, zadebljanje zidova, periholecistni izliv, elongacija - uvećanje žučne kese) - posebno kod kolika za koje ne znamo jesu li bilijarne, renalne ili crevne
- Pregled desnog bubrega radi isključenja hidronefroze kod kolika, ali kod stanja kao što su profuzne hematurije, stanja nalik sepsi (ne zaboraviti apscese bubrega!), itd.
- Pregled desnog pleuralnog recezusa.kod sumnje na izliv

Kao i kod prethodne pozicije, pregled će možda zahtevati da se sondom naprave manje ili veće rotacije, nagibanja ili umerena pomeranja - ali bitno je znati gde i kako počinje pregled RUQ. On dosta zavisi od oblika grudnog koša (optimalan je cilindrični oblik, dok su bačvasti i zvnasti grudni koš nezgodni za ehosonografiju), a jako je bitno i koliko je pacijent gojazan. Ono što dopunski otežava pregled je što se BASE10 obavlja BEZ PRETHODNE PRIREME PACIJENTA, obavlja se u uslovima urgentnih stanja i služi - još

The probe is placed in the right subcostal position, less frequently intercostally. In this "RUQ" space, the examination goals and key findings are:

- Evaluation of liver morphology (primarily focal lesions, rupture, tumor masses, etc.)
- Detection of free fluid in Morison's pouch or subdiaphragmatically, above the liver
- Gallbladder status (presence of calculosis, wall thickening, pericholecystic fluid, gallbladder elongation and enlargement) – particularly in colic of unknown origin (biliary, renal, or intestinal)
- Examination of the right kidney to rule out hydronephrosis in cases of colic, as well as in conditions such as profuse hematuria, sepsis-like presentations (do not forget renal abscesses!), etc.
- Examination of the right pleural recess when pleural effusion is suspected

As with the previous position, the examination may require minor or major rotations, tilting, or slight displacements of the probe - but it is essential to know where and how the RUQ examination begins. It depends significantly on the shape of the chest (a cylindrical shape is optimal, whereas barrel-shaped and bell-shaped chests are challenging for ultrasonography), and patient obesity also plays a major role.

jednom - za BRZU i GRUBU evaluaciju stanja ugroženog.

What further complicates the examination is that the BASE 10 protocol is performed WITHOUT PRIOR PATIENT PREPARATION; it is executed in emergency settings and serves—once again—for a RAPID and GROSS evaluation of the critically ill patient.

SEDMA POZICIJA - SEVENTH POSITION

Sonda se postavlja subkostalno levo, ponekad i interkostalno levo, na srednoj ili zadnjoj aksilarnoj liniji. Posmatraju se slezina (znaci rupture, slobodna tečnost u Kolerovom špagu ili subdijafragmalno), levi bubreg (hidronefroza, TU mase, apscesi), levi pleuralni recezus. Pregled patoloških nalaza u ovoj i ostalim "abdominalnim" pozicijama pogledajte u Atlasu.

The probe is placed in the left subcostal position, occasionally also intercostally on the left, along the mid-axillary or posterior axillary line. The spleen (signs of rupture, free fluid in Koller's pouch or subdiaphragmatically), the left kidney (hydronephrosis, tumor masses, abscesses), and the left pleural recess are observed. For a review of pathological findings in this and other "abdominal" positions, please refer to the Atlas.

OSMA POZICIJA - EIGHTH POSITION

Sonda se postavlja suprapubično. Perivezikalno se neretko prvo uočava ascit i slobodne vijuge tankog creva koje "plivaju" u njemu. Unutar mokraćne bešike posmatramo debljinu i glatkost njenog zida, otkrivamo eventualno prosustvo kalkulusa, ugrušaka i sl. Grubo procenjujemo veličinu mokraćne bešike kod sumnje na retenciju. Kod pacijenata sa urinarnim kateterom posmatramo balon katetera. Kod muškaraca vidimo prostatu. Kod žena gledamo položaj i veličinu uterusa,

The probe is placed suprapubically. Perivesically, ascites and free loops of the small intestine "floating" in it are frequently observed first. Inside the urinary bladder, we examine the thickness and smoothness of its wall, detecting the potential presence of calculi, blood clots, and similar findings. We roughly estimate the size of the urinary bladder when retention is suspected. In patients with an urinary catheter, we observe the catheter balloon. In men, the prostate is visualized. In women, we assess the position and size of the

isključujemo ili detektujemo intrauterinu trudnoću (gestacioni mešak sa ili bez srčane akcije, CRL do kraja prvog trimestra, eventualno razvijeni fetus kome se preko BPD i FL lako odredi gestaciona starost), stanje adneksa (ciste, hidrosalpinks, solitarni tumori jajnika...), prisustvo slobodne tečnosti u Daglasovom špagu...

Uz malo pomeranje ili nagibanje sonde sa usmeravanjem zraka desno, možemo da evaluiramo i periapendikularnu regiju i da tražimo indirektne znake apendicitisa: izolovanu hipoehogenu nepokretnu crevnu vujugu, izliv oko nje, eventualno hipervaskularnost - ukoliko koristimo Doppler. Ponekad nam i samo stanje crevne peristaltike - koju uzredno posmatramo u svim abdominalnim pozicijama - govori o eventualnom postojanju ileusa, ili diferencijaciji između paralitičkog i opstruktivnog ileusa.

uterus, rule out or detect intrauterine pregnancy (gestational sac with or without cardiac activity, crown-rump length [CRL] up to the end of the first trimester, or a developed fetus where gestational age can be easily determined via BPD and FL), evaluate the state of the adnexa (cysts, hydrosalpinx, solitary ovarian tumors...), and check for the presence of free fluid in the pouch of Douglas...

With a slight shift or tilt of the probe directing the beam toward the right, we can also evaluate the periapendicular region and search for indirect signs of appendicitis: an isolated hypoechoic immobile intestinal loop, fluid around it, and potential hypervascularity—if Doppler is used. Sometimes, the state of intestinal peristalsis alone—which is incidentally observed across all abdominal positions—provides insight into the potential existence of ileus, or helps differentiate between paralytic and mechanical obstruction.

Pozicije 9 i 10:
Dopunski pregledi prema indikacijama

Positions 9 and 10:
Supplementary examinations according to indications

DEVETA POZICIJA - NINTH POSITION

Deveta pozicija - ili: deveti deo pregleda - je provera da li postoji duboka venska tromboza. To je posebno bitno kod pacijenata u stanju šoka, neobjašnjive hipotenzije, kad je smanjen priliv krvi zadržane u nogama. DVT je najčešće nemi izvor masivne plućne embolije (PE).

Osnovna tehnika koja se koristi u hitnim stanjima je provera kompresibilnosti femoralnih i poplitealnih vena. Ova metoda se ne oslanja na protok krvi (kolor dopler), već na mehaničku osobinu zdrave vene da se potpuno spljošti pod pritiskom. Za pregled je poželjna linearna sonda - mada se često dijagnoza DVT može potvrditi i konveksnom sondom. Sonda se postavlja transverzno nad safenofemoralnim ušćem, levo i desno. Ako u lumenu nema tromba, pritiskom je moguće venu kolabirati. Kada je to nemoguće, u lumenu je masa: sveži tromb, koji je najčešće hipoehogen, ili stariji tromb koji postaje sve svetliji, ulazi u fazu "tromboorganizacije" ili trombolize, a pored njega se naknadno doplerom

The ninth position - or the ninth part of the examination - is checking for the presence of deep vein thrombosis (DVT). This is particularly important in patients presenting with shock, unexplained hypotension, or when there is a reduced venous return due to blood pooling in the legs. DVT is most frequently the silent source of massive pulmonary embolism (PE).

The primary technique used in emergency settings is testing the compressibility of the femoral and popliteal veins. This method does not rely on blood flow (color Doppler), but rather on the mechanical property of a healthy vein to completely flatten under pressure. A linear probe is preferred for this examination—although a DVT diagnosis can often be confirmed with a convex probe as well. The probe is placed transversely over the saphenofemoral junction, both left and right. If there is no thrombus in the lumen, the vein can be collapsed using pressure. When this is impossible, a mass is present within

može uočiti i rekanalizacija vene.

Na isti način se proveravaju i poplitealne vene.

U diferencijaciji krvnih sudova koristimo kompresibilnost, pulzacije i dopler - ako ga imamo. Ali, postoji i relativno jednostavan sistem pamćenja odnosa između arterija i vena u femoralnoj i poplitealnoj regiji: femoralna arterija je malo površnije u odnosu venu, dok je u zatkolenoj jami na monitoru situacija obrnuta - "vena je gore, a arterija dole".

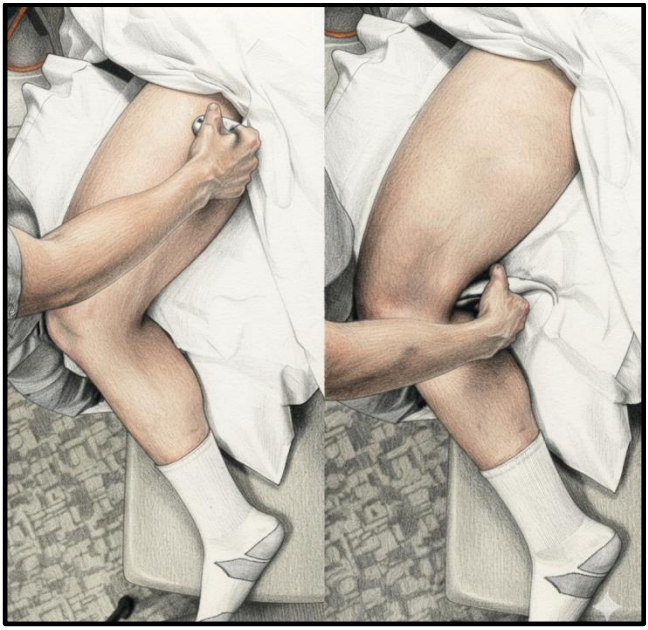
U provceni tromboze koristimo ponekad i test "augmentacije" - za šta je potreban dopler - gde distalno od mesta suspektne tromboze stisnemo pacijentu nogu i izazovemo priliv krvi, koji odmah verifikujemo na monitoru.

the lumen: a fresh thrombus, which is most often hypoechoic, or an older thrombus that becomes progressively brighter, entering the phase of "thromboorganization" or thrombolysis, alongside which recanalization of the vein can subsequently be detected using Doppler.

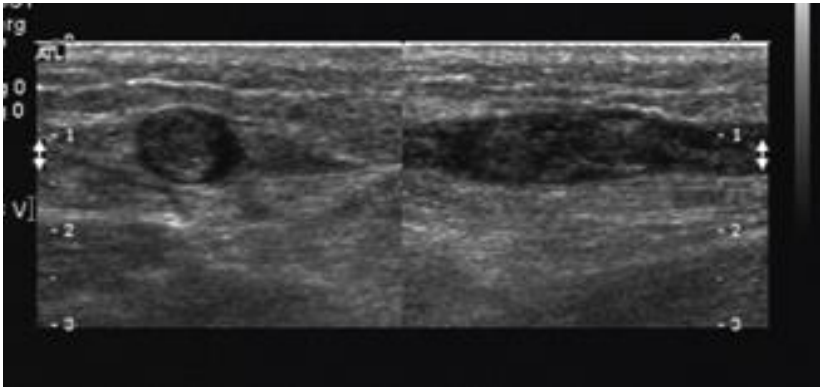
The popliteal veins are examined in the exact same manner.

To differentiate blood vessels, we rely on compressibility, pulsations, and Doppler—if available. However, there is also a relatively simple mnemonic system for remembering the relationship between arteries and veins in the femoral and popliteal regions: the femoral artery lies slightly more superficial relative to the vein, whereas in the popliteal fossa the situation on the monitor is inverted—"the vein is on top, and the artery is on the bottom."

In assessing thrombosis, we sometimes also use the "augmentation" test—which requires Doppler—where we compress the patient's leg distal to the site of suspected thrombosis to induce an inflow of blood, which is immediately verified on the monitor.



DVT test



Tromb u lumenu vene - poprečni i uzdužni skan
Thrombus in the vein lumen — transverse and longitudinal scan

DESETA POZICIJA - TENTH POSITION

Poslednja pozicija je postavljanje linearne sonde nad mestom gde sumnjamo da se nalazi prelom ili naprslina kosti, krv u zglobu, ruptura mišića ili tetive. Radi se, dakle, o muskuloskeletnim (MSK) lezijama.

Metodologija muskuloskeletnog ultrazvuka (MSK POCUS) zasniva se na ortogonalnom skeniranju – obaveznom pregledu u uzdužnoj i poprečnoj ravni, uz postavljanje snopa pod pravim uglom kako bi se izbegli artefakti. Kod sumnje na prelome i naprsline kostiju, vizualizacija korteksa zahteva precizno praćenje kontinuiteta hiperehogene periostalne linije. Patognomonični sonografski nalaz za prelom je znak "stepenika", koji se manifestuje kao oštar, geometrijski prekid glatke konture kosti, gde su segmenti korteksa dislocirani u različitim ravnima. Kod okultnih, naprslih i avulzionih preloma, poput Osgud-Šlaterove bolesti (Osgood-Schlatter), ključni vizuelni supstrat je subperiostni hematom – anehogena ili hipoehogena kolekcija krvi koja odiže periost od površine kosti, što je često praćeno hiperehogenim avulzionim koštanim fragmentom direktno unutar pripoja patelarne tetive.

Za evaluaciju mišića koristimo poznavanje njohove fibrolaminarne građe. Akutne rupture mišića i Ahilove tetive vizuelizuju se kao

The final position involves placing the linear probe over the site where a bone fracture or crack, joint effusion, muscle rupture, or tendon tear is suspected. This therefore pertains to musculoskeletal (MSK) lesions.

The methodology of musculoskeletal ultrasound (MSK POCUS) is based on orthogonal scanning - a mandatory examination in both longitudinal and transverse planes, with the beam positioned at a right angle to avoid artifacts. When suspecting bone fractures and cracks, visualization of the cortex requires precise tracking of the continuity of the hyperechoic periosteal line. The pathognomonic sonographic finding for a fracture is the "step-off" sign, manifested as a sharp, geometric disruption of the smooth bone contour, where the cortical segments are dislocated in different planes. In occult, hairline, and avulsion fractures, such as Osgood-Schlatter disease, the key visual substrate is a subperiosteal hematoma - an anechoic or hypoechoic collection of blood lifting the periosteum away from the bone surface, often accompanied by a hyperechoic avulsion bone fragment directly within the insertion of the patellar tendon.

For muscle evaluation, we rely on our knowledge of their fibrolaminar structure. Acute muscle and Achilles tendon ruptures are visualized as direct, focal disruptions in this organized tissue architecture, where

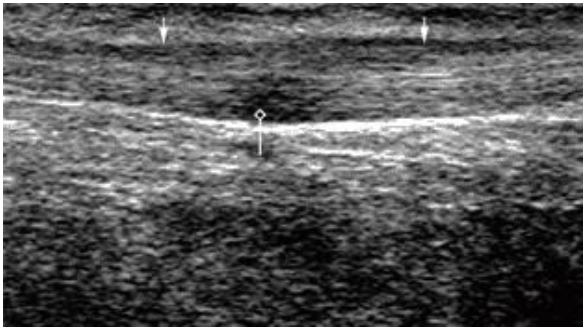
direktni, fokalni prekidi u toj organizovanoj arhitekturi tkiva, gde se pokidani i retrahovani krajevi vlakana zadebljavaju, dok se prostor između njih puni nehomogenim, pretežno hipoehogenim hematomom.

U diferencijalnoj dijagnostici nejasnih stanja i otoka nad mišićima, koji klinički mogu ličiti na rupturu, hematom, tumor ili venski tromb, POCUS MSK sa upotrebom doplera je nezamenjiv: akutni hematom se prikazuje kao inkapsulirana tečna kolekcija koja narušava fibrilarnu građu ali nema unutrašnji protok, dok maligni ili benigni tumori zadržavaju solidnu, nehomogenu strukturu, uglavnom sa manje ili vie izraženom ruvnom ili unutrašnjom sopstvenom neovaskularizacijom. Venska tromboza se isključuje prethodno opisanim testom kompresibilnosti.

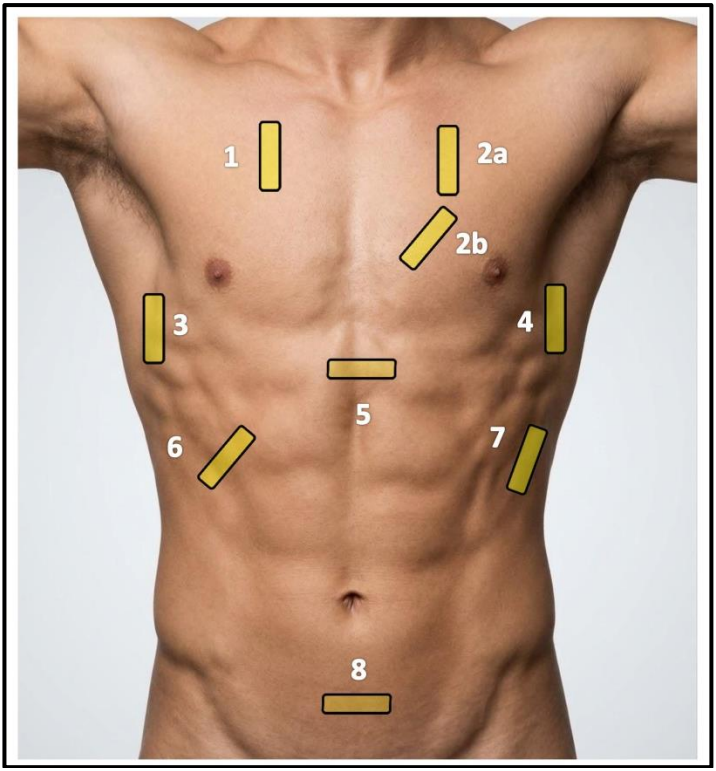
the torn and retracted ends of the fibers thicken, while the space between them fills with an inhomogeneous, predominantly hypoechoic hematoma.

In the differential diagnosis of ambiguous conditions and swelling over muscles - which may clinically mimic a rupture, hematoma, tumor, or venous thrombus - MSK POCUS with the use of Doppler is indispensable: an acute hematoma appears as an encapsulated fluid collection that disrupts the fibrillar structure but lacks internal flow, whereas malignant or benign tumors retain a solid, inhomogeneous structure, mostly with a more or less pronounced peripheral or internal intrinsic neovascularization. Venous thrombosis is ruled out using the previously described compressibility test.

Prelom rebra - Rib fracture



Parcijalna ruptura Ahilove tetive
Partial rupture of the Achilles tendon



BASE10 - The first 8 positions

NAPOMENA - NOTE:

Iako BASE10 protokol pokriva najčešće životno ugrožavajuće situacije (šok, dispneja, trauma, bol u grudima...), urgentna stanja u medicini su preobimna da bi jedan protokol zadovoljio sve kliničke potrebe. Kad smo svojevremeno u Akademiji pravili PROBE protokol (**P**OCUS **R**apid **O**verall **B**ody **E**xam), ispostavilo se da na njega treba dodati nešto što smo nazvali "PROBE Plus" (UZ pregled skrotuma, dojki, MSK itd.). Tako je i ovde verovatno potrebno da postoji "**BASE10 Plus**". To bi bile dopunske POCUS veštine za brojna druga urgentna stanja. Evo samo nekoliko njih:

1. Merenje ONSD *(Optic Nerve Sheath Diameter)***:** Kod pacijenata sa akutnim poremećajem svesti, traumatskom povredom mozga ili sumnjom na nagli skok intrakranijalnog pritiska, primena linearne sonde preko zatvorenih očnih jabučica i merenje ONSD omogućava trenutnu, neinvazivnu detekciju intrakranijalne hipertenzije pre pojave klasičnih znakova herniacije.

2. UZ testisa kod sumne na torziju: Kod pacijenata sa akutnim, iznenadnim bolom u skrotumu, UZ pregled linearnom sondom je ključan za hitnu diferencijalnu dijagnozu između hirurške hitnosti (torzija testisa sa prekidom perfuzije) i inflamatornih procesa.

Although the BASE 10 protocol covers the most common life-threatening situations (shock, dyspnea, trauma, chest pain...), emergency conditions in medicine are far too extensive for a single protocol to meet every clinical need. When we originally created the PROBE protocol (*POCUS Rapid Overall Body Exam*) at the Academy, it became clear that we needed to add what we termed "PROBE Plus" (ultrasound evaluation of the scrotum, breast, MSK, etc.). Similarly, a "BASE 10 Plus" is likely needed here as well—representing supplementary POCUS skills for numerous other acute clinical conditions. Here are just a few examples:

1. **Measurement of ONSD (*Optic Nerve Sheath Diameter*):** In patients with acute altered mental status, traumatic brain injury, or suspected sudden spikes in intracranial pressure, placing a linear probe over closed eyelids to measure the ONSD allows for immediate, non-invasive detection of intracranial hypertension before classical signs of herniation appear.

2. **Testicular Ultrasound for Suspected Torsion:** In patients presenting with acute, sudden scrotal pain, a linear probe ultrasound examination is critical for emergency differential diagnosis between a surgical emergency (testicular torsion with cessation of perfusion) and inflammatory processes.

3. POCUS radi verifikacija ispravne intubacije: Brza potvrda pravilnog položaja endotrahealnog tubusa u realnom vremenu.

4. POCUS kod akutnih stanja u oftalmologiji: Primena linearne sonde za brzu detekciju ablacije retine (retinal detachment), stranog tela ili luksacije sočiva posle udarca.

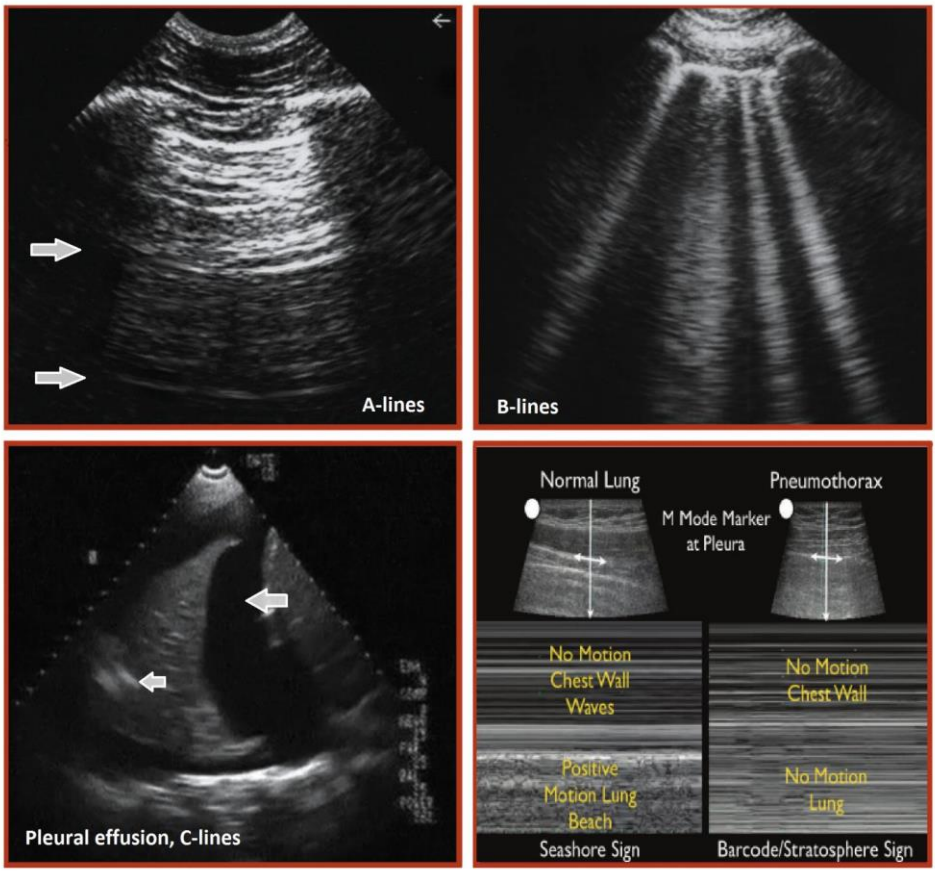
Poruka svim mladim lekarima je: naučite osnovni protokol, neka vam to postane rutina. Jednom kad naučite da "vozite" - nijedan teren vam neće biti nedostupan!

3. **POCUS for Real-Time Intubation Verification:** Rapid confirmation of proper endotracheal tube placement in real time.

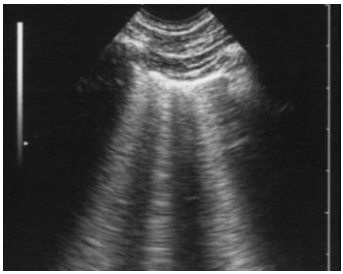
4. **POCUS in Ocular Emergencies:** Application of a linear probe for rapid detection of retinal detachment, foreign bodies, or lens dislocation following ocular trauma.

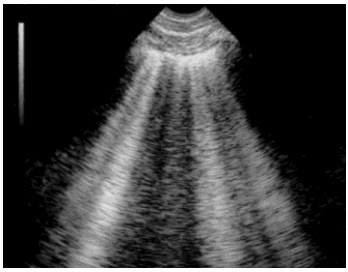
The message to all young physicians is: learn the core protocol first and make it second nature. Once you master how to "drive"—no terrain will be off-limits!

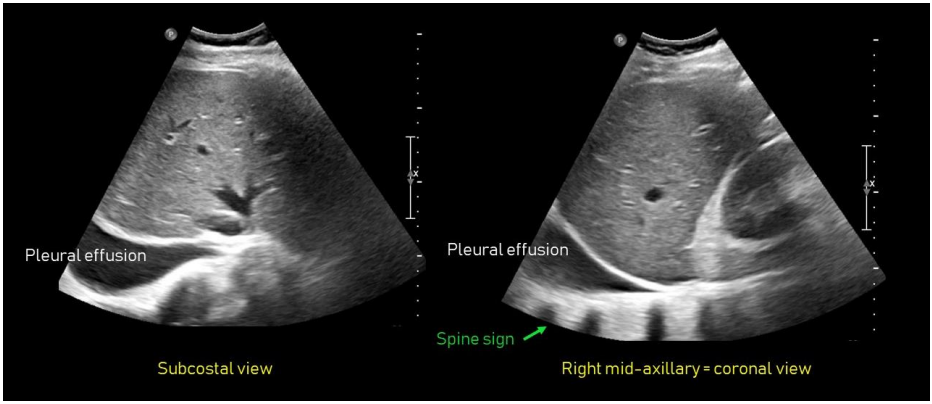
ATLAS

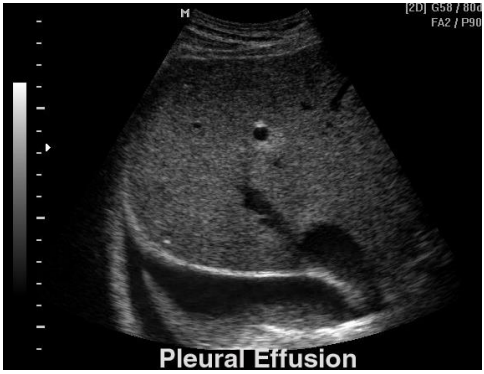


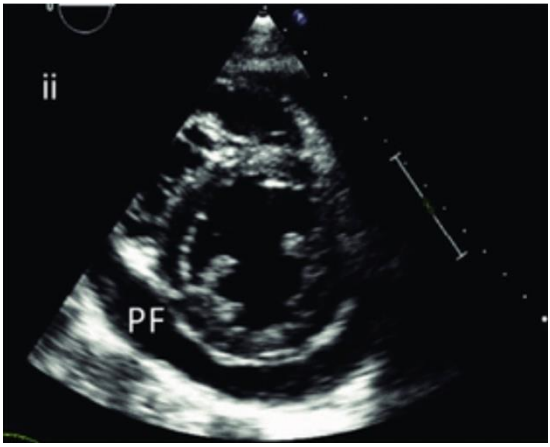
Lung ultrasound





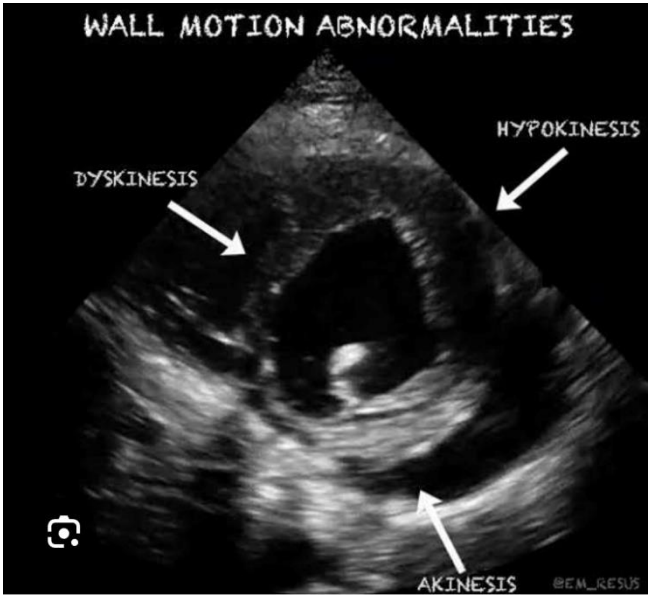






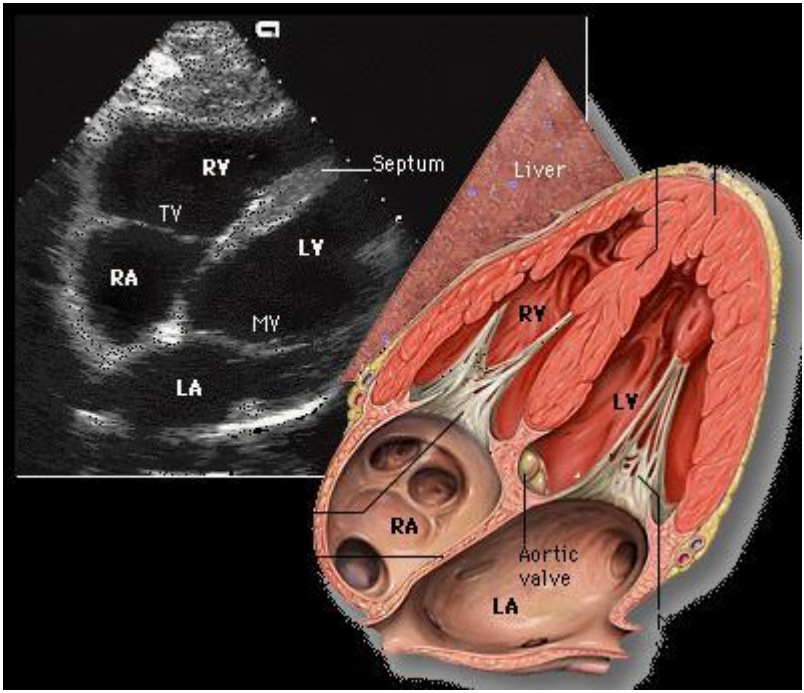
PSAX - Effusio pericardialis

PSAX - Effusio pericardialis

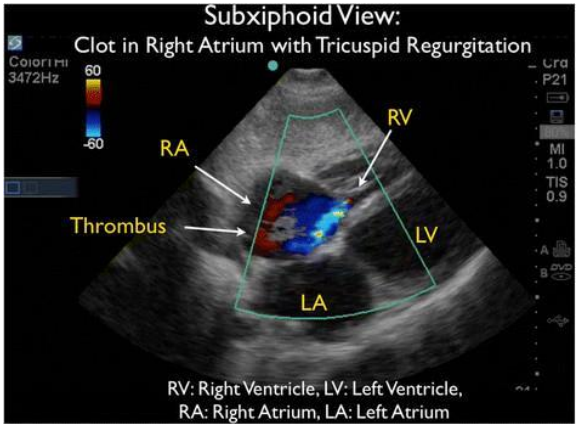


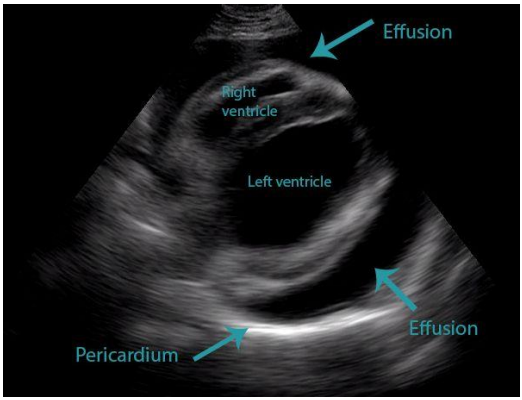
PSAX: effusio pericardialis + dyskinesis, hypokinesis et akinesiis myocardii

PSAX: D-shaped LV, embolio pulmonis (PE)



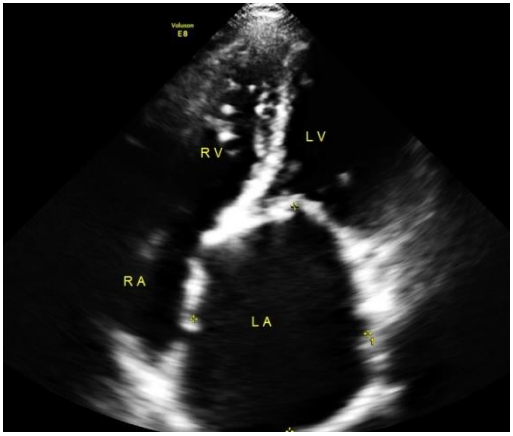
BASE10 position 5: Subxyphoid view



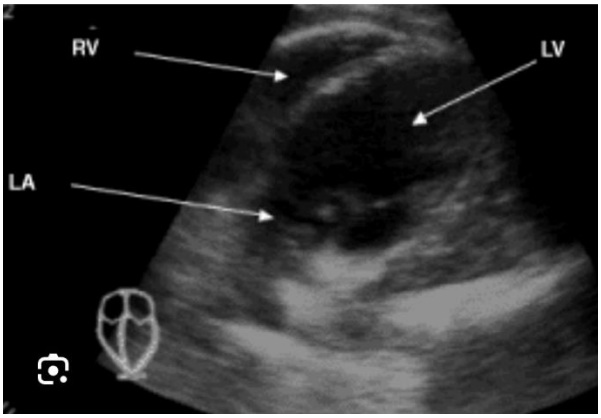


Subxyphoid view: effusio pericardialis

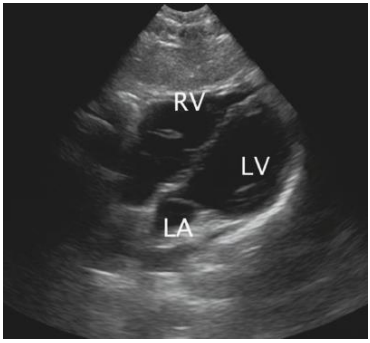
BASE10 position 5: VCI

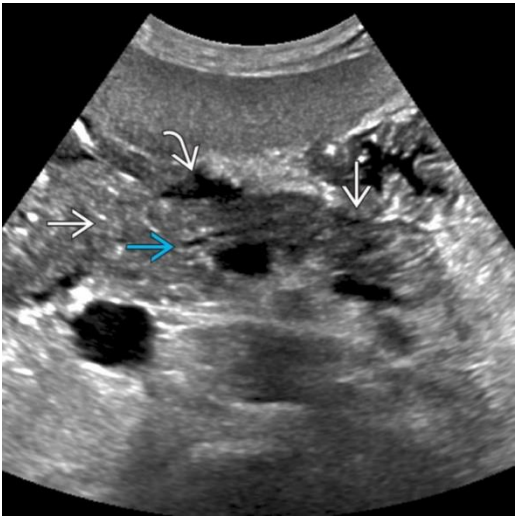


Dilatatio atrii lat. sin. (Stenosis valvulae mitralis)

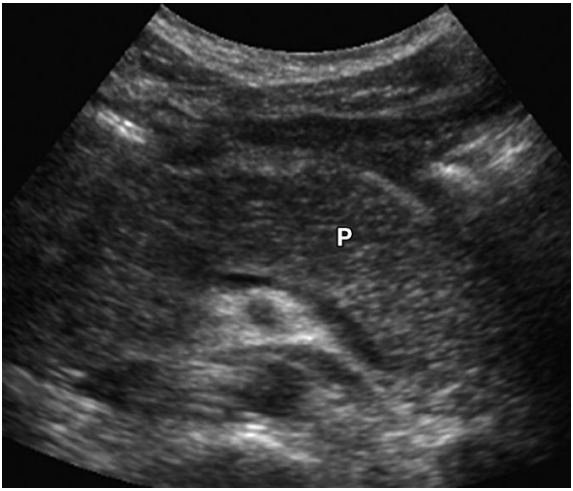


Dilatatio ventriculi lat. sin. (Cardiomyopathia dilatativa)

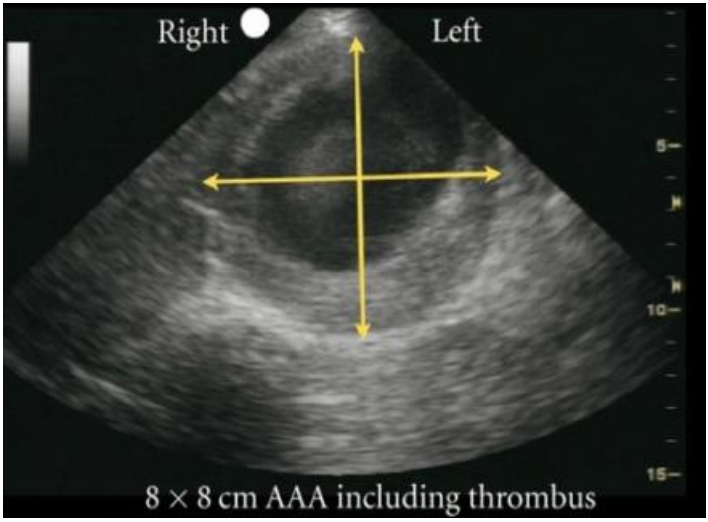




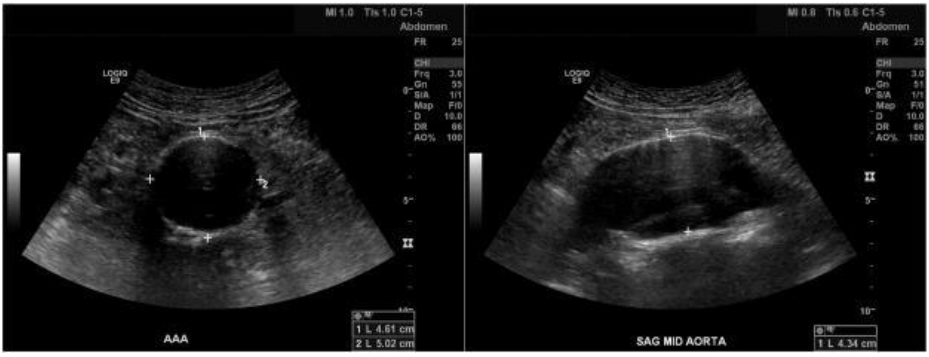
BASE10 position 5: Pancreatitis acuta

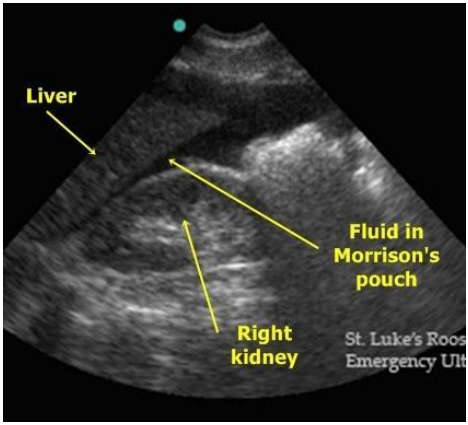


BASE10 position 5: Pancreatitis acuta

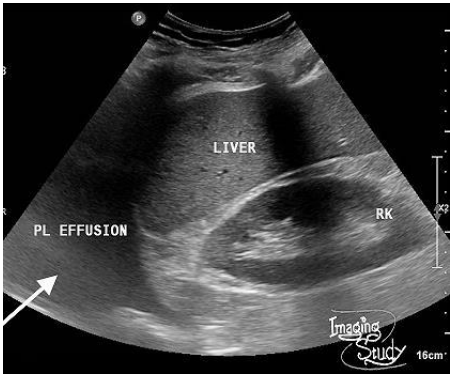


BASE10 position 5: Aneurysma aortae abdominalis cum thrombus muralis

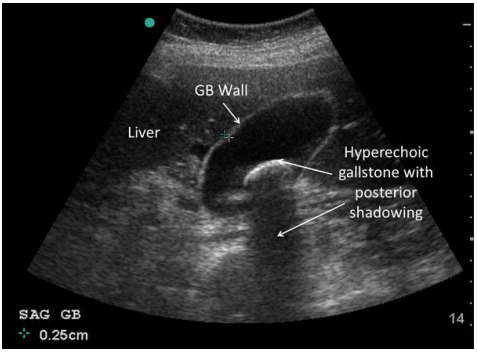




BASE10 position 6: RUQ, ascites



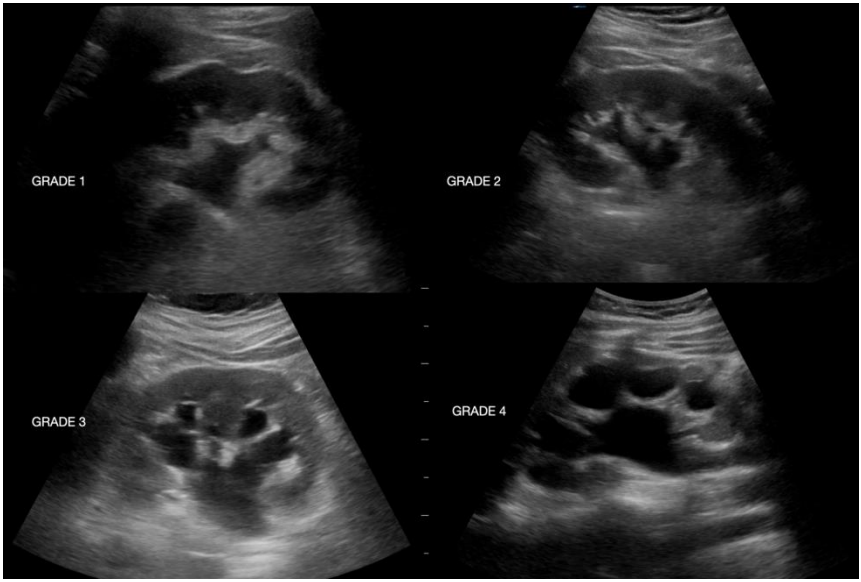
BASE10 position 6: RUQ, effusio pleuralis

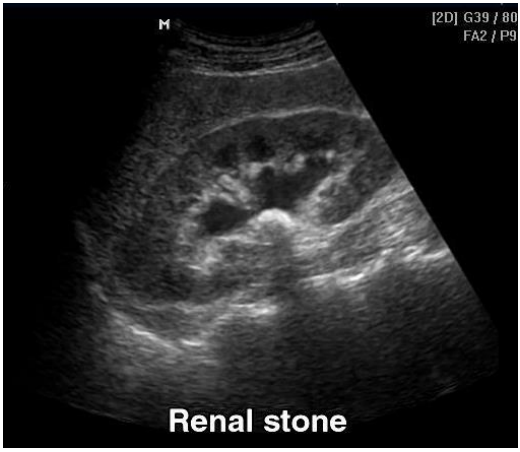


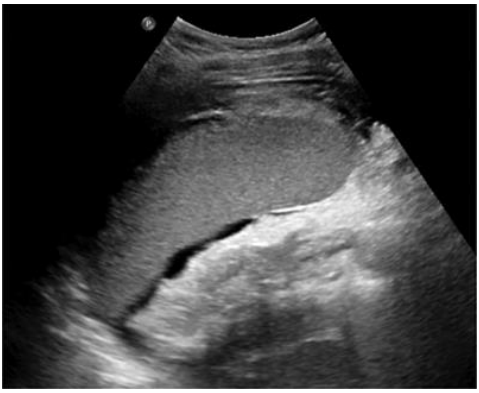
BASE10 position 6: RUQ, calculus vesicae felleae

Moderate hydronephrosis

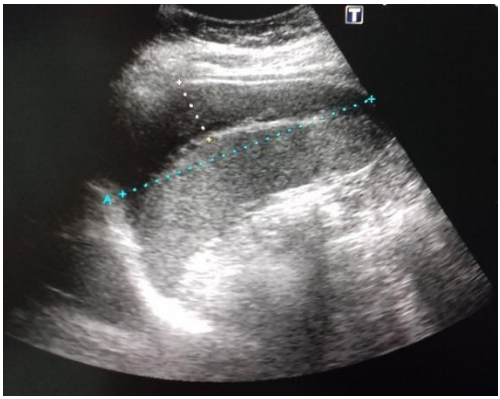
Severe hydronephrosis

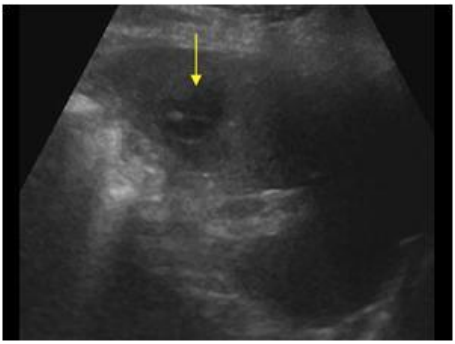




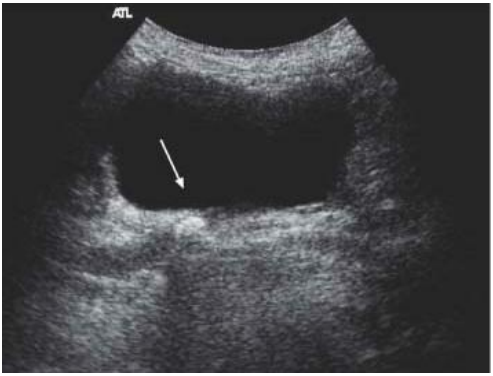


BASE10 position 7: LUQ, perispleniic hemorrhage

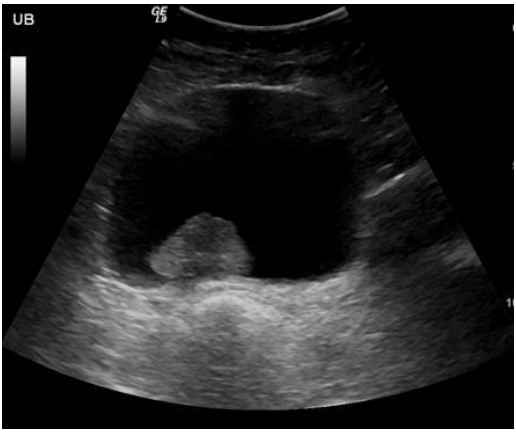




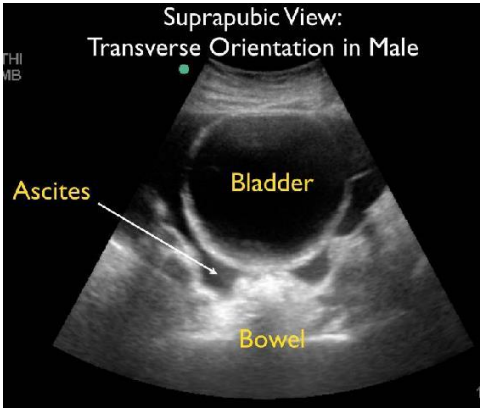
Ruptura lienis

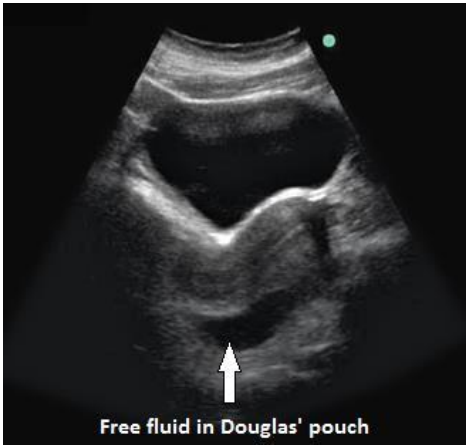


BASE10 Position 8: Calculus ureteris lat.dex.



Haemathoma vesucae urinariae


Suprapubic View:
Transverse Orientation in Male
Ascites
Bladder
Bowel


Free fluid in Douglas' pouch

1st Trimester of pregnancy - CRL
CRL 3.94cm
GA 10w6d

Zaključak - Conclusion

BASE10 protokol predstavlja direktnu nadogradnju i racionalizaciju zvanično usvojenih doktrina u POCUS dijagnostici. On u sebi ujedinjuje veštine koje se uče u drugim protokolima (eFAST, RUSH, FATE, BLUE, PEARLS...) i omogućava lekaru u službi hitmne pomoći ili u urgentnoj službi da za 3-5 minuta dobije uvid u stanje najbitnijih organa i organskih sistema koji se mogu pregledati ultrazvukom.

The BASE10 protocol represents a direct upgrade and rationalization of officially adopted doctrines in POCUS diagnostics. It unifies skills taught in other protocols (eFAST, RUSH, FATE, BLUE, PEARLS...) and enables a physician in emergency medical services to gain insight into the state of the most critical organs and organ systems accessible by ultrasound within 3 to 5 minutes.

Već godinama se zalažemo da upotreba ultrazvuka postane peti deo propedevtike. Pored inspekcije, palpacije, perkusije i auskultacije - uvodimo i INSONACIJU. U ranijim knjigama prikazali smo kakko može da izgleda upotreba ultrazvuka u pregledu "od glave do pete" (*head to heel*). Taj takozvani WBU (*whole body ultrasound*, ultrazvuk "celog tela") promovisali smo kao poseban PROBE protokol namenjen lekarima opšte medicine, interne medicine, urgentne medicine...

For years, we have advocated for the use of ultrasound to become the fifth pillar of propedeutics. Alongside inspection, palpation, percussion, and auscultation - we are introducing INSONATION. In our earlier books, we demonstrated what the use of ultrasound could look like in a "head to heel" examination. We promoted this so-called WBU (whole body ultrasound) as a dedicated PROBE protocol intended for general practitioners, internists, emergency physicians...

PROBE protokol je po obimu širi, složeniji i zahtevniji - pa je donekle nepraktičan za urgentna stanja, odnosno onda kada je potrebno donostiti brze odluke. Svakako - oni koji su naučili PROBE protokol - oni sve izneseno ovde već znaju. Ali, smatrali smo da bi bilo korisno da se u obuci i primeni ultrazvuka u redovnom radu možda krene sa nečim manjim.

The PROBE protocol is broader, more complex, and more demanding in scope - making it somewhat impractical for ER conditions, i.e., when rapid decisions must be made. Certainly, those who have mastered the PROBE protocol already know everything presented here. However, it might be useful to start with something easier in US training and routine clinical application.

Lekari najčešće krenu od ultrazvuka abdomena (što je posebno zanimljivo, s obzirom da je u abdomimalnoj duplji smešteno mnogo organa i ta dijagnostika je veoma ozbiljna). Poneki krenu od štitne žlezde - taj je početak kudikamo normalniji, jer ipak se radi o samo jednom organu i o relativno užem spektru patoloških nalaza,

Prezentiranjem BASE10 protokola, ponudili smo treće rešenje: naučite najpre ovo, krenite da koristite sondu tokom dežurstava, pa ćemo posle nastaviti dalje. Odgovornost na lekarima koji su (često bez dovoljno kliničkog iskustva) postavljeni i OSTAVLJENI da rade sa najkritičnijim pacijentima u najurgentnijim uslovima je već ogromna. Šansa da načine grešku, naprave pogrešnu procenu i ISPANIČE je neporeciva. BASE10 protokol ne treba da im pruži lažnu sigurnost tamo gde imaju sumnju ii ne mogu da odluče šta dalje. Za mlade lekare (pa i neke starije!) odavno je nepisano zlatno pravilo "Ako ne znate šta dalje - prosledite dalje!". Mi nemamo ništa protiv toga, jer razumemo okolnosti u kojima se nalaze neiskusni mladi doktori medicine, naprasno gurnuti na prvu liniju fronta, u najveću vatru. Ako će znaja u sklopu ovog protokola i njegova primena makar malo da im olakšaju težak posao koji obavljaju - sjajno!

BASE10 je ne samo protokol za obavljanje pregleda, nego i smernica za izvođenje obuke. Ne samo sa

Physicians most frequently start with an abdominal ultrasound (which is particularly interesting, given that the abdominal cavity houses many organs and this diagnostics is very serious). Some start with the thyroid gland.- that beginning is considerably more normal, as it involves only a single organ and a relatively narrower spectrum of pathological findings.

By presenting the BASE10 protocol, we have offered a third solution: learn this first, start using the probe during your shifts, and we will continue further afterwards. The responsibility placed on physicians who are (often without sufficient clinical experience) assigned and LEFT to work with the most critical patients in the most urgent conditions is already immense. The chance that they will make a mistake, miscalculate, and PANIC is undeniable. The BASE10 protocol is not meant to provide false security where they have doubts or cannot decide what to do next. For young physicians (and even some older ones!), an unwritten golden rule has long been "If you don't know what to do next - send them away!". We have nothing against that, as we understand the circumstances in which inexperienced young medical doctors find themselves, abruptly pushed onto the frontline into the thick of it. If the knowledge within this protocol and its application can make their difficult job just a little bit easier - that is fantastic!

lekarima koji rade u urgentnoj medicini, nego i sa lekarima koji su udaljenim zdravstvenim stanicama, na kruzerima, na terenu - bilo gde i u bilo kojim uslovima gde se ne može tek tako osloniti na "hitni transport" i gde ponekad POCUS može da nas spreči i zaustavi da u žurbi ne napravimo još veću grešku.

Nadamo se da će i kolege koje tek počinju sa POCUS dijagnostikom, kao i oni koji se bave POCUS edukacijom imati koristi od ove knjižice.

BASE10 is not only a protocol for performing examinations, but also a guideline for conducting training. Not just with physicians working in emergency medicine, but also with doctors in remote health stations, on cruise ships, in the field—anywhere and under any conditions where one cannot simply rely on "emergency transport" and where POCUS can sometimes prevent and stop us from making an even greater mistake in our haste.

We hope that colleagues who are just starting with POCUS diagnostics, as well as those engaged in POCUS education, will find this booklet useful.

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