## Recommended Action

**DDI minimum information models definitions**

<https://docs.google.com/spreadsheets/d/1dhUp496riwZ0AHqRP7I85oEvuP2jjEI0rcw1Fcm2zI8/edit#gid=0>

### Proposed User-Centered Definition (Qualtrics)

**Recommended Action:**

Evidence-based strategy to mitigate the potential clinical consequences of a drug-drug interaction; e.g., use only if benefit outweighs risk, assess risk and take action if necessary, no special precautions.

**For example:**

* **No precaution**: “In patients on beta-blockers who are actually in anaphylaxis, administration of epinephrine tends to have very little (positive or negative) effects. So there is general consensus that epinephrine should be given to treat anaphylaxis, but one should also be ready to use alternative measures (fluids, etc.) if the response to the epinephrine is inadequate” (Footnote 5)
* **Use only if benefit outweighs risk**: “When a systemic dose of epinephrine is given to a person on one of these nonselective beta-blockers, an acute hypertensive reaction is almost certain. Systolic BPs of 250 mm/Hg are not uncommon. Most people can probably withstand a short episode of such a hypertensive reaction without permanent sequelae, but strokes have occurred in susceptible patients. Thus, it is best to avoid this reaction if possible. If a patient is likely to receive systemic epinephrine, it would be prudent to use a cardioselective beta-blocker” (Footnote 7)
  + **Source**: Beta-blocker - Epi Decision Table, NIH Project: R21-HS023826-01; Title: Individualized Drug Interaction Alerts; Authors: Daniel C. Malone , University of Arizona; John Horn, Philip Hansten, University of Washington
* **No precaution**: “If the NSAID is being used as an analgesic or antipyretic, it would be prudent to use an alternative such as acetaminophen. In some people, acetaminophen can increase the anticoagulant effect of warfarin, so monitor the INR if acetaminophen is used in doses over 2 g/day for a few days. For more severe pain consider short-term opioids in place of the NSAID.“
  + **Source**: Footnote 2 to Warfarin-NSAID Decision Table, NIH Project: R21-HS023826-01; Title: Individualized Drug Interaction Alerts; Authors: Daniel C. Malone , University of Arizona; John Horn, Philip Hansten, University of Washington

**Background Information:**

* **ORCA**: OpeRational ClassificAtion of Drug Interactions
  + **Class 1: Contraindicated**
    - No situations have been identified where the benefit of the combination outweighs the risk
    - Action: **Avoid Combination** (Risk of combination outweighs benefits)
  + **Class 2: Provisionally Contraindicated**
    - The combination increases the risk of adverse effects. Avoid concurrent use unless the interaction is desired or no alternative is available. I the combination is used, increased monitoring may be necessary.
    - Alternate: **Usually Avoid Combination** (Use only under special circumstances)
  + **Class 3: Conditional**
    - Risk may be increased, depending on the clinical situation. Assess risk and take action as needed.
    - Alternate: **Minimize Risk** (Assess risk and take one or more of the following actions if needed:
      * Consider alternatives
      * Circumvent
      * Monitor?
  + **Class 4: Minimal Risk**
    - Risk of adverse outcome appears small. No special precautions appear necessary.
    - Alternate: **No Special Precautions** (Risk of adverse outcome appears small)
  + **Class 5: No Interaction**
    - Evidence suggests that the drugs do not interact
    - Alternate: **Ignore** (Evidence suggests that the drugs do not interact)
  + Hansten PD, Horn JR, Hazlet TK. ORCA: OpeRational ClassificAtion of Drug Interactions. J Am Pharm Assoc. 2001;41:161-5.
  + Actions: Hansten PD, Horn JR. Top 100 Drug Interactions 2015: A Guide to Patient Management. 2015 ed. Freeland, WA: H&H Publications, LLC; 2015:vi.
* **DIDEO:**
  + **Drug-drug interaction management option**: A plan specification that specifies processes to prevent or mitigate a drug-drug interaction
    - **Comment**: An instance of this entity would represent an optional recommendation for the clinical management of patients who are exposed or about to be exposed to a potential DDI. Management options may be generated by expert opinion, consensus, and/or a review and synthesis of relevant evidence
* **DINTO**: Data properties:
  + **has dose recommendation** (""change dose schedule"" , ""decrease from baseline"" , ""increase from baseline"" , ""no change necessary"" , ""use specific dose""),
  + **has drug selection recommendation** ({""add medication"" , ""change administration route"" , ""no change necessary"" , ""not-restart"" , ""use alternative""}),
  + **has monitoring recommendation** ({""change monitoring strategy"" , ""not-necessary"" , ""recommended"" , ""required""}), has test recommendation ({""not-necessary"" , ""recommended"" , ""required"" , ""take note it is available""})
  + Adapted from Samwald M, Freimuth R, Luciano JS, Lin S, Powers RL, Marshall MS, et al. An RDF / OWL Knowledge Base for Query Answering and Decision Support in Clinical Pharmacogenetics. Stud Health Technol Inform. 2013;192:539-42.

**Suggested User-Centered Definition (Google Sheets)**

* **Recommended actions(s)**
* List of suggestions for strategies to mitigate potential harm e.g., dose modification, order cancellation, ordering an alternate medication, or monitoring/surveillance actions
  + Locally customizable to take into account formulary and other organizational factors"
* If the seriousness of the interaction dictates that the drugs should not be used together, the clinician must be presented with the option to discontinue one or both medications
  + Accompanied by the strength of the recommendations"
* In DINTO we adopted the model from Samwald et al. (2013) to represents the strategies to manage or avoid DDIs. They are represented as data properties that describe the DDI:
  + has dose recommendation (""change dose schedule"" , ""decrease from baseline"" , ""increase from baseline"" , ""no change necessary"" , ""use specific dose""),
  + has drug selection recommendation ({""add medication"" , ""change administration route"" , ""no change necessary"" , ""not-restart"" , ""use alternative""}),
  + has monitoring recommendation ({""change monitoring strategy"" , ""not-necessary"" , ""recommended"" , ""required""}), has test recommendation ({""not-necessary"" , ""recommended"" , ""required"" , ""take note it is available""})
  + Samwald M, Freimuth R, Luciano JS, Lin S, Powers RL, Marshall MS, et al. An RDF / OWL Knowledge Base for Query Answering and Decision Support in Clinical Pharmacogenetics. Stud Health Technol Inform. 2013;192:539–42.
* The type of recommendation is related to the seriousness of the DDI (and vice versa)
* "An information content entity [an information entity]...
  + To be more specific one could use IAO 'plan specification' as a parent. "