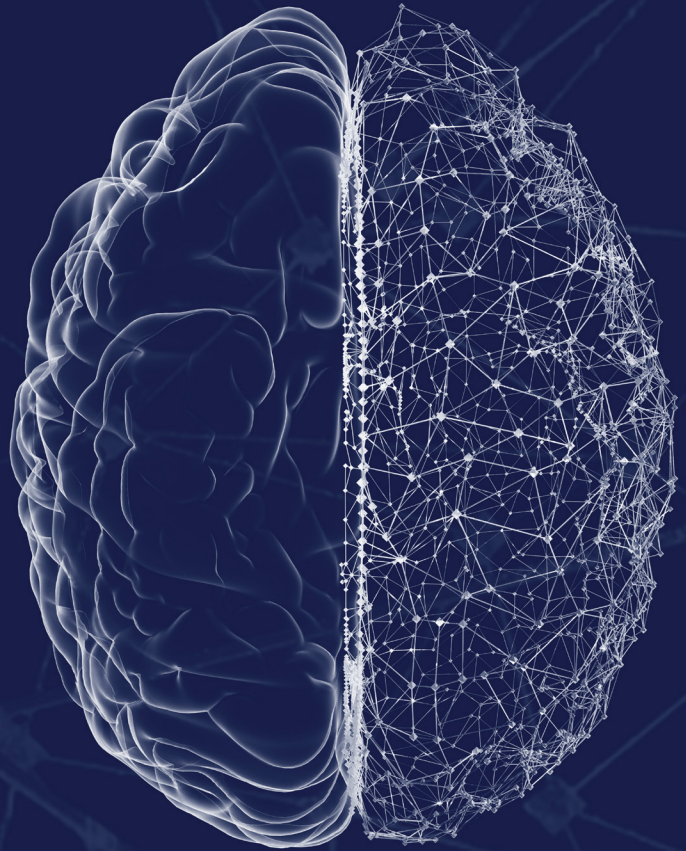# BrainInsight™

Automated AI tools for brain imaging.

BrainInsight has the potential to improve patient outcomes by increasing the accessibility of life-saving neuroimaging interpretation techniques and decreasing the time to diagnose and treat.

Challenges in access to quantitative imaging can impact neurocritical care. The Radiological Society of North America defines quantitative imaging as the extraction of quantifiable features from medical images for the assessment of normal or the severity, degree of change, or status of a disease, injury, or chronic condition relative to normal. Due to limited access to neuroimaging, a challenge in neurocritical care is obtaining quantitative imaging biomarkers, such as midline shift[1].

Midline shift is the amount of displacement of the brain's midline from its normal symmetric position. It is an essential quantitative biomarker for clinicians to assess the severity of brain injury and signify neurological damage after stroke. Identifying midline shift, especially with early or subtle onset, can significantly improve patient outcomes. In emergency situations, it is not always a neuro-specialist taking the first look at the study. Automated midline shift measurement would provide value to nonspecialists, especially those who read images in emergency situations[2].

Another imaging biomarker calculation is ventricular volume measurements, which quantifies the cerebrospinal fluid within the ventricles. Ventricular volume has relevance for many neurological conditions and has demonstrated utility in managing conditions such as hydrocephalus. Changes in ventricular size and shape can help clarify a patient's clinical status and thus guide neurosurgical decision-making[3].

Hyperfine BrainInsight provides automated artificial intelligence (AI) tools for brain imaging giving clinicians valuable quantitative biomarker information that can potentially streamline patient care and reduce the burden of performing manual measurements on neuroradiological specialists.

BrainInsight Automated AI Tools

Available with the Swoop® Portable MR Imaging System™ cloud offering, BrainInsight is an automated AI decision support tool for routine patient care. It provides measurements of brain structures, such as midline shift and lateral ventricular volume, from T1 and T2 axial images for patients ages 18 years and older. By introducing BrainInsight into the neurocritical care workflow, a clinical care team can gain access to more insights regarding the patient's condition[1].

By design, BrainInsight seamlessly integrates into the Swoop workflow. After the point-of-care Swoop system acquires images and uploads them to the Hyperfine cloud image viewer, BrainInsight automatically calculates and displays the measurements, presenting them as color overlays. Each color represents a segmented region or spatial measurement of the anatomical structures. BrainInsight processing takes approximately seven minutes and includes midline shift (detection and measurement) and lateral ventricle (segmentation and volume measurement).

Midline Shift. BrainInsight holds excellent potential for improving the workflow in the neurocritical care setting. Study results from intensive care units demonstrate that BrainInsight provides automatic midline shift measurements equivalent to manual measurements from expert neuroradiologists. This enabling technology can potentially reduce the burden on neuroradiological specialists for acute stroke follow-up imaging. BrainInsight automated midline shift measurement can also benefit nonspecialists, especially those reading images in emergencies[1].
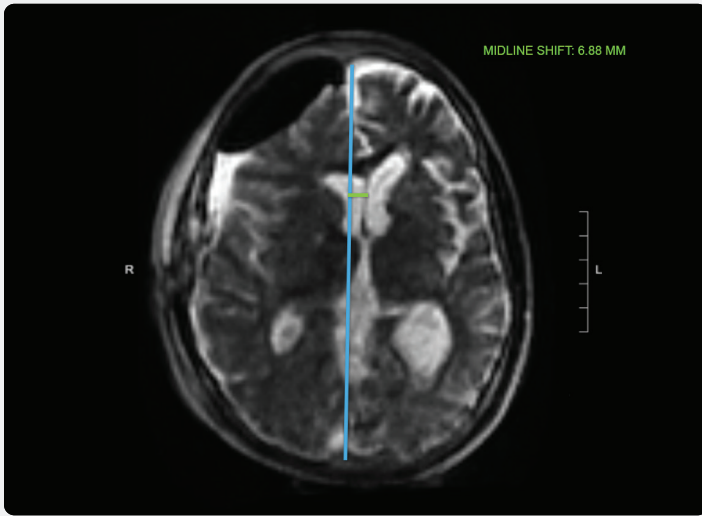
Lateral Ventricular Volume. Using BrainInsight to measure lateral ventricle volume can streamline patient care and provide more data-driven tools in the clinician's hands. Manual ventricular volume calculations are time-consuming and labor-intensive and can take an average of 30 minutes[4]. Nevertheless, segmentation of the ventricles provides a quantitative measurement for the ventricle changes and forms crucial diagnostic information. Consistently and accurately tracking ventricular volumes over time can significantly improve and standardize the clinical management of lifelong conditions, such as hydrocephalus[3].

Motivated by today's healthcare challenges of limited access to imaging and manual calculations of imaging biomarkers, BrainInsight has the potential to improve patient outcomes by increasing the accessibility of life-saving neuroimaging interpretation techniques and decreasing the time to diagnose and treat.

1. Kundu, P., et al: Point-of-Care MRI with Artificial Intelligence to Measure Midline Shift in Acute Stroke Follow-Up. medRxiv. [Preprint] January 24, 2022. https://doi.org/10.1101/2022.01.22.22269697
2. American College of Radiology Data Science Institute. Neuroradiology. Detect and Measure Midline shift. Available at https://www.acrdsi.org/DSI-Services/Define-AI/Use-Cases/Midline-Shift
3. Yepes-Calderon, F., et al: Automatically measuring brain ventricular volume within PACS using artificial intelligence. PloS One, 2018. https://doi.org/10.1371/journal.pone.0193152
4. Zhou, X., et al: AI-based medical e-diagnosis for fast and automatic ventricular volume measurement in patients with normal pressure hydrocephalus. Neural Comput & Applic. 2022. https://link.springer.com/article/10.1007/s00521-022-07048-0
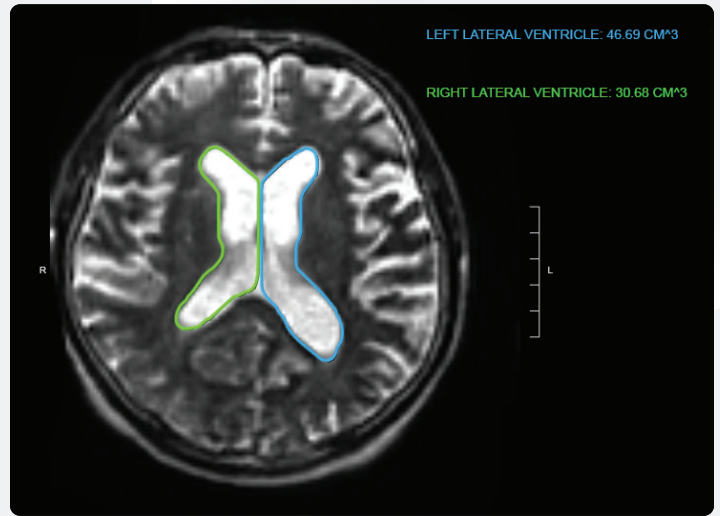
BrainInsight at Work

Midline Shift

MIDLINE SHIFT: 6.88 MM

R   L

BrainInsight reports the midline shift by finding the slice that contains the most significant shift. The midline (blue line), shift (green line), and the midline shift measurement in millimeters (green text) are shown here.

Lateral Ventricular Volume

LEFT LATERAL VENTRICLE: 46.69 CM^3

RIGHT LATERAL VENTRICLE: 30.68 CM^3

R   L

BrainInsight uses axial scans to visualize the contours of the left and right lateral ventricles and their calculated volumes (in centimeters squared). Contours around the left (blue line) and right (green line) lateral ventricles and their volumes (blue and green text) are shown here.

Swoop Portable MR Imaging System

Hyperfine designed the Swoop system to address the limitations of current imaging technologies and make MR imaging accessible anytime and anywhere.

Ready to scan in less than two minutes, the system produces its first images just minutes after that, enabling care decisions without the need for patient transport to radiology.

Small and highly portable, the system is ideal for neuroimaging in intensive care units and pediatric settings. Designed to fit inside elevators and through 34-inch doors, the Swoop system effortlessly maneuvers through crowded healthcare environments to a patient's bedside at the point of care. Imaging sequences include T1, T2, FLAIR, and DWI (with accompanying ADC map).

1. AI-Enabled. The Swoop system automatically maps and corrects for electromagnetic interference within the imaging environment. The result is crisp, clear T1, T2, FLAIR, and DWI (with ADC map) sequences. Advanced AI Applications also offer automated and auto-aligned brain volume measurements, ventricular volume, and midline shift.

2. Power Supply. The Swoop system plugs into a standard 120V wall outlet and is ready to scan in less than two minutes. Astonishingly efficient, the system uses just 900 watts, about the same power as a coffee maker.
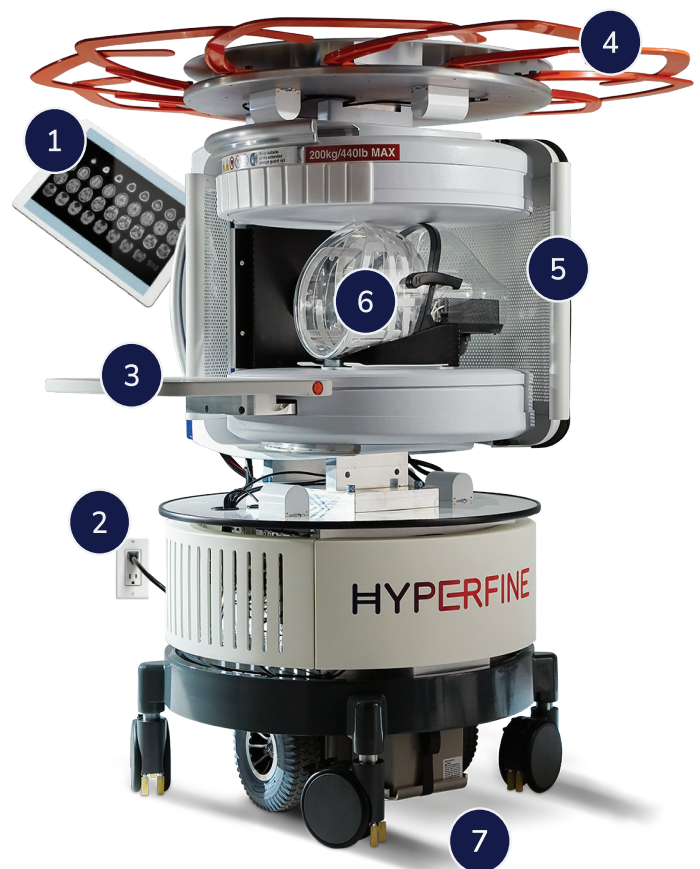
3. Transfer Bridge. Unfold the transfer bridge for easy bedside patient loading. Fold the bridge back up to move the system to your next patient.

4. Gauss Guard. Even in a crowded health care environment, the system assures safety with a convenient 62-inch diameter 5 gauss guard that quickly expands and contracts.

5. Shield Door. Operation requires no external shielding with built-in continuous 'noise cancellation' of electromagnetic interference and the specific design of our aluminum screen.

6. Head Coil. An 8-channel removable head coil comes encased in clear, durable, and easy-to-disinfect polycarbonate plastic.

7. Casters and Joystick. The Swoop system effortlessly glides between patients, courtesy of a joystick and powered drive wheels.

BrainInsight is not indicated for use with imaging data obtained on 1.5 T and 3.0 T MRI systems. BrainInsight software is only available for Swoop Portable MR Imaging System imaging studies.

Indications for Use: BrainInsight is intended for automatic labeling, spatial measurement, and volumetric quantification of brain structures from a set of low-field MR images and returns annotated and segmented images, color overlays, and reports.

HYPERFINE

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