To instantiate the safety case pattern with placeholders replaced by specific details from the domain information about the Generic Patient-Controlled Analgesia (GPCA) system, we will use details about hazards, contexts, and strategies. Here is the instantiated hierarchical tree format for the safety case:

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- Goal (G1, Operational safety is verified in GPCA system)

- Strategy (S1, Argument over the satisfaction of all specs over GPCA system [UNDEVELOPED])

- Goal (G2, All operational hazards are mitigated)

- Strategy (S2, Argument over reliability in all suitable levels of GPCA system [UNDEVELOPED])

- Strategy (S3, Argument over operational hazards)

- Goal (G3, Overinfusion is mitigated)

- Goal (G3, Underinfusion is mitigated)

- Strategy (S4, Argument over the applied scenarios of Overinfusion)

- Goal (G4, Overinfusion is mitigated under excess bolus requests scenario)

- Strategy (S5, Argument over all specs related to excess bolus requests scenario)

- Goal (G5, Flow rate sensor is appropriate for excess bolus requests scenario)

- Strategy (S6, Argument the appropriateness of flow rate sensor over properties)

- Goal (G6, Period to trigger the underinfusion alarm is appropriate for flow rate sensor)

- Strategy (S7, Argument over the source of the period definition)

- Goal (G7, FDA standard is appropriate and trustworthy)

- Solution (Sn1, FDA standard document provided)

- Goal (G8, Period definition is sufficient)

- Solution (Sn2, Technical report on period measurement accuracy)

- Context (C6, Source is given by property.source)

- Context (C2, Operational hazards are given by operational hazard.allInstances())

- Context (C4, All related specs are given by scenario.spec.allinstances())

- Context (C5, Properties are given by spec.property.allinstances())

- Context (C3, All related scenarios are given by operational hazard.scenarios)

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\*\*Explanation and Breakdown of Each Level:\*\*

- \*\*G1\*\*: Confirms that the overall operational safety of the GPCA system is verified.

- \*\*S1\*\*: Broad strategy covering all specifications for the GPCA system, marked as undeveloped (placeholder yet to be fully specified).

- \*\*G2\*\*: Ensures that hazards like overinfusion and underinfusion are addressed.

- \*\*S3\*\*: Discusses mitigation strategies specifically for identified hazards.

- \*\*G3\*\*: Instantiates twice, once for each hazard type — overinfusion and underinfusion.

- \*\*S4\*\*: Focuses on scenarios applicable to each hazard.

- \*\*G4\*\*: Assesses hazard mitigation under specific conditions such as excessive bolus requests.

- \*\*S5\*\*: Evaluates necessary specifications concerning the given scenario.

- \*\*G5\*\*: Checks for appropriateness of specific system components.

- \*\*S6\*\*: Discusses how specified properties meet required conditions.

- \*\*G6\*\*: Looks at whether crucial settings for system components are suitable.

- \*\*S7\*\*: Assesses credibility and sufficiency of the data sources defining key system properties.

- \*\*G7 & G8\*\*: Address reliability and accuracy from the source and definition perspectives.

This tree structure cascade represents how the safety case for the GPCA is constructed step by step, addressing each essential component using the information provided about hazards, scenarios, and safety requirements, and involving documents like FDA standards where relevant.