To instantiate the given safety case pattern for a Generic Patient-Controlled Analgesia (GPCA) system, we first need to replace the placeholders with specific information about hazards such as "Overinfusion" and "Underinfusion," relevant safety requirements, and scenarios as provided in the domain information.

Below is the instantiated safety case in a hierarchical tree format.

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- G1: Operational safety is verified in GPCA system

- S1: Argument over the satisfaction of all specs over GPCA system (undeveloped)

- G2: All operational hazards are mitigated

- S3: Argument over operational hazards

- G3: Overinfusion is mitigated

- S4: Argument over the applied scenarios of Overinfusion

- G4: Overinfusion is mitigated under scenario where bolus volume/concentration too high

- S5: Argument over all specs related to this scenario

- G5: Flow rate sensor is appropriate for this scenario

- S6: Argument the appropriateness of Flow rate sensor over properties

- G6: Period to trigger the overinfusion alarm is appropriate for Flow rate sensor

- S7: Argument over the source of the Period definition

- G7: Source, FDA standard, is appropriate and trustworthy

- Sn1: Expertise opinion confirms FDA standard

- G8: Period definition is sufficient

- Sn2: Period defined as 15 minutes

- G3: Underinfusion is mitigated

- S4: Argument over the applied scenarios of Underinfusion (same decorative strategy as Overinfusion)

- G4: Underinfusion is mitigated under scenario where programmed rate too low

- S5: Argument over all specs related to programmed rate scenario

- G5: Flow rate sensor is appropriate for programmed rate scenario

- S6: Argument the appropriateness of Flow rate sensor over properties

- G6: Flow rate less than 90% of the programmed rate is appropriate for Flow rate sensor

- S7: Argument over the source of the Flow rate property

- G7: Source, Expertise opinion, is appropriate and trustworthy

- Sn1: Expertise opinion based on previous knowledge confirms property definition

- G8: Flow rate property definition is sufficient

- Sn2: Validated through testing

- S2: Argument over reliability in all suitable levels of GPCA system (undeveloped)

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\*\*Incontext Statements:\*\*

- S1, C1: All specs are given by allInstances() of the specs for GPCA.

- S3, C2: Operational hazards are specified by allInstances() for GPCA hazards.

- S4, C3: All related scenarios are accounted for each operational hazard.

- S5, C4: All related specs are detailed for each scenario.

- S6, C5: Properties detailed for each spec.

- S7, C6: The source is detailed for each property.