Impact of a formulary alternative clinical decision support tool on inpatient medication prescribing and discharge orders

UCSF Medical Center

UCSF Benioff Children's Hospital

Clara Mikhaeil, PharmD[1]; Johnny Rau, PharmD, BCPS[2]; Dwight Utzman, PharmD, BCPS[3]; Sheri VanOsdol, PharmD, BCPS[4]

Department of Clinical Pharmacy, School of Pharmacy, University of California, San Francisco[1], Department of Pharmaceutical Services, University of California, San Francisco[2], Department of Information Technology—Clinical Services, University of California, san Francisco[3], Department of Clinical Pharmacy, Medication Outcomes Center, University of California, San Francisco[4]

Background [1-3]

- The importance of establishing and managing a hospital formulary system is well recognized and emphasized by both the American Society of Health-System Pharmacists (ASHP) and the Joint Commission.
- The use of a computerized provider order entry (CPOE) system allows for the use of clinical decision support (CDS) tools to aid prescribers in adherence to a formulary.
- The electronic health record at the University of California, San Francisco Medical Center (UCSFMC) that allows for CPOE and implementation of CDS is Epic®.
- In April 2014, a new formulary alternative CDS tool was implemented at UCSFMC.
- The new CDS tool includes a dose conversion tables that allow providers to order the equivalent dose of the alternative formulary medication.

Purpose

The purpose of this study is to evaluate the impact of the new formulary alternative CDS tool on the quality of prescribing when patients are transitioned to the UCSFMC formulary alternative and upon discharge.
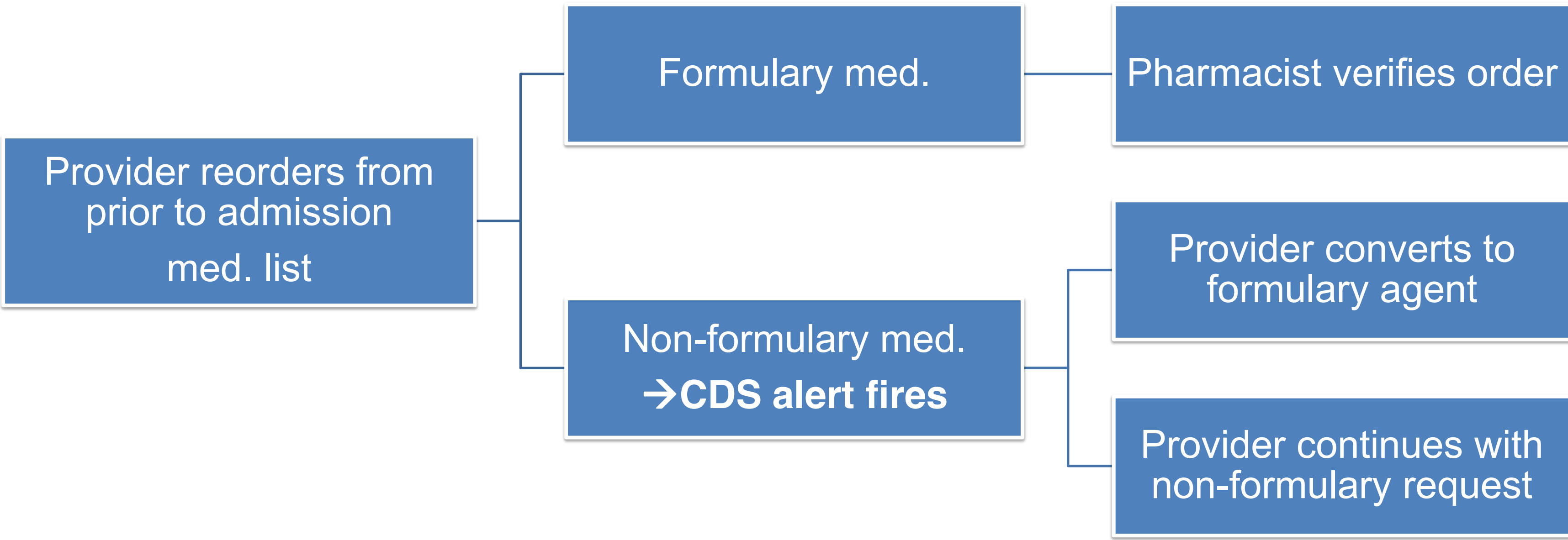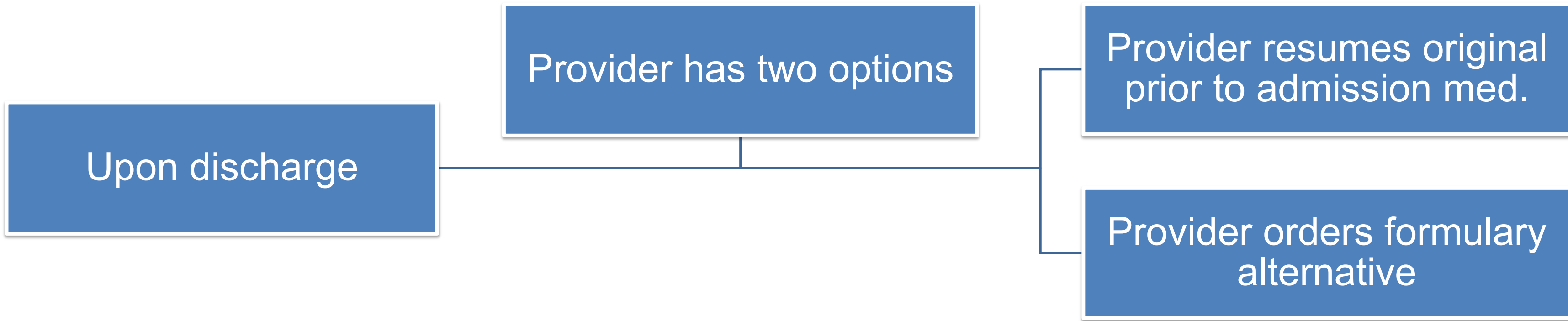
Figure 1. Prior to admission workflow

Figure 2. Discharge ordering workflow

Correspondence: Clara Mikhaeil, Pharm.D., PGY1 Pharmacy Practice Resident, Department of Clinical Pharmacy, UCSF.
521 Parnassus Ave, C-152. San Francisco, CA 94143-0622.
e-mail: clara.mikhaeil@ucsf.edu; fax: 415-514-2680.

Methods

- This is a retrospective cohort study assessing four medication classes for which a new formulary alternative CDS tool was implemented.

Table 1. Drug classes with a formulary alternative CDS tool

Drug Class	UCSFMC Formulary
Angiotensin converting enzyme inhibitors (ACEI)	Valsartan and Losartan
Angiotensin receptor blockers (ARB)	Lisinopril
Proton pump inhibitors (PPI)	Lansoprazole
Statins	Pravastatin and Atorvastatin

- Data was collected for 6 month periods before (10/2013 - 3/2014) and after (5/2014 - 10/2014) the CDS tool go-live date.
- Generated reports display the prior to admission (PTA) medication and the corresponding medication ordered during hospital stay.
- A subset of orders converted to a formulary alternative in the post implementation period were randomly assessed through chart review for action at discharge (e.g. Conversion back to PTA medication, continuation of formulary drug or other action).
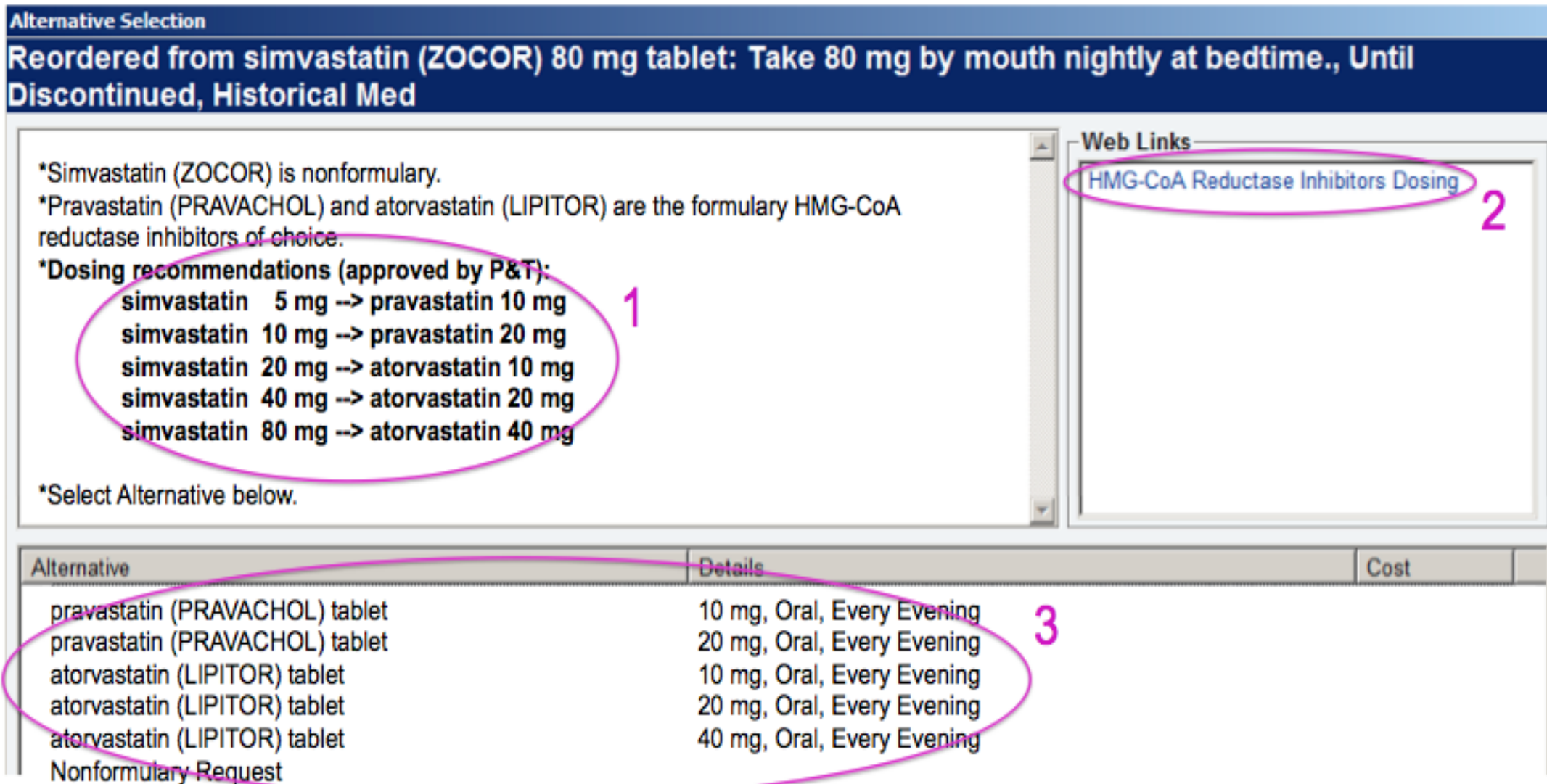

Figure 3. Newly implemented CDS tool

1) Dose conversions
2) Medication class dose conversion link
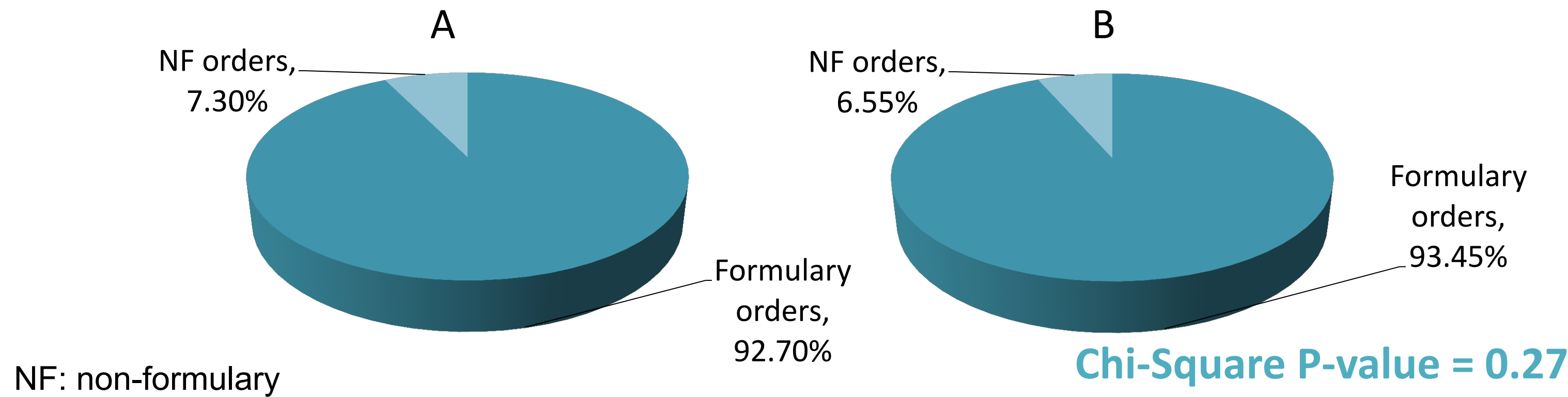3) Direct links to formulary alternatives

Results

Data collection

Table 2. Orders analyzed before and after the CDS tool go-live date

	Before go-live date N (%)	After go-live date N (%)
# orders	2521	3146
ACEI	170 (6.74)	260 (8.26)
ARB	38 (1.51)	85 (2.70)
PPI	2101 (83.34)	2485 (78.99)
Statin	212 (8.41)	316 (10.04)

Formulary vs. non-formulary orders

Figure 4. Graph A: before go-live date, graph B: after CDS tool go-live date

NF orders, 7.30% — Formulary orders, 92.70%

NF orders, 6.55% — Formulary orders, 93.45%

NF: non-formulary

Chi-Square P-value = 0.27

Appropriate dose strength/ frequency conversion

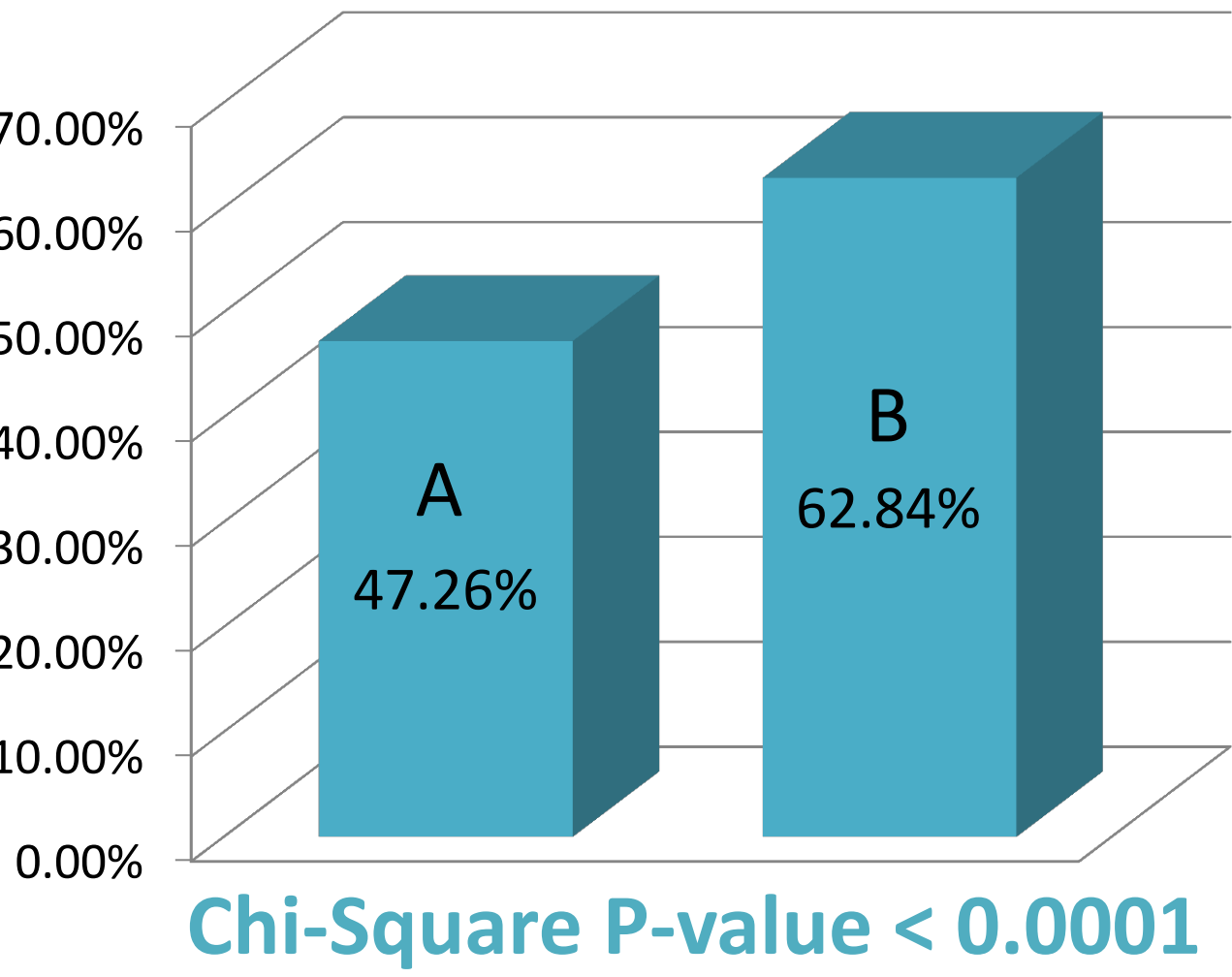A 47.26% B 62.84%

Chi-Square P-value < 0.0001

Figure 5. Percentage of orders converted appropriately to a formulary alternative before (A) CDS tool go-live date and after (B) upon hospital admission

Medication reconciliation upon discharge

Table 2. Medication reconciliation upon discharge during the 6 months period after the CDS tool go-live date

Total chart reviews	505
Reconciled back to PTA medication	474 (93.90%)
Continued on formulary alternative medication	8 (1.60%)
Continued on both PTA and formulary alternative medication	1 (0.20%)
Neither PTA nor formulary alternative resumed	22 (4.40%)

Conclusions

- While adding a dose conversion table to the formulary alternative CDS tool did not change providers formulary adherence at UCSFMC, it significantly improved appropriate dose conversion to a formulary alternative upon hospital admission.
- Errors during medication reconciliation upon discharge include continuing the formulary alternative in addition to or instead of the patients' PTA medications.
- New CDS tools that aid providers in medication reconciliation upon discharge may help eliminate such discrepancies.

References

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Approved by the UCSF Committee on Human Research