

# Automated IoT Data Collection for Hospital-at-Home

## How a multi-vendor telehealth device cloud shields clinical teams from device complexity

### Context – Hospital-at-Home Monitoring

Medisanté supported an HAH deployment using 40 plug-and-play monitoring kits over nine months, generating ~36,000 measurements. Each kit combined a pre-configured 4G telehealth gateway with up to four Bluetooth selectable medical devices requiring no patient setup, enabling rapid inclusion of elderly, or digitally untrained acute patients. Despite stable cellular signal and functioning devices, intermittent delays in data availability were observed, prompting operational investigation to identify **four key factors** affecting transmission reliability.

### Methods – Identification of Operational Challenges

Challenges were identified during a Hospital-at-Home deployment through **helpdesk tickets** submitted by the virtual care platform provider to Medisanté. Tickets were created when physiological measurements were missing, delayed, or clinically inconsistent and were investigated by Medisanté technical support. M+Hub system logs related to gateways and devices were analyzed to identify recurring patterns in **device behaviour, device-patient interaction, gateway environment, and operational workflows**.

### 1 Device Behaviour

Connected medical devices contain internal logic that influences how measurements are stored, timestamped, and transmitted.

- **Device memory buffers** - measurements are stored locally before transmission (e.g., large buffers in glucose meters vs. smaller buffers in thermometers)
- **Technical handshake timestamps** - the first device-gateway connection assigns a historical timestamp (e.g., 2014) to the reading before network time synchronization
- **Buffer retransmission** - stored measurements are retransmitted when a device connects to a new gateway, potentially creating short bursts of data traffic

**Key insight:** Device logic is largely invisible to clinicians but can affect the timing and order in which measurements appear in clinical systems.

### 4 Operational Workflows

Operational workflows influence how monitoring kits are prepared, deployed, returned, sanitized, and reused in Hospital-at-Home programs.

- **Kit preparation** - preparing multiple monitoring kits simultaneously can lead to unintended device-gateway connections and buffer unloading
- **Gateway assignment** - changing the gateway associated with a kit triggers retransmission of stored measurements, temporarily increasing transmission load
- **Device redeployment** - redeploying devices without clearing their memory may cause historical measurements to be retransmitted when multiple gateways are switched on during onboarding

**Key insight:** Reliable remote monitoring depends not only on technology but also on well-defined operational procedures that maximize IoT data collection once devices are deployed in patients' homes.

## M+edisanté



### 2 Device-Patient Interaction

Connected medical devices rely on correct patient interaction for measurements to be captured and transmitted reliably. Several device-patient interaction edge cases were observed during deployment.

- **Blood pressure monitor switched off too early** - switching off the device after measurement may interrupt transmission to the gateway
- **Cold fingers during pulse oximetry** - poor peripheral circulation may prevent a stable signal, while rubbing the finger improves detection
- **Glucose meter test strip removed prematurely** - removing the strip without using the auto-ejector button prevents transmission of the reading
- **Infrared thermometer positioning** - pressing the button away from the forehead triggers a room temperature reading instead of body temperature, which is not transmitted by the gateway

**Key insight:** Small variations in device handling or patient physiology can affect measurement transmission and data availability.

### 3 Gateway Environment

The telehealth gateway creates the communication environment in which connected BLE medical devices transmit measurements.

- **Unlinked auto-pairing** - BLE devices automatically connect to any gateway in range, enabling flexible kit assembly without manual pairing or device linking in M+Hub
- **Gateway switching** - when a device connects to a new gateway, stored measurements are retransmitted and handled as duplicates by M+Hub
- **Multiple gateways active** - several gateways switched on during kit preparation or patient onboarding can trigger unintended device-gateway connections

**Key insight:** Gateway environments influence how devices connect and how measurements are transmitted, and unlinked auto-pairing enables flexible monitoring kit deployment across care pathways.

### DO

- Assign devices and gateway during patient onboarding
- Use the same gateway for each monitoring kit deployed
- Monitor expected measurements in the clinical platform

### DON'T

- Prepare multiple kits with gateways switched on
- Reassign gateways without clearing device memory
- Ignore missing measurements during acute monitoring

A dedicated device interoperability and management layer allows clinical teams to focus on patient care instead of managing device complexity