7.1.2 Clinical Decision Support

Clinical decision support systems (CDSS) are designed to assist clinicians at the point of care on decision making tasks. Examples of applications of clinical decision support include:

- Checking conformance with clinical guidelines and protocols
- Guide clinicians through complex care pathways
- Protect against errors in prescribing (e.g. drug-drug and allergy-drug contraindication checking)
- Highlight critical laboratory results
- Display clinical knowledge resources upon request, that are relevant to the given patient's diagnosis, symptoms, procedures or medications

Most CDSSs consist of three parts:

1. The knowledge base, with rules and guidelines – for example:
   - IF drug = << 48603004 \textit{warfarin} AND 77386006 \textit{pregnant} THEN alert user
   - IF drug has active ingredient = \textit{codeine} AND past history of 292055008 \textit{codeine adverse reaction} THEN alert user
   - IF diagnosis = << 195967001 \textit{asthma} THEN display Asthma Management Guidelines

2. The inference engine, which uses the data from the patient record to determine which rules from the knowledge base should be executed – for example:
   - When a patient, with finding 77386006 \textit{pregnant} is prescribed 375374009 \textit{warfarin sodium 4mg tablet}, the inference engine triggers Rule a. above.
   - When a patient, with past history of 292055008 \textit{codeine adverse reaction} is prescribed 412575004 \textit{aspirin 325mg/codeine 30mg tablet}, the inference engine triggers Rule b. above.
   - When a patient's primary diagnosis is entered as "195949008 \textit{chronic asthmatic bronchitis}" the inference engine triggers Rule c. above.

3. A mechanism to communicate, which allows the system to display alerts or clinical knowledge to the user

Using a combination of SNOMED CT techniques, including mapping, subsets, subsumption and defining relationships, SNOMED CT helps to support the inference engine in determining the appropriate rules to execute.

For example, Kaiser Permanente's HealthConnect system uses SNOMED CT to support efficient translation of its business rules into decision support rules. The National Board of E-Health in Denmark is developing a centralized decision support service based on the Danish SNOMED CT drug extension, which utilizes the hierarchical and defining relationships of SNOMED CT.

A number of commercial tools also use the capabilities of SNOMED CT to implement Clinical Decision Support. For example, Cambio's COSMIC tool binds GDL (Guideline Definition Language) rules to SNOMED CT concepts to support the triggering of appropriate rules. Allscripts' Sunrise InfoButton™ feature provides relevant medical reference content to clinicians wherever patient care decisions are made, by using SNOMED CT encoded patient problem lists and medication data to query third-party medical content. The Epic system provides decision support alerts (called 'Best Practice Advisories'), which are able to use the SNOMED CT hierarchy to help define their criteria. And First DataBank delivers clinical decision support solutions linked to SNOMED CT, primarily to detect safety issues arising from certain combinations of medications, diagnoses and drug adverse reaction histories.