

Project Title

Economic Burden of Adverse Drug Reactions and Potential for Pharmacogenomic Testing in Singaporean Adults

Project Lead and Members

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Organisation(s) Involved

SingHealth, SingHealth Health Services Research Centre, Singapore General Hospital, National University of Singapore, Genome Institute of Singapore, University of British Columbia

Aims

To quantify the economic burden of adverse drug reactions (ADRs), and to estimate the breakeven cost of pre-emptive pharmacogenetic (PGx) testing in Singapore.

Project Category

Clinical improvement, Safety, Research

Keywords

Singapore General Hospital, National University of Singapore, University of British Columbia, Clinical Improvement, Safety, Research, Hospitalisation Costs, Adverse Drug Reactions, Hospital Admissions, Economic Burden, SingHealth Health Services Research Centre, Health Sciences Authority, Duke-NUS Medical School, Genome Institute of Singapore, Pre-Emptive Pharmacogenetic Testing, Wilcoxon Sign Rank Test

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INTRODUCTION

- Adverse drug reactions (ADRs) contribute to increased hospital admissions¹
- ADR survey in 1000 random adults admitted non-electively to SGH²
 - 12.4% of patients had at least 1 ADR at admission
 - 8.1% of admissions were caused by an ADR
- Pre-emptive pharmacogenetic (PGx) testing can potentially reduce ADRs and its associated costs

OBJECTIVES

- To quantify the economic burden of ADRs
- To estimate the breakeven cost of pre-emptive PGx testing in Singapore

METHODS

- Itemized cost for 1000 random non-elective adult hospitalizations in SGH
- Economic burden
 - Total cost of hospitalizations caused by ADRs
 - Incremental costs
 - Cost of admissions with ADRs vs. that of propensity score-matched controls
 - Wilcoxon sign rank test
- Pre-emptive PGx testing breakeven cost
 - Avoidable hospitalization costs due to drugs with a PGx association*
 - Estimated number of people taking those drugs*
 - Amounts extrapolated to entire Singapore population over a year

RESULTS and CONCLUSIONS

Total Cost

- 81 admissions caused by ADRs → **S\$788, 298**
- Bleeding and/or elevated International Normalized Ratio (INR) cost more than other types of ADRs (Table 1)

Table 1 Total cost of admissions cause by top 5 ADR types

ADR type	N	Median (range), S\$		P
		Yes	No	
Gastrointestinal	18	\$2760 (\$981 - \$112600)	\$4179 (\$817 - \$55710)	0.385
Bleeding/elevated INR	15	\$13690 (\$1953 - \$26710)	\$3111 (\$817 - \$112600)	6.58 x 10⁻³
Electrolyte abnormalities	8	\$2289 (\$1082 - \$8331)	\$4179 (\$817 - \$112600)	0.157
Infection/sepsis	6	\$6563 (\$2256 - \$55710)	\$3902 (\$817 - \$112600)	0.422
Hypotension	6	\$2960 (\$1082 - \$6054)	\$4228 (\$817 - \$112600)	0.245

Incremental Cost

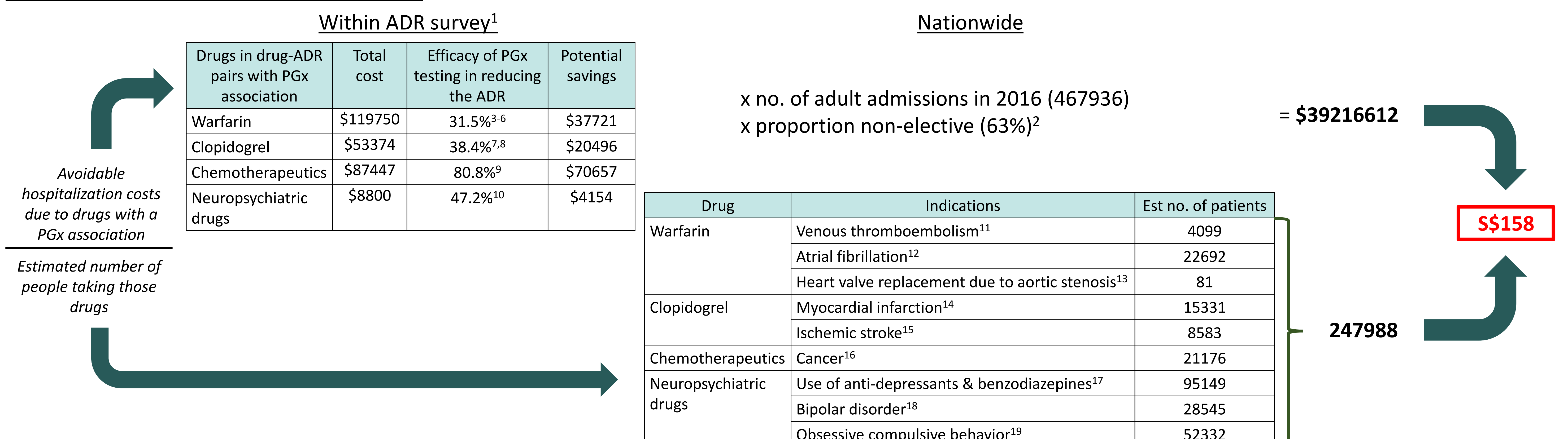
- Total incremental cost was not significantly higher
- Costs for laboratory investigations were significantly higher in admissions with ADRs (Table 2)

Table 2 Incremental costs of ADRs

Cost type	Admissions caused by ADRs		Admissions with but not caused by ADRs	
	Median of differences (95%CI), S\$	p	Median of differences (95%CI), S\$	p
Total	\$477 (-\$685 - \$3455)	0.243	-\$12 (-\$2077 - \$5893)	0.561
Drugs	\$66 (-\$23 - \$203)	0.100	-\$11 (-\$142 - \$164)	0.941
Laboratory investigations	\$259 (\$124 - \$901)	0.005	\$391 (\$137 - \$1410)	0.014
Other investigations	\$28 (-\$199 - \$521)	0.412	\$293 (-\$77 - \$896)	0.118
Treatments and procedures	\$36 (-\$135 - \$484)	0.329	\$86 (-\$205 - \$732)	0.265
Ward	\$106 (-\$65 - \$1159)	0.104	\$79 (-\$533 - \$1784)	0.455
Service and facility fees	\$0 (-\$189 - \$282)	0.903	\$0 (-\$422 - \$1241)	0.874
Consumables and misc	-\$7 (-\$100 - \$133)	0.912	\$10 (-\$164 - \$737)	0.747

The numbers each of cases and controls for admissions caused by ADRs and admissions with but not caused by ADRs were 76 and 37, respectively.

Pre-emptive PGx breakeven cost



References

- Sultana *et al.* J Pharmacol Pharmacother. 2013 Dec;4(5):73
- Chan *et al.* Br J Clin Pharmacol. 2016 Dec;82(6):1636-46
- Wen *et al.* Pharmacogenomics. 2017 Feb;18(3):245-53
- Pengo *et al.* PLoS One. 2015 Dec 28;10(12):e0145318
- Belley-Cote *et al.* Thromb Haemost. 2015 Oct;114(4):768-77
- Shi *et al.* PLoS One. 2015 Jan;10(12):e0144511
- Sánchez-Ramos *et al.* Int J Cardiol. 2016 Dec 15;225:289-95
- Xie *et al.* Int J Cardiol. 2013 Oct 9;168(4):3736-40
- Deenen *et al.* J Clin Oncol. 2016 Jan 20;34(3):227-34
- Olson *et al.* Prim care companion CNS Disord. 2017;19(2)
- Molina *et al.* Ann Acad Med Singapore. 2009 Jun;38(6):470-8
- Yap *et al.* J Electrocardiol. 2008 Mar;41(2):94-8
- Tay *et al.* Singapore Med J. 2013 Jan;54(1):36-9
- NRDO. Trends in acute MI in Singapore 2007-2013
- NRDO. Trends in stroke in Singapore 2005-2013
- NRDO. Singapore Cancer Registry Annual Registry Report 2015
- Subramaniam *et al.* BMC Psychiatry. 2013 Sep 23;13:231
- Subramaniam *et al.* J Affect Disord. 2013 Apr 5;146(2):189-96
- Subramaniam *et al.* Soc Psychiatry Psychiatr Epidemiol. 2012 Dec;47(12):2035-43