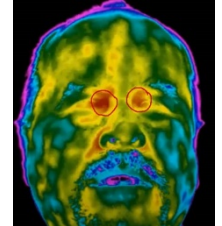


Thermal Scanning

COVID-19 has a wide range of symptoms, one of which is a fever. Screening individuals for elevated body temperature (EBT) can assist in determining if an individual may have a fever. In order to maintain physical distancing during the screening process and to avoid direct physical contact of temperature devices, the use of infrared (IR) cameras can be a screening option. For EBT screening, it is recommended to measure a single individual's temperature at the inner canthus (tear duct), which has the best correlation with a person's inner body temperature.



Disclaimer

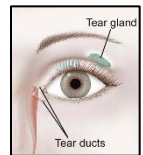
Infrared screening will only detect EBT and cannot determine if someone has a fever, virus, or is contagious. Screening for EBT is not a direct replacement for diagnostic decisions by healthcare professionals; it is just an initial trigger for an individual to seek a medical professional. All devices that have acquired FDA 510(K) clearances are "intended to be used as an adjunct to other clinical diagnostic procedures by quantifying differences in skin surface temperature changes."

Best Practices - Equipment:

- Utilize FDA 510(K) approved infrared cameras.
- Use a system with pixel resolution capable of recording at least 3 pixels within the typical tear duct area of 5mm² (1.6mm/pixel) at the desired camera distance. As an example, a camera with 350 pixels can capture these pixels (1.6mm/pixel) at a distance of 22 in.
- Consider a system with built-in artificial intelligence to help identify facial features to ensure proper facial alignment to the camera.
- Consider a system that uses a known reference temperature "black body reflector":
 - Typically placed near the individual being tested to allow the camera to see both the individual and the reference at the same time.
 - This compensates for drift in the measurement electronics and changing ambient conditions.
 - Thermal imaging technology will typically achieve $\pm 2^{\circ}\text{C}$ / 3.6°F (2%) accuracy without a reference, while the use of a reference could decrease measurement uncertainty to $\pm 0.2^{\circ}\text{C}$.
 - Less subjective than using a baseline group temperatures to compare individual readings for EBT determination.
- Consider a system with accuracy correction against a known reference or calibrate routinely to help ensure accurate EBT screening, if reference temperature devices are not an option.
- Use a system with alarms for reacting to EBT (audible, visual, or used to activate other alert methods). Alarm values need to be determined; research studies tend to use a value of 100°F. CDC considers someone to have a fever if temperature is measured at 100.4°F or above.
- Consider systems that can display temperatures and/or print out readings for each individual.
- Consider purchasing from companies with products and practices developed prior to the COVID-19 pandemic to avoid less-verified systems.

Best Practices - Processes:

- Maintain physical distancing throughout the screening process.
- If screening process will require screeners, consider requiring the use of personal protection equipment (PPE) while in close contact with tested individuals (see 'screening employees' guidelines for specifics).
- Place system in an environmentally controlled area (suitable HVAC), avoiding nearby inlet and outlet ducts.
- Consider means to ensure individuals stand still during testing and remove eye glasses; excessive eyelash makeup or sweat should be removed.
- Ensure the measurements are taken at a consistent distance and approximately repeated facial positioning. Consider using marking tapes or other aids to help position the face to the camera.
- Scan the inner canthus (tear duct) area for temperature reading. Studies suggest that inner body temperature is best correlated with this area. Forehead temperatures can vary widely at different positions on an individual's head, thus increasing measurement uncertainty of EBT.
- Any detected fevers should be confirmed with use of a clinical or medical thermometer, preferably through a medical professional.
- Scanning of moving crowds is attractive from the point of view of volume throughput, but understand the potential impact on measurement accuracy.
- Consider conducting repeatability and reproducibility studies to evaluate the proposed system and process.



Additional Resources & References:

- [CIRAS Screening Employees Guide](#)
- <https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html>
- <https://movitherm.com/knowledgebase/coronavirus-screening-for-elevated-body-temperature/>
- <https://movitherm.com/knowledgebase/thermal-camera-for-elevated-body-temperature-screening/>
- <https://www.fda.gov/medical-devices/device-approvals-denials-and-clearances/510k-clearances>
- <https://wwwnc.cdc.gov/eid/article/16/11/pdfs/10-0703.pdf>
- https://stacks.cdc.gov/view/cdc/24857/cdc_24857_DS1.pdf
- <https://www.accessdata.fda.gov/CDRH510K/K033967.pdf>
- <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0203302>
- <https://www.ncbi.nlm.nih.gov/pubmed/19215720>

For help responding to the COVID-19 emergency or implementing a response plan, contact:

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