

Use of a wireless ultrasound probe for venous line insertion in COVID-19 patients

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Purpose
To report single centre experience with use of wireless ultrasound probe for bedside venous line placement in COVID-19 patients.

Material and method
From October 2020 to September 2021, we performed venous catheter insertions in 209 patients with COVID-19. The procedure was done at the angiographic suite in 33 patients and one hundred seventy-six patients with COVID-19 underwent bedside venous line placement. In the bedside insertion group there were 115 males and 61 females with an average age of 74.9 years (from 16 to 96 years). The largest group were patients between the ages of 71 to 80 years (33.5%, 59/176). The age distribution in our cohort of patients is shown in graph 1. We used a wireless linear ultrasound (US) probe with a frequency of 4–13 MHz (Clarius L7 HD) in 164 cases and a linear US probe with a frequency of 7.5–10 MHz (LeapMed) in 12 cases. Large 12-inch tablets (iPadPro, Apple) were used to display the ultrasound image. A physician (radiologist, infectionist, orthopedist) with one nurse performed bedside venous cannulations. The US probe and the tablet were wrapped into nonsterile covering before entering the infectious space. The first step was preprocedural evaluation with the rapid peripheral vein assessment (RAPEVA) or the rapid central vein assessment (RACEVA) and the zone insertion method (ZIM) for the vein and puncture/exit site. Before the puncture, the US probe was put into the sterile cover. After the procedure, the US probe was disinfected and together with the tablet also decontaminated by ultraviolet radiation with the use of an open ultraviolet emitter (Prolux G, Promos). The UV decontamination had a duration of 30 minutes.

Results
We evaluated a group of patients who underwent bedside venous line insertion (n=176). The venous line was successfully inserted at the bedside in 172 (97.8 %) patients at the first attempt. Four patients underwent a second procedure because of vein dissection in 2 patients and hematoma and vein spasm in 2 patients. The repeated procedure was performed by an interventional radiologist. All repeated procedures were successful. The most common venous lines we used at the bedside were midline in 143 patients. The PICC was inserted in 26 patients and a central venous catheter (including dialysis catheter) was placed in 7 patients. The bedside ECG was used to verify the tip position of the central inserted central venous catheter and PICCs. Table 1 summarises the venous type and the side of the puncture in the patients with PICC and midline insertion. In this group, the most punctured vein was the brachial vein 42.5% (72/169), while the least one was cephalic 5/169. The right-sided veins were cannulated in 85.2% (144/169). The type and cannulation side in a group of patients, in which the central vein puncture was performed, is assessed in table 2. The most cannulated vein in this group was the right jugular vein 57.1% (4/7). The linear US probe Clarius L7 HD was significantly heating up in the double cover (sterile and nonsterile), therefore the nonsterile covering was cancelled. No infection transmission from patient to vascular access team was observed throughout the study.



Image 1:
WiFi ultrasound probe Clarius L7 HD and smart device iPad Pro (Apple)

Side	Side		All
	Rigth	Left	
Vein			
Brachial	72	11	84
Basilic	67	8	74
Cephalic	5	6	11
All	144	25	169

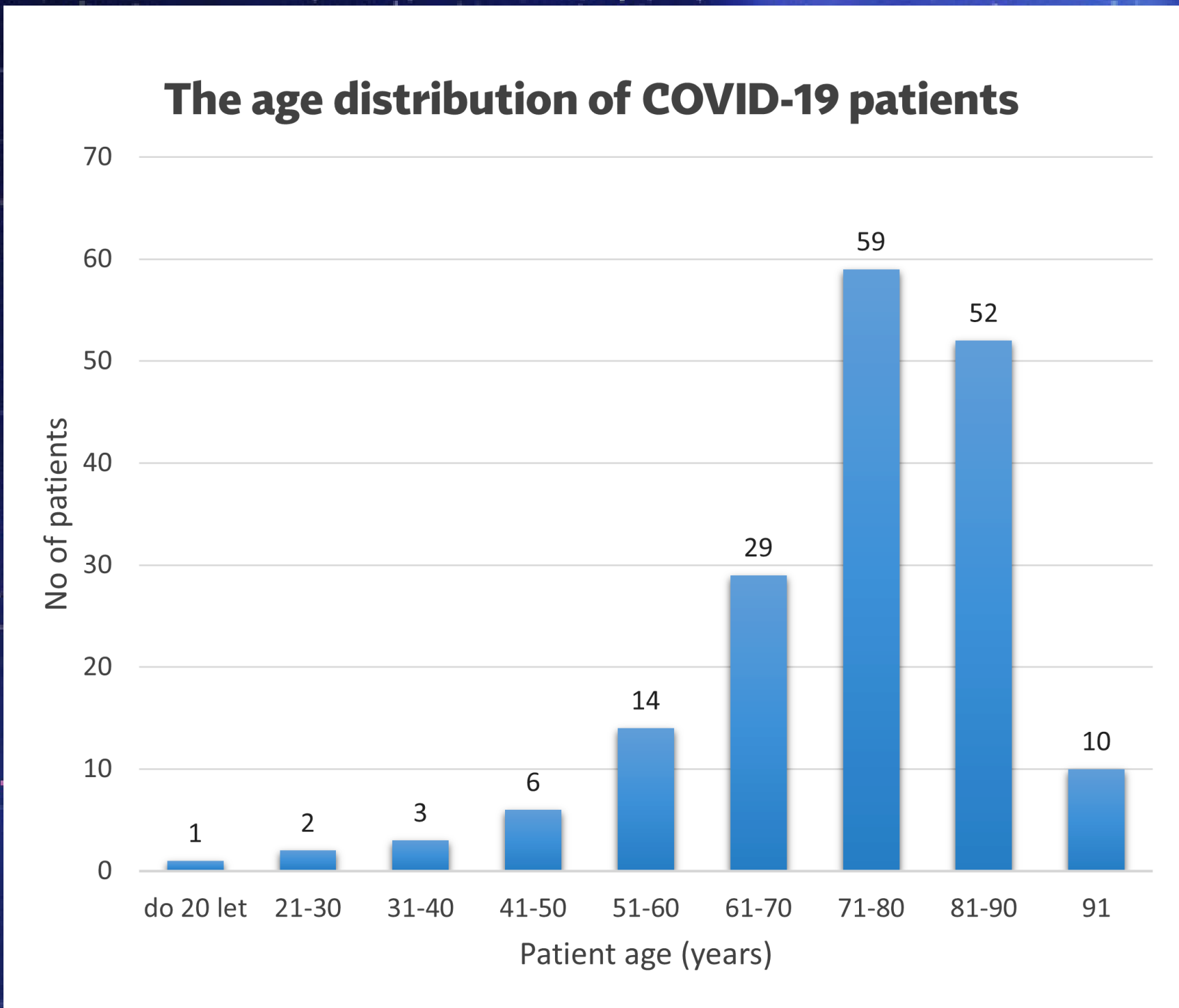
Table 1:
The side and cannulated vein in patients with midline and PICC

Side	Side		All
	Right	Left	
Vein			
Jugular	4	1	5
Subclavian	2	0	2
All	6	1	7

Table 2:
The side and cannulated vein in patients with central vein puncture



Image 2:
Bedside venous cannulation in patient with COVID-19 disease with wireless ultrasound device (Clarius L7 HD)



Graph 1:
The age distribution of COVID-19 positive patients

Conclusion
Our experience confirms that the use of wireless US probes is convenient for bedside venous line placement in a patient with COVID-19. The main advantage is simple manipulation, preservation of anti-epidemic conditions and easier probe dressing with a sterile cover since there is no cable between the US probe and the tablet.

References

1. Lamperti M, Biasucci DG, Disma N, Pittiruti M, Breschan C, Vaflati D, et al. European Society of Anaesthesiology guidelines on peri-operative use of ultrasound-guided for vascular access (PERSEUS vascular access). Eur J Anaesthesiol. 2020;37(5):344-76.
2. Lamperti M, Bodenham AR, Pittiruti M, Blaivas M, Augoustides JG, Elbarbary M, et al. International evidence-based recommendations on ultrasound-guided vascular access. Intensive Care Med. 2012;38(7):1105-17.
3. European Society of R. ESR statement on portable ultrasound devices. Insights Imaging. 2019;10(1):89.
4. Malik AN, Rowland J, Haber BD, Thom S, Jackson B, Volk B, et al. The Use of Handheld Ultrasound Devices in Emergency Medicine. Curr Emerg Hosp Med Rep. 2021:1-9.
5. Cavenagh T, Katsari S, Kawa B, Karimaghahi R, Pavlidis V, Patsiogiannis V, et al. Role of interventional radiology in line insertion on intensive care during the Covid-19 pandemic. CVIR Endovasc. 2020;3(1):77.
6. bu Y, Mandal I, Lam S, Troumpoukis N, Uberoi R, Sabharwal T, et al. Impact of the COVID-19 pandemic on interventional radiology services across the world. Clin Radiol. 2021;76(8):621-5.
7. Pittiruti M, Pinelli F, COVID GAWGfVAI. Recommendations for the use of vascular access in the COVID-19 patients: an Italian perspective. Crit Care. 2020;24(1):269.
8. Scoppettuolo G, Biasucci DG, Pittiruti M. Vascular access in COVID-19 patients: Smart decisions for maximal safety. J Vasc Access. 2020;21(4):408-10.