



# ULTRASOUND IN PRIMARY CARE

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Point-of-care ultrasound (POCUS) has enjoyed increased interest and exposure over the last decade. A quick, non-invasive investigation modality is always a welcome tool in a clinic. Also, because ultrasound allows one to actually see in real time what we can only infer through history, palpation and/or auscultation, it is an exceptional feedback tool of the clinical examination.

POCUS was endorsed by the American Medical Association in 2001. Doctors from diverse specialties can, should, and have been trained to use ultrasound within their scope of practice.

### How ultrasound is being used

Traditional piezoelectric probes have varying frequency ranges allowing

proper penetration, image acquisition and good resolution of different organs. Very commonly, primary care doctors started off using POCUS within the familiar realms of obstetrics (acquiring the basic parameters for antenatal care – fetal presentation(s), amniotic fluid index, cardiac activity, placentation and estimated fetal weight). As practice grew,

**Table 1. The ever-increasing applications of ultrasound in primary care**

Acute	Obstetrics and Gynaecology	Assessing delayed menses, diagnosing pregnancy, threatened abortions/ectopic pregnancies, pelvic inflammatory disease, domestic helper check-ups, routine well-mother antenatal scans, “discovering” intrauterine contraceptive devices, etc
	General Surgery/ Gastroenterology	Assessing lumps and bumps, biliary colic, gallbladder stone/sludge, assessing acute jaundice, ureteric colic and acute hydronephrosis, triaging benign prostatic hyperplasia, testicular pain, assessing the acute abdomen, hernias, or for foreign bodies and post-removal checks (glass especially), etc
	Vascular	Detecting or monitoring abdominal aneurysms, bedside peripheral vascular access, assessing deep vein thrombosis or varicose veins, measuring carotid intima thickness, etc
	Eye	Assessing acute floaters for retinal detachment, measuring optic nerve diameter in raised intracranial pressure
	Orthopaedic	Assessing muscular strains/ligament or tendon tears or overuse injuries (usually by comparing both sides), imaging acute joint swellings, assessing the median nerve in carpal tunnel syndrome/other nerve entrapment, imaging peripheral nerve for nerve blocks, etc
	Lung/Respiratory	Assessing pneumothorax/shortness of breath (SOB), pneumonia, pleural effusions, assessing high-risk COVID-19 patients with SOB, etc
Chronic	Chronic non-communicable disease	Assessment of fatty liver, simple kidney/liver cysts, renal parenchyma thickness in chronic disease, assessing ventricular wall motion abnormalities, ejection fraction in simple cardiac assessments, etc
	Home care	Vascular access, ascitic tap, assessing the inferior vena cava for fluid status, assessing disease burden (when patient has eschewed further hospital visits), etc
	Nursing home	Checking nasogastric tube placement (where nurses may be uneasy with equivocal litmus paper results), difficult indwelling urinary catheter (IDC) placement or when the IDC is blocked, following up on simple kidney/liver cysts, assessing lumps and bumps and communicating the risks to family, assessing the lung for pneumonia (in delirious shouting patients) or haematuria/urinary tract infection in uncooperative and institutionalised patients, assessing residents with frequent chest pain/swollen limbs. To assess body functions at end of life

The above table of uses does not imply a clinical problem can be totally managed with POCUS – having the modality in most cases presents the clinician with more information and an opportunity to risk-stratify and safely guide next steps, where the absence of POCUS would have forced a community clinician to refer onwards.

physicians have found many other uses for it. With the advent of multi-frequency probes via microchip technology (eg, the Butterfly iQ), the opportunities have only multiplied (see Table 1).

One simply starts by scanning themselves first. It was interesting to discover renal cysts and a gallbladder polyp in my scans. It was instructional to discover my biceps tendon had been transposed anteriorly by the surgeon during the operation for a bad shoulder injury almost a decade ago. I had to correlate it with the operation notes on the National Electronic Health Record (accessed via another kind colleague's account! Ahem!).

I am blessed to have been exposed to routine bedside ultrasound work in my postings in general surgery and urology during my medical officer days. This foundation made getting started much easier. Getting a certificate in General Abdominal Ultrasound at the Singapore General Hospital's Postgraduate Medical Institute certainly helped to allay some fears. But this was not enough though.

### Pitfalls of POCUS

The problem with early adopters is that the naysayers are mostly right.

A POCUS practitioner does have to heed the concerns of their vastly more experienced radiology colleagues, because ultrasonography is operator-dependent. You will not see pathology if you are not even aware of its existence or what it is supposed to look like. Continuous learning is thus essential. Certain organs are much harder to learn to scan (eg, cardiac) than others. Having said that, the chances for absolute safe practice in a clinical environment reduces significantly as one moves into the community.

Even with the appropriate certification and background work, I have been caught out before (more than I would have liked, but thankfully less). I am forever indebted to the many colleagues and teachers who have given open, constructive feedback and probed my enthusiasm with sincere questions and pointers. I am also grateful to friendly radiographers who graciously provided image acquisition tips. Consistent, high-quality feedback is essential wherever one is practising.

However, an inquisitive mind grounded in the basic medical sciences and the

principles of ultrasound is also required to push the envelope and find new areas of application. Take the role of lung ultrasonography for risk-stratification of COVID-19-positive patients for instance, borne more out of necessity for lack of other imaging resources and a need for reducing patient contact and maintaining sterility.

Self-learning via multiple free and paid online websites, and attending local or overseas courses (out of one's pocket) certainly helped too. Of note, one should try to avoid courses the ultrasound teaching community refer to as "Pump and Dump", where techniques are taught or quickly demonstrated during the session which leaves no avenue for feedback for further practice on image acquisition – the certificate is useless then.

### The local scene

Pre-COVID-19, there were fledgling courses organised by the National University of Singapore for POCUS-related work, but the pandemic had since put a stop to that development. It was saddening to hear that courses were suspended after many years of background work to bring accredited teaching to Singapore. I look forward to those courses resuming soon.

But while COVID-19 took away the teaching, it brought patients closer to accepting the bedside scan. Especially since many simply did not want to visit the hospital or anywhere else.

Ultrasound probe companies have not been slacking either. As we may be aware, there are high distribution costs after the Health Sciences Authority's approval for the machine/probes, which may bump the retail price of a portable ultrasound set beyond S\$15k when it is being sold for around S\$4k to S\$5k elsewhere in the world. With more practitioners and growing interest in the devices, it would not be unrealistic to expect better probes at a much cheaper price point in the near future (one can already buy wireless probes for veterinary medicine on AliExpress and Taobao for approximately S\$2k). Battery life, heat management, improved portability, cloud storage, remote consulting and artificial intelligence-guided image acquisition and labelling are some of the common

trends in this space. Sonosite (Fujifilm), Clarius, EchoNous and GE Healthcare are some ultrasound-probe companies that come to mind.

It is also heartening to learn that medical students are now given the opportunity to use bedside ultrasound in their pre-clinical years (some American universities even presented students with a probe together with their white coat). I wonder if they are allowed to bring the probe to the dissection hall (pre-dissection)? It is hoped that this new group of students will come to find more high-value applications to bedside ultrasound and break the boundaries of clinical medicine for the benefit of all patients.

### Non-clinical perks

One of the greatest joys of practising ultrasound personally has to be documenting my third child in utero – from an intrauterine gestational sac, to her break-dancing with her stubby hands and feet at 12 weeks, to thumb-sucking, giving me the middle finger on the scan when she was at 20 weeks and making me guess her gender (I searched high and low for testes of course!).

I am immensely satisfied by my post-graduate journey to learn POCUS, and I look forward to discussing POCUS images with and learning from my colleagues in the near future! ♦

#### Legend

1. The author's daughter flipping the finger in utero

Dr Kwong is a GP anchor who also practises in a nursing home. He last contributed to *SMA News* for "Overcoming the Last Mile on Diabetes" with a cartoon guide to Type 2 diabetes (<http://bit.ly/4810-Opinion2>) which he still finds to be the best tool for explaining the condition to patients.

