



USING RELATIONSHIPS TO ENABLE CLINICAL DECISION SUPPORT

STEVE SWINSBURG | OCT 2016



Welcome

- ▶ Orion Health
- ▶ Intro to relationships and reference sets
- ▶ Data models from Australia and the UK
- ▶ Drug classes
- ▶ Algorithms we developed
- ▶ Orion Health Clinical Decision Support

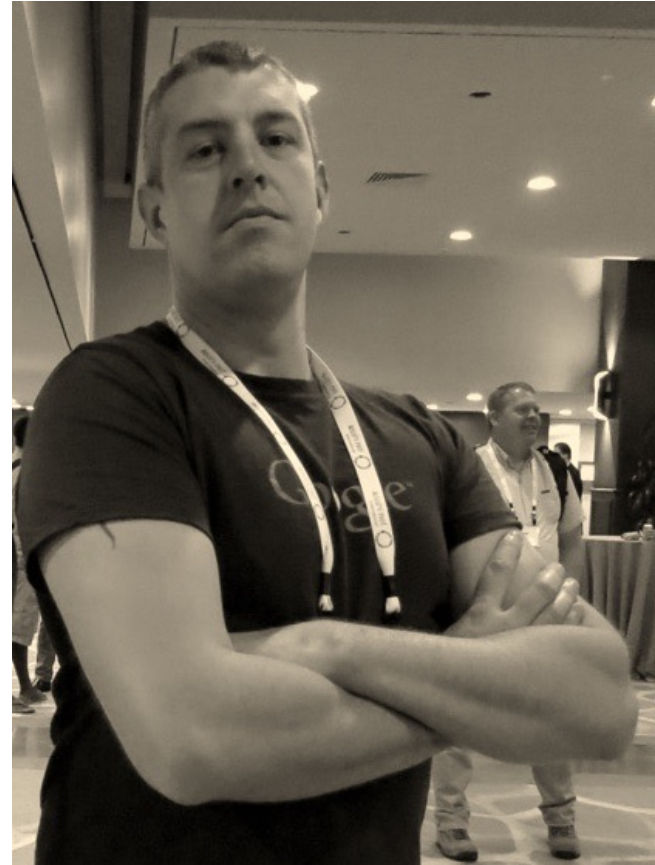


WHO AM I?



Who am I?

- ▶ Responsible for Medicines R&D at Orion Health
- ▶ Previous: Department of Health, Australia and the Pharmaceutical Benefits Scheme
- ▶ 5 years with SNOMED CT
- ▶ Integrations are my thing





Our work

- ▶ Global Drug Model
 - Terminology agnostic medicines data model
 - Currently have support for 7 different terminologies from around the world
 - Customisable
 - Graceful degradation
 - GTINs and alternative codes
 - Powers our Medicines and Problem List products
 - Supports drug classes and cross reactivity
 - FHIR enabled APIs



Our work

- ▶ Clinical Decision Support
 - Duplicate Therapy check
 - Drug allergy check
 - Class, substance or product based
 - Monographs
 - Drug additional information
 - Grouping related drugs
 - **Third party integrations**
 - NZF, FDB, Wolters Kluwer, etc
 - FHIR enabled APIs

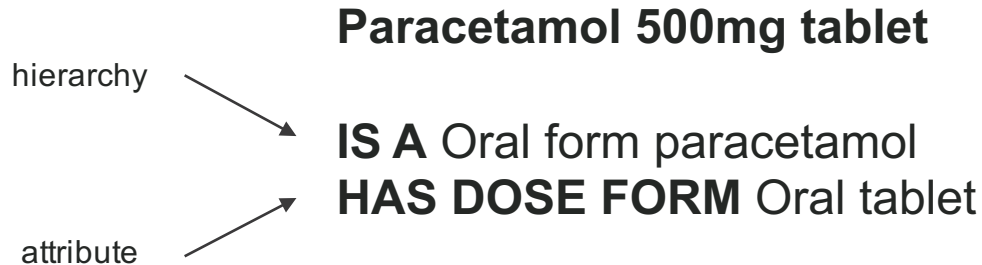


RELATIONSHIPS AND REFSETS



Relationships

- ▶ Concept to concept links
- ▶ Computer processable, massive data set
- ▶ Source, destination, type id, active flag
- ▶ Hierarchy = UP, Attributes = ACROSS



Relationships

Parents

- ● SNOMED CT Concept (SNOMED RT+CTV3)
- ^ ● Pharmaceutical / biologic product (product)
- ^ ● Analgesic (product)
- ^ ● Non-opioid analgesics (product)
- ^ ● Analgesic AND antipyretic product (product)
- ^ ● Acetaminophen (product)
- ● SNOMED CT Concept (SNOMED RT+CTV3)
- ^ ● Pharmaceutical / biologic product (product)
- ^ ☰ Oral dosage form product (product)
- ^ ☰ Oral form paracetamol (product)

● **Paracetamol**
500mg tablet (product) ☆ 📄
SCTID: 322236009

322236009 | Paracetamol
500mg tablet (product) |

Paracetamol 500mg tablet
Paracetamol 500mg tablet (product)
Acetaminophen 500mg tablet

Has active ingredient →
Acetaminophen
Has dose form → Oral tablet

<http://browser.ihtsdotools.org>



Reference sets

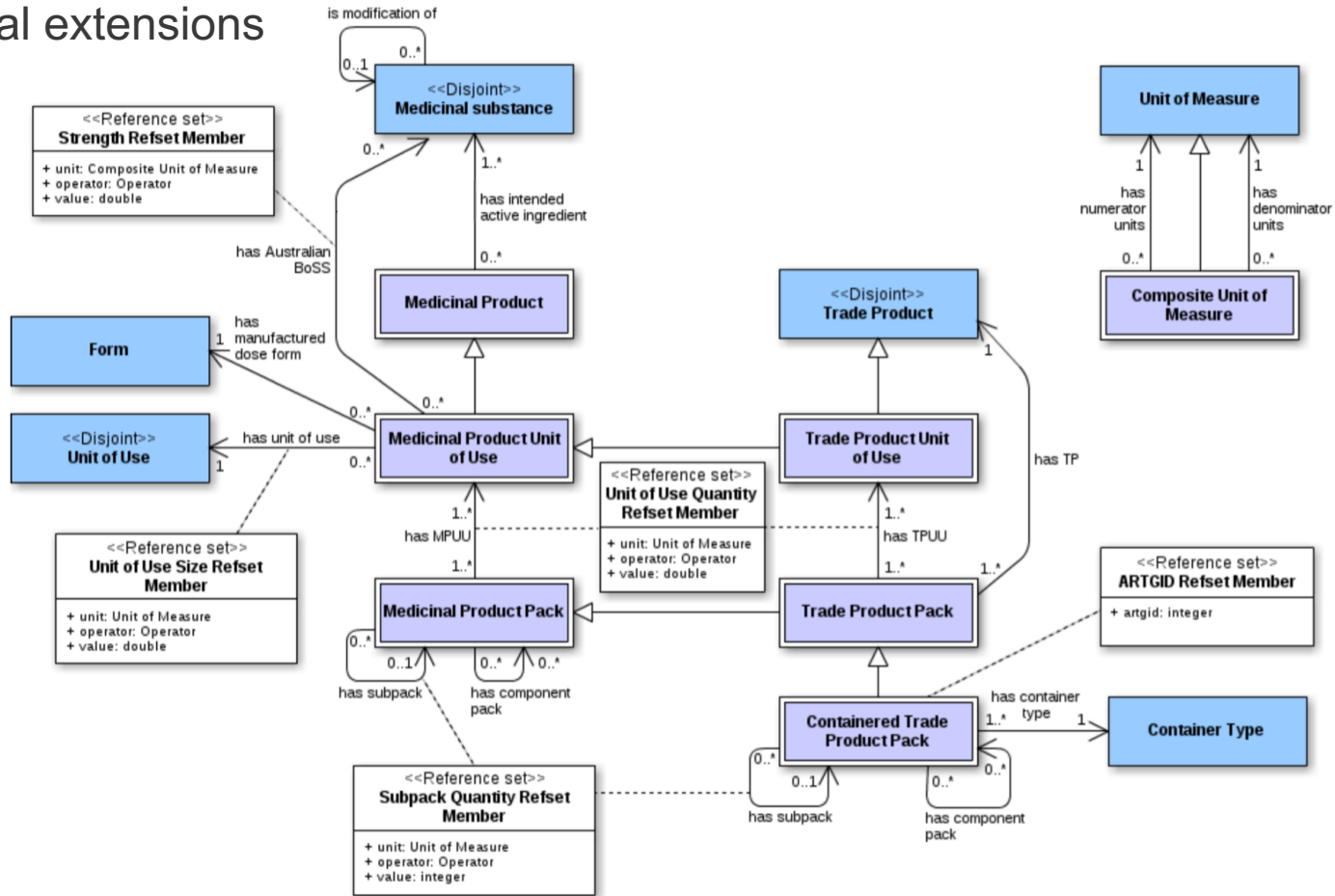
- ▶ Curated list of codes, grouped together for some common purpose
- ▶ Not necessarily in the same hierarchy
- ▶ Examples (from SNOMED CT-AU)
 - Adverse reaction agents (substances and products)
 - Bee venom, sulfur products
 - Clinical manifestations (findings and disorders)
 - Tachycardia, rash



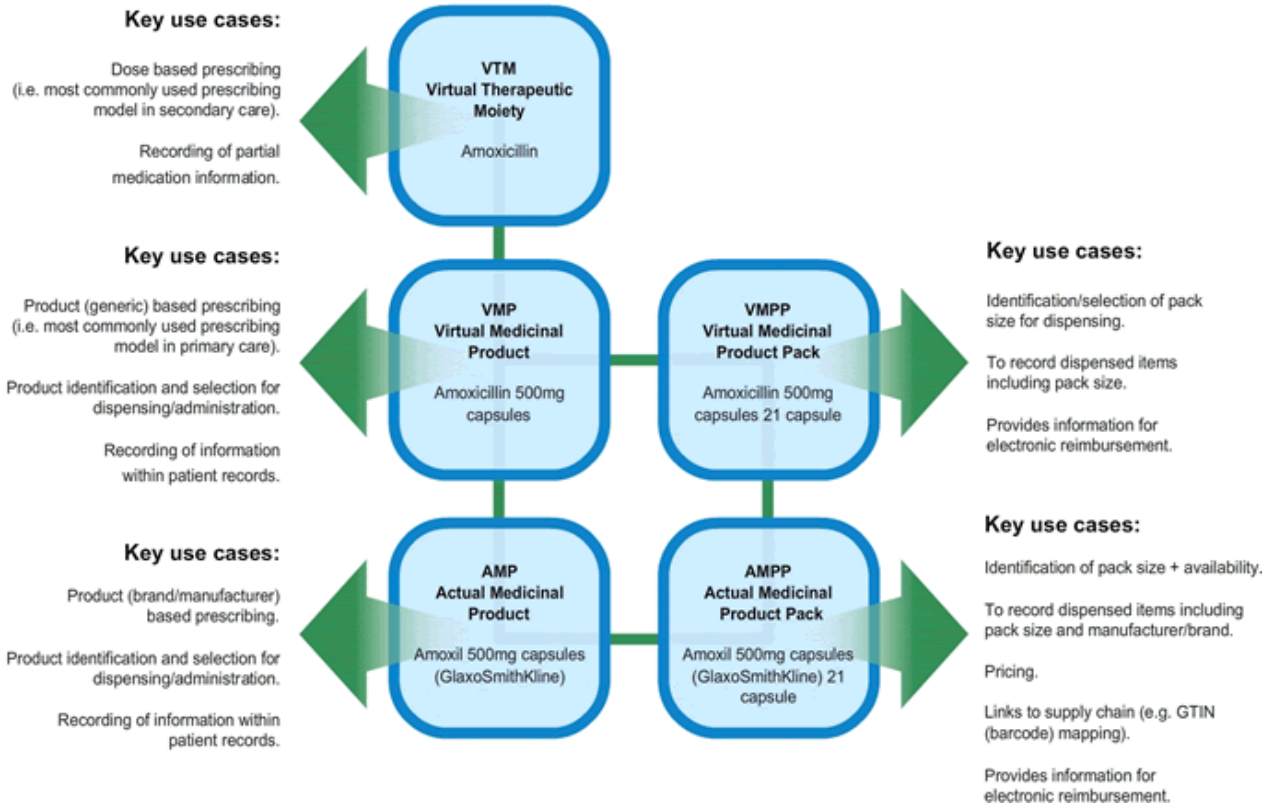
NATIONAL EXTENSIONS



National extensions



National extensions

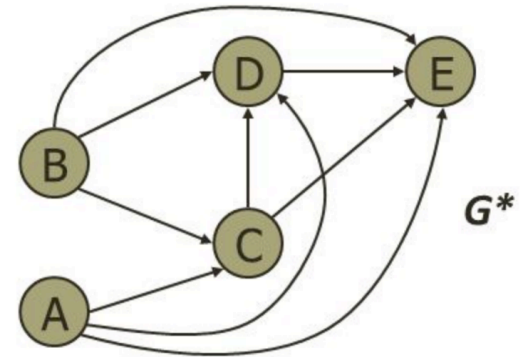
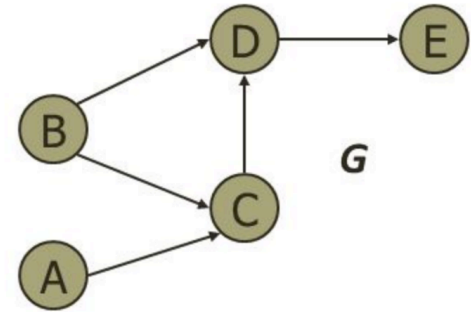


ALGORITHMS



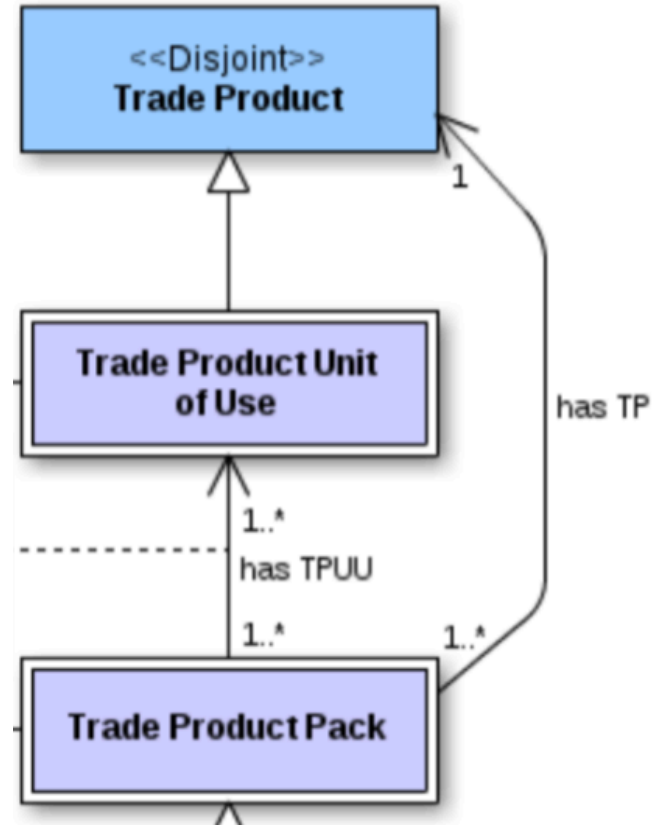
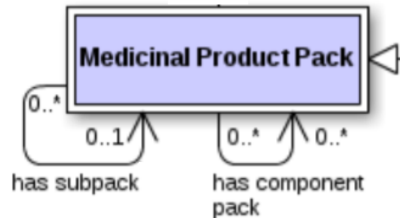
Concept Lineage Algorithm

- ▶ Traverse all of the structural relationships
- ▶ Pick any point in the lineage
- ▶ Instantly determine:
 - Children
 - Ancestors
 - Siblings (sharing common ancestor and of same concept type)
- ▶ Facilitates the change drug workflow – from one brand to another. Resolves common MP then finds siblings.
- ▶ Available via FHIR API



Concept Lineage Algorithm - Issues

- ▶ 'Pigs ear' relationships
- ▶ Deduce salt and base forms
- ▶ Inevitably end up with duplicates
 - Direct links
 - Indirect links
- ▶ Multi ingredient MPs in dm+d
- ▶ Missing data

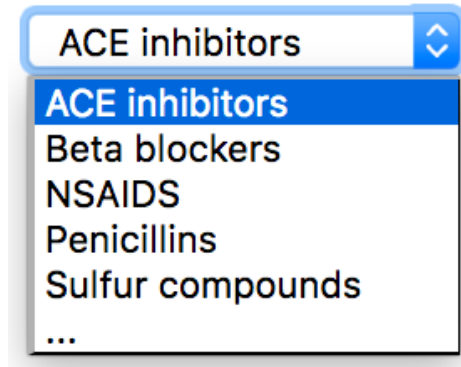


DRUG CLASSES



Drug classes

- ▶ UK - reference set for drug classes (~300)
- ▶ Australia - no official set
- ▶ NZ - NZF drug groups
- ▶ **Refset = list of codes**



Drug classes

- ▶ Overlay this reference set on the SNOMED CT hierarchical relationships
- ▶ Discover all substances in that class
- ▶ Forms the Drug Allergy CDS

● Penicillin -class of antibiotic- (substance)



- ▼ ● Antipseudomonal penicillins (substance)
 - ▶ ● Azlocillin (substance)
 - ▶ ● Carfecillin (substance)
 - ▶ ● Piperacillin (substance)
 - ● Piperacillin + tazobactam (substance)
 - ▶ ● Temocillin (substance)
 - ▶ ● Ticarcillin (substance)
- ▼ ● Broad spectrum penicillins (substance)
- ▼ ● Aminopenicillin (substance)
 - ▼ ● Amoxicillin (substance)
 - ● Amoxicillin sodium (substance)
 - ● Amoxicillin trihydrate (substance)
 - ● Amoxicillin + clavulanate (substance)

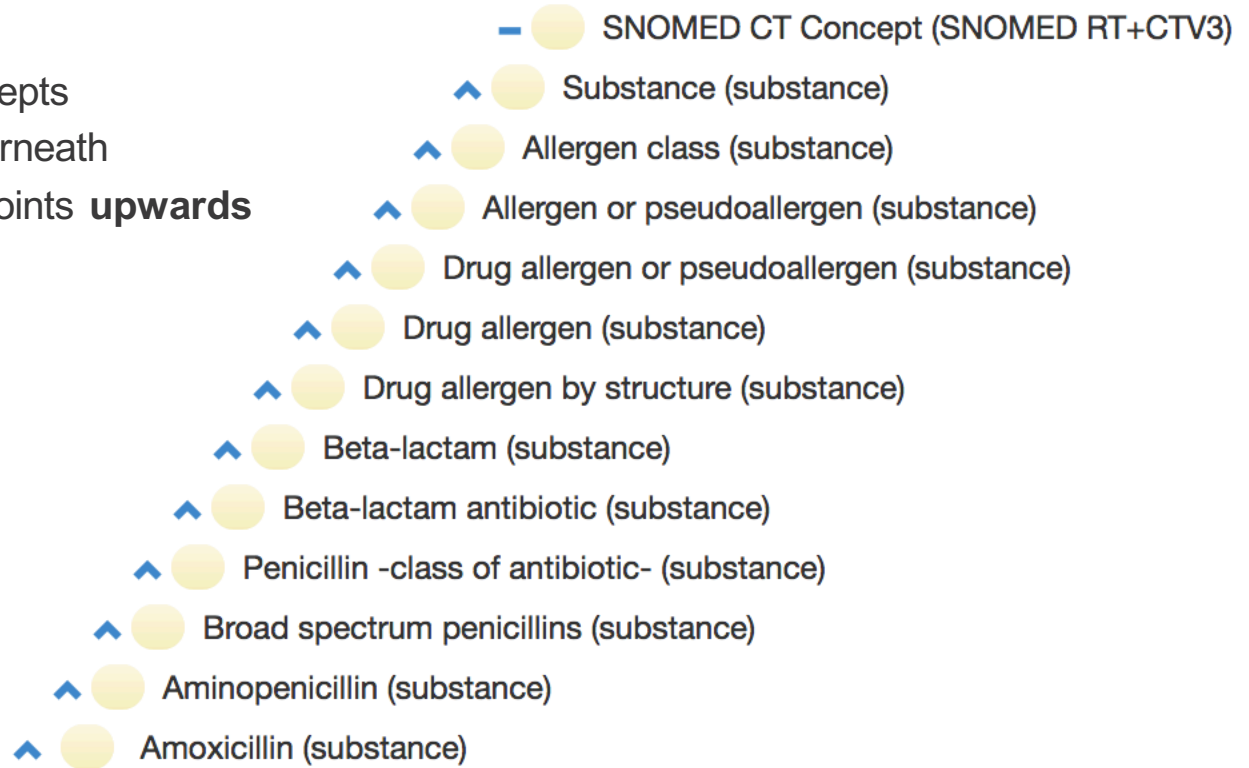


ALGORITHMS



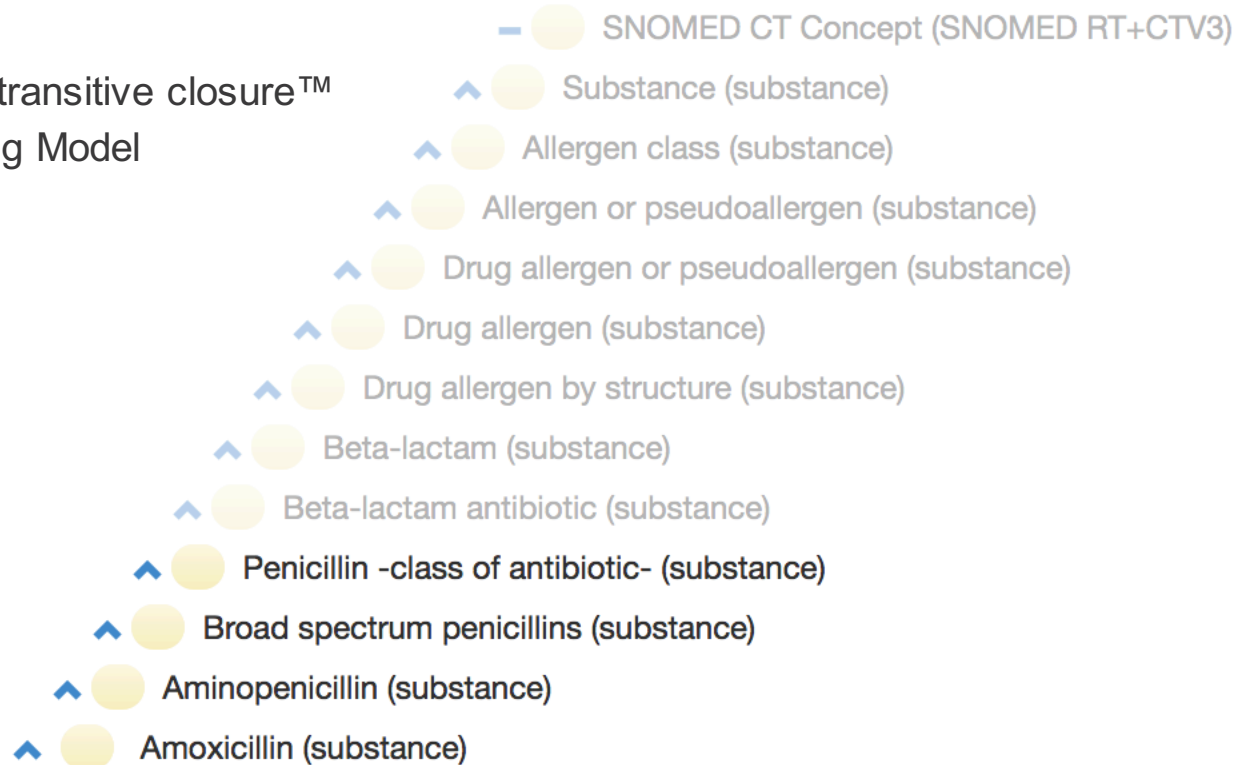
Drug Class Substances Algorithm

- ▶ Arbitrary anchor concepts
- ▶ Want everything underneath
- ▶ But hierarchy (IS A) points **upwards**



Drug Class Substances Algorithm

- ▶ Breadth first inverted transitive closure™
- ▶ Part of the Global Drug Model



**PUTTING IT
TOGETHER**



Orion Health Clinical Decision Support

Medications Summary

Last updated by Example Clinician on 26-Oct-2016 16:33

PRESCRIBED **1**

Paracetamol 500mg / Caffeine 65mg tablets

ORAL 2 tablet three times daily

+ Add Medication

INACTIVE MEDICATIONS (LAST 90 DAYS) **0**

There are no medications recorded.

Add Medication

Drug Sudafed Congestion & Headache Relief Max Strength capsules (McNeil Products

! 2 Drug Alerts [Details](#)

Route *

Indication

Instructions Input drug instructions.

Dose * Unit * capsule

[Change to Free Text](#)

Additional Instructions

Intended Duration

Intended Supply Yes No

Details

Save Cancel

! Duplicate Therapy

Selected Drug

Sudafed Congestion & Headache Relief Max Strength capsules (McNeil Products Ltd)

Duplicate Of

Paracetamol 500mg / Caffeine 65mg tablets

Source Orion Health Global Drug Model

i Contains caffeine

Contains caffeine which may keep you awake at night

Source Orion Health Global Drug Model

[Monograph](#)

Orion Health Clinical Decision Support

- ▶ Links Orion Health Medicines and Problem List
- ▶ Powered by our Global Drug Model
 - Medications and Drug Classes
- ▶ 7 terminologies supported
- ▶ FHIR enabled APIs
 - MedicationStatement
 - Medication
 - Substance
 - DetectedIssue





ORION 
HEALTH
THINKING SOFTWARE FOR LIFE