Biometric Cardiovascular Disease Risk Factors and Workplace Productivity Loss

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Program Description and Purpose

The Heart of New Ulm Project (HONU) is a 10-year demonstration project aimed at reducing myocardial infarctions (MI) and modifiable heart disease risk factors in New Ulm, Minnesota. For more information, visit www.heartsbeatback.org. The long-term goal of the project is reduction of acute MI and the moderate-term (5-year) goal is to reduce modifiable heart disease risk factors at a community level.

HONU is monitoring cardiovascular heart disease (CHD) risk factors in the community. This research was conducted to inform interventions with worksites. Although there is growing literature on workplace productivity, more studies are needed to understand its determinants and consequences, as well as refine its definition[1,2] and measurements.

Metabolic syndrome has been associated with increased illnesses days and increased trend of short-term disability incidence.[3] Literature on presenteeism has preliminary evidence that it can be affected by worksite health promotion (WHP) and some risk factors are of importance.[4] Absenteeism has been shown to decrease among those participating in WHP and potential mechanisms involved might be related to improved psychological well-being, increased exercise and weight reduction.[5]

Purpose of study: To evaluate the association between workplace productivity and levels of biometric risks among people attending community health screenings offered by the HONU Project.

Acknowledgements

Methods

- Free heart health screenings were offered to any adult resident in target zip code in 2009. Screenings were held at a variety of locations including worksites, medical center, churches and other community spaces. Participants completed a questionnaire and biometric measures (i.e., blood pressure, height, weight, waist circumference, fasting blood draw).

- Analysis for workplace productivity was conducted on a subsample of 2,910 fasting adults aged 18-86 years who worked at least 16 hours/week, did not report diabetes or heart disease, and underwent a CHD risk screening.

- Workplace productivity loss was created by combining absenteeism and presenteeism from the Work Productivity and Activity Impairment questionnaire[6], reflecting the percentage loss of all available work hours (per work agreement) due to health reasons.

- Predictors included: systolic and diastolic blood pressure; total, HDL and LDL cholesterol; triglycerides, c-reactive protein (CRP), blood glucose and glomerular filtration rate. Multiple linear regression analyses were conducted to identify significant predictors (p<0.05) (all models were adjusted for age and sex). All analyses were conducted using SAS 9.2 (SAS Institute Inc., Cary, NC).

Results

After adjustment for age and sex, only CRP was retained as a significant predictor of workplace productivity loss.

- Least squares adjusted mean±SE productivity loss was 7.1±1.1% for CRP >10.0 (mg/L), 5.9±0.5% for CRP 3.1-10.0, 4.9±0.4% for CRP 1.0-3.0, and 4.4±0.4% for CRP <1.0 (overall model p<0.001).

- Post hoc comparisons revealed that workplace productivity loss for participants with CRP >10.0 was significantly greater than other CRP categories, except CRP 3.1-10.0, and participants with CRP 3.1-10.0 had significantly greater productivity loss relative to those with CRP <1.0.

Descriptive characteristics of 2009 screening participants with a work commitment of at least 16 hours/week and no history of heart disease or diabetes (n = 2910)		
Variable	**n**	**Percent**
Age (mean ± sd yrs)	46.5 ± 11.8	
Female	1647	56.6
White	2813	96.7
College Degree or Higher	1023	35.2
Health Insurance	2838	97.3
High Stress (8-16)	346	11.9
BMI (kg/m²)		
Normal (18.5-24.9)	776	26.7
Overweight (25-29.9)	1042	35.8
Obese (>30)	1065	36.6
Physical Activity*	1928	66.5
Fruit and Vegetables (> 5 servings / day)	383	13.2
Alcohol Consumption (1-14 drinks / week)	1796	61.7
Current Non-smoker	2565	88.1
High BP: ≥140/90 mmHg , %	622	21.4
High Total Cholesterol: ≥ 200 mg/dL , %	1366	46.9
High LDL: ≥ 130 mg/dL, %	1108	38.1
Low HDL: < 40 (men) or 50+ (women) mg/dL, %	834	28.7
High Triglycerides: ≥150 mg/dL, %	776	26.7
hs-C-reactive Protein, mg/dL %		
> 10.0	156	5.4
3.1-10.0	690	23.7
1.0-3.0	1083	37.2
<1.0	981	33.7
Impaired GFR: < 60 mg/dL %	155	5.3
High Glucose: ≥ 100 mg/dL %	641	22

* Based on >50 min / week of moderate intensity equivalent

hs-C-reactive Protein Level by Workplace Productivity Loss Percentage
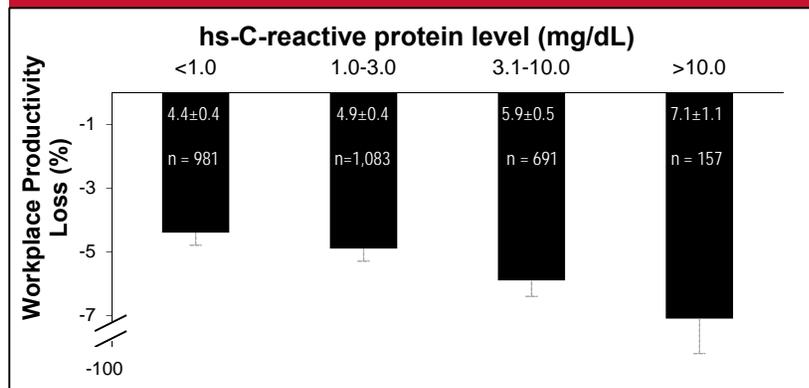
Discussion

- Literature on worksite productivity is relatively young, varied and in need of additional studies to determine which risk factors are predictors of absenteeism and presenteeism. Addressing inflammatory markers may potentially be useful for the improvement of CHD health and as a consequence, influence worksite productivity.

- As inflammation plays a role in the development of atherosclerosis and CHD, attention is drawn to inflammatory markers' usefulness in predicting CHD risk[7]. High-sensitivity c-reactive protein (hs-CRP) is one of the inflammatory serum biomarkers associated with the risk of CHD in prospective studies.[7] CRP is a protein produced by liver and adipocytes and vascular smooth muscle cells in response to a rise in interleukim-6 and tissue necrosis factor-alpha.[8-9] Infections, inflammatory conditions and cancer often cause the increase of CRP levels.[8,10]

- Low risk for CHD is observed at a CRP value of <1 µg/ml and levels above 3 µg/ml increase the risk of CHD.[7] Medications like statins and healthy behaviors like smoking cessation, weight loss and physical activity are known to reduce CRP levels.[11-15] Associations have been found between state-level socioeconomic conditions and CRP among healthy women[16].

- Although CRP is still under debate since recent studies have not supported a causal role for it in atherogenesis[11], inflammatory markers may be more useful for those in the intermediate-risk category.[7]

Conclusion

The only biometric risk factor associated with worksite productivity was CRP. Relative to optimal CRP <1.0 µg/ml, CRP >3.0 µg/ml is associated with less productivity. At high levels, this may be reflective mainly of CRP's sensitivity to acute flu. CRP may also stand as a marker of other risks (e.g., obese, sedentary) that have a direct impact on productivity loss. More research is needed to examine the degree to which CRP consistently stands out as independent predictor of workplace productivity.

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