

Expanding the Mammalian Phenotype Ontology to Meet the Needs of COVID-19 Model Curation

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Abstract

Through the course of the COVID-19 pandemic a wide array of signs and symptoms displayed by patients have been identified. Mouse models of COVID-19 display phenotypes that correlate to many of these signs and symptoms. To capture the phenotypes of these mouse models in the Mouse Genome Informatics database the Mammalian Phenotype (MP) ontology was reviewed to map these symptoms to existing MP terms and add new terms where needed. This review identified over 350 COVID-19 signs and symptoms and resulted in the addition of 127 new MP terms.

Search Approach

bioRxiv / medRxiv

Manual review of COVID-19 archive for papers describing symptoms in cohorts of patients

PubMed

Search using combination of keywords

- “COVID-19”, “SARS-CoV-2” or “2019-nCoV” plus
- “symptoms”, “signs”, “characteristics”, “features”, “manifestations” or “complications”
- Organ system keywords (e.g. “ophthalmological”, “ocular”, “eye” or “vision”) when looking for clinical phenotypes related to specific systems

Mapping to Phenotype Ontologies

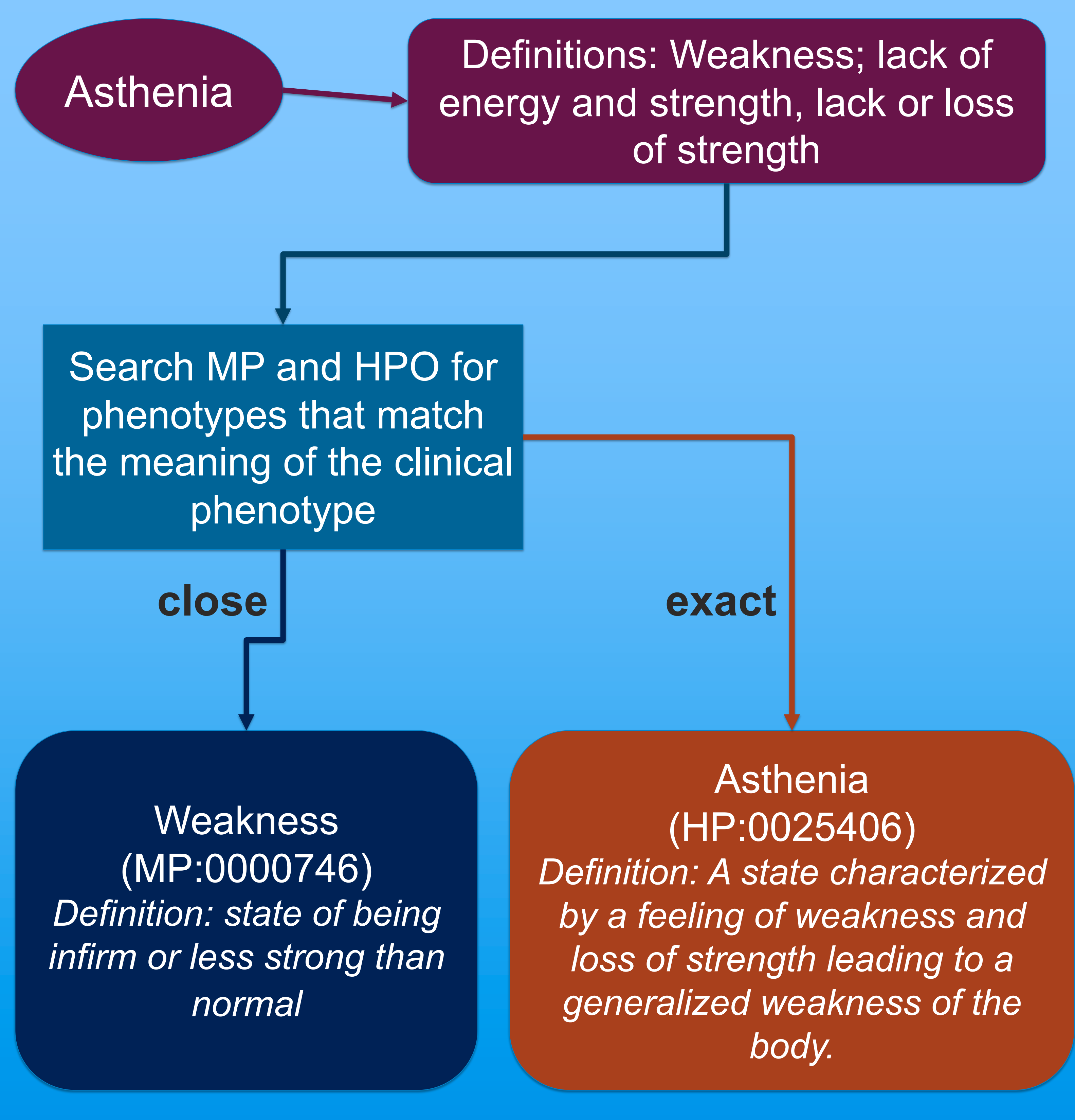


Table 1

Examples of mapping reported COVID-19 symptoms to MP and HPO terms

Reported symptom	MP term (ID)	SKOS Match	HPO term (ID)	SKOS match	Reference
Dyspnea	respiratory distress (MP:0001954)	exact	Dyspnea (HP:0002094)	exact	PMID:32586739
Anosmia	anosmia (MP:0004512)	exact	Anosmia (HP:0000458)	exact	PMID:32464367, PMID:32383370
Fever	increased body temperature (MP:0005533)	broad	Fever (HP:0001945)	exact	PMID:32574165
Interstitial pneumonia	interstitial pneumonia (MP:0001862)	exact	Interstitial pneumonitis (HP:0006515)	exact	PMID:32526193
Hemiparesis	Hemiparesis (MP:0031201)	exact	Hemiparesis (HP:0001269)	exact	PMID:32354768, PMID:32436105
Cephalgia (headache)	No term		Headache (HP:0002315)	exact	PMID:32464367, PMID:32574165
Elevated blood C-X-C motif chemokine ligand 10 level	increased circulating CXCL10 level (MP:0031220)	exact	No term		PMID:32360286, PMID:31986264

Table 2

Examples of new MP terms added for COVID-19 related phenotypes. In many cases inverse terms were added (i.e. increased/decreased pairs) based on MP development guidelines.

Reported symptom	MP Term (ID)	Inverse term
Elevated blood C-X-C motif chemokine ligand 10 level	increased circulating CXCL10 level (MP:0031220)	decreased circulating CXCL10 level (MP:0031219)
Low vitamin K levels	decreased vitamin K level (MP:0031263)	increased vitamin K level (MP:0031264)
Diffuse alveolar damage	diffuse alveolar damage (MP:0031237)	
Hypercoagulability	hypercoagulability (MP:0031214)	
Elevated plasma Angiotensin II level	increased circulating angiotensin II level (MP:0031232)	decreased circulating angiotensin II level (MP:0031231)
Loss of taste (complete)	ageusia (MP:0031090)	
Loss of taste (partial)	hypogeusia (MP:0031091)	
Altered sense of taste	dysgeusia (MP:0031092)	

Primary ticket on the Mammalian Phenotype GitHub:

<https://github.com/mgijax/mammalian-phenotype-ontology/issues/3406>

Other COVID-19 related tickets have the tag

COVID-19

