Real-World Evidence and Post-Marketing Surveillance to Support Treatment and Coverage Decisions

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Executive Director, BBCIC
January 23, 2019
Outline

- It All Started with Generics
- Then Came Biosimilars
- Barriers to Biosimilars
- Data Sources for Decision Makers
- BBCIC: One Approach to Real-World Evidence
It All Started With Generics
History of Generic Drugs in the U.S.

Hatch-Waxman Act

ANDA

Market Exclusivity

1984
1989
2002
2008
2017

33%
53%
72%
90%


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Adverse Events

470 ANDAs filed

1984 1985

1069 ANDAs filed


Investigation by House Energy and Commerce = Multiple convictions of FDA officials, manufacturers, consultants for bribery

Manufacturers discovered to be falsifying data

Generic Drug Enforcement Act

Kesselheim AS. CMAJ 2011;183(12):1350-1351.
Adverse Events

Hatch-Waxman Act

Meanwhile…

Generic Drugs

Market Exclusivity

“Pay-To-Delay”

1984

Kesselheim AS. CMAJ 2011;183(12):1350-1351.
Economic Impact of Generics in the U.S.

- **90%**: Prescriptions filled with generics in 2017
- **23%**: Prescription drug spending attributed to generics
- **$1.6 trillion**: Savings to U.S. healthcare system in the past decade
- **$265 billion**: Savings to the U.S. healthcare system in 2017 alone

[https://accessiblemeds.org/resources/blog/2017-generic-drug-access-and-savings-us-report](https://accessiblemeds.org/resources/blog/2017-generic-drug-access-and-savings-us-report)

www.bbcic.org
Then Came Biosimilars...
Biosimilars in the U.S.

Biologics Price Competition and Innovation Act of 2009 (BPCIA)

abbreviated licensure pathway for biological products shown to be biosimilar to or interchangeable with an FDA-licensed reference product

2010

351(k) Application

www.bbcic.org

www.fda.gov/biosimilars
Requirements for FDA Registration

Demonstrating Biosimilarity → TOTALITY of EVIDENCE

Analytical

- Demonstrate the product is “highly similar” to the reference product

Non-Clinical

- Toxicity

Clinical Pharmacology

- Clinical study to assess immunogenicity and PK/PD showing safety/purity/potency in at least 1 relevant indication

Additional Clinical Studies

- If necessary

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https://www.fda.gov/biosimilars
Biosimilars Approved in US – as of January 2019

- **2015**
  - Zarxio® (filgrastim-sndz)
  - Basaglar® (insulin glargine)*
  - Inflectra® (infliximab-dyyb)
  - Erelzi™ (etanercept-szzs)
  - Amjevita™ (adalimumab-atto)

- **2016**
  - Renflexis® (infliximab-abda)
  - Lisduna™ (insulin glargine)*
  - Cyltezo™ (adalimumab-abdm)
  - Mvasi™ (bevacizumab-awwb)
  - Ogivri™ (trastuzumab-dkst)
  - Admelog® (insulin lispro)*
  - Ixifi™ (infliximab-qbttx)

- **2017**
  - Retacrit® (epoetin alfa-epbx)
  - Fulphila® (pegfilgrastim-jmdb)
  - Nivestym® (filgrastim-aafi)
  - Hyrimoz™ (adalimumab-adaz)

- **2018**
  - Mvasi™ (bevacizumab-awwb)
  - Ogivri™ (trastuzumab-dkst)
  - Admelog® (insulin lispro)*
  - Ixifi™ (infliximab-qbttx)

- **2019**
  - Ontruzant™ (trastuzumab-dttb)
  - Truxima™ (rituximab-abbs)
  - Herzuma™ (trastuzumab-pkrb)

*FDA approval as a follow-on biologic


Biosimilars Approved by EMA – as of December 2018

<table>
<thead>
<tr>
<th>Year of EMA Approval</th>
<th>Biosimilar Product</th>
<th>Reference Product</th>
<th>Number of Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>Somatropin*</td>
<td>Norditropin®</td>
<td>3</td>
</tr>
<tr>
<td>2007</td>
<td>Epoetin alfa</td>
<td>Epogen®</td>
<td>3</td>
</tr>
<tr>
<td>2007</td>
<td>Epoetin zeta</td>
<td>Retacrit®</td>
<td>2</td>
</tr>
<tr>
<td>2013/2014</td>
<td>Follitropin alfa</td>
<td>Gonal-f®</td>
<td>2</td>
</tr>
<tr>
<td>2013/2016/2018</td>
<td>Infliximab</td>
<td>Remidade®</td>
<td>4</td>
</tr>
<tr>
<td>2014/2017/2018</td>
<td>Insulin glargine</td>
<td>Lantus®</td>
<td>3</td>
</tr>
<tr>
<td>2016</td>
<td>Enoxaparin sodium</td>
<td>Lovenox®</td>
<td>2</td>
</tr>
<tr>
<td>2016/2017</td>
<td>Etanercept</td>
<td>Enbrel®</td>
<td>2</td>
</tr>
<tr>
<td>2017/2018</td>
<td>Adalimumab</td>
<td>Humira®</td>
<td>8</td>
</tr>
<tr>
<td>2017</td>
<td>Insulin lispro</td>
<td>Humalog®</td>
<td>1</td>
</tr>
<tr>
<td>2017</td>
<td>Rituximab</td>
<td>Rituxan®</td>
<td>6</td>
</tr>
<tr>
<td>2017</td>
<td>Teriparatide</td>
<td>Forteo®</td>
<td>2</td>
</tr>
<tr>
<td>2017/2018</td>
<td>Trastuzumab</td>
<td>Herceptin®</td>
<td>5</td>
</tr>
<tr>
<td>2018</td>
<td>Bevacizumab</td>
<td>Avastin®</td>
<td>1</td>
</tr>
<tr>
<td>2018</td>
<td>Pegfilgrastim</td>
<td>Neulasta®</td>
<td>5</td>
</tr>
</tbody>
</table>

TOTAL APPROVALS = 58*

*4 (2 filgrastim, 2 somatropin) were withdrawn in 2011, 2012, 2016, 2017
Biosimilar Sales

Sales of Biologics and Biosimilars in the U.S. and Europe

- United States: 59% Biologic Sales, 2% Biosimilar Sales
- Europe: 87% Biologic Sales, 22% Biosimilar Sales
- Japan: 6% Biologic Sales, 7% Biosimilar Sales
- Other: 13% Biologic Sales, 4% Biosimilar Sales

Barriers to Biosimilar Utilization
Factors Influencing U.S. Biosimilar Utilization

Legislation Finally in Place: BPCIA

Criticisms:
- Delay in FDA Guidance
- Slow approvals by FDA
- CMS policy
- FDA naming policy

www.fda.gov
1. Improving the efficiency of the biosimilar and interchangeable product development and approval process;

2. Maximizing scientific and regulatory clarity for the biosimilar product development community;

3. Developing effective communications to improve understanding of biosimilars among patients, clinicians, and payors; and

4. Supporting market competition by reducing gaming of FDA requirements or other attempts to unfairly delay competition.

Factors Influencing U.S. Biosimilar Utilization

BPCIA → Market Tactics

Biosimilars

“Pay-To-Delay”

Contracting

Patent Litigation

2010

Factors Influencing U.S. Biosimilar Utilization

Uncertainty - Prescribers


- **1,201 US physicians** in specialties that are high biologics prescribers
- **75%** trust the FDA approval decisions, but…
- When asked if they believe biosimilars are safe and appropriate for naïve and existing patients…

<table>
<thead>
<tr>
<th>Specialty</th>
<th>Agree Biosimilars are Safe and Appropriate for Naïve and Existing Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>44.8%</td>
</tr>
<tr>
<td>Rheumatology</td>
<td>34.5%</td>
</tr>
<tr>
<td>Dermatology</td>
<td>37.5%</td>
</tr>
<tr>
<td>Gastroenterology</td>
<td>43.8%</td>
</tr>
<tr>
<td>Nephrology</td>
<td>45.5%</td>
</tr>
<tr>
<td>Medical Oncology</td>
<td>50.5%</td>
</tr>
<tr>
<td>Hematology-Oncology</td>
<td>57.0%</td>
</tr>
</tbody>
</table>

www.bbcic.org
Factors Influencing U.S. Biosimilar Utilization

Uncertainty - Patients


PERCENT OF U.S. PATIENTS WHO AGREE WITH EACH STATEMENT

<table>
<thead>
<tr>
<th>Statement</th>
<th>Unaware of Biosimilars (n = 610)</th>
<th>Aware of Biosimilars (n = 270)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effective care/Reasonable cost</td>
<td>24%</td>
<td>40%</td>
</tr>
<tr>
<td>Affordable</td>
<td>19%</td>
<td>37%</td>
</tr>
<tr>
<td>Effective treatment</td>
<td>33%</td>
<td>51%</td>
</tr>
<tr>
<td>Best option</td>
<td>21%</td>
<td>41%</td>
</tr>
<tr>
<td>Has minimal side effects</td>
<td>21%</td>
<td>34%</td>
</tr>
<tr>
<td>Is safe</td>
<td>30%</td>
<td>47%</td>
</tr>
<tr>
<td>Comfortable switching</td>
<td>31%</td>
<td>48%</td>
</tr>
</tbody>
</table>

- Basic awareness = Defined as reporting at least a general impression of biologics or knew the term “biologic” or “biosimilars”.

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Factors Influencing U.S. Biosimilar Utilization

Medical Specialists’ Attitudes to Prescribing Biosimilars

Subjective Complaints as the Main Reason for Biosimilar Discontinuation After Open-Label Transition from Reference Infliximab to Biosimilar Infliximab
*Arthritis Rheumatol* 2018;70(1):60-68.

Barsell et al. *A Survey Assessment of US Dermatologists’ Perception of Biosimilars*
*J Drugs Dermatol* 2017;16(6):6122-615.

….and others

Post-approval studies evaluating comparative safety and effectiveness will be critical to generating real-world evidence to inform clinical practices and policy decisions

OPPORTUNITY FOR EDUCATION

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Biosimilars: Data Sources for Decision-Makers
Data Source – Clinical Trials

Strengths:

Randomized Controlled Trials (RCTs) = **GOLD STANDARD**

Carefully designed to **reduce**:

- **BIAS**
- **CONFOUNDING**
- **PLACEBO EFFECT**

Limitations:

✓ May not be sufficient to address all relevant questions

✓ Exclude potentially large segments of the population

✓ Cover a limited length of time, often very short

✓ Do not often reflect normal clinical settings

✓ Very Expensive
Real-world utilization quickly outpaces available clinical evidence

Real world evidence development initiatives are focused on expanding evidence **effectively, rapidly and cost effectively** (e.g., FDA EvGen, PCORI, NIH Collaboratory)

6-7 years & $0.8B-$1.2B on a few thousand patients

**CONSEQUENCE**
- Great variation between study cohorts and real-world population
- Resistance from payers to reimburse for new therapies
- Hesitation of physician to prescribe therapy
- Undetermined real-world effectiveness of treatments

**Phase 1**
- 20-100 healthy volunteers

**Phase 2**
- 100-500 patients with target condition

**Phase 3**
- 1000-5000 patients with target condition

**Phase 4**
- Post-marketing research and monitoring
Data Sources – Real World Evidence

RWE and Regulatory Use

21st Century Cures requires FDA to establish a program to evaluate potential use of RWE for approval of new indications or to satisfy post-approval study requirements, label expansion or revision, and benefit/risk profiles.

“The FDA uses RWE for regulatory decisions, albeit primarily related to safety. Nevertheless, for some drugs, the demonstration of efficacy has been based on RWE from case series or registries.” – Jarrow et al.

“Multiple converging sub-studies from the same populations, or independent studies combining multiple data sources, could bring real-world data closer to ‘causality’ and could be perceived as acceptable alternatives to randomized trials.” - Greenfield

“…on average, there is little evidence for significant effect estimate differences between observational studies and RCTs, regardless of specific observational study design, heterogeneity, or inclusion of studies of pharmacological interventions.” – Anglemyer et al.

Greenfield. Value in Health 2017;20:1023-4
Real-World Data Sources

- Study Types
  - Pragmatic Clinical Trials
  - Prospective Observational Studies
  - Registry Studies
  - Retrospective Database Studies
  - Case Reports

- Data Sources
  - Pragmatic or Prospective Trials
  - Administrative Claims
  - Electronic Health Records
  - Patient-Reported/Self-Generated
  - Registries
Strength of Secondary Data

Patient interaction with the U.S. healthcare system generates data

Why is data collected?

- Payment/billing
- Document clinical care
- Physician decision support
- Recordkeeping
- Registries
- Data provide rich source of information for patient safety evaluations

Commonly Used Data Sources

Administrative Claims
Electronic Medical Records

Real World Evidence

Limitations:

- ✓ Data is usually collected for reasons OTHER THAN research, NOT RANDOMIZED
- ✓ Longitudinal: Requires consistent care in one healthcare delivery system and/or insurance plan
- ✓ Clinical outcomes: may not be readily identified
- ✓ Market uptake: influences research capability
- ✓ Coding: Non-specific codes or errors


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Patient-Generated Data

- Not just a PRO Instrument anymore...
  - Wearable devices
  - Mobile phone applications
  - Social Media

- Mobile app Social Media
- Electronic Health Record
- Administrative Claims
- Enriched Data

www.bbcic.org
Patient-Generated Data

Limitations:

- Requires careful privacy protections
- Subject to recall bias and other reporting errors
- Requires active and willing participation
- Must be able to LINK DATA to a longitudinal source (administrative claims) or electronic medical record to be useful

BBCIC:
One Approach to
Real-World Evidence Generation
A non-profit, multi-stakeholder, collaborative, scientific public service initiative conducting rigorous post-marketing observational research to monitor biosimilar products and novel biologics for effectiveness and safety in a real-world setting.
Generics saved the US well over $1.6 trillion in past decade *but it took 20 years.*

— Generics are safe and effective, resulting in increased patient access to critical medications.
— Slow generic uptake influenced by anecdotal reports that got wide press coverage.
— Lingering uncertainty among physicians and patients about safety and comparability.

Physician survey, 2011

**GENERICS**

23% – concern about efficacy
50% – concern about quality

Physician survey, 2015

**BIOSIMILARS**

78% – very concerned about safety/immunogenicity

The AMCP BBCIC strategy provides a unique opportunity for Managed Care to support public knowledge of biologic and biosimilar drugs with robust science.

BBCIC leverages the Sentinel Initiative

- Improves the efficiency and cost-effectiveness of post-marketed observational studies.

BBCIC actively monitors biosimilars and innovators

- Anonymous data from ~150 million patients

BBCIC is a multi-stakeholder collaboration

- Diverse expertise allows for a larger voice with more credibility

A forum for collaboration between managed care organizations, integrated delivery networks, PBMs, pharma companies and research institutions

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The BBCIC Charter outlines transparent organized process for conducting research. There are no surprises.

CER protocols, designed by KOLs and following ISPOR-ISPE guidelines, must explicitly pre-specify the epidemiologic, statistical and clinical thresholds required to identify a safety-related finding.

18 founding participants including Managed Care Organizations, Integrated Delivery Networks, PBMs & Harvard-Pilgrim Health Care Institute

Public representatives on Planning Board: ASCO, American College of Rheumatology, National Health Council
BBCIC Governance Overview

BBCIC Board of Managing Directors

BBCIC Planning Board
Operational leadership
Participants: BBCIC Executive Director, Representatives from participant organizations in good standing

Science Committee
Guides research plans, Reviews study applications, protocols & disclosure of results
Participants: BBCIC Executive Director, BBCIC retained advisors, Appointed representatives from participant organizations in good standing

Communications Committee
Coordination and Content of press releases
Participants: BBCIC Executive Director, Representatives from participant organizations in good standing

Coordinating Center
Data, Query & Study Management
Privacy Panel/IRB

Participants have seats (and seats on any research team)

www.bbcic.org
BBCIC Progress to Date

- **June 2015**: Consortium officially kicked off
- **October 2015**: Governance approved
- **February 2016**: First research plan approved
- **Q3 2016**: Three research protocols initially registered on [http://www.clinicaltrials.gov](http://www.clinicaltrials.gov)
- **Q3 2017**: Four research teams convened
- **Q4 2017**: Descriptive analyses conclude
- **Q1 2018**: Switching and NDC/J-Code Workgroups convened
- **Q1 2018**: Descriptive analysis publications in preparation
- **Q1 2018**: CER Methods and ICD-10 Conversion Workgroups convened
- **Q3 2018**: Switching Methods recommendations submitted for publication
- **Q1 2019**: Convene G-CSF CER Research, Oncology Feasibility analysis
- **Q2 2019**: Convene Switching Methods descriptive analysis

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BBCIC 2017-2019: Lines of inquiry

• Data fitness / infrastructure
  – Data availability and characterization
    • Capture of NDC information on medical claims
  – Impact of transition from ICD-9 to ICD-10, claims-based algorithms

• Descriptive studies

• Study design and methods
  – Switching study design and analytic approaches
  – Comparative safety/effectiveness study design and analytic approaches

• Protocol-Driven Comparative Safety/Effectiveness Studies
BBCIC - Progress

- What we have DONE
- What we are DOING
- What we PLAN to DO
BBCIC - Progress

• What we have **DONE**
  • What we are **DOING**
  • What we **PLAN** to **DO**
Descriptive Analysis Research Teams

In 2016, the BBCIC Science Committee convened 4 research teams to conduct descriptive analyses using the BBCIC DRN

<table>
<thead>
<tr>
<th>Project</th>
<th>Disease Indications</th>
<th>Drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulins</td>
<td>• Diabetes</td>
<td>Insulin</td>
</tr>
<tr>
<td>Colony Stimulating Factors (G-CSF)</td>
<td>• Febrile Neutropenia risk reduction in non-myeloid malignancies treated with myelosuppressive anti-cancer drugs associated with febrile neutropenia</td>
<td>Filgrastim (Neupogen), PEG-filgrastim (Neulasta), TBO-filgrastim, filgrastim-sndz (Zarxio)</td>
</tr>
<tr>
<td>Anti-Inflammatories</td>
<td>• Rheumatoid Arthritis</td>
<td>Adalimumab (Humira), infliximab (Remicade), infliximab-dyyb (Inflectra), infliximab-abda (Renflexis), rituximab (Rituxan), tocilizumab (Actemra), abatacept (Orenzia), etanercept (Enbrel), certolizumab (Cimzia), golimumab (Simponi), ustekinumab (Stelara), secukinumab (Cosentyx), natalizumab (Tysabri), golimumab (Simponi)</td>
</tr>
<tr>
<td>• Psoriasis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Psoriatic Arthritis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Ankylosing Spondylitis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Ulcerative Colitis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Crohn's Disease</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Erythropoietin-Stimulating Agents (ESA)</td>
<td>• Anemia (CKD, Hemodialysis)</td>
<td>Epoetin alfa (Epogen, Procrit) darbepoetin alfa (Aranesp), methoxy polyethylene glycol-epoetin beta (Mircera)</td>
</tr>
</tbody>
</table>
In 2016, the BBCIC Science Committee convened 4 research teams to conduct descriptive analyses using the BBCIC DRN

<table>
<thead>
<tr>
<th>Project</th>
<th>Objective</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulins</td>
<td>Describe treatment patterns and outcomes of adult patients with diabetes who use long-acting (LAI) or intermediate-acting (NPH) insulin</td>
<td>(1) major cardiac events, combined; severe hypoglycemic events; (2) A1C baseline and follow-up</td>
</tr>
<tr>
<td>Colony Stimulating Factors (G-CSF)</td>
<td>Descriptive analysis G-CSF use in breast or lung cancer patients who received chemotherapy with Grade III or IV neutropenic-risk.</td>
<td>(1) rate of hospitalizations; (2) severe neutropenia; anaphylaxis; combined measure of bone pain, glomerulonephritis, capillary leak syndrome, hyperleukocytosis and splenic rupture.</td>
</tr>
<tr>
<td>Anti-Inflammatories</td>
<td>Describe treatment patterns and outcomes of patients with autoimmune diseases receiving biologic treatments</td>
<td>Serious infections requiring hospitalization.</td>
</tr>
<tr>
<td>Erythropoeitin-Stimulating Agents (ESA)</td>
<td>Assess the feasibility of currently available BBCIC data to conduct a study of ESA biosimilars and innovators in hemodialysis (HD) patients.</td>
<td>Chronicity of HD among patients; similarity of population of HD patients described by USRDS</td>
</tr>
</tbody>
</table>

- Outcome rates were **consistent with other clinical and observational studies**.
- With the BBCIC DRN we are able to **reliably identify and characterize** exposures, outcomes, and potential confounders for the disease cohorts of interest.
## Descriptive Analysis – Lessons Learned

**OVERALL:**
- The BBCIC DRN is robust and reliable for large-scale observational studies
- Additional methods and data sources are being incorporated to enrich the data and capabilities of the BBCIC

<table>
<thead>
<tr>
<th>Project</th>
<th>Challenges</th>
<th>Lessons Learned/Solutions</th>
</tr>
</thead>
</table>
| Insulins         | • Design Considerations | • Coding algorithms for diagnosis inconsistency  
|                  |                     | • Careful attention to episode gap length  
|                  |                     | • Alternative methods for patient adherence  |
| G-CSF            | • Exposures  
|                  | • Outcomes             | • Broader inclusion criteria  
|                  |                     | • Careful attention to covariates and clinical outcome measures |
| Anti-Inflammatory| • Outcomes             | • Clinical effectiveness measures are difficult to identify from administrative claims  
|                  |                     | • Pilot to link PRO and clinical measures to claims  
|                  |                     | • Include linked EMR + claims data sources |
| ESA              | • Data Sources      | • Data sources with adequate patient numbers |
BBCIC - Progress

• What we have DONE

• What we are DOING

• What we PLAN to DO
In 2017, the BBCIC Science Committee convened 4 workgroups to develop best practices in research methodology and a platform for future studies

<table>
<thead>
<tr>
<th>Project</th>
<th>Challenges Addressed</th>
<th>Study Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switching</td>
<td>• Design Considerations</td>
<td>Treatment of switching/sequencing as a covariate/confounder in BBCIC CER studies</td>
</tr>
<tr>
<td>CER Methods</td>
<td>• Design Considerations</td>
<td>Develop best-practices based on current methodology for conducting observational comparative-effectiveness research</td>
</tr>
<tr>
<td>NDC / J-Code</td>
<td>• Exposures • Outcomes</td>
<td>Investigate the extent to which NDCs are being supplied on physician-office claims</td>
</tr>
<tr>
<td>ICD-10 Mapping</td>
<td>• Exposures • Outcomes</td>
<td>In preparation for future descriptive and CER projects, ICD-9 codes are being mapped to ICD-10 codes to allow utilization of data both before and after October 2015.</td>
</tr>
</tbody>
</table>
2018 Presentations

5 Podium Presentations

- ICPE
- ISPOR
- DIA
- AMCP Nexus
- NW AMCP

7 Poster Presentations

- HCSRN
- ICPE
- AMCP Nexus
• What we have DONE

• What we are DOING

• What we PLAN to DO
## 2019 Planned Publications

| Insulins                              | **In Progress:** A pair of companion manuscript completing internal review  
|                                      | **Next Steps:** January submission planned to the *Journal of Managed Care & Specialty Pharmacy* |
| G-CSF                                 | **In Progress:** Manuscript in preparation |
| Anti-Inflammatories                   | **In Progress:** Internal review underway  
|                                      | **Next Steps:** February submission planned to the *Journal of Managed Care & Specialty Pharmacy* |
| ESA                                   | **In Progress:** Final report in preparation  
|                                      | **Next Steps:** Report will be posted on [www.BBCIC.org](http://www.bbcic.org) |
| Switching                             | **In Progress:** Manuscript under review at *Pharmacoepidemiology & Drug Safety*  
|                                      | **Next Steps:** Respond to peer-review revisions, resubmit |
| CER Methods - review                  | **Completed:** Literature review and report have been prepared  
|                                      | **Next Steps:** Prepare a manuscript |
| CER Methods – best practices          | **In Progress:** Final Report prepared based on Workgroup meetings, undergoing internal review  
|                                      | **Next Steps:** Abstracts; Manuscript |
| “Gaps” Paper                         | Opportunity to describe the state of observational research, challenges and gaps we have identified, and our efforts to address the gaps and opportunities  
|                                      | **In Progress:** Draft outline  
|                                      | **Next Steps:** Prepare manuscript; May submission planned |
G-CSF
First BBCIC CER study to compare the G-CSF originator biologic to available biosimilars in the US. The Research Team is expected to kickoff in Q4 of 2018 and research will commence in earnest by Q1 2019.

Insulins
The topic of a PCORI grant application.

Oncology Data Feasibility and Descriptive Analysis
We anticipate research will commence research in Q1 2019.

Switching Methods Descriptive Analysis
The next phase of the Switching Methods Workgroup. This study will include an in-depth discussion of best practices for study design, and a descriptive analysis to test study designs in the BBCIC DRN.
Practical Application of BBCIC Research

WHAT WE PROVIDE:

REAL-WORLD EVIDENCE
Fill evidence gap with large-scale, multi-stakeholder, post-marketing assessment of biosimilars and reference biologics

EDUCATION
Source of education for stakeholders

WHAT WE NEED:

ENGAGEMENT
Health Plans
Patients
Pharmacy Benefit Managers
Manufacturers
Prescribers and Healthcare Practitioners

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Sources of Post-Marketing Data
Rapidly Evolving Landscape

- FDA (U.S. Food and Drug Administration) [https://fda.gov]
- EvGen Evidence Generation
- Sentinel Initiative
- Innovation in Medical Evidence Development and Surveillance
- Reagan-Udall Foundation for the Food and Drug Administration
- PCornet [https://pcornet.org]
- CNODES [https://www.cnodes.ca]

www.bbcic.org
Sources of Post-Marketing Data for BIOSIMILAR Research
To date the only multi-stakeholder, multi-source research consortium dedicated to proactive surveillance of safety and effectiveness of biosimilar products and reference biologics in the United States.
QUESTIONS?

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