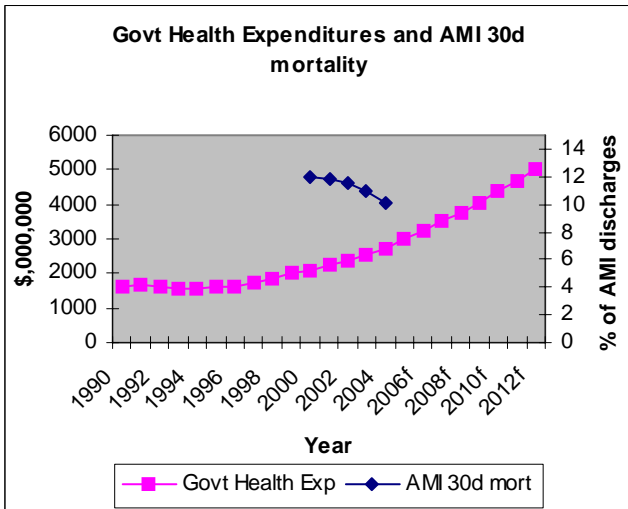
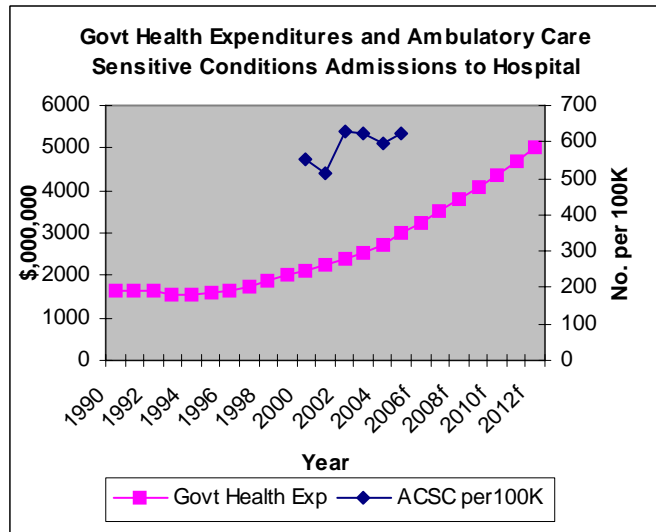
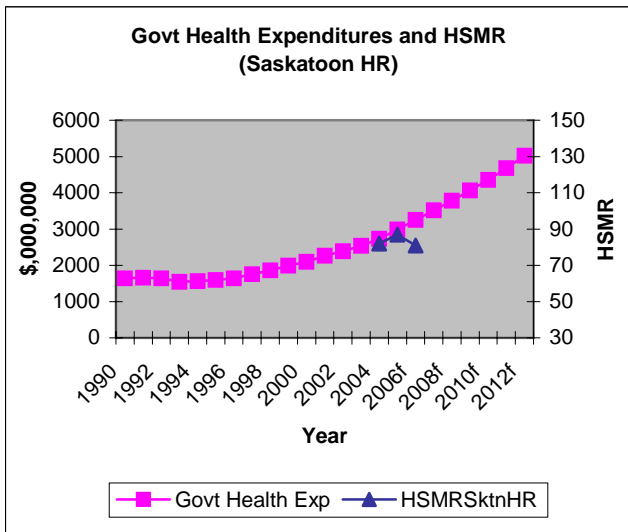
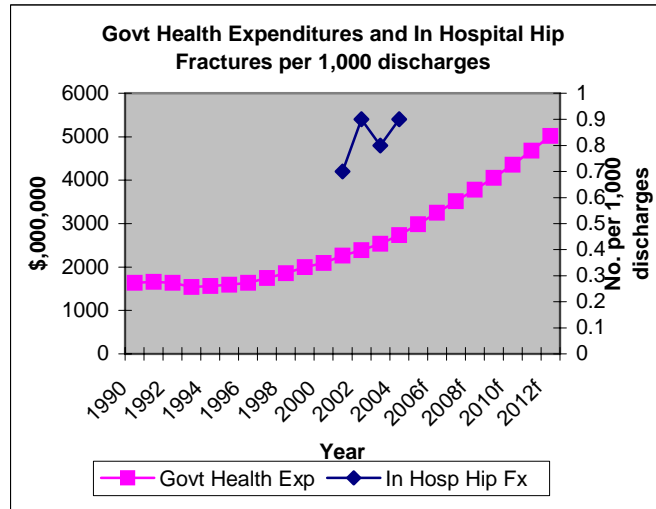
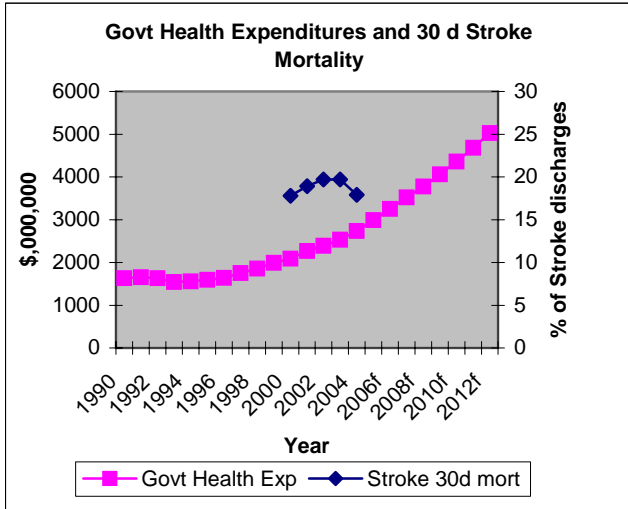


Increase Quality/Spend Smarter: A Proposal to Improve the Effectiveness and Efficiency of Health Care in Saskatchewan

APPENDICES

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Appendix A. Persistent concerns with quality despite increases in health expenditures



Appendix B

Table of Evidence showing the Cost-effectiveness of implementing QI initiatives

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Study (Reference)	Setting / Study Participants	Study design	Economic Analysis / Perspective	Domain: QI initiative / intervention and target condition	Costs and consequences considered	Results of the study	Limitations
I. PRIMARY CARE							
Gray et al. 2000 (18)	23 UK hospital clinic based study centers 3867 patients	Longitudinal (panel) data analysis	Program evaluation Healthcare provider's perspective	Intensive blood glucose control program	Intervention Costs: Personnel time, medication costs Consequences: Change in health care utilization and QALY.	Intensive glucose control increased trial treatment costs by £695 per patient but reduced the cost of complications by £957 compared with conventional management. The incremental cost per event-free year gained was £1166.	None identified.
Wise et al. 2006 (24)	32370 individuals	Cross sectional data analysis	Program evaluation Healthcare provider's perspective	Integrated set of care coordination tools and chronic disease management interventions	Intervention Costs: fixed costs (data analytic support, IT, management), variable costs (personnel time) Consequences: Change in health care utilization	Integrated care coordination helped to reduce per member per year cost \$756 compared to control group. ROI estimated 5-to-1.	Results are not statistically significant.

Study (Reference)	Setting / Study Participants	Study design	Economic Analysis / Perspective	Domain: QI initiative / intervention and target condition	Costs and consequences considered	Results of the study	Limitations
Rost et al. 2005 (25)	211 patients	Longitudinal (panel) data analysis	Program evaluation Societal perspective	Enhancing primary care depression management on an ongoing basis	Intervention costs: Personnel costs, overhead costs, health care utilization costs Consequences: Gained QALY	Enhanced care significantly increased the number of days free of depression compared to usual care (648 vs. 588) while incremental health plan costs decreased significantly (\$568 vs. -\$12).	None identified.
Simon et al. 2001 (26)	228 patients	Longitudinal (panel) data Analysis	Cost-effectiveness analysis Healthcare provider's perspective	Collaborative care program	Intervention Costs: Prescription costs, physician costs Consequences: Depression-free days	The incremental cost-effectiveness ratio is \$21.44 per depression-free day	No administrative or material costs were calculated for the collaborative. A short time period (6-month).

Study (Reference)	Setting / Study Participants	Study design	Economic Analysis / Perspective	Domain: QI initiative / intervention and target condition	Costs and consequences considered	Results of the study	Limitations
Huang et al. 2007 (27)	17 Community Health Centers United States 80 adult patients / health center and time period (1998, 2000, 2002)	Longitudinal (panel) data analysis	Cost-effectiveness analysis Societal perspective	Health Disparities Collaborative to improve diabetes care	Intervention Costs: Physician costs, medication costs Consequences: QALY	Average improvement in QALY = 0.35. Incremental cost-effectiveness ratio = \$33,386/QALY Multiple processes of care significantly improved (e.g., testing and screening, drug prescribing). Significant improvement in mean A1c and cholesterol level. No significant improvement in blood pressure.	None identified.
Schoenbaum et al. 2005 (28)	1356 patients	Longitudinal (panel) data analysis	Program evaluation Healthcare provider's perspective	Quality improvement programs for depression through medication or psychotherapy	Intervention costs: Screening, intervention materials, personnel time, patient time Consequences: health care utilization and gained QALY	Cost per QALY for men ranged btw \$16.600 and \$42.600 under psychotherapy. For women, estimated costs per QALY were \$23.600 or below under medication therapy and \$12.500 or below under psychotherapy	Costs are not detailed. The study population is limited to patients who sought health care in primary care settings.

Study (Reference)	Setting / Study Participants	Study design	Economic Analysis / Perspective	Domain: QI initiative / intervention and target condition	Costs and consequences considered	Results of the study	Limitations
Verstappen et al. 2004 (29)	194 primary care physician	Longitudinal (panel) data analysis	Program evaluation Healthcare provider's perspective	Education program for physicians to improve test ordering	Intervention Costs: Cost of the education program Consequences: Number and cost of test ordering by physicians	Cost of the comprehensive intervention program is €644 more compared to alternative program (a limited intervention) whereas the benefits from the comprehensive program are only €140 more compared to alternative program.	Case-mix of the patients were not controlled which may have an effect on the number of test orders.
Solberg et al. 2004 (30)	Approximately 16800 patients	Longitudinal (panel) data analysis	Program evaluation Healthcare provider's perspective	Implementing an open access to primary care clinics for patients with chronic conditions	Intervention costs: Increased number of primary care physician visits Consequences: Change in overall resource utilization (e.g. other physicians, emergency department, hospital, etc.)	Open access to primary care clinics for patients with chronic conditions was associated with increased use of primary care but did not affect overall resource use.	There is no control group.

Study (Reference)	Setting / Study Participants	Study design	Economic Analysis / Perspective	Domain: QI initiative / intervention and target condition	Costs and consequences considered	Results of the study	Limitations
Kelly et al. 2000 (31)	80 children	Longitudinal (panel) data analysis	Program evaluation Healthcare provider's perspective	Asthma education and medical treatment. A nurse maintained monthly contact with the families.	Intervention Costs: Allergy clinic visits, home health visits, nurse time Consequences: Change in quality of life scores and health care utilization	Emergency department visit, hospitalization, and asthma related health care costs of intervention group decreased significantly compared to control group	Some cost items for intervention are missing such as administrative, research, etc. Medication usage difference between the intervention and control group was not recorded.
Pyne et al. 2005 (32)	211 patients	Longitudinal (panel) data analysis	Program evaluation Societal perspective	Education of primary care teams to assess, educate, and monitor depressed patients	Intervention costs: Personnel costs, overhead costs, health care utilization costs Consequences: Gained QALY	Among patients receptive to antidepressants, the incremental cost-effectiveness ratio was \$5864 per QALY. For patients not receptive to antidepressants the intervention was no more effective than usual care.	No inpatient costs included.

Study (Reference)	Setting / Study Participants	Study design	Economic Analysis / Perspective	Domain: QI initiative / intervention and target condition	Costs and consequences considered	Results of the study	Limitations
Lucas et al. 2001 (33)	137 individuals	Longitudinal (panel) data analysis	Program evaluation Healthcare provider's perspective	Asthma self-management program	Intervention Costs: Cost of the education program Consequences: Change in health status and health care utilization	Health status of the participants improved significantly compared to pre-intervention. Return on investment was found to be 254percent.	All health status and health care utilization data was collected through self-reported data. There is no control group. No covariates controlled.
Feldman et al. 2005 (34)	628 patients	Longitudinal (panel) data analysis	Program evaluation Healthcare provider's perspective	Information-based provider reminder to improve self-care management	Intervention costs: Administrative costs Consequences: health care utilization and improvement in quality of life scores	Overall cost of 5percent improvement in the quality of life score was \$183 for the basic intervention and \$235 for the augmented intervention compare to usual care.	Costs and consequences were not expressed clearly. Timeline of the study is not clear.
II. ACUTE CARE							
Wheeler et al. 2003 (35)	452 women	Longitudinal (panel) data analysis	Cost-benefit analysis Healthcare provider's perspective	Heart disease self-management program	Intervention Costs: Personnel cost, material cost Consequences: Change in health care utilization	Program participants experienced 46percent fewer in-patient days and 49percent lower in-patient costs compared to control group. Hospital cost savings exceeded program costs by a ratio of nearly 5-to-1.	None identified.

Study (Reference)	Setting / Study Participants	Study design	Economic Analysis / Perspective	Domain: QI initiative / intervention and target condition	Costs and consequences considered	Results of the study	Limitations
Solberg et al. 2002 (36)	18 provider groups (HMOs)	Longitudinal (panel) data analysis ANCOVA	Cost vs. quality comparison Healthcare provider's perspective	Comparison of the quality of ambulatory care among different providers	Intervention Costs: No intervention Consequences:	No significant relationship between overall cost of care and quality on any measures.	No covariates was controlled which may effect the costs.
Rogowski et al. 2001 (37)	19 Neonatal Intensive Care Units 3391 patients	Longitudinal (panel) data analysis	Program evaluation (Cost-benefit analysis) Healthcare provider's perspective	Quality improvement through collaborative	Intervention Costs: Personnel costs, administrative costs, material costs Consequences: Change in health care utilization	Costs per patient reduced. On average hospitals spent \$68,206 for the intervention. Average saving per hospital was \$2.3 million in the post-intervention year.	Voluntary participation of the hospitals in the study can create bias.
O'Connell et al. 2000 (38)	60.000 members of a health plan	Longitudinal (panel) data analysis	Program evaluation (Cost-benefit analysis) Healthcare provider's perspective	Telephone-based nurse triage service	Intervention Costs: Personnel costs, implementation fees, communication and triage costs Consequences: Decline in emergency department and physician office utilization.	Emergency department and physician office services decreased significantly. Return-on-investment ratio was found to be 1.7-to-1.	There is no control group. No covariates controlled.

Study (Reference)	Setting / Study Participants	Study design	Economic Analysis / Perspective	Domain: QI initiative / intervention and target condition	Costs and consequences considered	Results of the study	Limitations
Lorig et al. 1999 (39)	952 adult (40+) patients	ANCOVA Two-way analysis	Program evaluation (Cost-benefit analysis) Healthcare provider's perspective	Self-management program for chronic diseases	Intervention Costs: Personnel costs, material costs, administrative costs Consequences: change in health behaviour, change in health status, change in health care utilization	Improvement in health behaviour, reduced health care utilization, improvement in the health status. For the treatment subjects, savings in hospital utilization exceeded the program costs by a ratio of nearly 12-to-1.	Voluntary participation in the study can create bias. Costs were not calculated in detail. Utilizations measured by self-administrative questionnaires.
III. LONG-TERM CARE							
Wodchis et al. 2007 (40)	99 long term care facilities	Longitudinal (panel) data analysis	Cost vs. quality comparison Healthcare facility's perspective	Comparison of quality vs. cost	Intervention Costs: No intervention Consequences:	Authors found that one quality indicator is directly related to costs another indicator is inversely related to costs.	Only facility level costs were considered rather than health care provider's costs.
Mukamel and Spector 2000 (41)	525 nursing homes	Longitudinal (panel) data analysis	Cost vs. quality comparison Healthcare facility's perspective	Comparison of quality vs. cost	Intervention Costs: No intervention Consequences:	Non-linear relationship btw quality and costs suggests that there are quality regimens in which higher quality is associated with lower costs.	Only facility level costs were considered rather than health care provider's costs.

Study (Reference)	Setting / Study Participants	Study design	Economic Analysis / Perspective	Domain: QI initiative / intervention and target condition	Costs and consequences considered	Results of the study	Limitations
IV. PALLIATIVE CARE							
Morrison and Meier (42)	Case study					In this study authors combined some peer reviewed articles, newspaper articles, and some other statistics to show that quality improvement in palliative care can reduce overall health care utilization.	
Penrod et al. 2006 (43)	314 older patients	Longitudinal (panel) data analysis	Cost vs. quality comparison	Effect of palliative care on ICU use and hospital costs	Intervention Costs: No intervention Consequences:	Palliative care patients were 42percent less likely to be admitted to ICU. Total direct costs per day were \$239 lower and ancillary costs were \$98 lower than costs for usual care patients. There was no difference in pharmacy costs.	None identified.
Morrison et al. 2007 (44)	22714 older patients	Longitudinal (panel) data analysis	Cost vs. quality comparison	Hospital-based palliative care consultation	Intervention Costs: No intervention Consequences:	Palliative care consultation is associated not only with improved clinical care and increased family satisfaction but also results in significant cost savings when compared to usual hospital care.	

Appendix C. Summary Of Cost Avoidance Calculations

Selected Preventable Hospitalization Reasons and Potential Savings through Quality Improvement in Saskatchewan^{1,5}

	Number of hospital admissions		Number of hospital admissions per 100,000 population		Average length of stay (days)		Total length of stay (days)		Potential reduction (%) in hospitalization through quality improvement ²			RIW factor ⁴	Potential savings (\$) through quality improvement (SK) ³		
	Canada	SK	Canada	SK	Canada	SK	Canada	SK	Low	High	Average		Low	High	Average
Chronic Diseases															
- Diabetes Mellitus	30,065	1,909	97	187	10.0	8.0	301,571	15,181	9	71	34	1	\$1,024,718	\$8,083,883	\$3,871,155
- Hypertensive Diseases (High Blood Pressure)	12,375	953	40	93	8.6	5.3	106,346	5,023	16	16	16	1	\$602,760	\$602,760	\$602,760
- Asthma	31,013	1,392	101	136	3.5	3.6	109,414	5,074	15	32	24	1	\$570,825	\$1,217,760	\$913,320
Acute Myocardial Infarction	64,930	2,375	211	232	8.4	7.0	543,628	16,581	21	60	36	1	\$2,611,508	\$7,461,450	\$4,476,870
Pneumonia, Influenza, and Bronchitis^{6,7}	69,134	3,675	1,791	2,482	9.6	8.1	663,686	29,768	63	79	71	1	\$11,105,144	\$14,677,244	\$12,891,194
Adverse Effects of Medical Agents	17,423	989	56	97	3.6	2.6	62,735	2,558	93	93	93	1	\$1,784,205	\$1,784,205	\$1,784,205
Complications of Medical and Surgical Care	55,616	1,934	184	189	8.4	8.2	476,405	15,812	49	58	55	1	\$5,810,910	\$6,878,220	\$6,522,450
Total potential savings:												\$23,510,069	\$40,705,521	\$31,061,954	
Adjusted to 50%:												\$11,755,035	\$20,352,761	\$15,530,977	
TOTAL (all reasons for hospitalizations)	2,889,586	134,316	9,370	13,133	7.2	6.0	20,939,966	804,413							
2007 sick time cost estimates (SAHO) – \$57 million per year. Assume 60% of sick time requires replacement - \$34.2 million, Reduction in sick time to bring SK (15.2 days) to level of national average (12.8 days) would result in \$6.2 million (18%) in savings. Apply this to 50% of workforce:															\$3,100,000
Reduction in turnover costs. Assume annual cost to SK for RN turnover at \$40 million (SUN estimate). Experience from United States demonstrates turnover reductions of 50% are possible. Assume conservative reduction of 10% would result in \$4 million. Apply this to 50% of workforce:															\$2,000,000
Estimated net cost avoidance due to improved efficiencies via FHHR Pursuing Excellence Program - \$600,000. Extrapolated to 50% of province.															\$6,000,000
Total potential savings/cost avoidance															\$26,630,977

NOTES:

¹ Hospital admissions and length of stay data were retrieved from CIHI's Hospital Morbidity Database Report (HMDB), 2000/01.

² Numbers were taken from peer-reviewed journal articles. The list of the articles can be found at the "Reference" section of the document.

³ In order to make the calculation for potential savings, total length of stay and potential reduction percentages were multiplied by \$750 (approximate cost of per patient per hospital day in a non-teaching hospital in SK). Since the significant portion of the admissions were to RUH, which is a teaching hospital, and the cost of per patient per hospital day in teaching hospitals is higher than non-teaching hospitals (approximately \$1000 per patient per hospital day) potential savings will likely be higher than the ones reported in the table.

⁴ Each condition has unique resource consumption at the hospital. The resource consumptions are expressed with RIW. In the table above it was assumed each condition has equal resource consumption. This unrealistic assumption will be replaced by the true RIW. This will affect the potential savings.

⁵ In the table only selected conditions were reported. A system-wide quality improvement (QI) will likely to affect other aspects of the system such as effective and efficient use of work force, lean management techniques, and conditions that are not reported in the table. Thus the potential savings reported in the table are very conservative numbers.

⁶ Admissions for pneumonia, influenza, and bronchitis were reported only for seniors (65+) in the table. The reason behind that is the dominant QI strategy for pneumonia, influenza and bronchitis is vaccination. Since to vaccinate the whole population may not be cost-effective, calculations were made for only senior patients. Senior patients constitute over 60 percent of pneumonia, influenza, and bronchitis related hospital admissions. For this reason free of charge vaccination for seniors is thought to be cost-effective. The potential savings reported in the table considers the cost of vaccination of all seniors in the province.

⁷ Since the HMDB, 2000/01 does not report the hospital admissions by age group for each province; it was assumed that the ratio of whole population for pneumonia, influenza, and bronchitis admissions to senior population for pneumonia, influenza, and bronchitis admissions in SK is identical to Canadian average that was reported in the HMDB. "Number of hospital admissions per 100,000 population" cell for "Pneumonia, Influenza, and Bronchitis" row was calculated using this ratio.

Prevalence Rates for Selected Conditions in Saskatchewan

	Population with the condition	95% confidence interval	Prevalence rate (%)
Diabetes	40,072	35,073 – 45,072	5.1
Asthma	67,034	60,132 – 73,936	8.5
High Blood Pressure	125,145	118,290 – 132,000	15.9
Arthritis or Rheumatism	149,754	141,267 – 158,240	19.0

Source: Canadian Community Health Survey, 2005

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