

Proj. No.	Design and Implementation of a Black Box Integrated Patient Monitoring System in The Operating Room	
M4		

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Sustainable Development Goals Performed:	Goal 3 / Goal 4 / Goal 9
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Abstract	Results and conclusions
<p>Abstract: This project designs an integrated black box system tailored for operating rooms. It unifies patient vital signs capture with secure data storage and advanced analysis to enhance surgical safety</p>	<p>Results and conclusions: The project successfully implemented a fully integrated medical workstation built on a mobile trolley, featuring a centralized hub for surgical control and data logging. The system established a high-speed wireless connection with the RemoteXY mobile application, providing the surgical team with real-time ECG waveforms alongside digital readings for SpO2 and heart rate without physical tethering. For safety and security, an RFID gateway successfully executed a power interlock mechanism, ensuring that data logging only initializes for authorized medical personnel, thereby creating an immutable forensic record. Additionally, custom surgical paddles were successfully fabricated utilizing CAD modeling and 3D-printing technology, providing lightweight and electrically insulated protection for the user. The hardware interface incorporates a color-coded control panel mapping individual visual indicators to distinct internal sensor channels to minimize human error.</p>
Methodology	
<p>The system uses an Arduino Mega 2560 to collect physiological data from MAX30100, AD8232, and NTC sensors. Electronic interfaces log the status of life-support equipment like ventilators and electrosurgery units on a unified temporal axis. An RFID-RC522 module authenticates users and triggers secure visual recording initialization, while an ISD1820 module captures the auditory environment and issues critical verbal alerts to the team</p>	
	
	 