

Surgical Analytics Lab

Cleopatra Surgical Camera

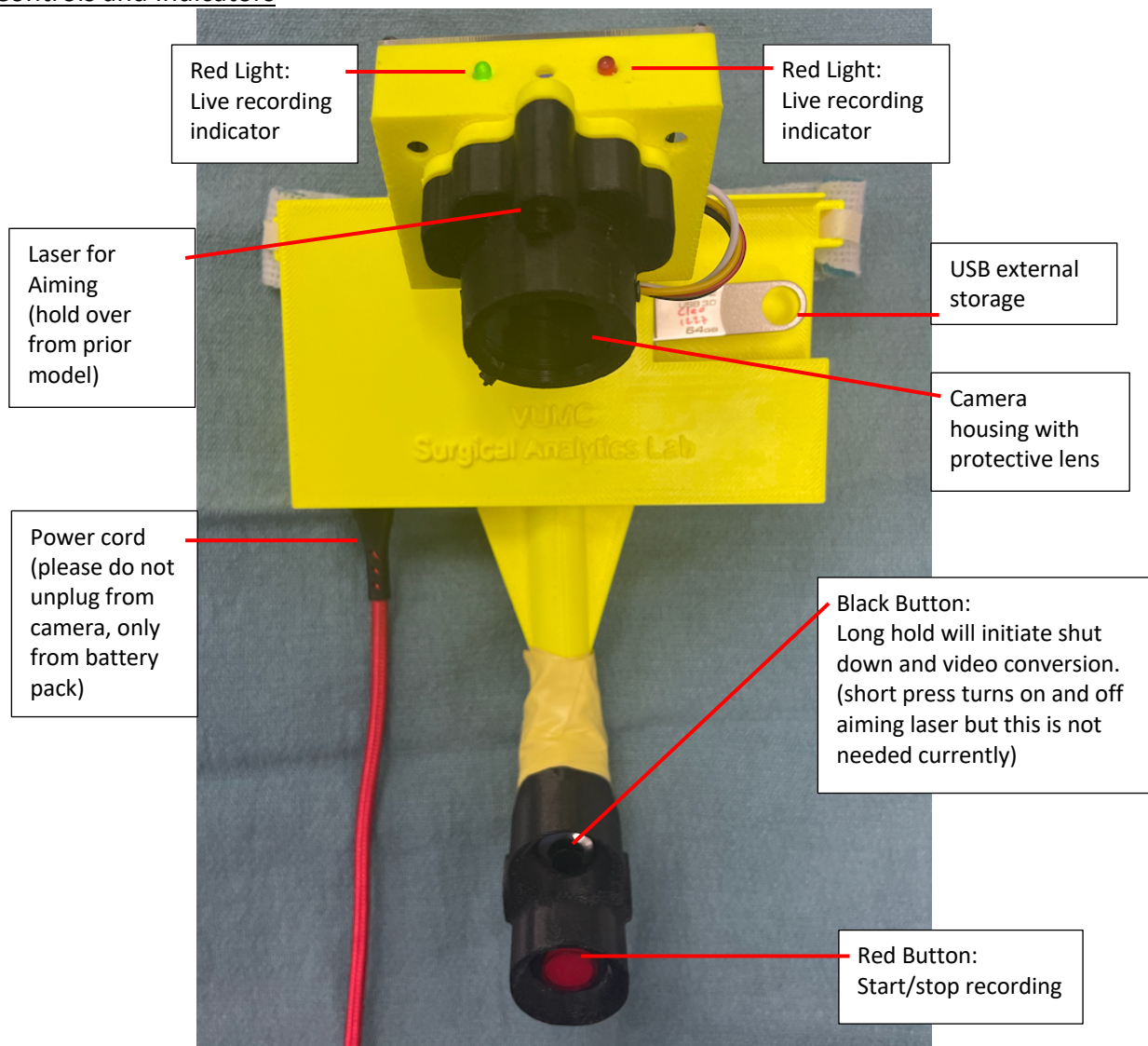
Documentation and Instructions for Use

Last Updated Jan 2023

System Design

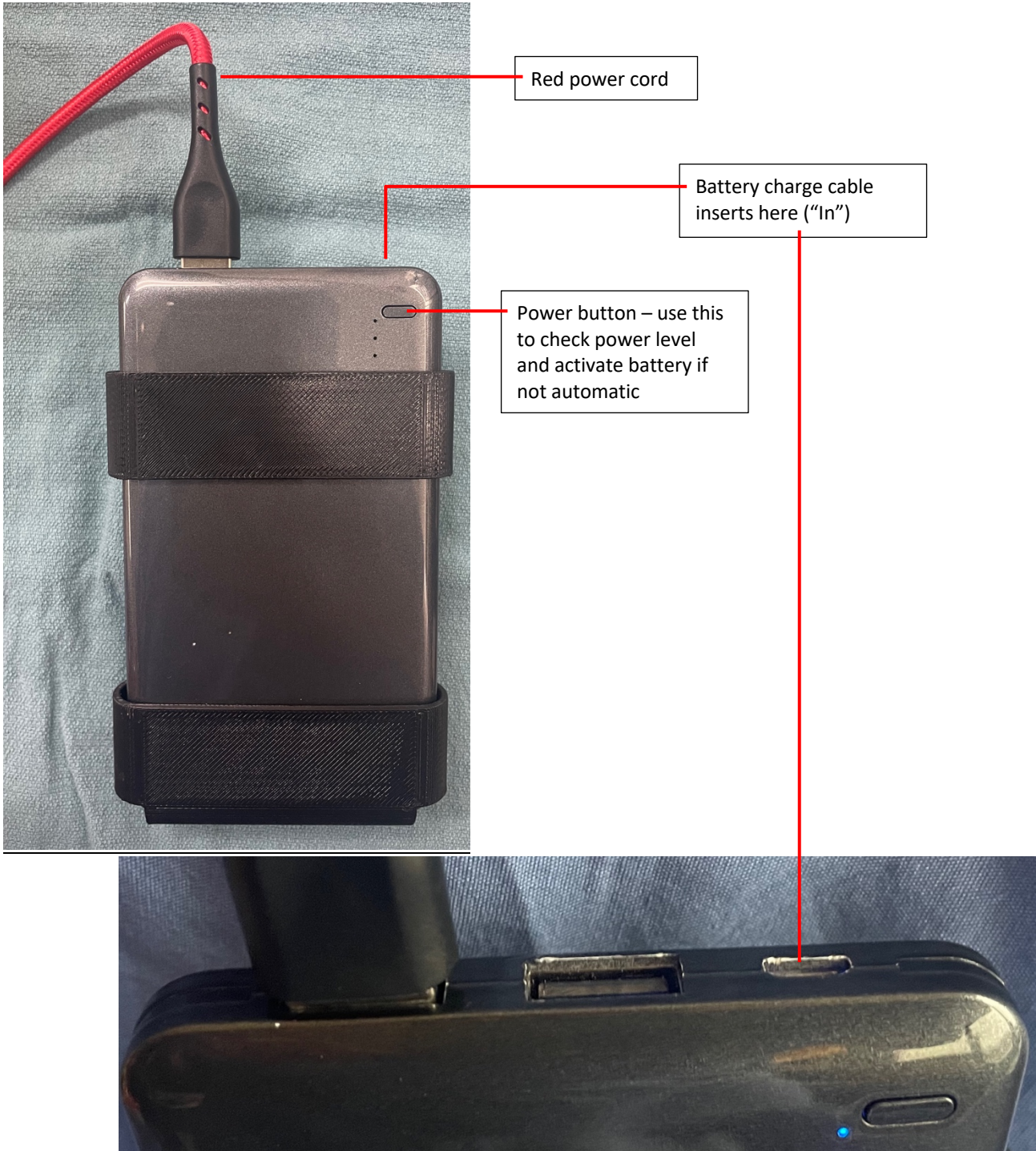
The Cleopatra surgical camera is based off a Raspberry Pi3 computer with a PiCam V2 1080p camera sensor. The lens has been focused for the best image at 30-45cm working distance and recording under full-intensity surgical lights. The camera records video in H264 file format, which is automatically converted to MP4 during the shutdown sequence. Videos are parsed into 20 minute segments for ease of file transfer and to preserve footage should the camera inadvertently be unplugged during use. There is no audio recording feature at this point. *The video files saved on Cleopatra have a scrambled date to avoid creating PHI.* It is the users responsibility to ensure proper chain of custody of surgical videos.

Camera Controls and Indicators



Battery Pack

Cleopatra prototypes are supplied with a Mogix external battery pack. A full charge on the battery pack will support at least 6 hours of surgical recording. Cleopatra should boot up when you connect the power cord to the battery; if this doesn't happen automatically, sometimes you need to press the power button on the battery pack (see pictures below). When connecting/disconnecting the battery pack from Cleopatra, the red power cord should be inserted/removed from the battery pack and not from the Cleopatra device. This is because we want to avoid wear and tear on the power port on the Raspberry Pi camera. If the red power cord gets disconnected from Cleopatra, it is Ok to reinsert it; you just don't want to make a habit of it. The battery pack can be charged with a MicroUSB to USB cord, supplied in the Cleopatra prototype kit.



Wearing Cleopatra

The camera has a Velcro neck strap attached (repurposed, new trach straps). The battery pack is clipped to your scrub waste. The camera should be placed at the approximate level of the top of your surgical gown, but low enough that it does not contact your chin when you bend your head forwards. The camera head should be brought close to the unit then pointed away towards the surgical field (similar to as shown in the below pictures) – this will keep the camera head out of your field of view. When you don your gown, the neck should go over the camera body and under the camera head as shown; the gown will typically hike the camera up a bit and provide support and stability to the device.



Once you're scrubbed in and positioned where you'll stand at the surgical field, you can use a large clamp to adjust the camera head. Pressing the large red button through your gown will activate the camera and you'll be able to see on the screen where the camera is pointing so you can adjust it optimally.



Recording

The controls are designed to be palpable through your gown – there is a large, flat red button at the bottom that starts and stops recording. When the device is recording, the red light on the camera head will be illuminated and the screen will show the camera's view. Every time you start then stop recording, a new file is created – this can be used to make short clips if you desire. If you leave the camera recording throughout the procedure, it will save the video in 20-minute clips. This is for ease of file handling and as a backup in case the device loses power – if this happens then the current recording file will be lost, but all prior 20-minute files will be preserved.

The camera records in h264, which technically can be viewed on computer using certain applications, but is not a easy file to work with. Therefore, when the camera is shut down at the end of the recording, Cleopatra converts all h264 files on the USB to a more universal MP4 file format. If you forget to do the shut-down sequence or lose power, you can still use Cleopatra to convert any h264 files on your USB. Just restart the camera with the USB in place, and run the shutdown sequence (below) – the device will look for any h264 files and convert them.

When you're done recording, press the large red start/stop button to end recording. Then press and hold the smaller black button just above it for about 10 seconds. The green light will start rapid flashing and the screen will show some code being executed. Once the green light converts to a steady on/off slow flash, then Cleopatra is converting its h264 files and you can release the black button. Once file conversion is complete, you can unplug the red cord from the battery and remove the USB.

The converted files have a scrambled date to avoid creating PHI in the metadata, but once you save it to your computer there will be a "date modified" timestamp. Please be aware that dates of recordings could be considered identifiable information if they represent the date of surgery. *Users are responsible for eliminating any metadata they create through file transfer or saving. Users are also responsible for obtaining consent for video recording and deleting any identifiable video footage if required.*

Every time you use Cleopatra, please fill out the short post-use survey that is linked via the QR code on the back of Cleopatra. It is also available here: <https://redcap.vanderbilt.edu/surveys/?s=KJECYY4FHJ>

If you run into trouble using Cleopatra, please feel free to call me, Alexander Langerman, on my cell: 847-721-2539. Thank you for being a beta tester!!