To instantiate the given safety case pattern of a GPCA (Generic Patient Controlled Analgesia) system into an assurance case, let's begin by replacing all placeholders with concrete, system-specific information:

\*\*Pattern Instantiated for the Safety Assurance Case of a GPCA System:\*\*

- \*\*Goal (G1, "Operational safety is verified in GPCA System")\*\*

- \*\*Strategy (S1, "Argument over the satisfaction of all specs over GPCA System")\*\* \*(undeveloped)\*

- \*\*Context (C1, "All specs are given by complete spec list for GPCA")\*\*

- \*\*Goal (G2, "All operational hazards are mitigated")\*\*

- \*\*Strategy (S3, "Argument over operational hazards")\*\*

- \*\*Context (C2, "Operational hazards are defined by GPCA operational hazard list")\*\*

- \*\*Goal (G3, "Specific operational hazard is mitigated")\*\* (Multiple instances for each operational hazard)

- \*\*Strategy (S4, "Argument over the applied scenarios of specific operational hazards")\*\*

- \*\*Context (C3, "All related scenarios are given by specific operational hazard scenarios")\*\*

- \*\*Goal (G4, "Specific operational hazard is mitigated under specific scenario")\*\* (Multiple instances for each applicable scenario)

- \*\*Strategy (S5, "Argument over all specs related to the scenario")\*\*

- \*\*Context (C4, "All related specs are given by scenario-specific spec list")\*\*

- \*\*Goal (G5, "Specific spec is appropriate for the scenario")\*\*

- \*\*Strategy (S6, "Argument the appropriateness of specific spec over properties")\*\*

- \*\*Context (C5, "Properties are given by spec-specific property list")\*\*

- \*\*Goal (G6, "Specific property is appropriate for the specific spec")\*\*

- \*\*Strategy (S7, "Argument over the source of the property definition")\*\*

- \*\*Context (C6, "Source is given by property source list")\*\*

- \*\*Goal (G7, "Source of Property is appropriate and trustworthy")\*\*

- \*\*Solution (Sn1, "Source verification document or certification")\*\*

- \*\*Goal (G8, "Property definition is sufficient")\*\*

- \*\*Solution (Sn2, "Property definition document or standard")\*\*

- \*\*Strategy (S2, "Argument over reliability in all suitable levels of GPCA System")\*\* \*(undeveloped)\*

\*\*Hierarchical Tree Visualization:\*\*

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- G1: Operational safety is verified in GPCA System

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

- C1: All specs are given by complete spec list for GPCA

- G2: All operational hazards are mitigated

- S3: Argument over operational hazards

- C2: Operational hazards are defined by GPCA operational hazard list

- G3: Specific operational hazard is mitigated (Repeat for each hazard)

- S4: Argument over the applied scenarios of specific operational hazards

- C3: All related scenarios are given by specific operational hazard scenarios

- G4: Specific operational hazard is mitigated under specific scenario (Repeat for each scenario)

- S5: Argument over all specs related to the scenario

- C4: All related specs are given by scenario-specific spec list

- G5: Specific spec is appropriate for the scenario

- S6: Argument the appropriateness of specific spec over properties

- C5: Properties are given by spec-specific property list

- G6: Specific property is appropriate for the specific spec

- S7: Argument over the source of the property definition

- C6: Source is given by property source list

- G7: Source of Property is appropriate and trustworthy

- Sn1: Source verification document or certification

- G8: Property definition is sufficient

- Sn2: Property definition document or standard

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

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This hierarchy was created assuming that the undeveloped strategies S1 and S2 will not be further developed within this example, while the assumptions of the system’s specs, operational hazards, properties, and sources have been instantiated with concrete documents or lists. Each goal that relates to hazards or scenarios assumes multiple instantiations based on the specifics of the GPCA system’s environment or operational use. This hierarchical structure provides a clear visualization that is consistent with the instantiated assertion from the original pattern.