To instantiate the given safety case pattern for the GPCA (Generic Patient-Controlled Analgesia) system, I will replace placeholders and remove additional decorators. Here's how the instantiated safety case would look in a hierarchical tree format using dashes (-) to denote different levels.

### Hierarchical Tree Format

- G1: Operational safety is verified in the GPCA system

- C1: All specs are given by spec.allInstances()

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

- Undeveloped

- G2: All operational hazards are mitigated

- S3: Argument over operational hazards

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

- G3: Overinfusion is mitigated

- S4: Argument over the applied scenarios of Overinfusion

- C3: All related scenarios are given by Overinfusion

- G4: Overinfusion is mitigated under Scenario 1

- S5: Argument over all specs related to Scenario 1

- C4: All related specs are given by scenario.spec.allInstances()

- G5: SR1.1 is appropriate for Scenario 1

- S6: Argument the appropriateness of SR1.1 over properties

- C5: Properties are given by spec.property.allInstances()

- G6: Flow rate sensor property is appropriate for SR1.1

- S7: Argument over the source of the Flow rate sensor definition

- C6: Source is given by property.source

- G7: FDA standard is appropriate and trustworthy

- Sn1: FDA standard

- G8: Flow rate sensor definition is sufficient

- Sn2: Flow rate sensor

- G4: Overinfusion is mitigated under Scenario 2

- [Similar structure as Scenario 1]

- G3: Underinfusion is mitigated

- S4: Argument over the applied scenarios of Underinfusion

- C3: All related scenarios are given by Underinfusion

- G4: Underinfusion is mitigated under Scenario 1

- S5: Argument over all specs related to Scenario 1

- C4: All related specs are given by scenario.spec.allInstances()

- G5: SR1.2 is appropriate for Scenario 1

- S6: Argument the appropriateness of SR1.2 over properties

- C5: Properties are given by spec.property.allInstances()

- G6: 15 minute trigger period is appropriate for SR1.2

- S7: Argument over the source of the 15 minute trigger period definition

- C6: Source is given by property.source

- G7: Expertise opinion is appropriate and trustworthy

- Sn1: Expertise opinion

- G8: 15 minute trigger period definition is sufficient

- Sn2: Trigger period

- G4: Underinfusion is mitigated under Scenario 2

- [Similar structure as Scenario 1]

### Detailed Instantiation Breakdown

#### Top-Level Goal

\*\*G1:\*\* Operational safety is verified in the GPCA system.

\*\*IncontextOf:\*\*

- \*\*C1:\*\* All specs are given by spec.allInstances()

\*\*SupportedBy:\*\*

- \*\*S1:\*\* Argument over the satisfaction of all specs over the GPCA system (Undeveloped)

- \*\*G2:\*\* All operational hazards are mitigated

#### Strategies & Goals for Hazards

\*\*S3:\*\* Argument over operational hazards

\*\*IncontextOf:\*\*

- \*\*C2:\*\* Operational hazards are given by operational hazard.allInstances()

\*\*SupportedBy:\*\*

- \*\*G3:\*\* Overinfusion is mitigated

- \*\*G3:\*\* Underinfusion is mitigated

### Instantiate Subgoals for Each Identified Operational Hazard

#### Goal for Overinfusion

\*\*G3:\*\* Overinfusion is mitigated.

\*\*SupportedBy:\*\*

- \*\*S4:\*\* Argument over the applied scenarios of Overinfusion

\*\*IncontextOf:\*\*

- \*\*C3:\*\* All related scenarios are given by Overinfusion

#### Goal for Overinfusion Under a Scenario

\*\*G4:\*\* Overinfusion is mitigated under Scenario 1.

\*\*SupportedBy:\*\*

- \*\*S5:\*\* Argument over all specs related to Scenario 1

\*\*IncontextOf:\*\*

- \*\*C4:\*\* All related specs are given by scenario.spec.allInstances()

### Arguments and Context for Specs

\*\*G5:\*\* SR1.1 is appropriate for Scenario 1.

\*\*SupportedBy:\*\*

- \*\*S6:\*\* Argument the appropriateness of SR1.1 over properties

\*\*IncontextOf:\*\*

- \*\*C5:\*\* Properties are given by spec.property.allInstances()

### Check Appropriateness of Properties

\*\*G6:\*\* Flow rate sensor property is appropriate for SR1.1.

\*\*SupportedBy:\*\*

- \*\*S7:\*\* Argument over the source of the Flow rate sensor definition

\*\*IncontextOf:\*\*

- \*\*C6:\*\* Source is given by property.source

#### Trustworthiness of Source and Property Definition

\*\*G7:\*\* FDA standard is appropriate and trustworthy.

\*\*SupportedBy:\*\*

- \*\*Sn1:\*\* FDA standard

\*\*G8:\*\* Flow rate sensor definition is sufficient.

\*\*SupportedBy:\*\*

- \*\*Sn2:\*\* Flow rate sensor

### Repeated Structure for Underinfusion

Similarly, instantiate goals and strategies for other operational hazards (Underinfusion), following the same hierarchical breakdown and replacing placeholders with specific details pertaining to underinfusion scenarios and specifications.

This instantiated safety case for the GPCA system ensures that all operational hazards such as "Overinfusion" and "Underinfusion" are thoroughly examined, specified, supported, and mitigated, fulfilling the requirements for a safety-critical system.