CAPE
Collaboration to Advance Pharmacy Enterprises

Collaboration to Harmonize Antimicrobial Registry Measures (CHARM) to Track Outpatient Antibiotic Use

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Senior Director, CAPE
Senior Director, CHARM

FERRIS STATE UNIVERSITY
COLLEGE OF PHARMACY

At the end of the session the attendee will be able to:

1. Discuss the purpose of the CHARM project
2. Summarize how CHARM can support a One Health approach to antibiotic use.
3. Outline the plans to expand CHARM into Illinois.

What is CHARM?

- The Collaboration to Harmonize Antimicrobial Registry Measures (CHARM) is a collaborative effort to utilize data from partner institutions' electronic medical records (EMR) to quantify and assess local antimicrobial prescribing practices.
  - By assisting partners understand their current prescribing practices, antimicrobial stewardship opportunities can be targeted and the impact of initiatives measured.
  - CHARM allows participating entities to benchmark their usage patterns against other systems.
- Supported by the Michigan Department of Health and Human Services (MDHHS).

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Collaboration to Harmonize
Antimicrobial Registry Measures

- Mission: Provide real-time guidance and direction to clinicians and health systems to optimize antibiotic use.
- Senior Director: Michael Klepser, PharmD
- Director: Minji Sohn, PhD
- Director of Research: Benjamin Pontefract, PharmD
- Data Analyst: Kushal Dhal, MS
- Interns: Cameron Lakatos and Jessica Swailes

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The CHARM Process

- CHARM was established in 2014, at the Ferris State University College of Pharmacy, in an effort to create a simple means for health systems to gather data and describe outpatient antibiotic usage patterns in a standardized fashion.

CHARM Process

- Extract data
  - Limited and masked data set
  - Identify episode of antibiotic use
    - Serves as the anchor for the collection of other relevant data
    - Link to a diagnosis (ICD-10 code)

Fields	
Masked Patient ID	Insurance Type
Facility/Clinic	Provider
Sex	Provider Type
Race/Ethnicity	Encounter Type
Date of Encounter	Antibiotic Allergies
Age	Renal Function
Body weight	Indication Code
Prescription	Indication Name
Antibiotic Name	Antibiotic Dose
Antibiotic Unit	Antibiotic Quantity
CPT Code	Test Results

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CHARM Process

- Summarize and analyze data
  - Quantify antibiotic use
    - Antibiotic prescriptions per 1,000 clinic visits
    - Antibiotic prescriptions per 1,000 clinic patients
  - Determine if the antibiotic selected and indication are in concordance with published guidelines, FDA-approved indications, and/or site-specific treatment pathways for the associated indication.

CHARM Process

- Summarize and analyze data
  - For agents that are concordant with respect to indication, determine dosing concordance

Prescribed Therapeutic Regimen (PTR)

$$PTR = (Dose_{Prescribed}\ x\ Duration_{Prescribed}\ x\ Frequency_{Prescribed})$$

Recommended Therapeutic Regimen ($RTR_{Min/Max}$)

$$RTR = (Dose_{Recommended}\ x\ Duration\ _{Recommended}\ x\ FrequencyRec_{ommended})$$

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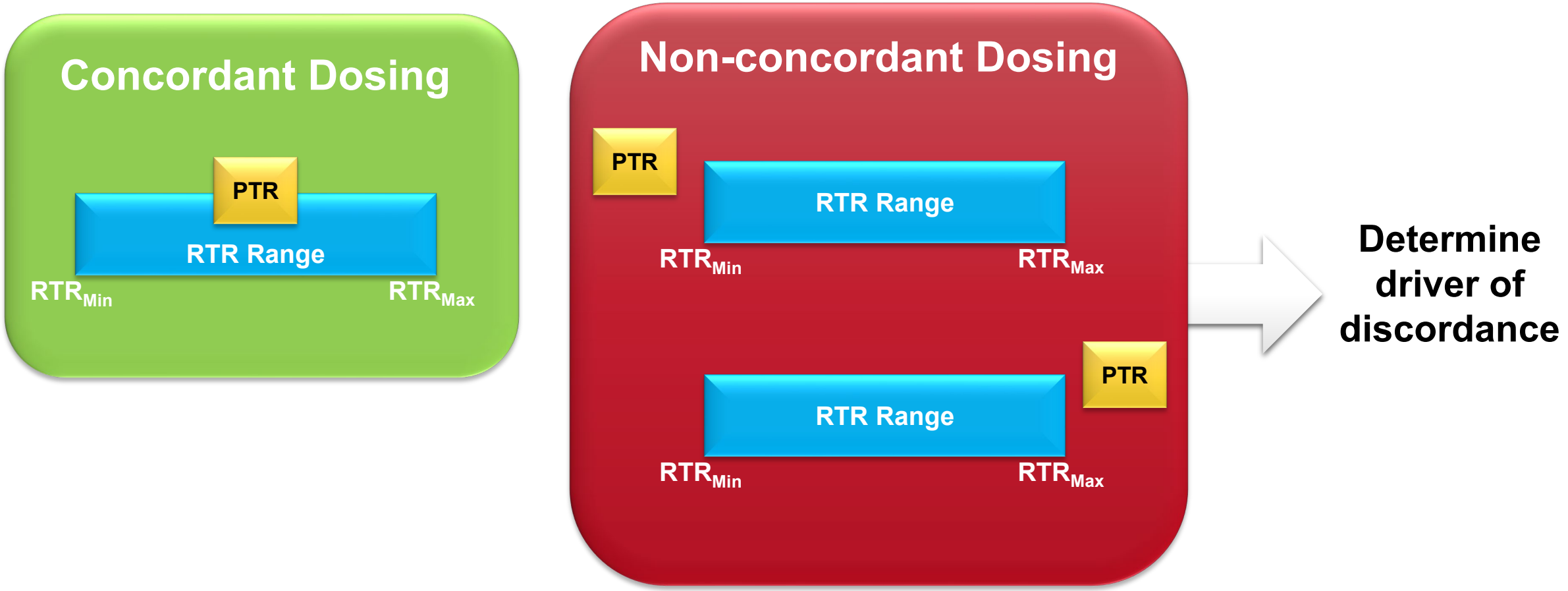
Klepser ME, et al. *Innovations in Pharmacy*. 2016.

CHARM Process



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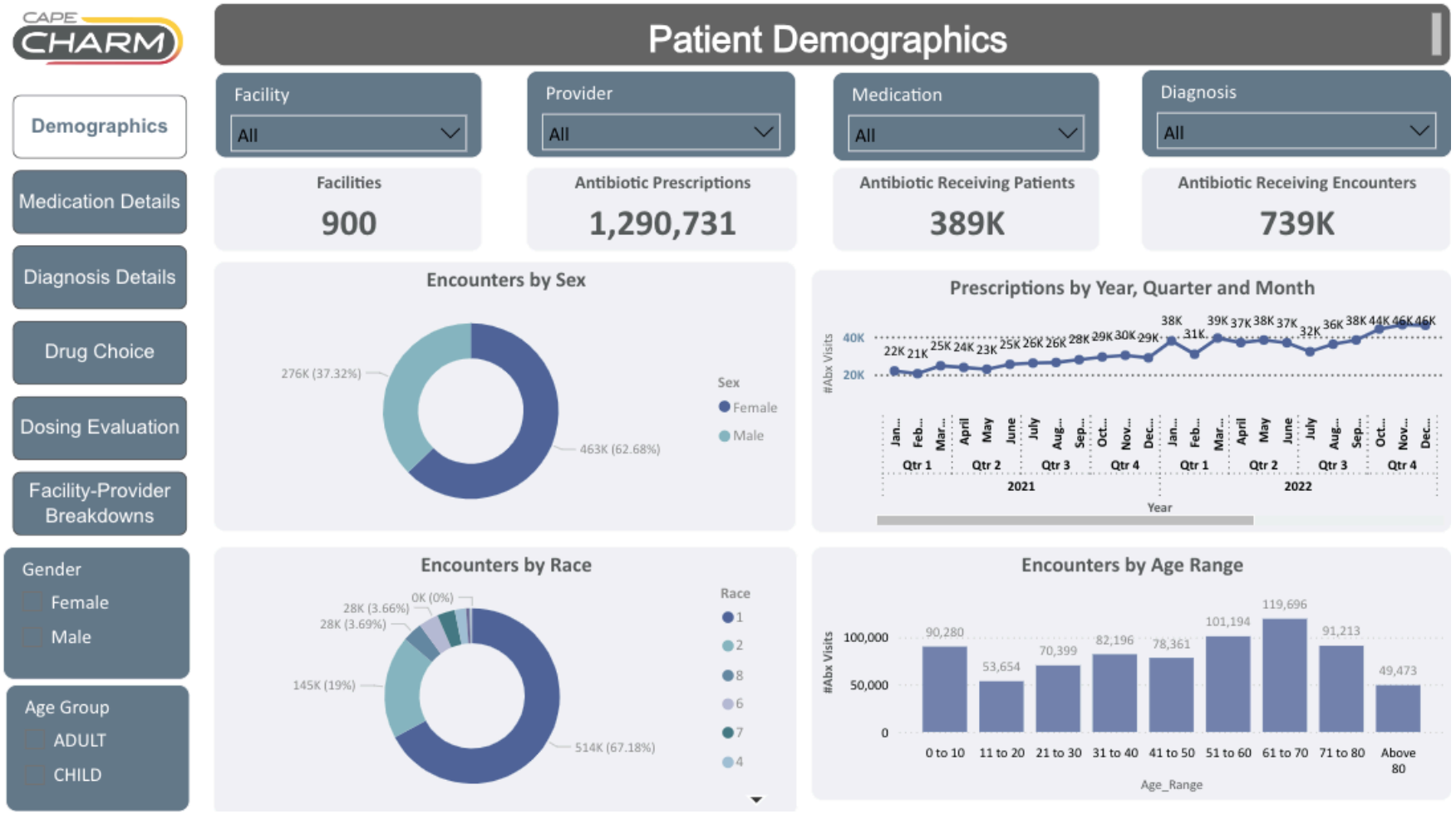

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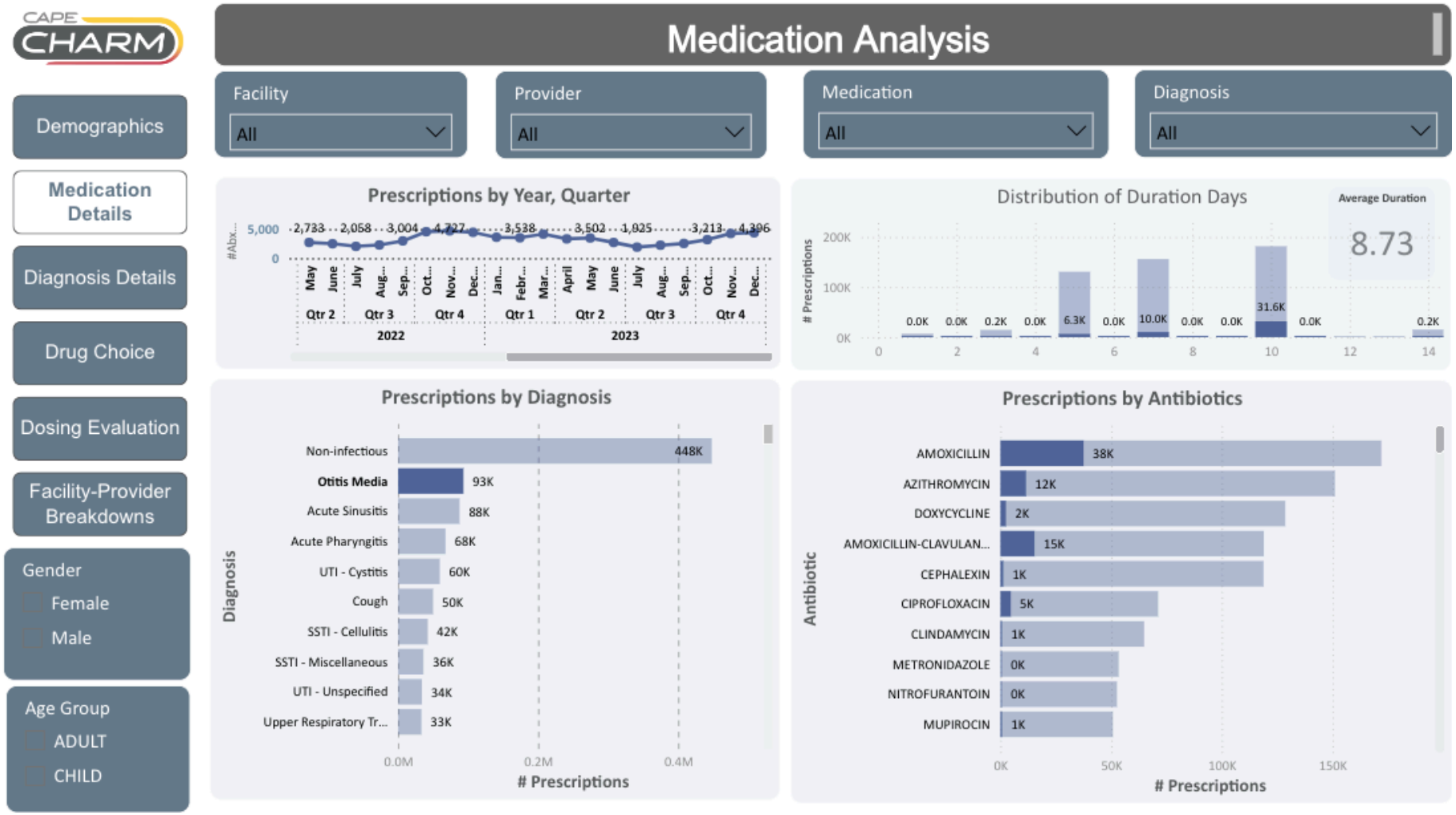

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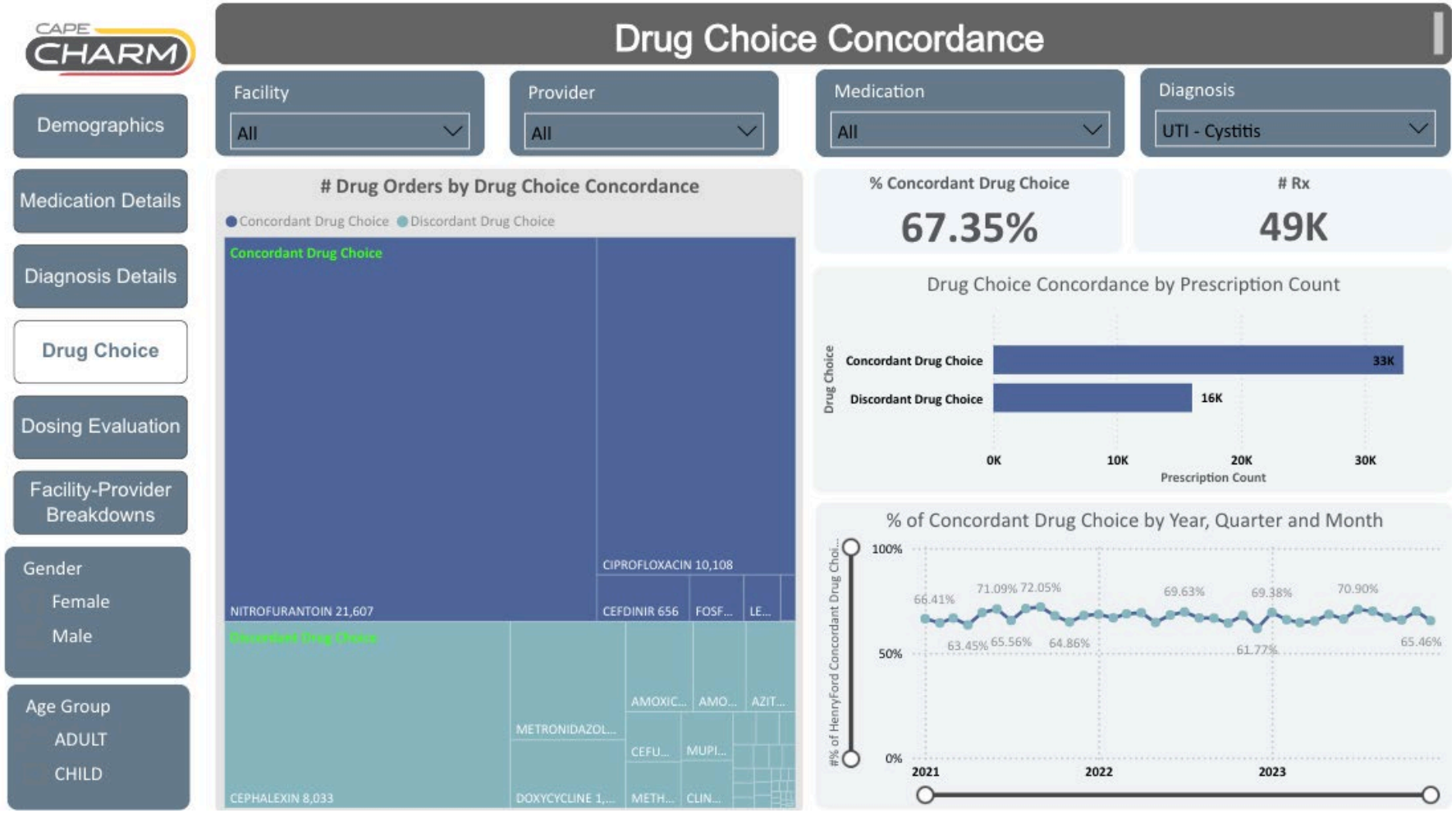

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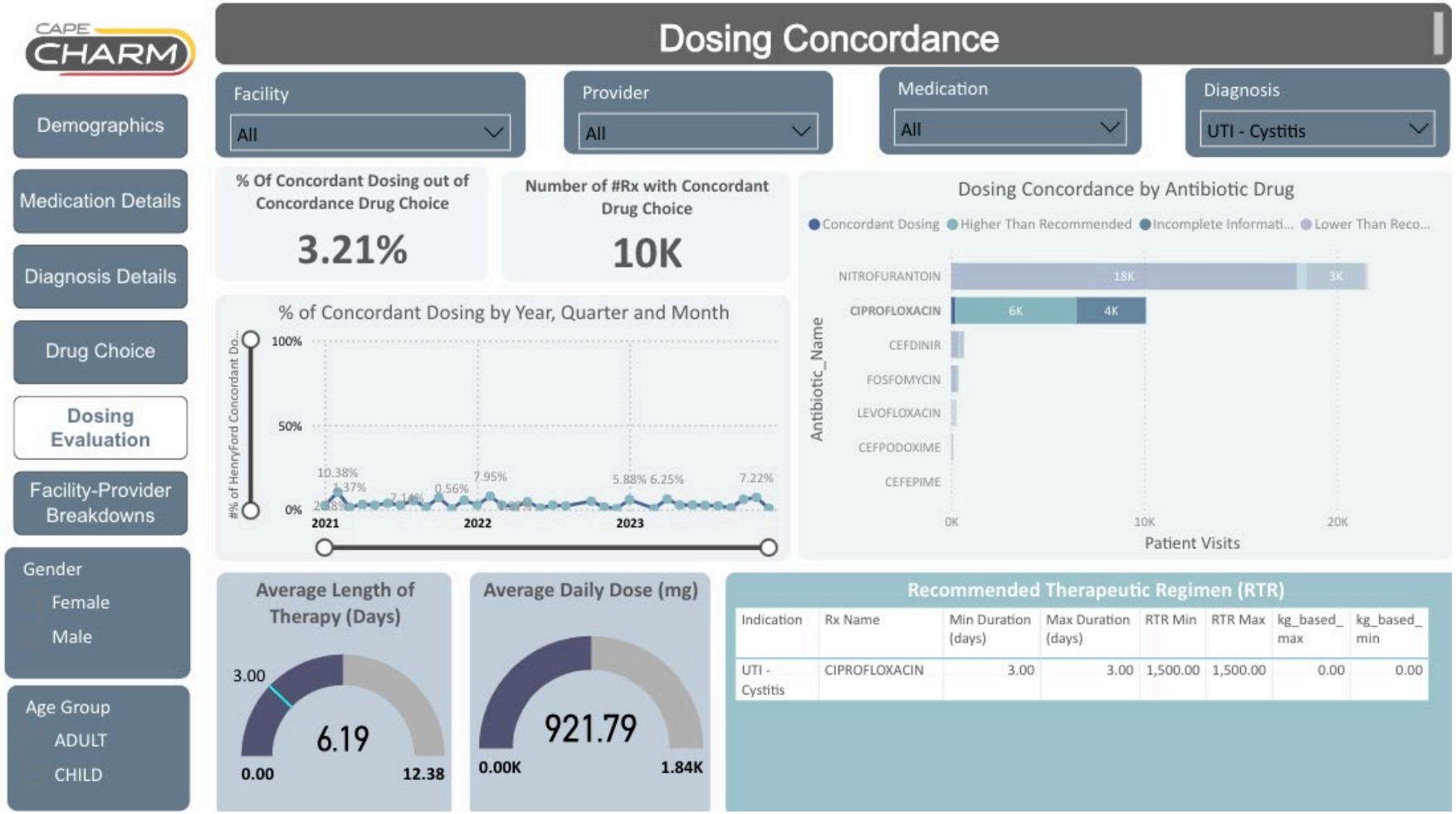

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- Demographics
- Medication Details
- Diagnosis Details
- Drug Choice
- Dosing Evaluation
- **Facility-Provider Breakdowns**

Gender
- Female
- Male

Age Group
- ADULT
- CHILD

Facility-Provider Breakdowns

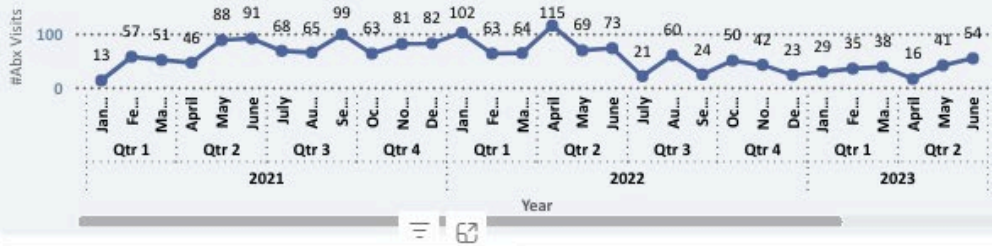
Provider Summary

Provider_name	Prescriptions	% of Prescriptions
639	1,880	40.13%
2278	753	16.07%
2432	521	11.12%
284	393	8.39%
762	186	3.97%
1497	166	3.54%
1570	150	3.20%
3894	106	2.26%
295	88	1.88%
2139	64	1.37%
1736	53	1.13%
Total	4,685	100.00%

Facility Summary

facility	Prescriptions	% of Prescriptions
837	1,880	99.21%
568	13	0.69%
588	2	0.11%
Total	1,895	100.00%

Prescriptions by Year, Quarter and Month



Diagnosis Group Summary

Diagnosis_Grouping	Prescriptions	% of Prescriptions
Non-infectious	4,094	46.70%
UTI - Cystitis	1,880	21.45%
Acute Pharyngitis	1,310	14.94%
Acute Sinusitis	908	10.36%
Candidiasis - Miscellaneous	808	9.22%
SSTI - Cellulitis	793	9.05%
Cough	775	8.84%
Otitis Media	769	8.77%
GU - Female	645	7.36%
Unspecified Sexually Transmitted Infection	561	6.40%
GU - Miscellaneous	286	3.26%
SSTI - Abscess	282	3.22%
UTI - Unspecified	220	2.51%
SSTI - Miscellaneous	195	2.22%
Upper Respiratory	179	2.04%

Antibiotic Medication

Antibiotic	Prescriptions	% of Prescriptions
CIPROFLOXACIN	659	36.96%
NITROFURANTOIN	346	19.41%
CEPHALEXIN	304	17.05%
METRONIDAZOLE	272	15.26%
AMOXICILLIN	67	3.76%
AZITHROMYCIN	40	2.24%
DOXYCYCLINE	27	1.51%
AMOXICILLIN-CLAVULANATE	23	1.29%
CLINDAMYCIN	23	1.29%
LEVOFLOXACIN	6	0.34%
MUPIROCIN	6	0.34%
OXFLOXACIN	6	0.34%
CEFDINIR	4	0.22%

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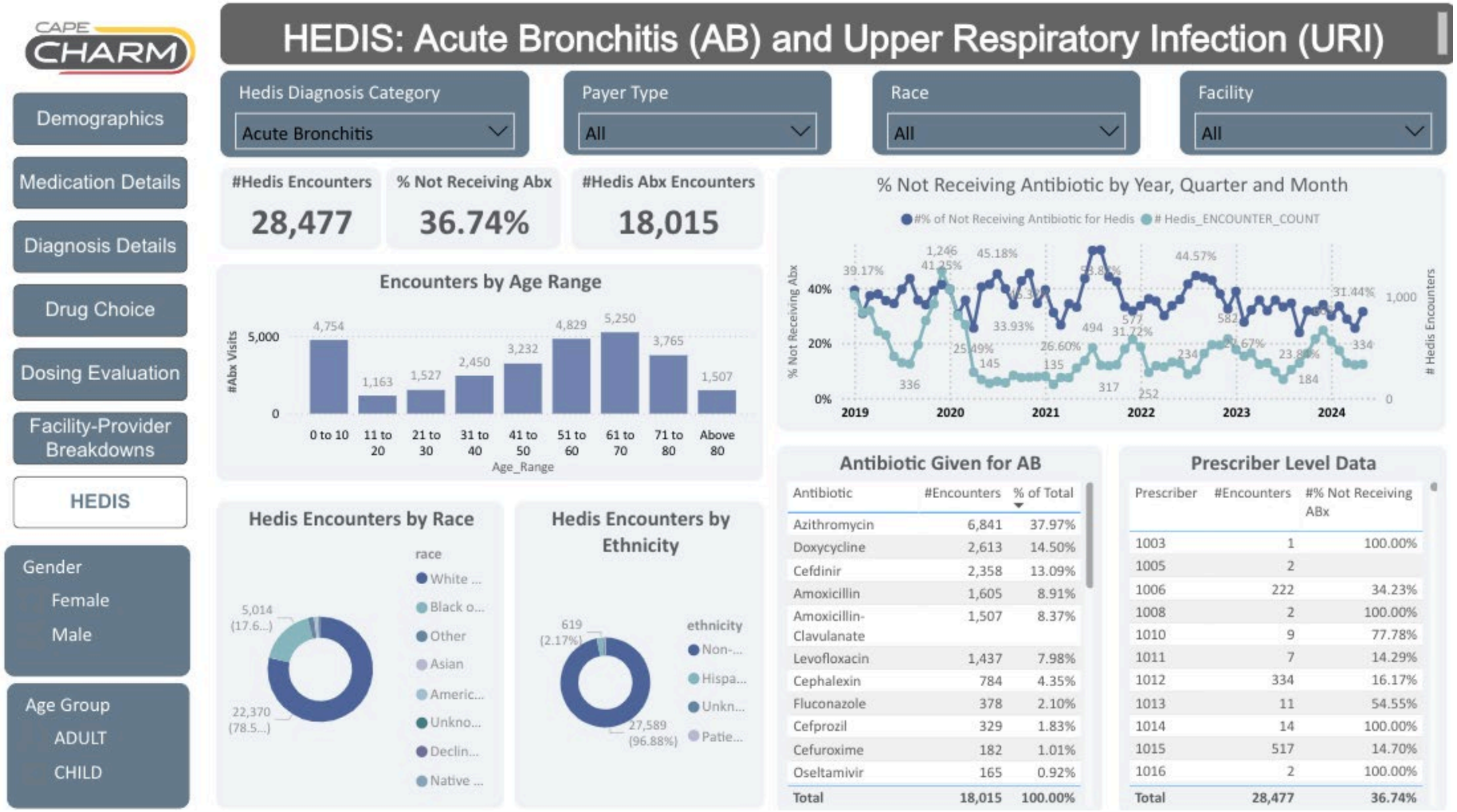

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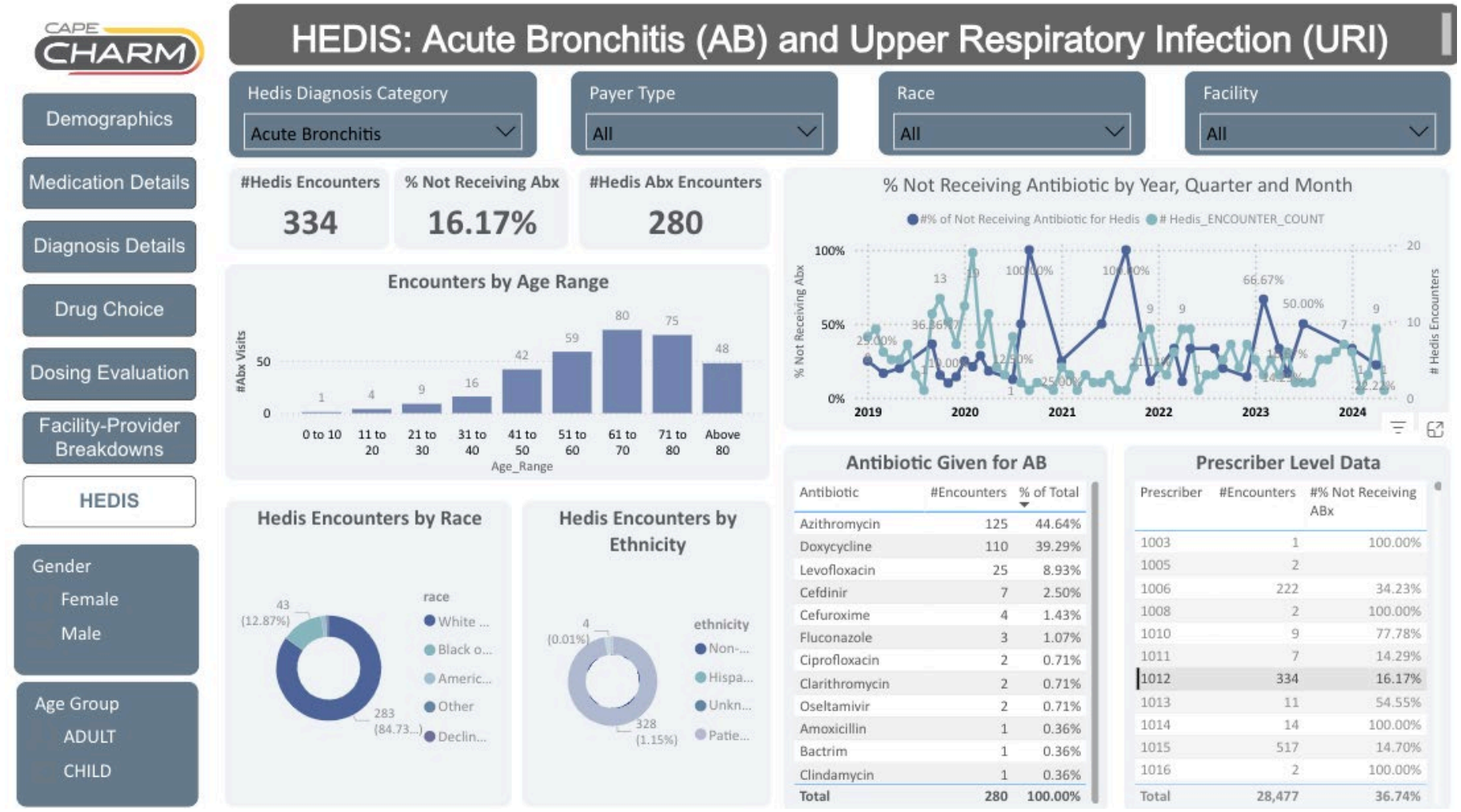

Antibiotic	#Encounters	% of Total
Azithromycin	125	44.64%
Doxycycline	110	39.29%
Levofloxacin	25	8.93%
Cefdinir	7	2.50%
Cefuroxime	4	1.43%
Fluconazole	3	1.07%
Ciprofloxacin	2	0.71%
Clarithromycin	2	0.71%
Oseltamivir	2	0.71%
Amoxicillin	1	0.36%
Bactrim	1	0.36%
Clindamycin	1	0.36%
Total	**280**	**100.00%**

Prescriber	#Encounters	#% Not Receiving ABx
1003	1	100.00%
1005	2	
1006	222	34.23%
1008	2	100.00%
1010	9	77.78%
1011	7	14.29%
1012	334	16.17%
1013	11	54.55%
1014	14	100.00%
1015	517	14.70%
1016	2	100.00%
Total	28,477	36.74%

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CHARM Logistics

Initial meeting with Ferris and Site AMS champions

- **Data Use Agreement (DUA) is established between the health system and Ferris.**

Ferris works with Site's IT dept for data extraction and transfer

- **Data is extracted in a .xlsx or .csv format.**
- **To transfer data, health system's IT staff uploads the extract to a Ferris' OneDrive for Business folder.**
- **Clinician members provide input during the extract process.**

Ferris analyzes data and provide clinic with interactive dashboards

- **Once developed, we simply feed new data into the dashboard.**
- **Revisions/tweaks are made as needed.**

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CHARM Logistics

- Initial data transfer can include significant historical data
- Subsequent data transfers occur monthly to quarterly
- Dashboard is updated as new data is submitted

Limitations

- Diagnoses are not verified
  - ICD-10 based diagnosis may be subject to coding bias
  - Not all systems link antibiotic prescriptions to diagnosis
- Renal function data are often not available
- Allergy data is not reliable

Advantages of CHARM

- Timely and actionable reports
  - Minimal data lag
  - Highly interactive dashboard allows for identification of areas for improvement
  - Allows for determination of intervention effectiveness
- Uses EHR data (no fee to acquire data, all-payer encounters)
- Not limited to a specific EHR software
- Highly granular reports
  - Data can be examined at various levels including facility, provider, and patient levels
- Flexibility
  - Assessment of antibiotic appropriateness can use site specific algorithms

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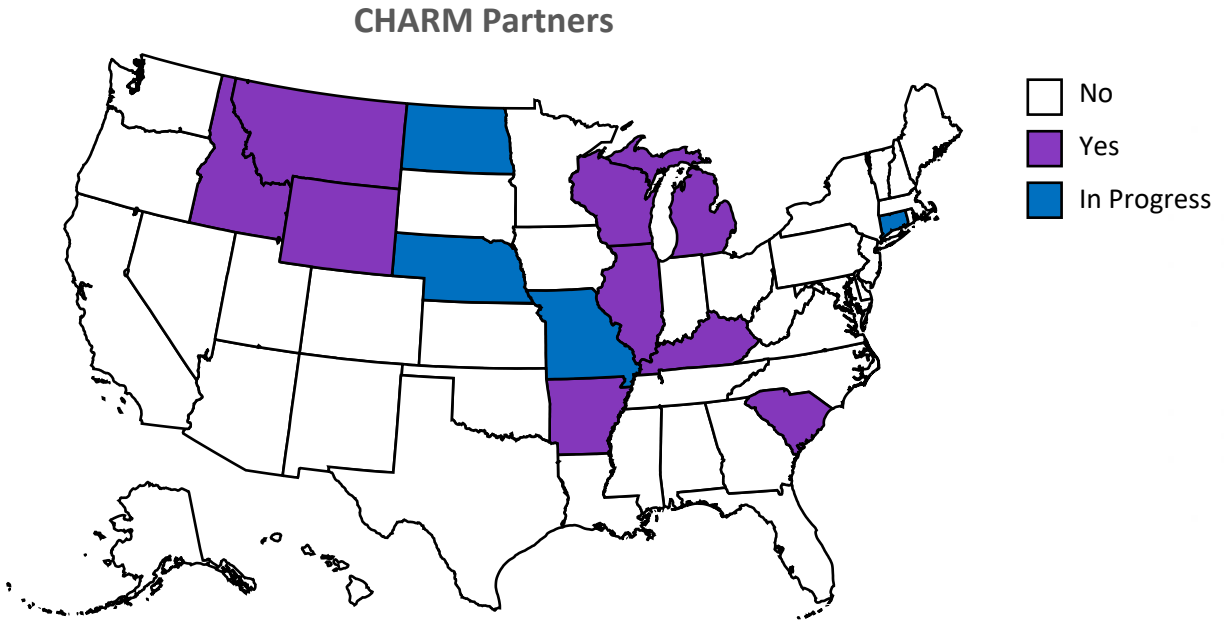
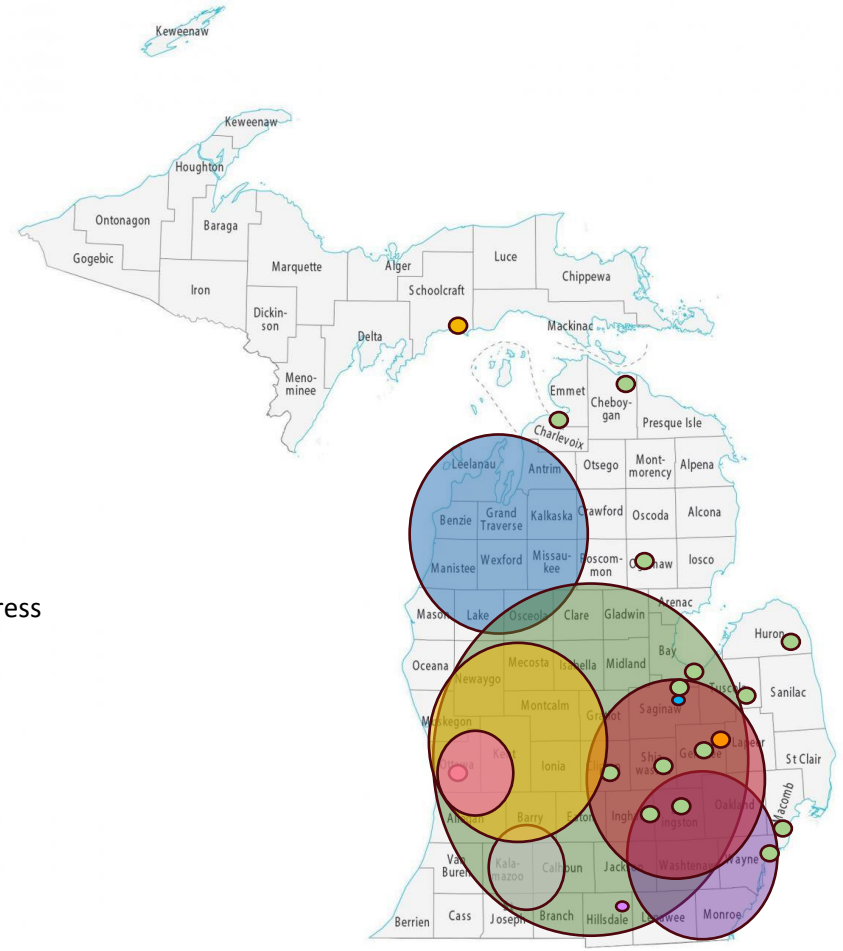
- Activities:
  - Support dashboards to track and assesses concordance of outpatient antibiotic for 17 health systems in Michigan and 8 health systems in other states.





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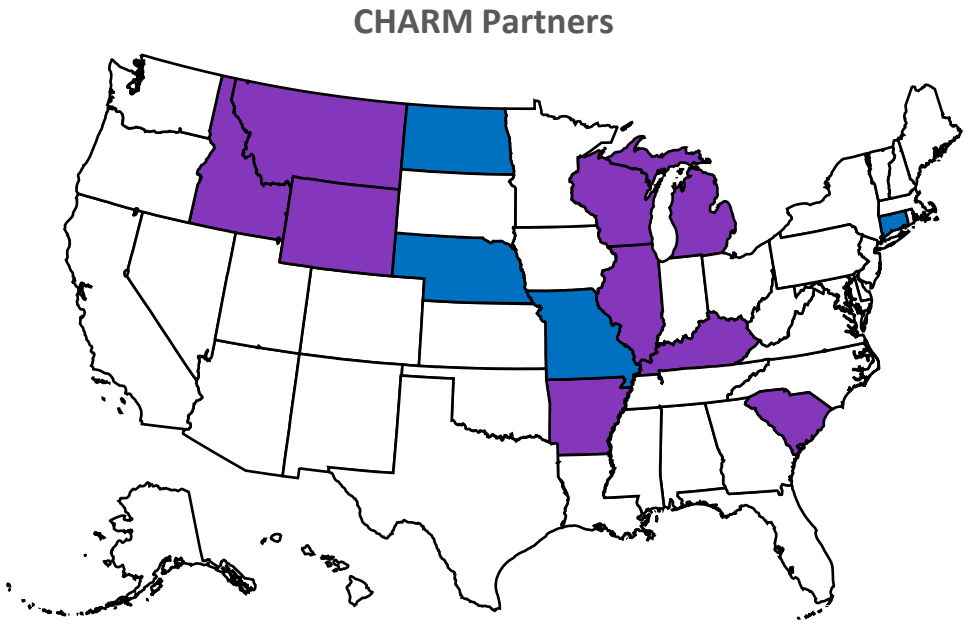
- Partners:
  - Health system partners include:
    - Large academic health systems
    - Small independent health systems
    - federally qualified health centers
    - Critical access systems
    - Indian nation health systems



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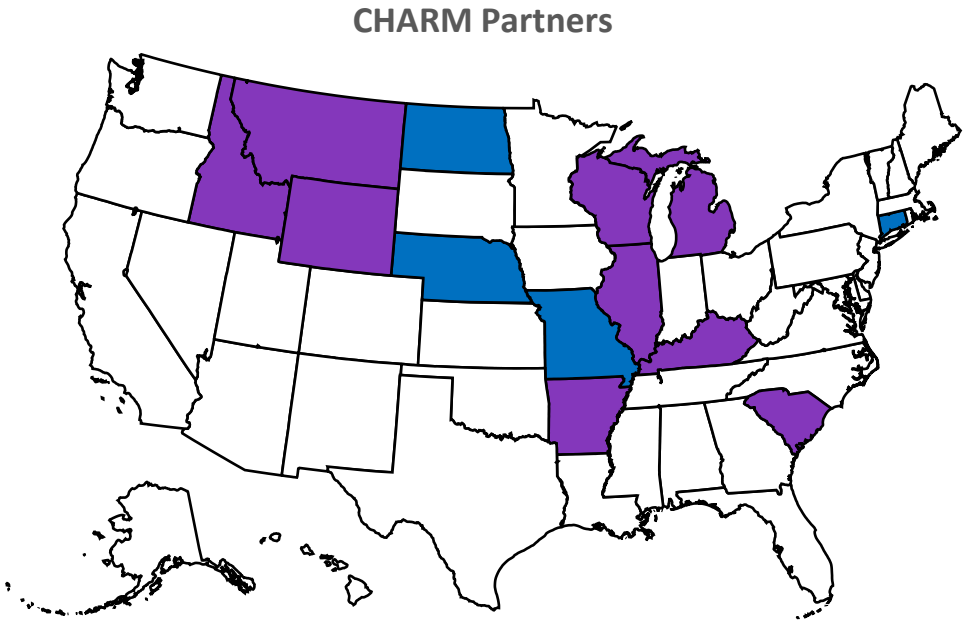
- Activities:
  - Maintain Michigan statewide benchmarking dashboard of outpatient antibiotic use
  - Developed a HEDIS progress dashboard for
    - Appropriate testing for pharyngitis
    - Avoidance of Antibiotic Treatment for Acute Bronchitis/Bronchiolitis
    - Appropriate Treatment for Upper Respiratory Infection
    - Antibiotic Utilization for Respiratory Conditions
  - Support numerous ongoing research projects
  - Supports GLID and OASIS



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- Impact of CHARM
  - Track approximately 65% of outpatient antibiotic prescriptions in Michigan.
  - Provide education on best practices for outpatient antimicrobial stewardship (Outpatient Antimicrobial Stewardship Innovations Symposium – OASIS)
  - Promotes and supports research among partner institutions
  - Knowledge dissemination
    - Numerous publications in medical journals and invited presentations
    - 21 projects presented at national meetings

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- Future Directions for CHARM
  - Develop provider report cards that can be auto-generated.
  - Pilot initiatives to evaluate if we can detect the impact of interventions on HEDIS measures.
  - Develop support services such as tele-antimicrobial stewardship programs for FQHC's, critical access, and resource limited health systems.
  - Examine data related to SDoH to evaluate areas for improvement in health equity.
  - Continue to expand into other states and secure funding to allow us to develop national dashboards for benchmarking.

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- **Future Directions for CHARM**
  - Dentistry
    - Currently have data from health system dental practices.
    - Obtained funding to expand into private dental practices.

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- **Future Directions for CHARM**
  - Veterinary Medicine
    - Pilot with Michigan State University School of Veterinary Medicine
    - Collect data from veterinary hospitals and clinics

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- **CHARM and One Health**
  - Expand antimicrobial stewardship into dental practices.
  - Support antimicrobial stewardship in veterinary medicine.
    - Superimpose utilization patterns between humans and animals.
    - Correlate antibiotic use in one species with pathogens/infections in other species.

Extending CHARM into Illinois

- Currently approaching health systems to participate in a pilot of CHARM.
  - Have identified a medical center that we are working to onboard.
  - Preliminary talks have occurred with 5 health systems about participation.
- Seek to expand to all interested parties in Illinois.
  - Medical
  - Dental
  - Veterinary

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Extending CHARM into Illinois

- Looking for interested partners.
- Goal is to have 8-10 health systems onboarded by 2026.
  - Develop statewide benchmarking map.

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