Below is a simplified safety case for a Generic Patient-Controlled Analgesia (GPCA) system, formatted in a hierarchical tree structure using Goal Structuring Notation (GSN):

1. \*\*Top-Level Safety Goal\*\*

- G1: Ensure that the GPCA system is safe for patient use.

2. \*\*Contexts\*\*

- C1: The GPCA system is used for delivering controlled doses of analgesics to patients.

- C2: The system will be used in various healthcare settings including hospitals and clinics.

3. \*\*Assumptions\*\*

- A1: The patients using the GPCA system have valid prescriptions.

- A2: Healthcare professionals are trained in the use of the GPCA system.

4. \*\*Strategies\*\*

- S1: Decompose the safety goal into specific safety requirements.

- S1.1: Safety requirements related to software functionality.

- S1.2: Safety requirements related to hardware components.

- S1.3: Safety requirements related to user interactions.

5. \*\*Safety Requirements\*\*

- SR1: The software must perform accurate dose calculations.

- G2: Verify that the GPCA software calculates doses accurately.

- E1: Test results showing accuracy of dose calculations.

- SR2: The system must alert users to potential errors.

- G3: Ensure the GPCA system provides clear and timely alerts.

- E2: User test results demonstrating effective alerts.

- SR3: The hardware must operate reliably under normal conditions.

- G4: Validate the reliability of hardware components.

- E3: Hardware reliability test results.

- SR4: The system must allow for easy user interface interaction.

- G5: Confirm the effectiveness and clarity of the user interface.

- E4: User interface usability studies.

6. \*\*Justifications\*\*

- J1: The dose calculation algorithm is based on clinically verified formulas.

- J2: Alert mechanisms are based on standard medical safety requirements.

7. \*\*Inferences\*\*

- I1: Satisfying all the safety requirements (SR1, SR2, SR3, SR4) will fulfill the top-level safety goal (G1) with provided contexts, assumptions, justifications, and evidence.

This assurance case outlines how each part of the GPCA system contributes to overall safety, from specific requirements and verification goals to strategic decomposition and evidence of safety measures. Each component of the tree structure explains a specific aspect of the safety argument, showing dependencies and support mechanisms to assure the safety of the GPCA system.