

Saving Time in Acute Stroke Treatment

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Symposium summary

Acute ischemic stroke (AIS) is a major global health challenge, with outcomes highly dependent on rapid access to endovascular therapy (EVT). Traditional stroke workflows often result in treatment delays due to separate modalities used for imaging and intervention steps being in different rooms, but the adoption of One-Stop management, where diagnostic imaging and EVT are performed in the angiography suite, can considerably reduce door-to-groin times and improve patient outcomes. Recent innovations, such as flat panel CT (FDCT) protocols and the ARTIS icono system, have addressed previous limitations in brain parenchyma imaging and workflow efficiency. Evidence from clinical experience and ongoing trials suggests that implementation of the One-Stop approach offers a promising pathway to faster, more effective stroke care and sets the stage for broader improvements in stroke management systems.

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Introduction

The estimated global cost of stroke is over US\$890 billion, and it remains a major cause of death and disability (expressed by disability-adjusted life-years lost – DALYs) worldwide.¹ EVT is highly effective, but neurological outcomes of stroke patients with acute large vessel occlusion (LVO) depend strongly on minimising door-to-groin time. Even small workflow improvements (10–15 minutes) translate into meaningful patient recovery gains and healthcare cost savings.² Currently, the standard pathway requires two locations: Computed Tomography (CT) scanning to confirm diagnosis of LVO and eligibility for EVT, and a separate angiography suite for EVT, typically causing 60–70 minutes of delay. A proposed

alternative, One-Stop management, combines the imaging (flat panel CT (FDCT), flat panel CT angiography (FDCT-A) and flat panel CT perfusion (FDCTP)) and EVT within the angiography suite, avoiding patient transfer delays and potentially reducing treatment times.²

In this symposium, Prof. Psychogios demonstrated how to reduce treatment delays in AIS, focusing on the ARTIS icono system and its role in enabling “One-Stop” management in acute stroke patients. Diagnostic workflows and EVT are combined in the angiography suite removing the need for patient transfers.

Rationale for One-Stop Management

One-Stop management involves one room only, where all imaging and treatment are performed. Currently, standard workflows involve CT imaging (non-contrast CT, CT angiography (CTA), CT perfusion (CTP)), followed by transfer to the angiography suite for EVT and this multi-step process adds 30–40 minutes to door-to-groin times. CT, CTA and CTP images are still needed for the One-Stop process, but going direct-to-angiography suite bypasses the CT/Magnetic Resonance Imaging (MRI) scanner. Such an approach, particularly for patients with NIH Stroke Scale (NIHSS) ≥ 9 , allows faster access to EVT since around 80% of these patients will have large vessel occlusions (LVOs), saving at least 30 minutes for those patients. This time saving becomes more meaningful when compared with cardiology patients who are routinely taken directly to the catheterisation lab, highlighting the inefficiencies of the standard stroke workflow.

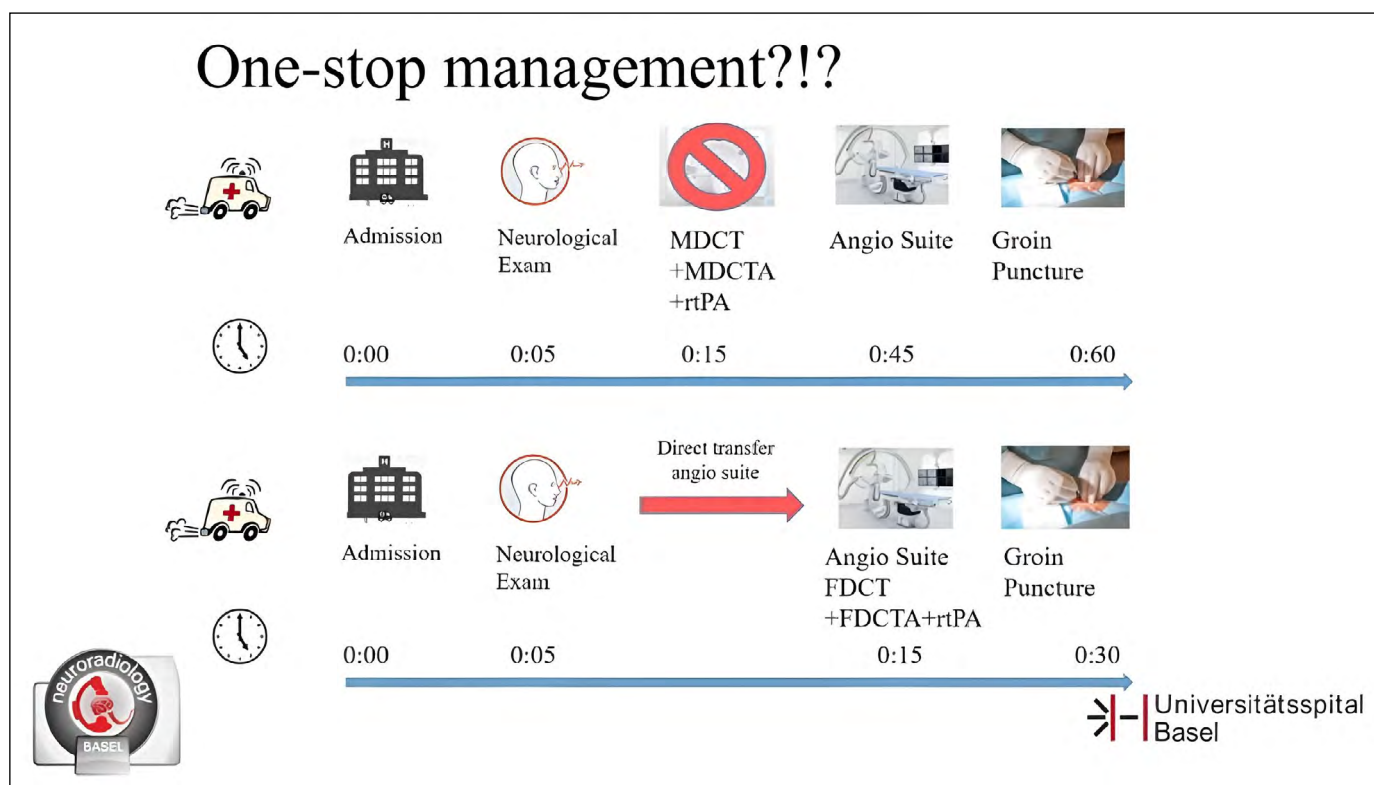
Current Evidence

The Hermes collaboration (2016)³ pooled patient-level data from five trials (MR CLEAN,⁴ ESCAPE,⁵ REVASCAT,⁶ SWIFT

PRIME,⁷ EXTEND 1A⁸) and analysed individual data for 1287 patients (EVT, n=634; Control, n=653) with a primary outcome of reduced disability on modified Rankin Scale (mRS) at 90 days across prespecified subgroups.³ This meta-analysis from 2016 reported median door-to-groin times of 104 minutes, and today, similar times are still being observed in more recent trials including ESCAPE-NA1 (2020)⁹ and ESCAPE-NEXT (2025),¹⁰ indicating limited improvement despite training. Prof. Psychogios emphasised that system-level workflow changes, rather than incremental training, are required to achieve significant time savings.

With One-Stop management the neurological examination occurs in the ambulance or at the hospital door. If the patient has NIHSS ≥ 9 or a Rapid Arterial occlusion Evaluation (RACE) >4 , then you go direct-to-angiography where the imaging is performed. Tissue Plasminogen Activator (tPA) is administered within the respective time window followed by groin puncture if you find an LVO or Medium Vessel Occlusion (MeVO), saving more than 30 minutes in multiple studies (Figure 1).

Figure 1. Overview of procedural steps and timescales for standard workflow versus One-Stop management.



Flat Detector CT (FDCT) vs Standard CT

Imaging requirements

- Non-contrast CT for haemorrhage detection
- CTA in portrait mode to locate the occlusion and the arch/cervical vessels
- CTP for distal occlusion detection and verification of clinical decisions

FDCT within the angiography suite can detect haemorrhage (particularly intracranial haemorrhage, ICH), identify vessel occlusions (often as part of multiphase CT angiography (mpFDCT-A), and perform perfusion imaging.¹¹ While image resolution is slightly lower than with multi-detector CT, sensitivity and specificity for major ICH detection are comparable (Figure 2).

Flat-Detector CT (FDCT)

Cone-beam CT, C-arm CT, DynaCT, XperCT

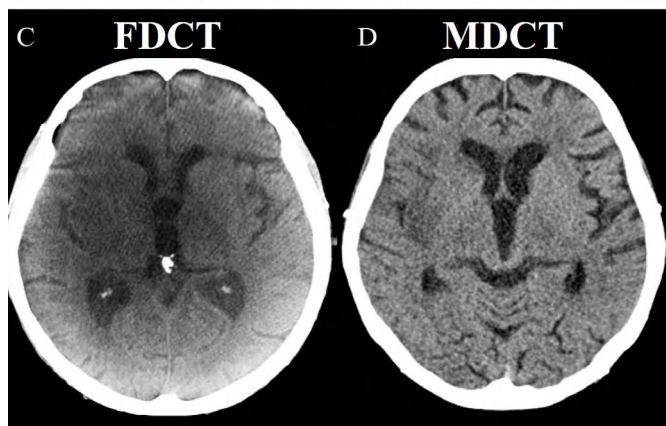


Figure 2. FDCT and MDCT images with evidence of haemorrhage..

Using the ARTIS icono, head movement by patients is no longer an issue due to faster scanning times. The syngo DynaCT Sine Spin protocol with its double oblique acquisition trajectory reduces artefacts in the basal part of the brain. There is improved image quality in the infratentorial region with better depiction of the prepontine cistern, the fourth ventricle and midbrain (Figure 3).

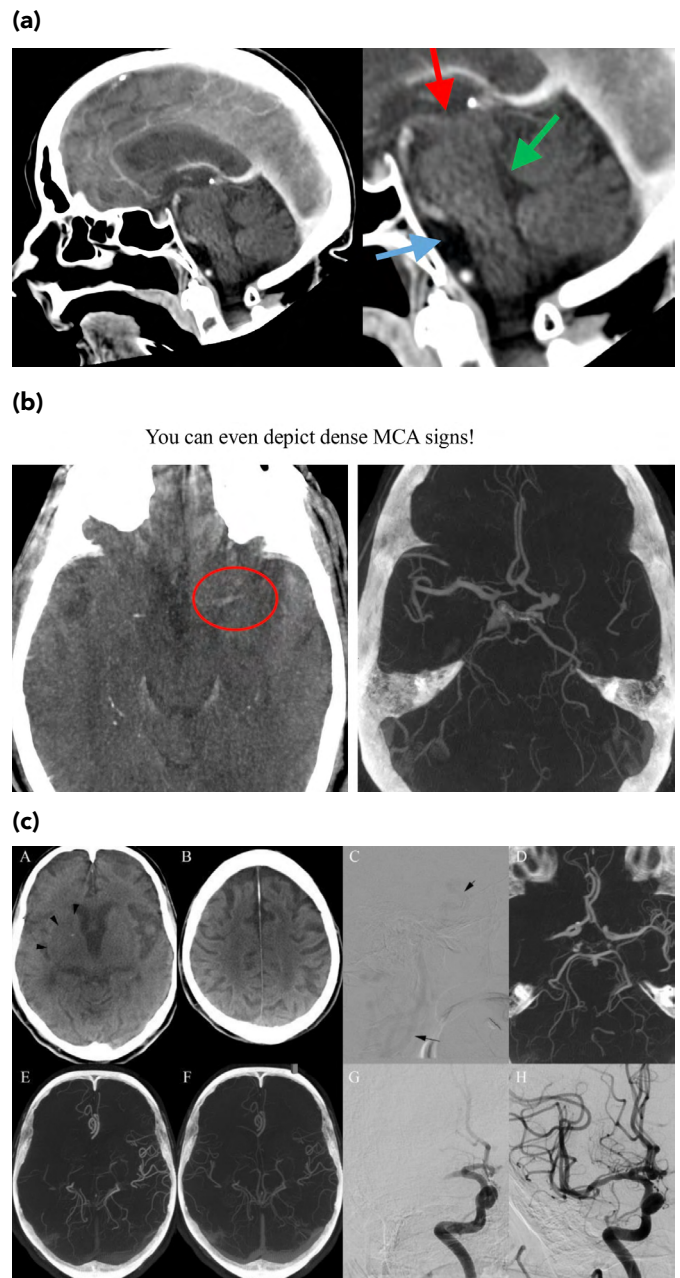


Figure 3. (a) ARTIS icono image at 7 seconds and syngo DynaCT Sine Spin, (b) Dense middle cerebral artery (MCA) signs are visible, (c) Images of the first ever reported case of a one-stop management in 2017.

Most importantly is the demonstration of haemorrhage detection. Previous retrospective studies showed that sensitivity and specificity are high,¹² but prospective studies are needed if the clinical guidelines are to be changed.

As a reminder, since 2022, the SPINNERS trial, which has successfully finished enrollment (ProSPective Evaluation of

Non-contrast sIne spiN Flat-detectoR CT for the Detection of Intracranial haemorrhageS),¹³ has evaluated whether a novel non-contrast FDCT protocol, (Sine Spin FDCT), is non-inferior to conventional MDCT for the detection of ICH in stroke patients. The goal is to establish if FDCT is reliable in a direct-to-angiography suite workflow and whether it can reduce treatment times, ultimately improving outcomes for stroke patients who need EDV. The presentation of the study results is planned at ESOC 2026.

FDCT long object protocols now allow visualisation of cervical vessels and the arch, addressing earlier criticisms around incomplete vascular assessment (Figure 4).¹⁴ Altogether, it is a better experience for the interventional team. Faster scans, syngo DynaCT Sine Spin, FDCTA (in portrait mode) panel positioning, case flows with predefined positions for faster switch from femoral to radial, improved 2D and 3D image quality, and perfusion imaging in the angiography suite, all contribute to reducing patient times.

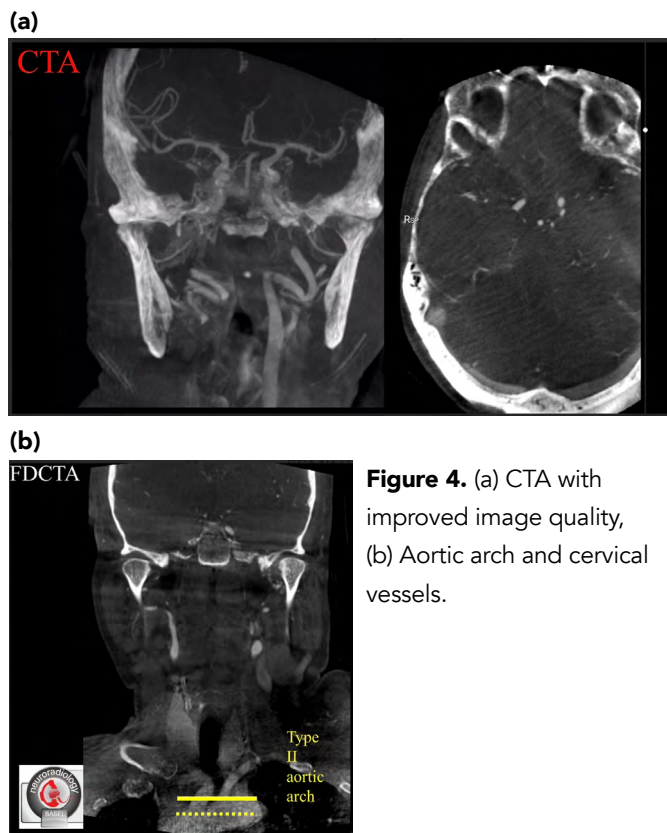


Figure 4. (a) CTA with improved image quality, (b) Aortic arch and cervical vessels.

Clinical Experience and Case Examples

Since 2016, the research workgroups around Prof. Psychogios have adopted One-Stop management, with door-to-groin times reduced to ~30 minutes in >230 patients (compared with 60–70 minutes in standard workflows).^{15, 16}

Case 1: A 90-year-old patient with NIHSS=18 (dysarthria, motor aphasia, left-sided hemiplegia facio-brachio-crural, left-sided hypaesthesia) underwent direct-to-angiography suite imaging, with rapid detection of LVO and intervention with a switch from femoral to radial access enabled by pre-set “Case Flow” positions, (Figure 5).

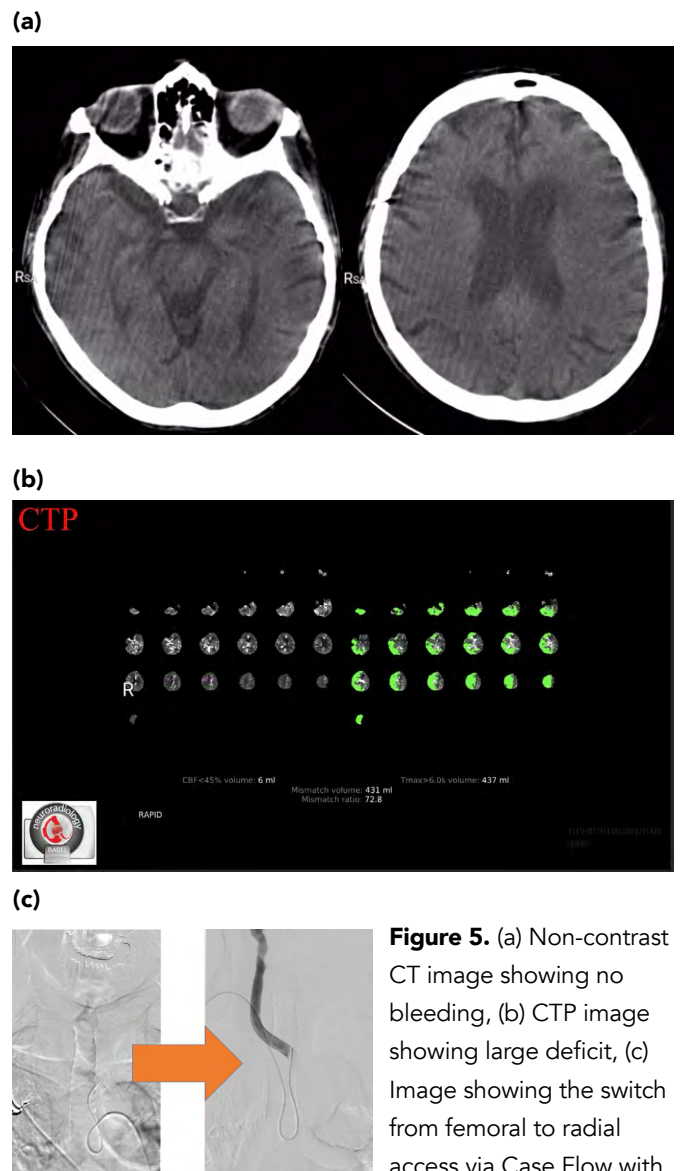
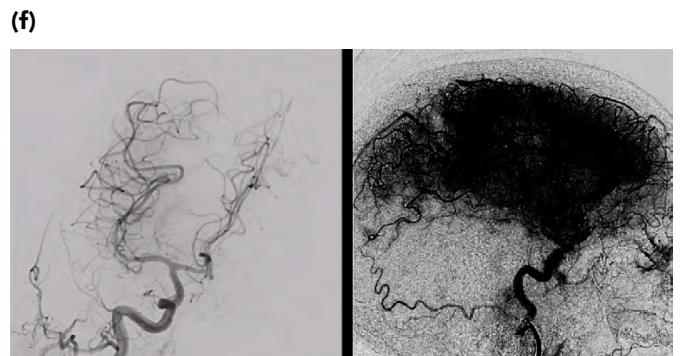
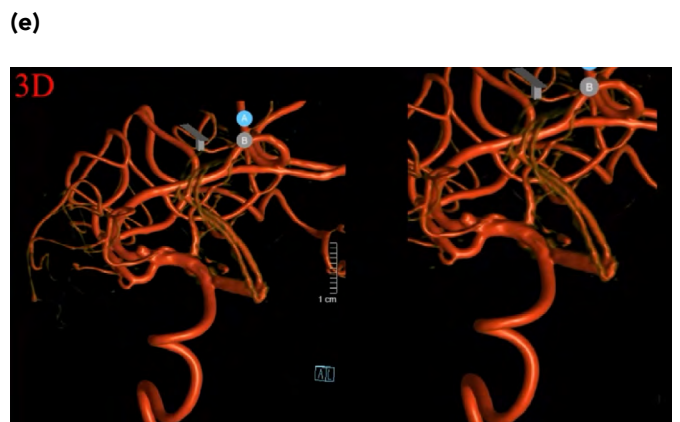
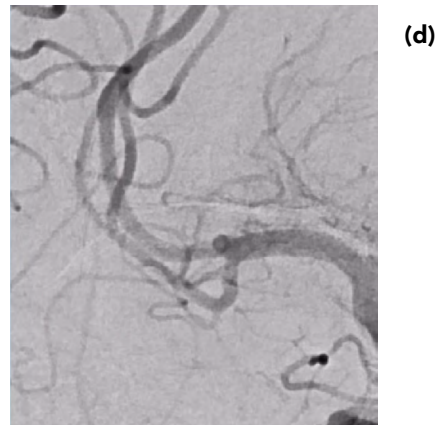
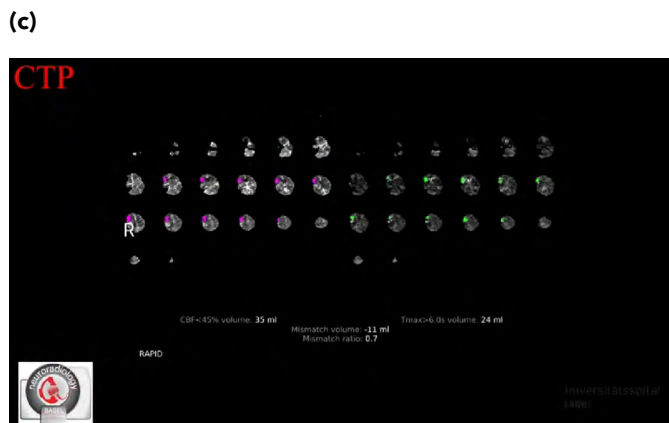
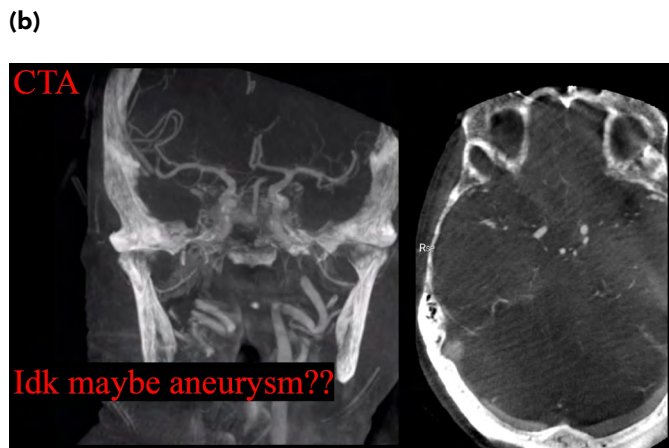
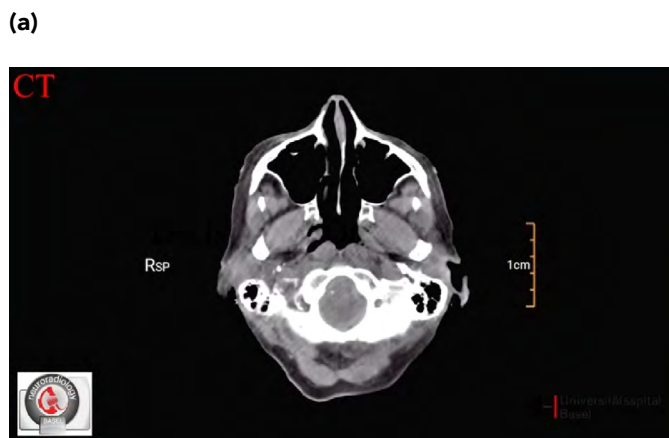


Figure 5. (a) Non-contrast CT image showing no bleeding, (b) CTP image showing large deficit, (c) Image showing the switch from femoral to radial access via Case Flow with ARTIS icono.

Case 2: An 83-year-old patient with NIHSS=17 (motor and sensory left-sided hemiparesis, gaze deviation to the right, multimodal extinction) presented with indefinite imaging findings (Figure 6). FDCT-A and perfusion imaging confirmed occlusion rather than aneurysm, enabling definitive treatment.

Figure 6. (a) Non-contrast CT shows no haemorrhage, (b) CTA image with no clear occlusion, (c) CTP image showing results for a deficit, (d) Close up of the angiogram, (e) 3D imaging, (f) Final result after catheterisation to recanalise the vessel.



Implementation Strategies

Initially, hospitals should apply One-Stop workflows starting with a 0–6-hour window in “drip-and-ship” patients with known LVOs, during working hours (08:00-18:00 hours) to build experience. Gradually expand to all 0–6-hour stroke patients, then beyond 6 hours with perfusion imaging guidance. Training of technicians is essential, as imaging acquisition can be delegated for efficiency. Once you can demonstrate to your administration how much faster you are with the system, you may be able to expand to a 24/7 workflow for One-Stop management.

Potential in Haemorrhagic Stroke

Additional imaging protocols such as Micro 4sDSA and HyperDyna support small aneurysm and vascular abnormality detection, extending One-Stop applications to haemorrhagic stroke management (Figure 7).

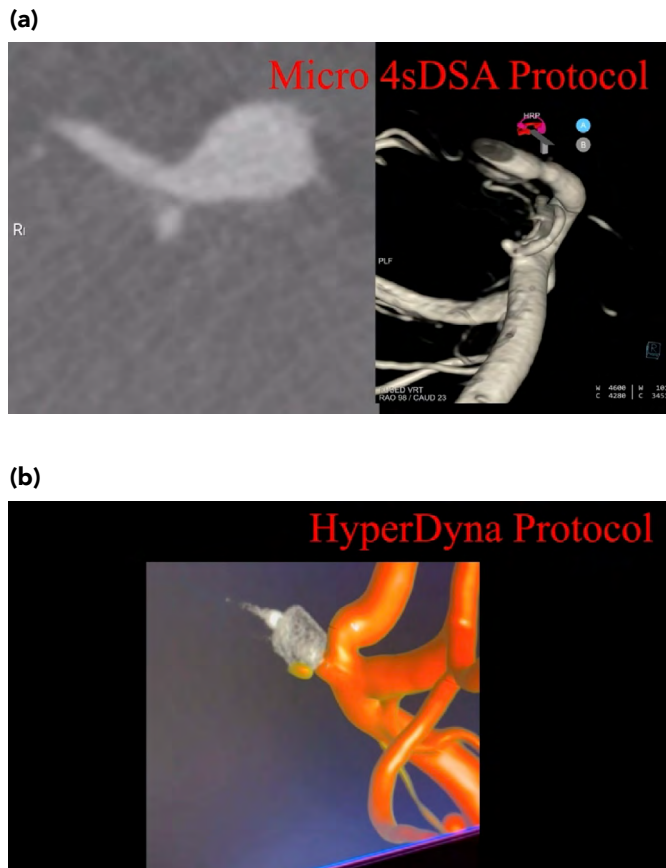


Figure 7. Imaging for identification of very small aneurysms (a) Micro 4sDSA protocol (b) HyperDyna protocol.

A Reminder of Ongoing and Future Trials

- SPINNERS Trial (2022–2025): Head-to-head diagnostic accuracy comparison of FDCT vs conventional CT in acute stroke. Results expected 2026.¹³
- GET-FAST Trial (2025–2028): A multicentre, randomized, pragmatic trial (Finland, Germany, Switzerland; n=390) comparing conventional vs One-Stop stroke workflows. Primary endpoint: mRS at 90 days.²

Conclusion

AIS due to large vessel occlusion is best treated with EVT but outcomes decline rapidly with treatment delays. One-Stop stroke management with the ARTIS icono demonstrates a feasible and effective method to reduce treatment delays, achieving door-to-groin times as low as 20 minutes. Evidence from ongoing trials aims to confirm diagnostic accuracy and clinical safety, with the goal of integrating this workflow into the clinical guidelines. Ultimately, the goal is to improve treatment and reduce death and disability from stroke for all patients, and hospitals should adopt system-level workflow changes rather than incremental optimisations to meaningfully improve stroke outcomes.

References

1. Feigin VL, Brainin M, Norrving B, et al. World Stroke Organization: Global stroke fact sheet 2025. *Int J Stroke*. 2025;20(2):132–144.
2. ClinicalTrials.gov. One-Stop manaGemEnT For A Swift Initiation of Endovascular Therapy (GET-FAST). Accessed 9 September, 2025. <https://clinicaltrials.gov/study/NCT07052045>
3. Goyal M, Menon BK, van Zwam WH, et al. Endovascular thrombectomy after large-vessel ischaemic stroke: a meta-analysis of individual patient data from five randomised trials. *Lancet*. 202;387(10029):1723–31.
4. Berkhemer OA, Fransen PS, Beumer D, et al. A randomized trial of intraarterial treatment for acute ischemic stroke. *N Engl J Med*. 2015;372(1):11–20.
5. Goyal M, Demchuck AM, Menon BK, et al. Randomized assessment of rapid endovascular treatment of ischemic stroke. *N Engl J Med*. 2015;372:1019–30.
6. Jovin TG, Chamorro A, Cobo E, et al. Thrombectomy within 8 hours after symptom onset in ischemic stroke. *N Engl J Med*. 2015;372(24):2296–306.
7. Saver JL, Goyal M, Bonafe A, et al. Stent-retriever thrombectomy after intravenous t-PA vs. t-PA alone in stroke. *New Engl J Med*. 2015;372:2285–95.

8. Campbell BCV, Mitchell PJ, Kleinig TJ, et al. Endovascular therapy for ischemic stroke with perfusion-imaging selection. *New Engl J Med*. 2015;372(11):1009–18.
9. Hill MD, Goyal M, Menon BK, et al. Efficacy and safety of nerinetide for the treatment of acute ischaemic stroke (ESCAPE-NA1): a multicentre, double-blind, randomised controlled trial. *Lancet*. 2020;395(10227):878–87.
10. Hill MD, Goyal M, Demchuk AM, et al. Efficacy and safety of nerinetide in acute ischaemic stroke in patients undergoing endovascular thrombectomy without previous thrombolysis (ESCAPE-NEXT): a multicentre, double-blind, randomised controlled trial. *Lancet*. 2025;405(10478):560-70.
11. Serrallach BL, Mujanovic A, Ntoulas N, et al. Flat-panel detector perfusion imaging and conventional multidetector perfusion imaging in patients with acute ischemic stroke : A comparative study. *Clin Neuroradiol*. 2024;34(3):625–35.
12. Leyhe JR, Tsogkas I, Hesse AC, et al. Latest generation of flat detector CT as a peri-interventional diagnostic tool: a comparative study with multidetector CT. *J Neurinterv Surg*. 2017;9(12):1253–57.
13. ClinicalTrials.gov. ProSPective Evaluation of Non-contrast sIne spiN Flat-dEtectoR CT for the Detection of Intracranial haemorrhageS (SPINNERS). Accessed 12 September, 2025. <https://www.clinicaltrials.gov/study/NCT05458908>
14. Hoelter P, Lang S, Beuscher V, et al. Extended multimodal flat detector CT imaging in acute ischemic stroke: A pilot study. *J Digit Imaging*. 2023;36(3):1198–1207.
15. Psychogios MN, Behme D, Schregel K, et al. One-Stop management of acute stroke patients: Minimizing door-to-reperfusion times. *Stroke*. 2017;48(11):3152–55.
16. Psychogios MN, Maier IL, Tsogkas I, et al. One-Stop management of 230 consecutive acute stroke patients: Report of procedural times and clinical outcome. *J Clin Med*. 2019;8(12):2185.