Comparative Effectiveness Research Opportunities using the OHDSI Network

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BACKGROUND

- Comparative effectiveness research (CER) seeks to identify interventions that work best for which patients under what circumstances.
- The National Academy of Medicine (NAM) recommended a list of 100 CER national priorities[1] , which identified areas of research with potential for the highest impact on patient care and informing the priorities for the Patient-Centered Outcomes Research Institute (PCORI).
- PCORI was established by the Affordable Care Act (ACA) to address the effectiveness of existing drugs and treatments. The impact of PCORI has not yet been fully realized[3] and with funding for PCORI authorized through 2019, conducting CER to address national priorities is crucial.
- The OHDSI multi-stakeholder, interdisciplinary collaborative is well positioned to address CER priorities as it employs a common data model (CDM), standard population estimation and patient level prediction tools, and represents 236 million patient lives across the four data sources utilized in this project (600 million patients lives in total).

OBJECTIVES

- Examine the list of 100 US CER priority topics to determine how many and which could be addressed using the OHDSI platform.
- Estimate the numbers of patients available for study within four US databases currently available in the ATLAS web based cohort building tool.

METHODS

- The list of 100 national priorities for CER was obtained from the website of the health and medicine division of the National Academies of Sciences, Engineering, and Medicine[1].
- Each research priority topic was evaluated by three experts in database research based on availability of critical exposure and endpoint data. 1 year of continuous enrollment was required prior to and after the index date.
- Definitions of the target (T) and comparator exposure(s)(C), and the outcomes(O) were created for each addressable research topic using the cohort definition tool in ATLAS. (Figure 1).

Figure 1. Target (T), Comparator (C), & Outcome (O) Assignment
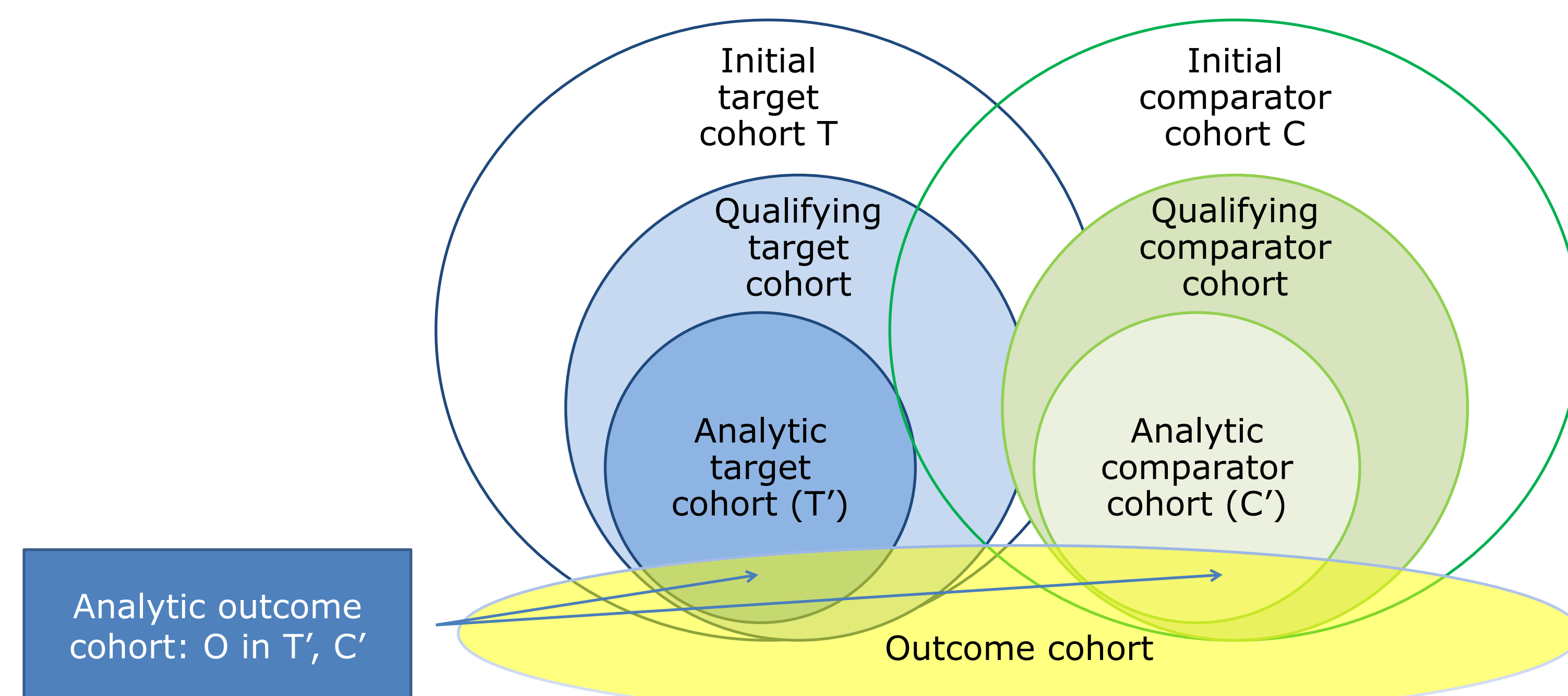
- Addressable research topics were evaluated for use of pharmacological agent and area of research were evaluated for each addressable study.
- Using ATLAS, OHDSI's web based tool[2] and studies in the top quartile, T/C/O cohorts were generated in US (Truven Commercial Claims and Encounters (CCAE), Medicare Supplemental (MDCR), and Medicaid Supplemental (MDCD), and Optum ClinFormatics (United Health Group)) databases to estimate numbers of subjects available for study. (Table 1).

Table 1. Database Descriptions

	Truven CCAE	Truven MDCR	Truven MDCD	Optum ClinFormatics
Patients	131.5MM	9.6MM	21.6MM	74.0MM
Coverage	2000 – 4/2016	2000 – 4/2016	2006 – 2014	2000 - 2016
In / Out-patient	Both	Both	Both	Both
Type	Claims (mostly private)	Claims (private insurance + Medicare claims)	Claims (state Medicaid plans)	Claims (private)
Data	Demographics Diagnosis Procedures Drug dispensings Lab results Health risk assessment	Demographics Diagnoses Procedures Drug dispensings Lab results	Demographics Diagnosis Procedures Drug dispensings	Demographics Diagnosis & procedures Drug dispensings Lab results
Source	US only	US only	US only	US only

- A minimum of 10 subjects were required for an outcome cohort in a study and database to be deemed feasible. The threshold of 10 was selected to ensure sufficient numbers of individuals with outcomes, especially for rare events.

RESULTS

- Among the top 100 NAM CER research priority topics, 35 were determined addressable using the OHDSI platform data and tools.
- T, C, and O assignments were possible for 8 of the 25 CER top quartile topics (Table 2).
- Sufficient numbers of subjects (N≥10) were available for study in one or more of the databases evaluated for the 8 of the 25 CER top quartile topics (Table 2).

Table 2. CER study descriptions, T, C, O assignments, and number of subjects available for 8 of the 25 CER top quartile topics

Research Area	Priority Topic[1]	Description T	Description C	Description O	Database	Number of Subjects T	Number of Subjects C	Number of Subjects O
CV	Compare the effectiveness of treatment strategies for atrial fibrillation including surgery, catheter ablation, and pharmacologic treatment.	catheter ablation procedure in atrial fibrillation patients	selective and non selective beta blocker use[2] in atrial fibrillation patients	ischemic stroke	CCAE	976	150,746	10,673
					MDCR	1,212	290,753	62,177
					MDCD	282	16,466	3,872
					OPTUM	1,627	243,096	43,786
Gastrointestinal disorders	Compare the effectiveness of upper endoscopy utilization and frequency for patients with gastroesophageal reflux disease on morbidity, quality of life, and diagnosis of esophageal adenocarcinoma.	fundoplication procedure in gastroesophageal reflux disease patients	esophagus destructive procedure in gastroesophageal reflux disease patients	esophageal adenocarcinoma	CCAE	15,058	2,253	186
					MDCR	2,847	1043	122
					MDCD	770	552	15
					OPTUM	7,147	1,965	202
Immune System, Connective Tissue, and Joint Disorders	Compare the effectiveness of different strategies of introducing biologics into the treatment algorithm for inflammatory diseases, including Crohn's disease, ulcerative colitis, rheumatoid arthritis, and psoriatic arthritis.	Crohns' patients who use biologic after methotrexate and steroids	Crohns' patients who use methotrexate and steroids	rheumatoid and psoriatic arthritis	CCAE	612	2376	305
					MDCR	67	360	44
					MDCD	121	29	17
					OPTUM	237	1086	152
		Crohns' patients who use biologic after methotrexate	Crohns' patients who use methotrexate	rheumatoid and psoriatic arthritis	CCAE	952	4104	490
					MDCR	98	562	66
					MDCD	47	227	27
					OPTUM	416	1911	265
Oncology and Hematology	Compare the effectiveness of management strategies for localized prostate cancer (e.g., active surveillance, radical prostatectomy [conventional, robotic, and laparoscopic], and radiotherapy [conformal, brachytherapy, proton-beam, and intensity-modulated radiotherapy]) on survival, recurrence, side effects, quality of life, and costs.	Prostatectomy in localized prostate cancer patients	radiotherapy in localized prostate cancer patients	death	CCAE	40,982	24,104	783
					MDCR	15,756	39,835	2,095
					MDCD	803	2,396	164
					OPTUM	25,364	34,873	51
Neurologic Disorders	Compare the effectiveness and costs of alternative detection and management strategies (e.g., pharmacologic treatment, social/family support, combined pharmacologic and social/family support) for dementia in community-dwelling individuals and their caregivers.	cholinesterase inhibitors use by dementia patients	Memantine use by dementia patients	death	CCAE	5,960	816	129
					MDCR	82,446	14,968	5,922
					MDCD	6,672	1,668	587
					OPTUM	58,846	10,813	188
Neurologic Disorders	Compare the effectiveness of pharmacologic and non-pharmacologic treatments in managing behavioral disturbances in people with Alzheimer's disease and other dementias in home and institutional settings.	atypical antipsychotics-risperidone, olanzapine, aripiprazole use by Dementia/Alzheimers patients	typical antipsychotics – haloperidol use by Dementia/Alzheimers patients	death	CCAE	7,375	608	169
					MDCR	48,701	8,930	3,992
					MDCD	7,295	2,067	614
					OPTUM	30,526	6,249	96
Oncology and Hematology	Compare the effectiveness of imaging technologies in diagnosing, staging, and monitoring patients with cancer including positron emission tomography (PET), magnetic resonance imaging (MRI), and computed tomography (CT).	positron emission tomography (PET)[3] in patients with non small cell lung cancer	MRI[3] in patients with non small cell lung cancer	metastases	CCAE	8,540	1,204	1,904
					MDCR	10,764	898	1,398
					MDCD	1,861	179	280
					OPTUM	10,905	1,255	2,131
Oncology and Hematology	Compare the effectiveness of management strategies for ductal carcinoma in situ (DCIS).	lumpectomy in ductal carcinoma in situ (DCIS) patients	lumpectomy followed by radiation in ductal carcinoma in situ (DCIS) patients	breast cancer	CCAE	6214	20170	25,636
					MDCR	2,559	5,805	8,129
					MDCD	355	803	1,135
					OPTUM	4,902	14,875	19,463

[1] Priority topic descriptions as phrased in NAM CER Priority List found here: http://www.nationalacademies.org/hmd/Reports/2009/ComparativeEffectivenessResearchPriorities.aspx
Defined as prescriptions for: [2]please see http://www.rxlist.com/beta_blockers-page3/drugs-condition.htm for discussion regarding difference between selective and non-selective; [3]30 days prior to cancer.
NOTE: all studies generated in 08/2016.

LIMITATIONS

- All T,C,O definitions used in this analysis should be considered preliminary and require clinical input and review.
- Lab results are only available within certain datasets and a subset of individuals, therefore studies requiring lab data may not be generalizable to broader populations.

STRENGTHS

- Use of the common data model allows for feasibility assessment of CER topics in US and ex-US databases, such as CPRD and JMDC.
- This analysis highlights opportunities and illustrates that there are sufficient numbers of subjects to study CER questions using real world data and the OHDSI platform.

CONCLUSIONS

- The OHDSI platform can be used to address approximately 1/3 of the NAM CER priority topics.
- Future CER should capitalize on the OHDSI platform to address these and other studies definable using the T, C, O framework.

POTENTIAL NEXT STEPS

- Assess the likelihood that observational data could generate strong, actionable signals for CER/PCORI.
- Characterize treatment patterns for each of these research areas.

REFERENCES

1. The National Academy of Medicine. [Webpage]. 2016; http://www.nationalacademies.org/hmd/Reports/2009/ComparativeEffectivenessResearchPriorities.aspx, Accessed August 2016.
2. OHDSI ATLAS. [Webpage]. 2016; www.ohdsi.org/web/atlas Accessed August 2016.
3. Emanuel Z, Spiro T, Huelskoetter T. Re-evaluating the patient-centered outcomes research institute. https://cdn.americanprogress.org/wp-content/uploads/2016/05/25103643/PCORI-brief1.pdf.

DISCLOSURES