Improvements in Cardiovascular Disease Risk Factors after Five Years of a Population-Based Intervention: The Heart of New Ulm Project

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BACKGROUND

- Started in 2009, the Heart of New Ulm (HONU) Project is a community-based demonstration project aimed at reducing CVD and associated risk factors in the rural community of New Ulm, MN.

- HONU targets the 7,855 adults age 40-79 years who reside in the 56073 ZIP code. The community is 98% white.

- Interventions are delivered at all levels of the social ecological model (Individual, institutional, community, environmental, policy) via community, worksite, and healthcare settings.

- The community is served by one health system (Allina Health) that operates New Ulm Medical Center, the only clinic and hospital in the community. The medical center is a key partner in the project and their electronic health records (EHR) are used for ongoing surveillance of CVD risk factors.

- We aimed to assess population-level changes in CVD risk factors over the first 5 years of the HONU Project.

METHODS

- EHR data was extracted to create multiple cross-sectional data sets for baseline (2008-2009) and two follow-up periods (2010-2011, 2012-2013).

- Residents were included if they lived in the target zip code, were age 40-79, and had at least one ambulatory visit during the time frame. The most recently known value of each CVD risk factor during each time period was extracted. Medication use was measured by the presence of an active prescription order during the time period. Risk factors were dichotomized into categories of 'at goal' or 'high-risk.'

- Generalized estimating equations were used to model the risk factors in order to adjust for within-subject correlation due to repeated measures. Models with continuous measures for the CVD risk factors and with binary dependent variables (at goal/high-risk) were run. Adjustment was included for time period, age, and gender.

- To examine changes stratified by baseline risk factor status (at goal/ high risk), analyses were limited to the cohort of individuals with data at baseline for each risk factor being examined.

Table 1: Prevalence of modifiable CVD risk factors in the EHR for target area residents age 40-76

	2008/09 n = 7222	2010/11 n = 7432	2012/13 n = 7584	p-value
Systolic BP (mmHg)	125.7 ± 0.2	125.1 ± 0.2	124.7 ± 0.2	<0.001
Diastolic BP (mmHg)	74.7 ± 0.1	73.7 ± 0.1	72.7 ± 0.1	<0.001
BP at goal (<140/90 mmHg), %	78.7	81.3	84.3	<0.001
BP medication, %	33.5	39.1	44.1	<0.001
LDL (mg/dL)	115.0 ± 0.5	111.5 ± 0.4	112.5 ± 0.4	<0.001
LDL at goal (< 130 mg/dL), %	68.0	72.4	72.1	<0.001
HDL (mg/dL)	50.7 ± 0.2	49.1 ± 0.2	48.9 ± 0.2	<0.001
HDL at goal (≥ 40 men, ≥ 50 women), %	64.0	58.9	57.8	<0.001
Lipid medication , %	19.8	24.2	28.0	<0.001
Triglycerides (mg/dL)	140.4 ± 1.1	133.8 ± 1.0	132.4 ± 1.2	<0.001
Triglycerides at goal (<150 mg/dL), %	66.4	68.7	70.1	<0.001
BMI (kg/m²)	30.1 ± 0.1	30.1 ± 0.1	30.1 ± 0.1	0.534
Not obese (< 30 kg/m²), %	55.9	55.6	55.4	0.474
Glucose (mg/dL)	105.6 ± 0.4	106.6 ± 0.5	109.4 ± 0.5	0.001
Glucose at goal (<100 mg/dL), %	54.3	55.4	47.9	<0.001
Aspirin / Anti-platelet medication, %	23.3	30.0	36.0	<0.001
Non-smoking, %	86.2	86.1	86.3	0.080

Continuous outcomes are reported as mean ± standard error, and categorical are reported as percent. P-values are a test for trend.

Table 2: Changes in modifiable CVD risk factors in the EHR among those with high-risk baseline values

High-Risk Definition , n	2008/09	2010/11	2012/13	p-value
SBP/ DBP (≥ 140/90 mmHg), n = 1382	148.1 ± 0.3	135.3 ± 0.5	133.1 ± 0.5	<0.001
	82.2 ± 0.3	76.9 ± 0.3	75.4 ± 0.3	<0.001
BP Medication Use, %	47.8	58.5	64.8	<0.001
LDL (≥ 130 mg/dL), n = 1513	152.6 ± 0.5	134.9 ± 0.9	131.2 ± 0.9	<0.001
Cholesterol Medication Use, %	16.9	28.8	35.7	<0.001
HDL (<40 men, <50 women), n = 1019	34.8 ± 0.1	35.4 ± 0.2	35.5 ± 0.2	<0.001
Cholesterol (≥200 mg/dL), n = 1985	229.1 ± 0.5	210.3 ± 0.8	207.1 ± 0.9	<0.001
Triglycerides (≥150 mg/dL), n = 1609	222.6 ± 2.2	188.8 ± 2.3	179.9 ± 2.4	<0.001
BMI (≥30 kg/m²), n = 2462	35.6 ± 0.1	35.4 ± 0.1	35.3 ± 0.1	<0.001
Glucose (≥100 mg/dL), n = 2391	123.7 ± 0.7	119.8 ± 0.9	122.1 ± 1.0	<0.001

Continuous outcomes are reported as mean ± standard error, and categorical are reported as percent. P-values are a test for trend.

RESULTS

- Of the 7,855 residents in the target population, 92-97% had visits during at least one time period.

- Residents with visits were 52% female and mean age was 55.9, 56.5, and 57.1 years old for each time period.

- In each time period, data availability for blood pressure (BP) was 88-96% and 55-67% for lipids.

- Mean BP decreased consistently across the 3 time periods. The proportion of residents with BP at goal increased from 78.7% to 84.3%.

- The proportion with LDL at goal increased from 68% to 72%.

- Mean triglycerides decreased 8 points, and the proportion at goal increased from 66.4% to 70.1%.

- Medication (anti-hypertensive, lipid, and aspirin/anti-platelet) orders increased.

- BMI, glucose, and smoking did not change. Poor HDL, and high glucose prevalence increased.

- There were few differences by gender: women had larger improvements in BP.

- The largest reductions in BP and LDL occurred among those with elevated levels at baseline. Individuals not at goal at baseline experienced a significant reduction in mean systolic BP (148.1 to 133.1 mmHg) and LDL (152.6 to 131.2 mg/dL).

CONCLUSIONS

- Significant improvement for BP and lipids were noted over five years in the HONU population. The bulk of these improvements were experienced by those who were not at goal at baseline, and were at least partially due to significant increases in the use of BP and lipid medications. Clinically relevant improvements in metabolic risk factors (high BMI, low HDL, high blood glucose) were not observed.

- The magnitude of population-level improvements for BP and LDL in HONU during this study timeframe exceed most national trends.

- HONU interventions included clinical and non-clinical, high-risk and population-based strategies. Efforts to determine the relative contribution of medication versus lifestyle changes are complex with EHR data, but are being explored.

- Next steps include comparison of CVD risk factor trends to a similar population (without HONU interventions) served by the same health system.

The authors have no conflicts of interest to report.