Medication Regimen Complexity Study

University of Colorado

Anne M. Libby, PhD
Kavita Nair, PhD
Doug Fish, PharmD
Sunny Linnebur, PharmD
Joseph Saseen, PharmD
Joe Vande Griend, PharmD
Kelli Metz, PharmD, Fellow
Sara Vu, P3
Patrick Hosokawa, MA

University of California San Diego

Jan D. Hirsch, RPh, PhD
Candis M. Morello, PharmD
Stephen Rettig, PharmD, PGY1
Thien Vu, P4
Carissa Chan, P4

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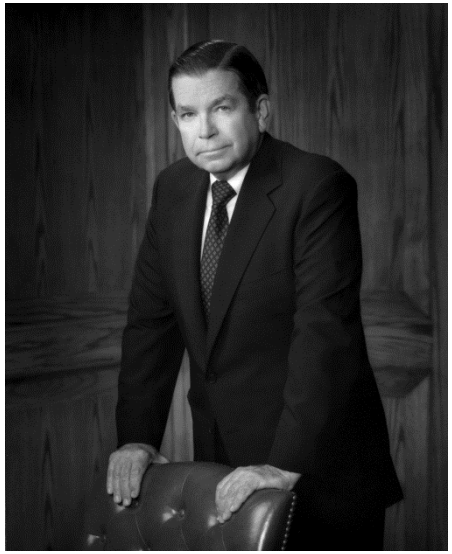

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Medication Regimen Complexity and Risk Measurement in Defined Clinical Populations

BACKGROUND AND SIGNIFICANCE

Medication critical part of chronic disease management, and adherence is central

- Medication Regimen Complexity
  - Multiple medications, frequent doses
  - Specific dietary or time requirements
- Gap in simple metrics (e.g. medication count)
  - Formulation, frequency, usage directions
  - Ignores medication risk in measurement
- Goal is objective, quantifiable tool
  - Used at point of care or in community
  - Automatically coded (EHR or portable app)
  - Can identify patients who need intervention

Medication Regimen Complexity Literature

Published Medication Complexity Studies			
Disease/ Pop	**Number**	**Countries**	**Using MRCI**
Geriatric	5	US, Israel	2011, 2011
Epilepsy	3	US, Brazil	
Diabetes	3	US, Brazil, Portugal	*2007*, 2011
Renal	2	US, Germany	*2010*, 2011
General	3	US, Brazil, South Africa	2011
HIV	2	US	
COPD	1	Australia	*2004*
Cardiac (HF)	1	US	2010

Medication Regimen Complexity associated with:

- ↓ Medication adherence, effectiveness
- Worsened Clinical outcomes (glycemic control)
- ↓ Patient knowledge of medications
- Utilization and cost?

Gaps Filled by this Study

- Comparing Medication Regimen Complexity Index across disease states and sites
  - Geriatric depression; HIV; Diabetes Mellitus; Hypertension
  - Bipolar, Epilepsy, Chronic Kidney Disease
- Measuring Patient-Centered MRC
  - Disease-specific, Other prescriptions, Reported OTCs
- Year 2: Expert panel to simplify and improve MRCI
  - Incorporate medication risk and enhance weighting
  - Link to clinical, economic, humanistic outcomes
  - Assess EHR platform for automation and portable apps for community practice sites

MRCI Weighted Score

- MRCI weighted score(s) based on:
  A. Formulation (e.g., tablet, inhalant, topical)
  B. Dosing Frequency (e.g., bid, qid)
  C. Special Instructions (e.g., take with food, dissolve, sliding scale)

- Patient-level MRCI a sum of 1-3 MRCI subtypes
  1. Disease-specific medications
  2. Other Prescribed medications (Other Rx)
  3. Over-the-Counter (OTC) herbals or supplements

George, J, Phun, YT, Bailey, MJ, Kong, DC & Stewart, K (2004) Development and validation of the medication regimen complexity index. *Annals of Pharmacotherapy,* 38(9), 1369-1376.

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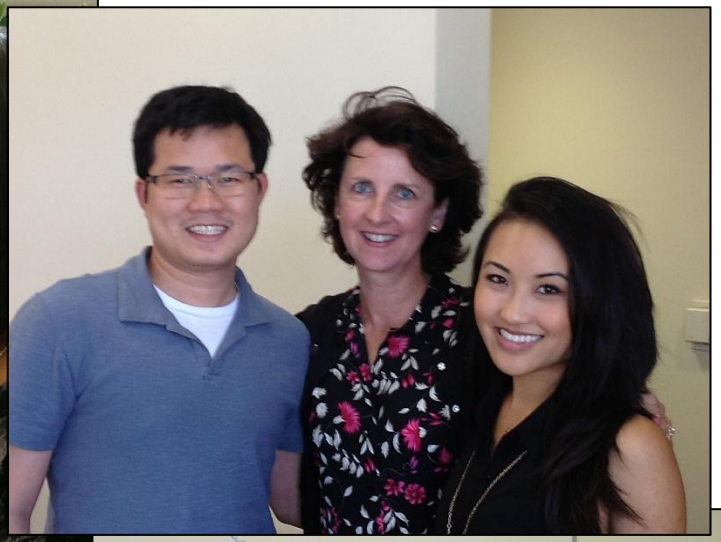
DATABASE TOOL FOR CLINICIAN CODING OF COMPLEXITY



Skaggs School of Pharmacy and Pharmaceutical Sciences

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Medication Regimen Complexity Index (MRCI) Instructions

1. MRCI applies to both prescribed and over the counter medications. All entries are to be made only based in information on the label or drug chart (at time of dispensing or discharge). No assumptions are to be made based on clinical judgment.

2. There are three sections in the scale. Complete each section before proceeding to the next. At the end, add the scores for the three sections to give the MRCI.

3. If the same medication (same brand and dosage form) is present more than once in different strengths (e.g. Warfarin 5mg, 3mg, and 1mg as directed), it is still considered 1 medication.

4. If a dosage is optional, choose the dosing instruction with the smallest dose/ frequency (e.g. Ventolin MDI 1-2 puffs, 2-3 times daily will receive weightings for 'metered dose inhalers', 'variable dose' and 'twice daily'; but not multiple units at one time)

5. In certain cases the dosing frequency needs to be calculated (e.g. Ranitidine 1 morning and 1 nightly is 1 tablet twice daily).

6. It is possible that with certain 'use as directed' instructions, the regimen will not get a score under dosing frequency (e.g. Prednisolone 5mg as directed).

7. If there is more than one dosing frequency direction, they should be scored for all the dosing frequency directions (e.g. Ventolin MDI 2 puffs twice daily and PRN, will receive scores for 'metered dose inhalers', 'multiple units at one time', 'twice daily' and 'PRN').

8. Instances where two or more medications are mutually exclusive, they need to be scored twice or more as PRN with the recommended dosing frequency (e.g. Ventolin MDI or Ventolin nebulizer twice daily PRN will receive scores for both 'metered dose inhalers' and 'nebulizer' under dosage forms, but needs to be scored two times for 'twice daily PRN').

9. In cases where there is no matching option, choose the closest option (e.g. 6 times daily could be considered as 'q4h'.

10. When there is confusion about the MRCI scoring, enter a description and rationale in the 'Special Cases' tab.

ID: 52 | Type: Other Rx | Med Count: 15 | Blank Freqs: 2

Dosage Form: 12 | Frequency: 25.5 | Directions: 6 | Total Score: 43.5

Report 1: Score Summary | Report 2: Special Notes | Report 3: Cohort Summary | Open Directions

Prev ID | Next ID | Prev Type | Next Type | Delete Current Record

Section A - Dosage Forms

Capsule/Tab:	☑	Paints/Solns:	☐	Nasal Spray:	☑	Dialysate:	☐
Gargle:	☐	Pastes:	☐	Accuhalers:	☐	Enemas:	☐
Gums:	☐	Patches:	☐	Aerolizers:	☐	Inj. Prefilled	☑
Liquids:	☑	Sprays:	☐	Metered Dose:	☑	Inj. Amp/Vial:	☐
Powders:	☐	Ear Drops:	☐	Nebulizer:	☐	Pessaries:	☐
Sublingual:	☐	Eye Drops:	☐	Oxygen:	☐	Analgesia:	☐
Creams:	☐	Eye Gels:	☐	Turbuhalers:	☐	Suppositories:	☐
Dressings:	☐	Nasal Drops:	☐	OtherDPIs:	☐	Vaginal:	☐

Special Notes

id0900

Record: 1 of 3 | No Filter | Search

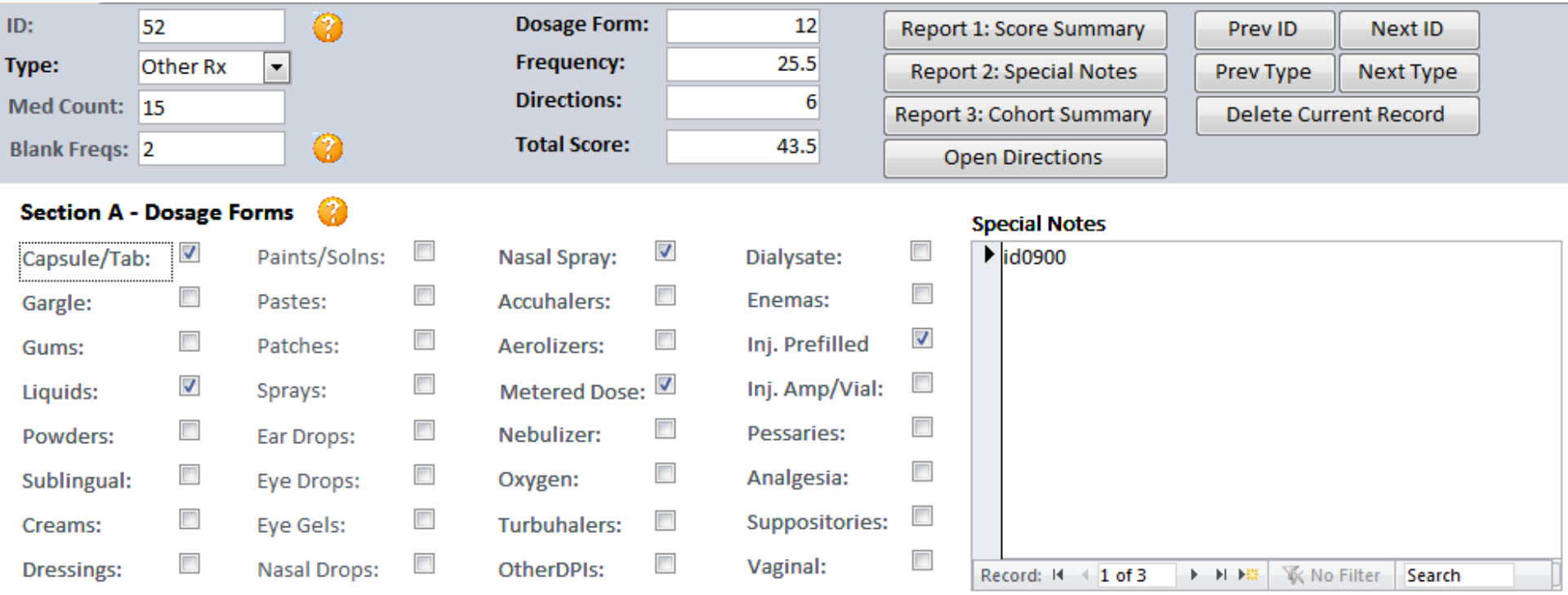
Section B - Dosage Frequency

Once Daily:	5	-	+	Q12H:	0	-	+	Q2H:	0	-	+
Once Daily PRN:	0	-	+	Q12H PRN:	0	-	+	Q2H PRN:	0	-	+
Twice Daily:	3	-	+	Q8H:	0	-	+	PRN:	0	-	+
Twice Daily PRN:	0	-	+	Q8H PRN:	0	-	+	Alternate Days:	0	-	+
Three Times Daily:	0	-	+	Q6H:	0	-	+	OxygenPRN:	0	-	+
Three Times Daily PRN:	1	-	+	Q6H PRN:	2	-	+	Oxygen < 15: hrs	0	-	+
Four Times Daily:	2	-	+	Q4H:	0	-	+	Oxygen < 15 hrs:	0	-	+
Four Times Daily PRN:	0	-	+	Q4H PRN:	0	-	+				

Section C - Additional Directions

Break/crush tablet:	0	-	+	Take at specified time:	1	-	+	Take/use as directed:	0	-	+
Dissolve tablet/powder:	0	-	+	Relation to food:	2	-	+	Tapering/increasing:	0	-	+
Multiple units at once:	2	-	+	Take with spec fluid:	0	-	+	Alternating dose:	0	-	+
Variable dose:	1	-	+								

MRCI: Form A Formulations



MRCI: Form B Dosing Frequency

Section B - Dosage Frequency

Once Daily:	5	- +	Q12H:	0	- +	Q2H:	0	- +
Once Daily PRN:	0	- +	Q12H PRN:	0	- +	Q2H PRN:	0	- +
Twice Daily:	3	- +	Q8H:	0	- +	PRN:	0	- +
Twice Daily PRN:	0	- +	Q8H PRN:	0	- +	Alternate Days:	0	- +
Three Times Daily:	0	- +	Q6H:	0	- +	OxygenPRN:	0	- +
Three Times Daily PRN:	1	- +	Q6H PRN:	2	- +	Oxygen < 15: hrs	0	- +
Four Times Daily:	2	- +	Q4H:	0	- +	Oxygen < 15 hrs:	0	- +
Four Times Daily PRN:	0	- +	Q4H PRN:	0	- +			

MRCI: Form C Dosing Frequency

Section C - Additional Directions

Break/crush tablet:	0	- +	Take at specified time:	1	- +	Take/use as directed:	0	- +
Dissolve tablet/powder:	0	- +	Relation to food:	2	- +	Tapering/increasing:	0	- +
Multiple units at once:	2	- +	Take with spec fluid:	0	- +	Alternating dose:	0	- +
Variable dose:	1	- +						

Report 1: Score Summary

Close Report

Cohort: CU Geriatric

Mean Score: 25.4 **Median Score:** 24 **Score Range:** 6 to 64

Patient ID	FormType	Dosage Form	Frequency	Directions	Total Score	Med Count	Total Patient Score	Total Med Count	Total Blank Freqs
3001	Disease	1	1	1	3	1	27	16	4
3001	Other Rx	5	5.5	3	13.5	10	27	16	4
3001	OTC	3	6.5	1	10.5	5	27	16	4
3002	Disease	1	1.5	3	5.5	2	18	9	0
3002	Other Rx	1	7.5	2	10.5	6	18	9	0
3002	OTC	1	1	0	2	1	18	9	0
3003	Disease	1	1	0	2	1	28.5	11	1
3003	Other Rx	7	11.5	6	24.5	9	28.5	11	1
3003	OTC	1	1	0	2	1	28.5	11	1
3004	Disease	1	1	1	3	1	28.5	15	1
3004	Other Rx	5	14.5	2	21.5	11	28.5	15	1
3004	OTC	1	3	0	4	3	28.5	15	1
3005	Disease	1	1	0	2	1	30	12	1
3005	Other Rx	3	14	1	18	8	30	12	1
3005	OTC	6	3	1	10	3	30	12	1
3006	Disease	1	1	2	4	1	35	15	2
3006	Other Rx	7	8	5	20	8	35	15	2
3006	OTC	3	7	1	11	6	35	15	2

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MRCI METHODS AND SCORES

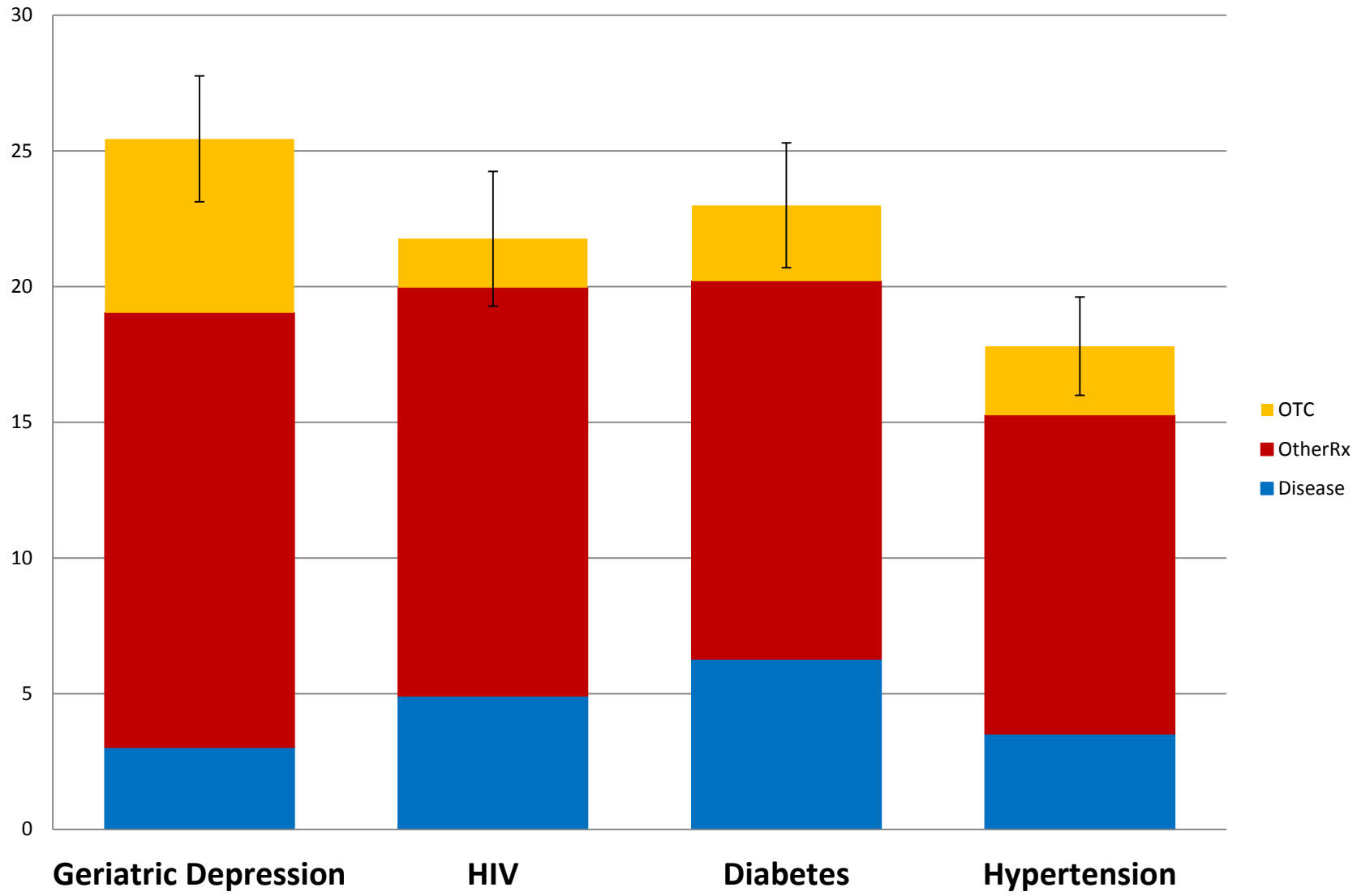
Methods: Data Sources and Procedures

- Select University Hospital Clinics
- Identify treated patients with qualifying diagnosis and current medication from associated drug class
  - Define active treatment in clinic
  - Randomly sample for cohorts (n=100)
  - Extract de-identified medication list, current comorbidities, usual care clinical measures, demographics
- Clinical faculty primary coders, fellow/student secondary coders using database tool
- Programmer analyst outputs data to statistical software

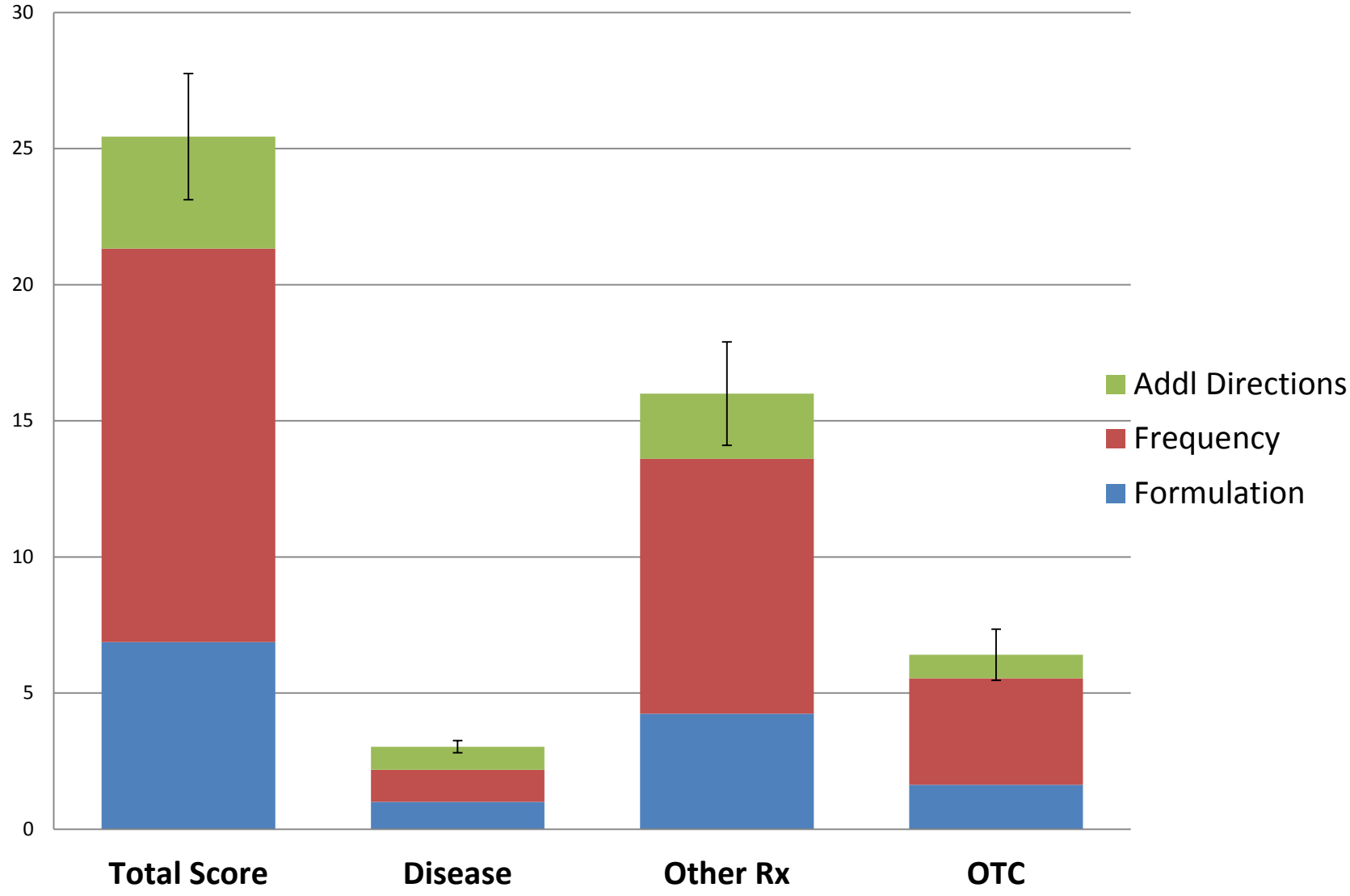
Patient and Medication Characteristics

	Geriatric Depression n=100	HIV n=100	Diabetes Mellitus n=100	Hypertension n=100
Medication Count Total Per Patient	12.1 (3-26)	10.8 (1-27)	10.4 (2-25)	8.3 (2-18)
Medication Count By Type				
Num. Disease Meds	1.2 (1-3)	2.3 (1-6)	1.9 (1-4)	2.1 (1-5)
Num. Other Rx	7.4 (1-19)	7.6 (0-23)	6.8 (0-18)	4.7 (0-12)
Num. OTC	3.5 (0-12)	1.0 (0-5)	1.7 (0-11)	1.5 (0-7)
Categorical (total)				
Pct. on 0-5 meds	4%	19%	15%	30%
Pct. on 6-10 meds	38%	33%	38%	42%
Pct. on 11+ meds	58%	48%	47%	28%

Mean MRCI by Medication Type



Mean MRCI for Geriatric Depression:
Type by Formulation, Frequency, Directions



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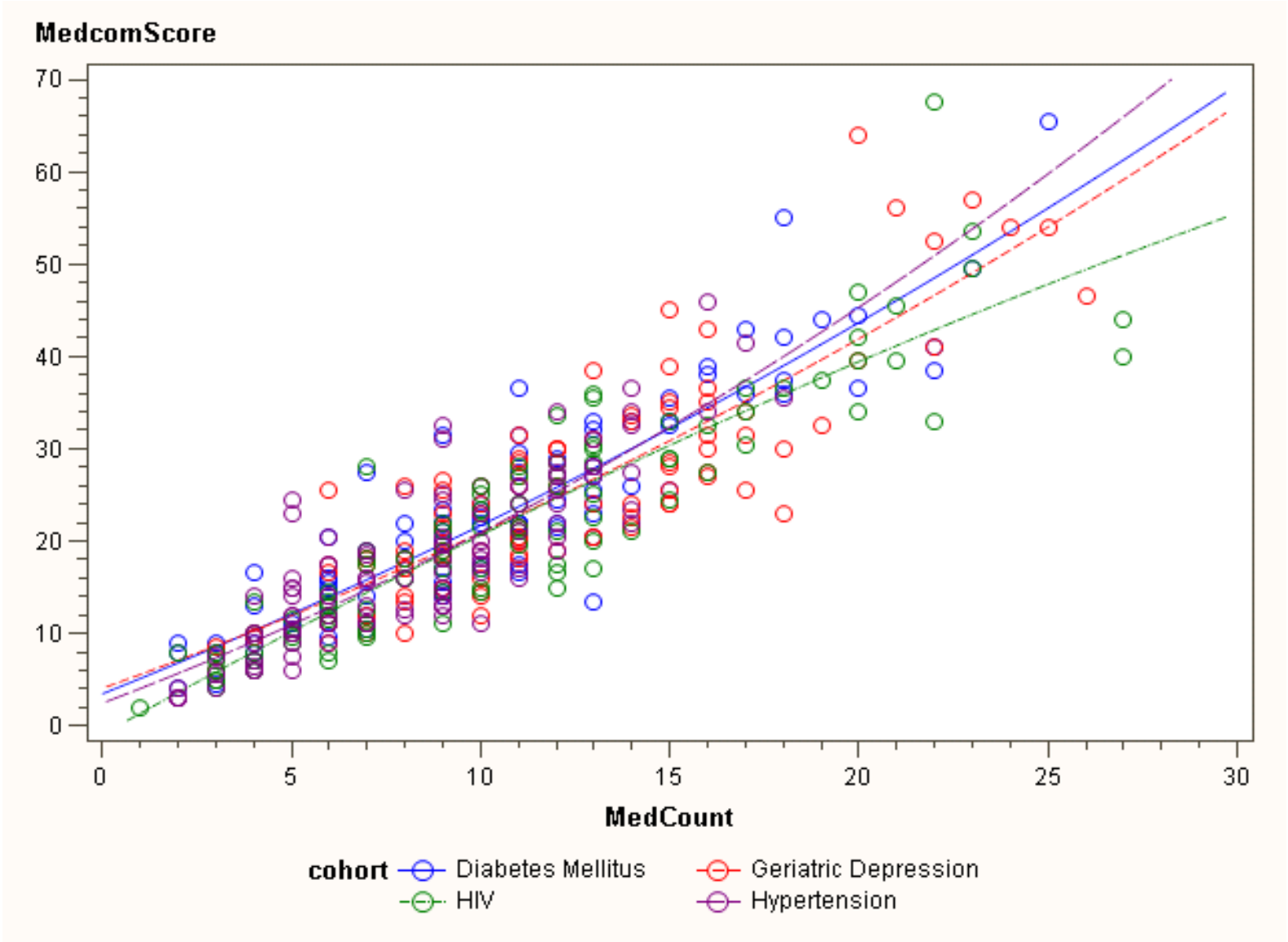
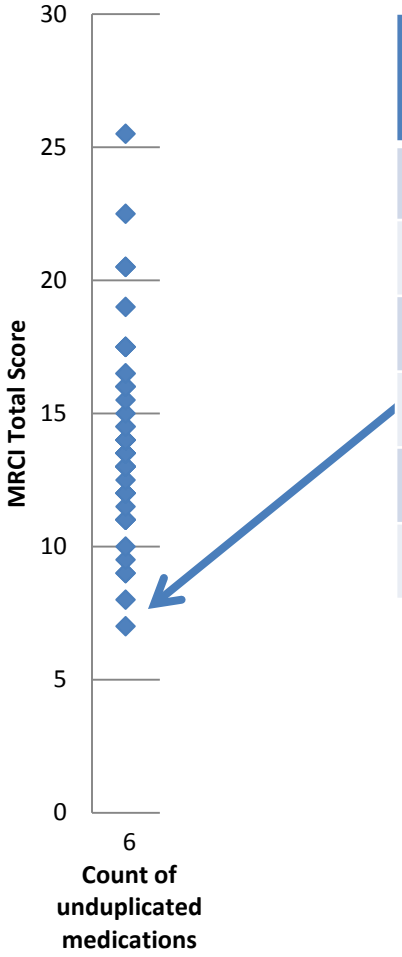
RESULTS FROM PATIENT-LEVEL MRCI SCORING

MRCI Varies for any Given Med Count

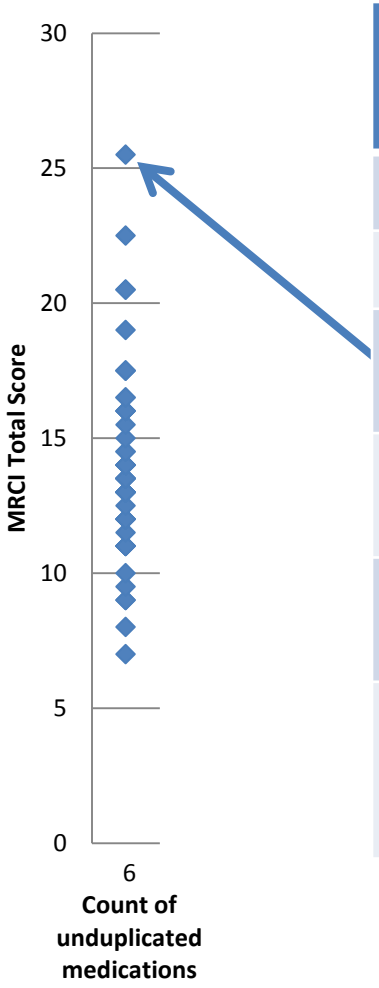


This patient on 6 medications has a MRCI score of 7



Medication	Formulation	Type	Frequency
ATRIPLA 600-200-300 mg	Tablet	Disease	Daily
FOSAMAX 70 mg	Tablet	Other Rx	Weekly
ZOFRAN 4 mg	Tablet	Other Rx	Daily
ZYPREXA 15 mg	Tablet	Other Rx	Daily
LAMICTAL 100 mg	Tablet	Other Rx	Daily
Lansoprazole 30 mg	Capsule	OTC	Daily

This patient on 6 medications has a MRCI score of 25.5



Medication	Formulation	Type	Frequency
METAMUCIL	Powder	OTC	Once
Acetaminophen 500 mg	2 Tablets	OTC	Daily
Calcium Carbonate 200 mg (500 mg)	2 ½ Chewable Tablets	OTC	2 Times Daily
REMERON 15 mg	½ Tablet	Disease	Nightly at Bedtime
AMBIEN 5 mg	Tablet	Other Rx	Nightly at Bedtime
PROVENTIL HFA VENTOLIN HFA 90 mcg/Actuation Inhaler	1-2 Puffs	Other Rx	Every 4 hours

Conclusions and Extensions

- Disease specific MRCI contributes only 12-18% of total medication complexity score
  - Adherence programs must look beyond disease treatment, consider complexity of all medications (Rx and OTC)
- Dosing frequency drives the MRCI score
  - Should special instructions have more weight?
- OTCs contribute 25% to medication complexity for geriatric depression
- Medication risk, in addition to formulation or drug administration, may add important components to complexity

Thank You!

janhirsch@ucsd.edu

anne.libby@ucdenver.edu