Assessment of Anti-Infective Utilization at Stanford Hospital

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ABSTRACT

Objectives:
-Analyze UHC data to identify areas and anti-infectives that represent opportunities for savings
-Where opportunities for cost-savings exist, compare Stanford anti-infective utilization to that of peer hospitals with equivalent outcomes and lower costs
-Conduct primary research interviews with stakeholders at Stanford
-Identify opportunities for shifting utilization behavior

Study Design:

Methods:
Both quantitative analysis of Stanford's antibiotic use across diagnosis related groups (DRGs) and qualitative interviews with key antibiotic stewardship stakeholders were performed.

Results:
-12 top spending DRGs were identified that collectively represent an opportunity for $1.6M in annual cost savings as compared to the University Health Care System (UHC) mean
-Utilization patterns of cost-driving anti-infectives vary widely across DRGs
-6 anit-infectives were responsible for almost $700K of potential savings in prioritized DRGs
-Across all prioritized anti-infectives, Stanford treats patients for considerably longer than its peer hospitals
-Physician stakeholders held mixed opinions about the helpfulness of infectious disease consults, but expressed a desire for greater availability of pharmacist consultations

Conclusions:
-Most physicians recognize that there are significant anti-infective stewardship issues at Stanford, but feel their prescribing practices are appropriate
-Stanford uses high-cost anti-infectives with both greater frequency and longer duration than its top-performing peers
-Most interviewed stakeholders believe that time-outs would be a reasonable means of reducing anti-infective overuse

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BACKGROUND

In 2010, Stanford Health Care ranked 4th highest among 86 UHC hospitals in the amount of antibiotics used per 1000 patients. In 2014, the Stanford "General Medicine" bucket ranked 78th out 98 UHC hospitals in total antimicrobial costs per patient, with costs almost 3 times the mean cost per patient for UHC hospitals.

The University Health System Consortium (UHC) is a group of 117 academic medical centers and their affiliated hospitals, which share basic benchmarking data with each other.

MATERIALS AND METHODS

Stanford data was compared to both individual peer UHC hospitals and to the UHC hospitals in aggregate. External references for best practices, such as IDSA and SHEA, were utilized to identify potential alternatives for anti-infective selection.

After DRGs were prioritized for analysis based on comparison to the average UHC hospital, a comparator set of UHC hospitals that are "top performers" on outcomes for each DRG were selected for subsequent analysis.

Qualitative interviews were performed with 13 stakeholders in the Stanford hospital system. Each interview was approximately 30 minutes long and conducted with a promise of blinding. Each interviewee was briefed with an introduction to the project. General perspectives were gathered to evaluate the personal perspectives on anti-infective stewardship at Stanford. Specific questions about the most highly rated DRGs and how prescription protocols may vary in these cases.

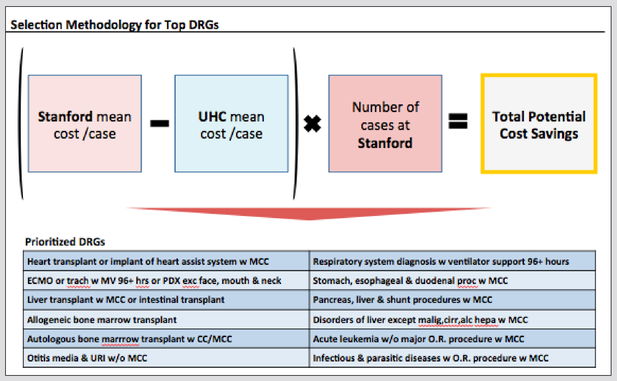

Figure 1. Selection Process for Top Spending DRGs

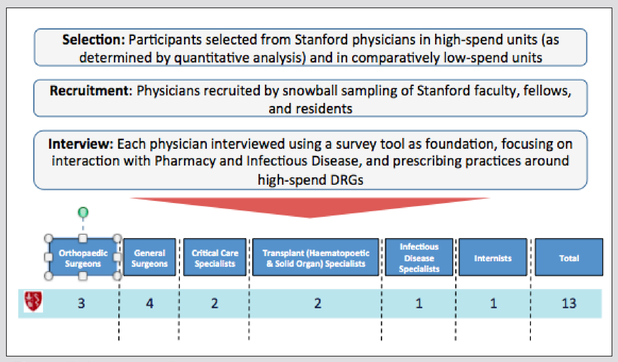

Figure 2. Interview Overview

RESULTS

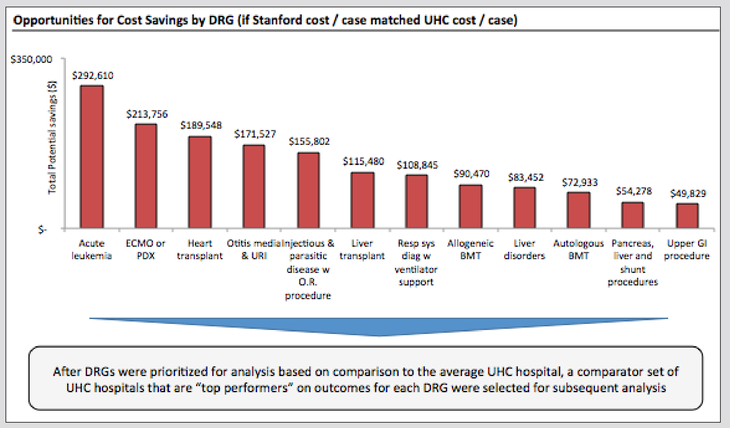

Figure 3. The 12 DRGs prioritized for analysis collectively represent an opportunity for $1.6M in annual cost savings compared to the UHC mean

Illustrative Data for Benchmarking Heart Transplant DRG

Individual Resource	Hospital	Clinical Population Denominator Cases	Clinical Population Numerator Cases	% Clinical Population Numerator Cases	Mean Days Resource Used/ Case	(DDD) Resource Total $	(DDD) Resource $/ Case - Denominator
linezolid	Stanford	58	7	12.07	15.1	25,188	434
linezolid	UHC	500	18	3.60	14.4	64,548	129
voriconazole	Stanford	58	2	3.45	9.5	4,668	80
voriconazole	UHC	500	8	1.60	15.8	15,278	31
caspofungin	Stanford	58	10	17.24	14.8	24,343	420
caspofungin	UHC	0	0	0.00	0.0	0	
valganciclovir	Stanford	58	23	39.66	15.2	40,793	703
valganciclovir	UHC	500	179	35.80	11.2	227,995	456
daptomycin	Stanford	58	4	6.90	22.8	28,668	494
daptomycin	UHC	500	15	3.00	10.7	49,325	99
meropenem	Stanford	58	12	20.69	25.3	6,967	120
meropenem	UHC	500	39	7.80	9.7	8,260	17
amphotericin b liposome (ambisome)	Stanford	58	3	5.17	5.3	6,000	103
amphotericin b liposome (ambisome)	UHC	500	7	1.40	7.6	17,355	35

The comparator set varied for each DRG, and was established by identifying a set of peer hospitals with at least as many cases as Stanford and equivalent or superior outcomes on mortality (based on benchmarking methodology established in UHC User Manual for Pharmacy Reporting)

Figure 4. For each prioritized DRG, resource utilization was compared to top-performing peer hospitals

Drug	Potential Savings	# of Cases
Caspofungin	$209,559.01	172
Ribavirin	$190,230.15	11
Amphotericin B liposome (ambisome)	$156,629.76	39
Linezolid	$61,985.29	85
Valganciclovir	$48,961.26	86
Meropenem	$29,965.14	228
Fidaxomicin	$12,991.20	5
Daptomycin	$11,361.01	34
Amphotericin B (fungizone)	$11,283.39	37
Anidulafungin	$10,647.23	12
Aztreonam	$9,826.18	30
Atovaquone	$7,374.64	34
Tigecycline	$7,301.04	2
Rifaximin	$7,248.59	89
Erythromycin (systemic)	$6,412.66	53
Itraconazole	$5,906.18	25
Clindamycin	$5,613.91	98
Piperacillin sodium/tazobactam sodium	$4,614.07	433
Acyclovir	$2,702.88	227
Nafcillin	$2,699.61	13
Ceftaroline fosamil	$1,819.57	2
Ciprofloxacin	$1,747.42	279
Cefoxitin	$1,450.76	53

Drug	Potential Savings	# of Cases
Azithromycin	$620.51	68
Tenofovir disoproxil	$408.32	5
Ceftriaxone	$170.05	112
Tobramycin sulfate	$105.52	4
Gentamicin	$98.19	48
Moxifloxacin	$39.06	4
Cephalexin	$29.38	8
Amoxicillin/clavulanate potassium	$9.45	23
Ampicillin	$-11.82	5
Ceftazidime	$-99.83	2
Ampicillin sodium/sulbactam sodium	$-195.85	8
Cefazolin sodium	$-262.04	154
Sulfamethoxazole/trimethoprim	$-595.71	142
Colistimethate	$-627.67	4
Levofloxacin	$-772.27	145
Fluconazole	$-1,797.51	211
Valacyclovir	$-2,060.28	30
Ganciclovir	$-2,691.37	58
Ertapenem	$-3,324.04	22
Metronidazole	$-4,930.43	117
Cefepime	$-5,674.82	250
Vancomycin	$-5,721.18	542
Voriconazole	$-13,355.56	103
Grand Total	$767,691.10	4,112

*Potential savings were calculated by comparing Stanford's anti-infective use with that of appropriate peer hospitals selected for each DRG, as described previously.

Figure 5. Potential savings by anti-infective across 12 prioritized DRGs

Overview of Potential Cost Savings by DRG and Anti-Infective

DRG	Anti-infective: Caspofungin	Ribavirin	Amphotericin B liposome (ambisome)	Linezolid	Valganciclovir	Meropenem	Grand Total
ECMO	$73,587		$31,070	$13,816	$8,079	$8,710	$135,261
Ventilator support >96h	$5,740	$79,494		$4,755	$1,378	$2,252	$93,619
Liver transplant	$61,189		$8,790	$13,924	$7,541	$1,459	$92,903
Otitis media		$87,941			$2,419		$90,360
Infectious disease OR procedure	$35,957		$3,621	$34,718	$4,025	$3,967	$82,288
Acute leukemia	-$819		$79,096	-$20,345		$2,600	$60,532
Heart transplant	$15,162		$4,073	$12,849	$17,365	$5,651	$55,100
Liver disorders	$6,835	$22,795		$1,380	$8,154	$1,334	$40,498
Pancreas/liver procedure	$12,823			$16,110		$1,707	$30,640
Upper GI procedure	$18,964			-$7,338		$2,809	$14,434
Allogeneic BMT	-$17,130		$29,981	-$7,883		-$159	$4,810
Autologous BMT	-$2,749					-$365	-$3,114
Grand Total	$209,559	$190,230	$156,630	$61,985	$48,961	$29,965	$697,331

Six anti-infectives were responsible for almost $700K of potential savings in prioritized DRGs

Figure 6. Utilization patterns of cost-driving anit-infectives vary widely across DRGs

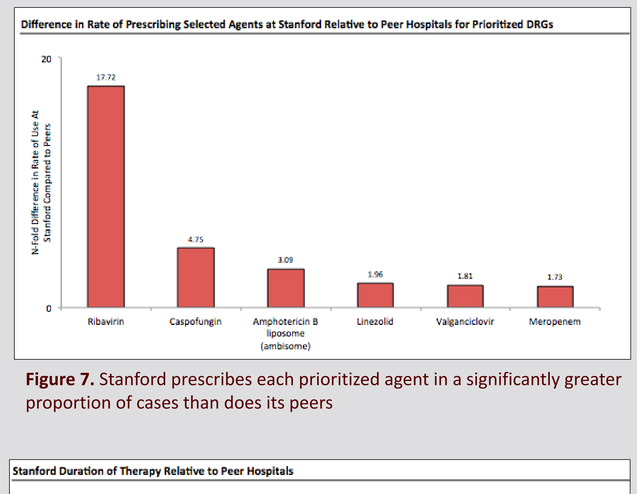

Figure 7. Stanford prescribes each prioritized agent in a significantly greater proportion of cases than does its peers

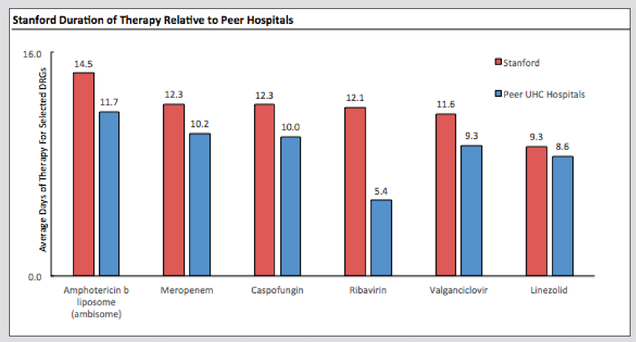

Figure 8. Across all prioritized anti-infectives, Stanford treats patients for considerably longer than its peer hospitals

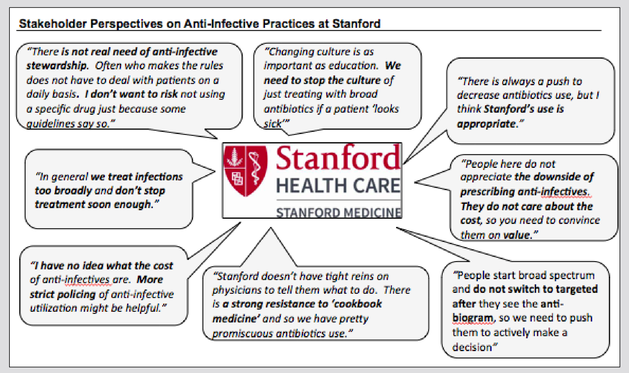

Figure 9. General perspectives on anti-infectives at Stanford

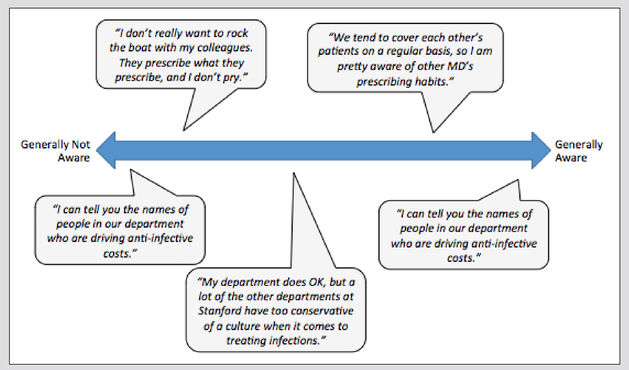

Figure 10. Interviewed stakeholders report varying degrees of awareness regarding their peers' prescribing practices

CONCLUSIONS

Most physicians recognize that there are significant anti-infective stewardship issues at Stanford, but feel that their prescribing practices are appropriate.
Six drugs across 12 DRGs collectively account for almost $700K in potential annual savings if Stanford's prescribing practices were more closely aligned with its top-performing peers.
Stanford uses high-cost anti-infectives with both greater frequency and longer duration than its top-performing peers.
Most interviewed stakeholders believe that time-outs would be a reasonable means to reducing anti-infective overuse.