# Policy Brief

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## Cost analysis of instant non-invasive and portable intracranial bleed detector in ambulance and different level of healthcare services

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## Recommendations

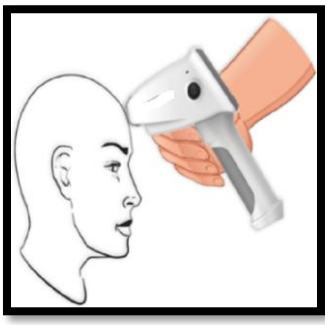
- NRI Intracranial detector can provide an initial, non-invasive assessment of intracranial bleeding. Its role is to enhance early detection, streamline triage, and prioritize cases for CT imaging. CT scans remain the gold standard for detailed imaging for TBI patients, NIR technology cannot replace CT scans.
- In ambulances, this device could act as a crucial pre-symptomatic screening tool for suspected TBI patients. At CHCs, the detector can identify TBI cases needing transfer to specialized neuro-facilities, minimizing the time to neurosurgical intervention and potentially improving patient outcomes by reducing delays in specialized care.
- In tertiary care centres, the detector can speed up head CT initiation by detecting intracranial bleeding early, optimize patient triage, and reduce imaging costs through fewer CT scans for post-surgery monitoring. Total unit cost of CT scan at tertiary care hospital is **Rs 2871**

## Key Findings

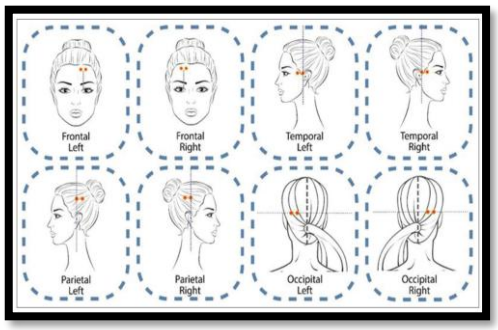
- Cost Efficiency Variation: The incremental cost per patient is Rs 984.15 at the ambulance level, Rs 360.90 at CHCs and Rs 289.78 at tertiary care centers. The cost per patient drops from ambulance level to CHCs and at tertiary care centers showing better cost efficiency at higher-level facilities.
- Significant Budget Impact: Nationwide adoption of NIR technology entails a first-year budget impact of ₹4,41,68,76,149.28 for ambulances and ₹1,87,77,37,556.97 for CHCs, highlighting substantial financial implications.
- Need for Strategic Planning: High initial costs across healthcare levels emphasize the need for careful financial planning and targeted deployment to optimize the benefits of NIR technology.

## Background

- One of the rapidly escalating public health problems worldwide is attributed to traumatic brain injury (TBI) due to road traffic accidents.
- An epidemiological shift from communicable, maternal, neonatal, and nutritional diseases to non-communicable diseases and injuries is linked to growing industrialization and changing demographics in Low middle income countries.
- To identify intracranial haemorrhage (ICH), a head Computed Tomography (CT) scan is the preferred examination. However, the concerns for CT scans are limited access, increased radiation exposure and an inappropriate burden on healthcare resources.
- At the point of care, portable near-infrared spectroscopy (NIRS) instruments have been developed to diagnose ICH.
- NIR light can non-invasively identify an extravascular bleed since it can pass through the skull, brain, and scalp.
- The aim of this study was to assess the cost of instant non-invasive and portable intracranial bleed detector per case detected for mild/moderate TBI patients.

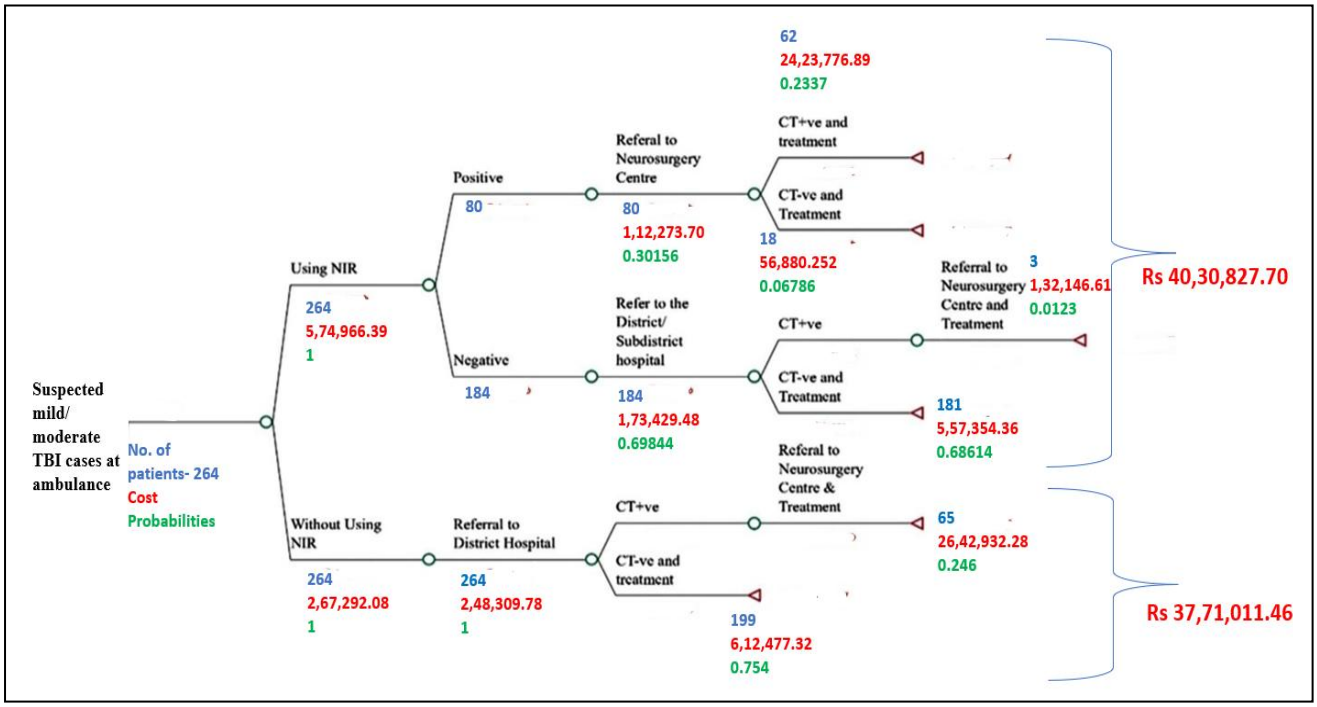


Examination of TBI patient by intracranial bleed detector




Measurement locations for scan using NIR technology for TBI patients

| PICO | Description of the components of PICO |
|---|---|
| Population | Patients with mild to moderate head injury at emergency ambulance services, CHC level or tertiary level |
| Intervention | Instant non-invasive and portable intracranial bleed detector (NIR) along with current standard of (in-hospital) care for patients with mild to moderate head injury |
| Comparator | Current standard of (in-hospital) care for mild to moderate head injury without using instant non-invasive and portable intracranial bleed detector (NIR) |
| Outcome | Cost per case detected with using instant non-invasive and portable intracranial bleed detector (NIR) from health system perspective at different levels of healthcare |




**Decision tree model for mild/moderate TBI diagnosis at ambulance level**

## Budget Impact Analysis

- Ambulance Level: Adopting NIR technology incurs an incremental cost of ₹2,59,816.24 for 264 patients, with a nationwide annual budget impact of ₹4,41,68,76,149.28 for 17,000 ambulances in the first year.
- CHC Level: Implementing NIR technology for 858 patients results in an incremental cost of ₹3,09,653.29, with a total annual budget impact of ₹1,87,77,37,556.97 for 6,064 CHCs across India in the first year.

## Conclusion

- **Cost per case detected**: Intra-cranial bleed detector device cost per mild/ moderate TBI case detected in ambulance is **Rs 2,177.90**, at CHC **Rs 748.09** and at tertiary health care **Rs 628.14**
- **Incremental Cost**: The financial evaluation of integrating Near-Infrared (NIR) technology for intracranial bleed detection reveals distinct cost implications across different levels of the healthcare system. The incremental cost per patient **is Rs 984.15** at the **ambulance level**, **Rs 360.90** at the **community health centre level** and **Rs 289.78** at the **tertiary health care level**.