

## MIRACLES MRI scanning SOP

This SOP outlines the process for scanning patients on the Hyperfine Swoop system as part of the MIRACLES study.

### 1. Pre-scan preparation

This SOP assumes the patient has already consented to the study and has been cleared as safe to undergo MRI after MRI safety screening following the MIRACLES MRI safety screening SOP. This guide contains excerpts from the Hyperfine Quick Reference Guide.

### 2. Scanner preparation

- Get the Hyperfine Swoop system key and iPad from \*location\*
- Remove all metallic objects from your person and place them in a safe place
- Turn the sign on the door around so it displays “MRI scan in progress”
- Plug in the Swoop system (if not already plugged in)
- Enter the Swoop system key to and turn it to Scan Mode (see picture)



- Turn the system on by pressing the silver power button. The system will make a noise to indicate when the self-tests are complete
- Fold down the patient bridge
- Power on the iPad – the code is
- The iPad should connect automatically to the Swoop system via a WiFi hotspot but if it doesn't, go into Settings > WiFi and select the hotspot labelled 'HGXXXXXXXX-hotspot'.
- Once connected, log into the Hyperfine User Interface through the Safari browser. If the window has been closed by the previous user, there is a link to the portal in the Favourites.  
Username:  
Password:
- Go to the Patient Information tab and enter the assigned subject number for this patient.  
**Patient name and other identifiable information such as date of birth should not be entered**

### 3. Patient preparation

- Check trolley for any metallic objects and remove where possible.
- Ensure the oxygen cylinder underneath the trolley is secured.
- Move the patient to the scanner room, once the bed is in position, put the brakes on the bed. The scanner should have the brakes applied already
- Move all patient equipment and monitoring devices lateral to the Swoop system, keeping them out with the Gauss Guard wherever possible.

Author	Owner	Revision	Active Date	Review date	Page
BJ	KM	1	10/11/23	As required	1 of 8
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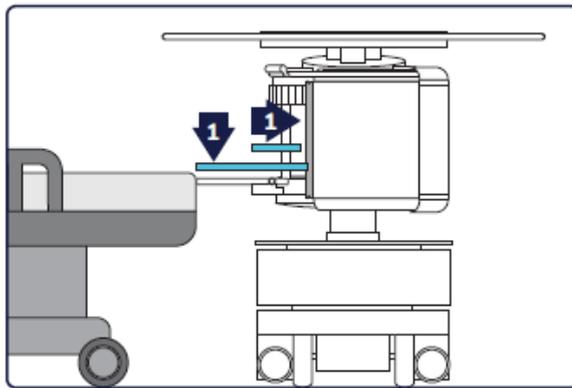
- The patient must wear earplugs during the scan, please ensure these are fitted correctly
- With at least two individuals, one on each side of the bed, move the patient into the Swoop system using a lift-and-slide manoeuvre. If more staff are required, they must have an MRI safety checklist completed and approved by an MR Authorised Person. Those on the MIRACLES research team should be positioned closest to the scanner.
- See Hyperfine's guidance for optimal patient positioning:

**The two most important things you can do to obtain the best image quality are proper positioning of the patient and minimizing patient motion.**

**Positioning:** Align the patient's head with the midline of the head coil, ensuring equal space on either side of the patient's head, and ensure that the patient's head is as far in the head coil as possible.

**Minimizing Motion:** Ensure the patient is properly positioned, comfortable, and well-padded in the head coil to reduce head motion. Caution the patient not to move their head at any point during the MRI exam.

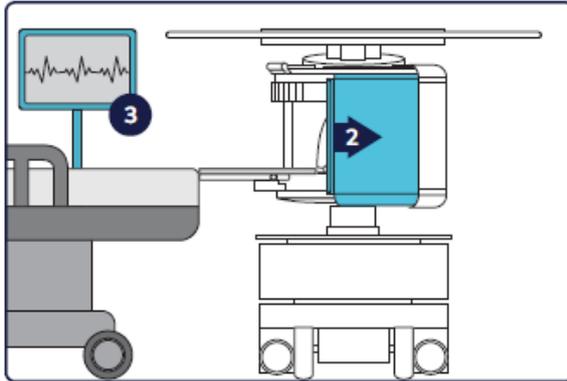
**Follow steps 1–7 for optimal patient positioning:**



**1. Position the Swoop System With the Patient's Bed**

- Ensure that the transfer bridge is covered by a back pad and in alignment with the head of the bed, with the bed slightly higher than the transfer bridge.
- Use padding to cushion the bottom of the head coil to lift the patient's head into the scanning field of view and ensure the best possible image quality.
- Ensure the padding in the head coil does not bunch up and block the back of the head coil.

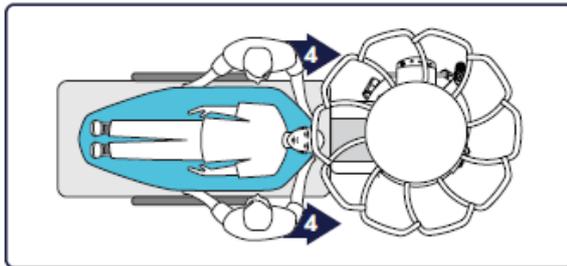
Author	Owner	Revision	Active Date	Review date	Page
BJ	KM	1	10/11/23	As required	2 of 8
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## 2. Open the Shield Door

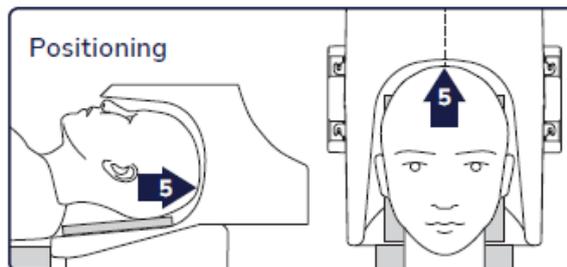
### 3. Cable Routing (IV lines, Tubes, and Cables)

- Ensure IV lines, tubes, cables, and other equipment are not compromised when positioning the patient.
- Position equipment as far as possible from the system to minimize the potential of noise interference during imaging.



## 4. Position the Patient

- With two individuals, one on each side of the bed, use a lift-and-slide maneuver to place the patient on the transfer bridge properly.



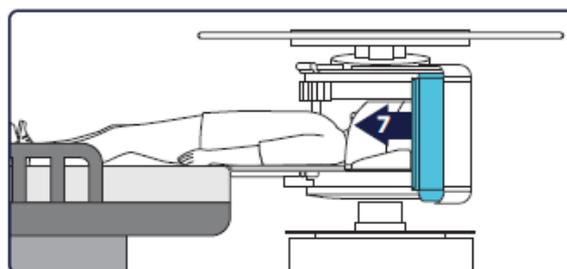
## 5. Maneuver the Patient's Head into the Head Coil

- Align the patient's head with the head coil's midline, ensuring equal space on either side of the patient's head.
- Ensure the patient's head is as far in the head coil as possible.



## 6. Prevent Head Motion in the Head Coil

- Caution the patient not to move their head during the MRI exam.
- Stabilize the head with side pads to ensure stability and prevent movement during the MRI exam.



## 7. Close the Shield Door

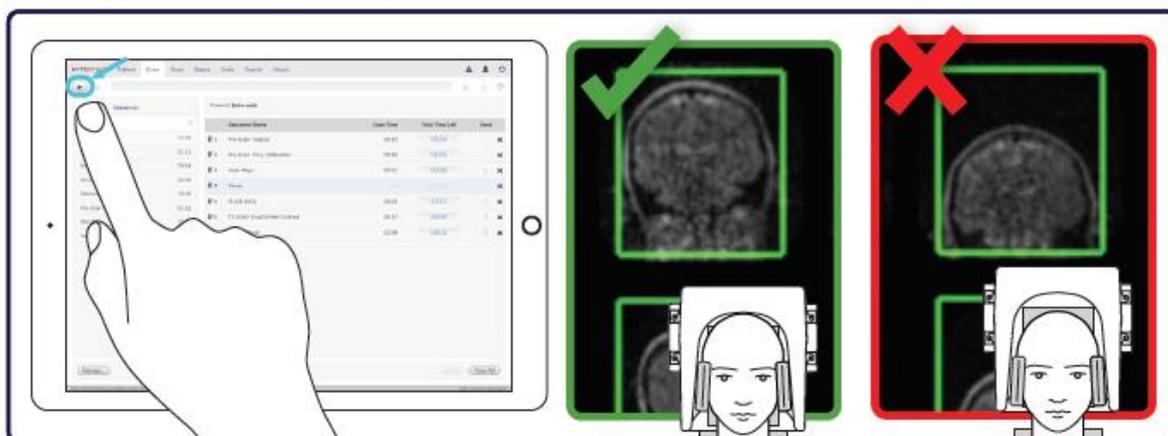
Author	Owner	Revision	Active Date	Review date	Page
BJ	KM	1	10/11/23	As required	3 of 8

- Move all patient equipment and monitoring devices lateral to the Swoop system, keeping them outside the Gauss Guard wherever possible.

#### 4. Performing the scan

- Hearing protection must be available for anyone who will be in the room during the scan but it is optional. If not wearing earplugs, we recommend you stand at least 2 metres from the centre of the scanner when it is scanning.
- Lock the door to the room when the scanner is in operation and keep closed wherever possible.
- On the iPad, switch to the Exam Tab and select the 'Stroke Action PMR' Protocol. Once the correct protocol is selected, press the play button at the top left of the screen to start the pre-scans and auto-alignment checks. If the auto alignment fails, move the patient further into the head coil and re-run the auto-alignment check. If it fails again after repositioning, just accept.

##### Starting the Exam in the Exam Tab

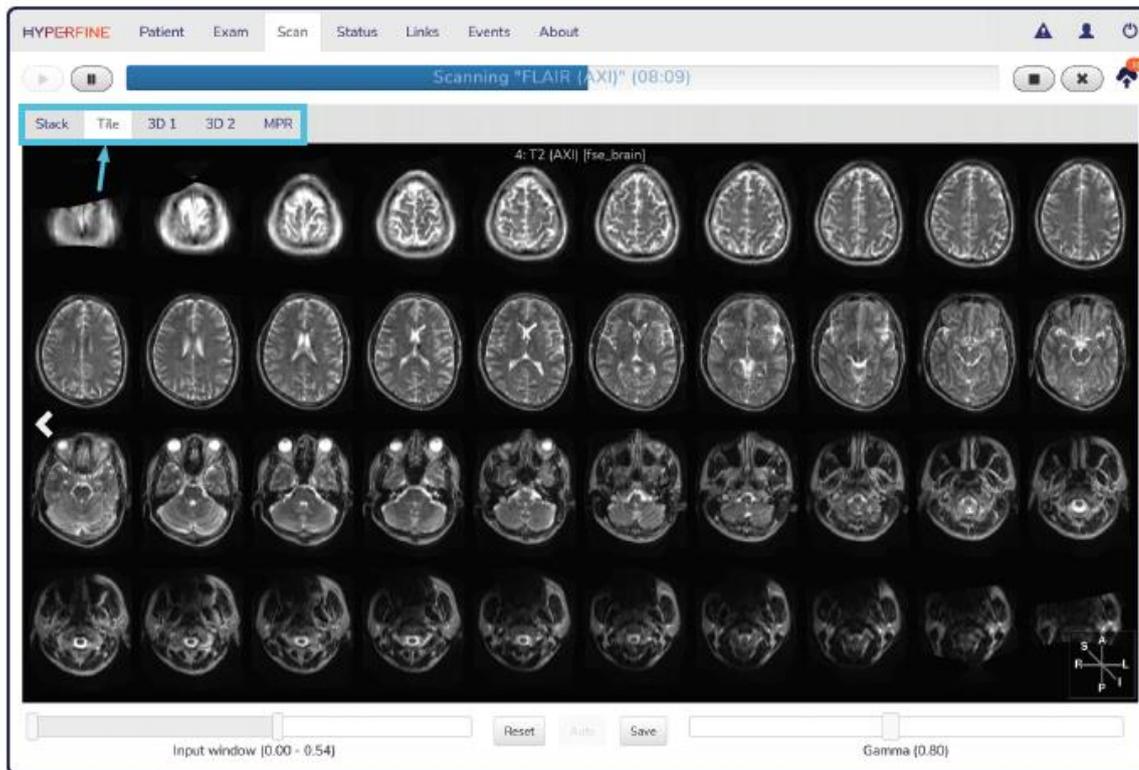


- Perform **Auto Align** at the start of the exam to ensure that the patient is well positioned. A warning is displayed if the patient is not adequately positioned in the head coil.
  - Tap the **Start** (triangle play) button on the top control bar.
- Once the main sequences begin to run, monitor the sequences in the Scan tab. If you see any major unexpected artefact, we recommend aborting the scan and removing the patient from the scanner slowly as there may be a previously undetected implant in situ.

**If this happens, please report this to the MRRP or MRI Physics immediately.**

Author	Owner	Revision	Active Date	Review date	Page
BJ	KM	1	10/11/23	As required	4 of 8
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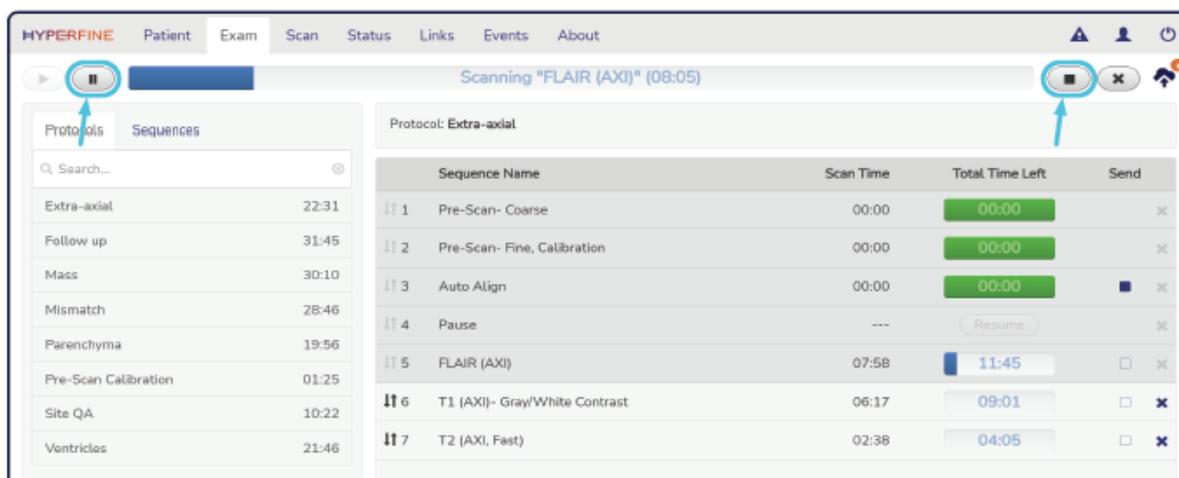
### Monitor the Sequence Images in the Scan Tab



- Toggle through the different display modes as needed.
- Adjust image windowing as needed.
- Monitor proper patient positioning throughout the exam.

□ The examination can also be monitored in the Exam and Status Tabs, as pictured below:

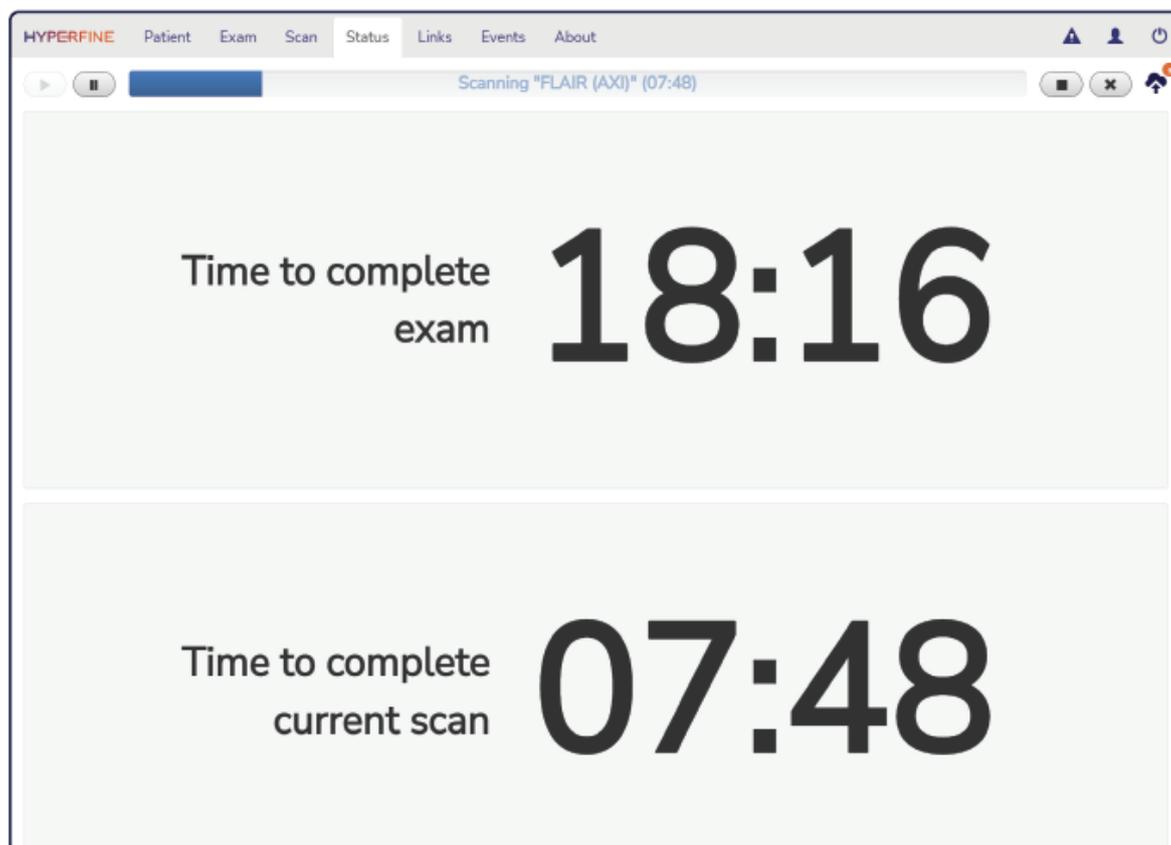
### Monitor the Exam in the Exam Tab



- Monitor and/or communicate scan time, total time left (scan time plus reconstruction time), and remaining time.
- Pause and/or stop the exam if needed.

Author	Owner	Revision	Active Date	Review date	Page
BJ	KM	1	10/11/23	As required	5 of 8

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Monitor the Exam in the **Status Tab**

- The Status tab displays a page with times listed to complete the exam and the current scan.

- Keep the patient in the scanner until all scans have been fully reconstructed and checked if possible.**

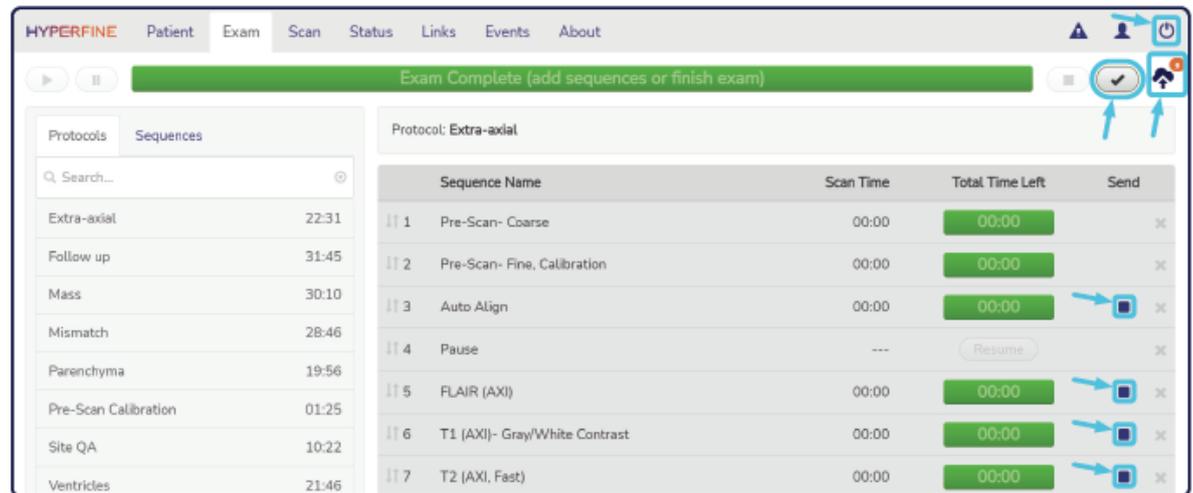
## 5. Image Archive

- Once the scans have been checked, press the tick button on the top right to send the images to ORTHANC.
- This may take some time to complete so please leave the system on while this data is being transferred, otherwise the data will be lost.

Author	Owner	Revision	Active Date	Review date	Page
BJ	KM	1	10/11/23	As required	6 of 8
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- Hovering over the cloud icon at the top right will tell you how many images are still to be uploaded.

### Send Images to PACS in the Exam Tab



- DICOMS for all sequences marked with **Send** will be sent to PACS.
- When the exam is complete, tap the checkmark button to upload DICOMS. Tap the cloud icon to view the count of pending uploads. If possible, ensure images have finished uploading before shutting off the system.

## 6. Removing the patient and turning off the system

- With at least two individuals, one on each side of the bed, remove the patient from the Swoop system using a lift-and-slide manoeuvre. If more staff are required, they must have an MRI safety checklist completed and approved by an MR Authorised Person. **Those on the MIRACLES research team should be positioned closest to the scanner.**
- The patient can be transferred back to their bay
- Go to the patient tab and press Clear Patient Data
- Once all the data has been uploaded, shut off the Swoop system using the iPad (Power Off at the top right of the Hyperfine app)
- Turn the Swoop system key to Storage Mode



- Turn off the iPad (hold down the power and volume buttons until a 'slide to power off' prompt appears on the screen) and remove the system key.
- Clean the Swoop system
- Fold the patient bridge back to the vertical position
- Turn the sign on the door back around so it displays "Strong Magnetic Field > 0.5 mT ALWAYS ON!"
- Store these systems securely and charge the iPad if required.

Author	Owner	Revision	Active Date	Review date	Page
BJ	KM	1	10/11/23	As required	7 of 8
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<b>Miracles MRI Operational scanning SOP</b>	

## 7. Miscellaneous

- Issues can be reported to Hyperfine through the iPad. Please also report any issues to the MRRP and/or MRSE.

Author	Owner	Revision	Active Date	Review date	Page
BJ	KM	1	10/11/23	As required	8 of 8
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